THE MAGAZINE OF THE ILLUMINATING ENGINEERING SOCIETY

# LD+A

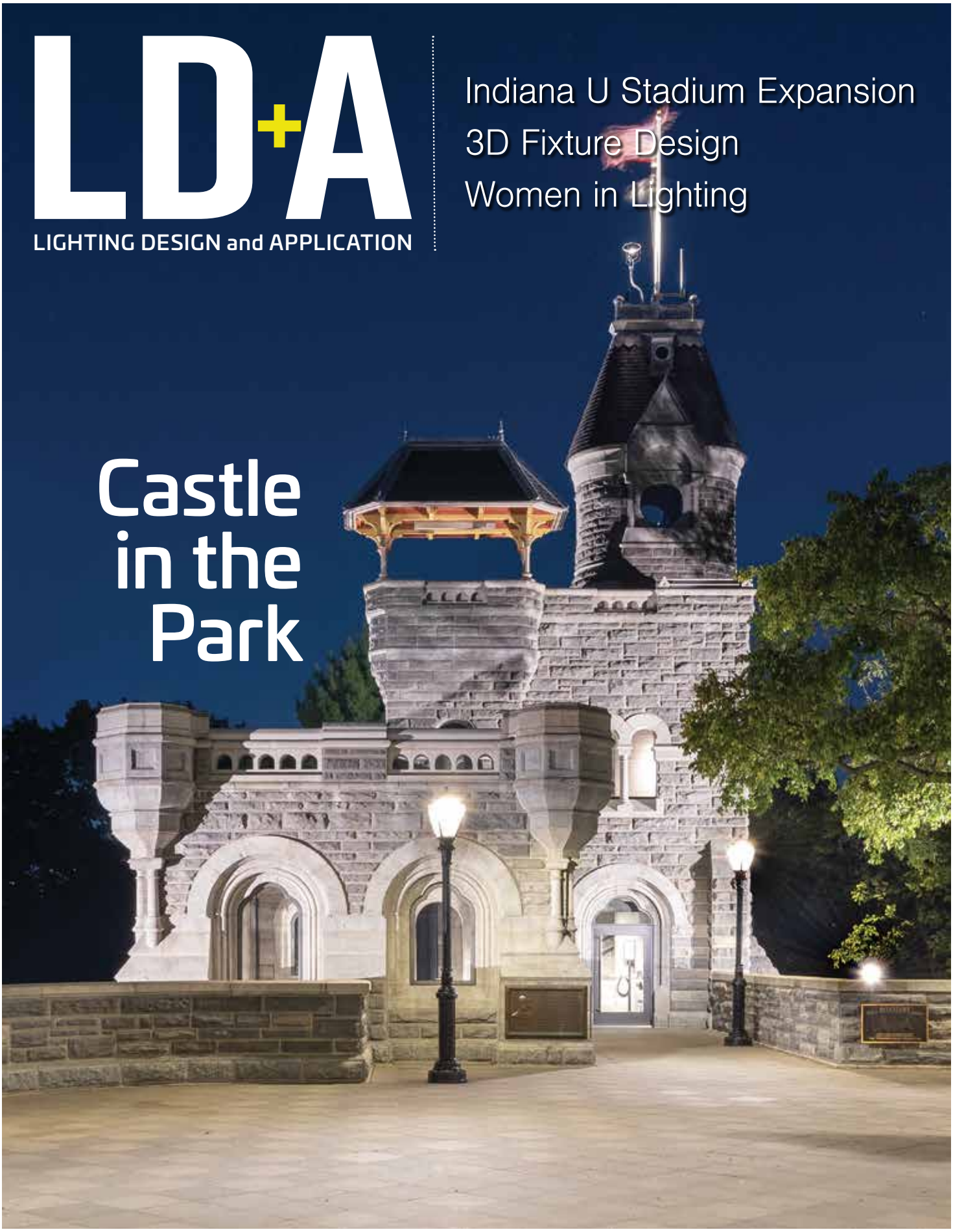
LIGHTING DESIGN and APPLICATION

Indiana U Stadium Expansion

3D Fixture Design

Women in Lighting

## Castle in the Park



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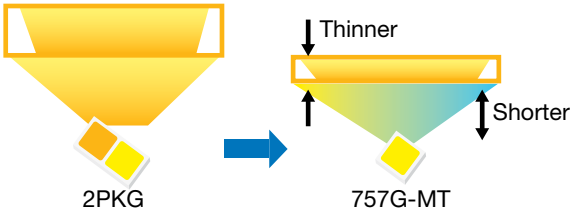


## Operational Freedom

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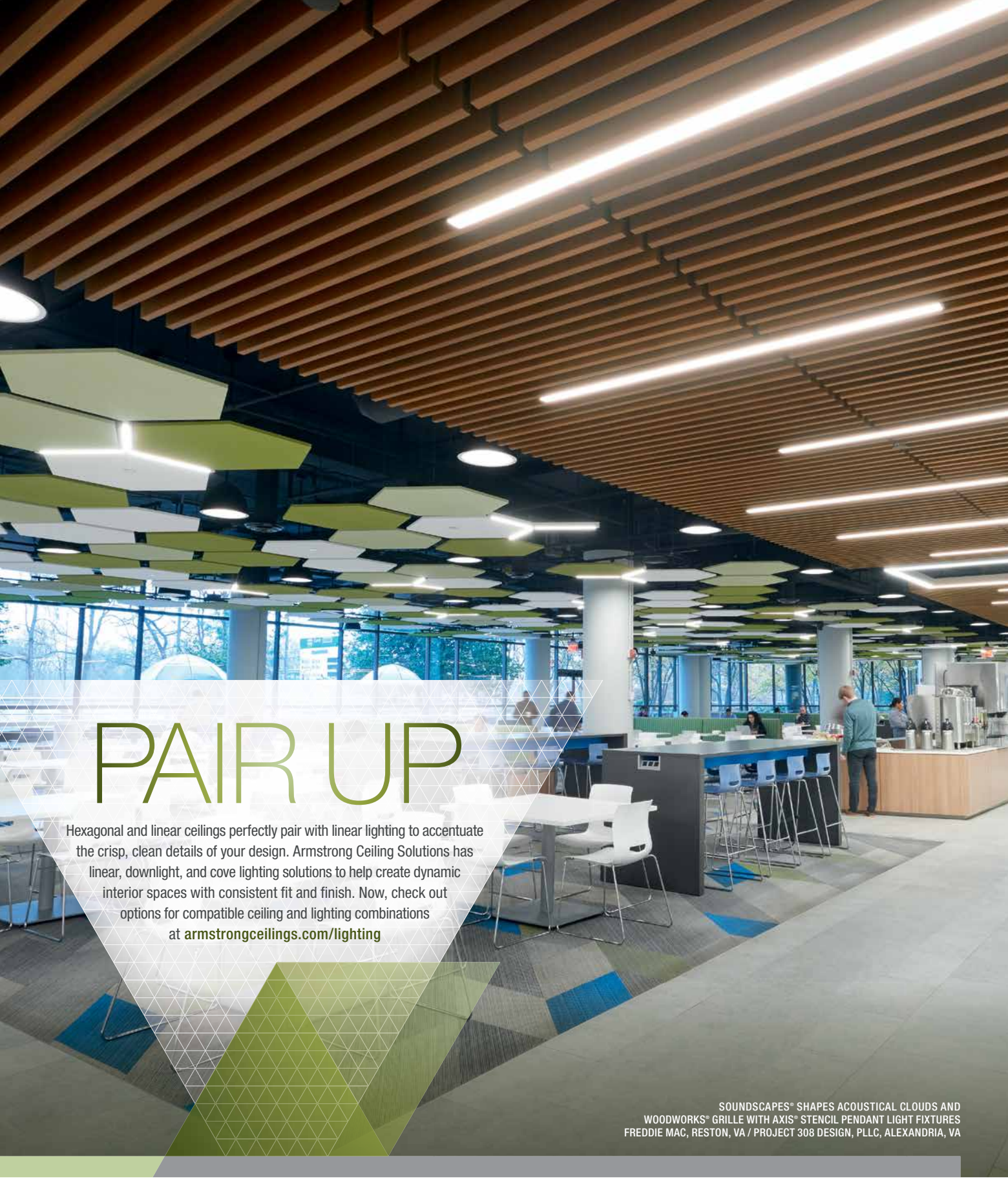

# PAIR UP

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## FIRST UP



## IN THIS ISSUE



## IN EVERY ISSUE




Photo: Jason Keen

## FEATURES



**On The Cover**
Floodlights wash the Belvedere Castle's façade with illumination at 3000K, bringing out the warmth of its stone surfaces (p. 40). Photo: Timothy Schenck

# EDITOR'S NOTE

## It's Just Business

The sweet spot for *LD+A* is usually the intersection of the art and science of illumination—where design, technology, research and application converge. But just as President Calvin Coolidge once said "the business of America is business," *LD+A* tries to give the business side of lighting its due.

Paul Pompeo, our second-longest tenured columnist trailing only Willard Warren, has been offering career and hiring advice for candidates and companies for well over a decade. Mark Lien's "Progressions" column often looks at the business of our industry in terms of the types of companies banging on our door and hoping to enter our market. And our first-ever "Market Sector" report in January on the transformative potential of connected lighting, light and health, and horticulture lighting got a lot of traction and commentary on our social media feeds.

> "You don't often hear 'FBI' and 'lighting' in the same sentence

There's a greater urgency today than ever for *LD+A* to home in on the business side. The technology revolution is over and LEDs won. A maturing market has resulted in fewer innovative product launches. Don't take my word for it, just look at the declining number of IES Progress Report submissions—from 2009 to 2019, that number has dropped more than 50% from 264 to 129. In fact, as Mark points out, much of the cutting-edge stuff today is coming from outside the industry. "The circadian light by my nightstand is very innovative. It is packed with sensors and features and comes from Casper, the mattress company. It is not from our lighting community." How will our companies respond? Will smart lighting, light and health, and horticulture products fill the gap left by a mature luminaire market?

There's other news to report on the business of lighting. As first reported in *EdisonReport*, 40 importers, to date, have been banned from LightFair and 145 applications from new exhibitors have been rejected due to the potential for unscrupulous business practices, including subletting of booth space and intellectual property theft. You don't often hear "FBI" and "lighting" in the same sentence, but LightFair has also had at least one phone call with the Bureau regarding protecting IP at the Las Vegas show.

In other words, we mean business.

**Paul Tarricone**
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LD+A
LIGHTING DESIGN and APPLICATION

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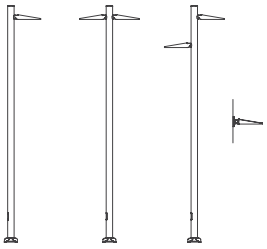

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# CONTRIBUTORS

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# PRESIDENT'S PERSPECTIVE

**Jennifer Jaques**

I am writing this article sitting at the desk in my home office, the same office where Lighting Application Sciences was born 20 years ago. As with every company, there were stretches and contractions over time, each of them teaching me something I didn't know or understand before. Sometimes I lost my ignorance gracefully, sometimes I was kicking and arguing, resolute in my stubbornness. This is my last article as your Society president, and with it comes the acknowledgement of my personal *Evolutionary Year*.

When I first considered submitting my nomination documents for this office, I spoke with many people seeking insight, opinions and suggestions. To be honest, it was about a 50/50 split between those who thought I should submit, and those who thought I shouldn't. Their reasons were varied, but many spoke of the time commitment, added stress, additional travel, and aspects of the Society that I didn't know or might not be able to manage well. It's true, this role requires more of you in transient ways like time, travel, stress and responsibility. But this role also requires attributes like vitality, mental acuity, the ability to build connections, positivity, flexibility, compassion and strategic thinking.

For me, the opportunities to step outside of "what I know" were chances that I relished to lessen my ignorance, weaken my stubbornness, and discover skills and attributes I didn't know existed. These opportunities were even more impactful because of the unending support from the Board of Directors, committee members and IES staff.

The IES was also in an *Evolutionary Year* during my term as president. This was the year we sought measurable improvement by continuing building and improving upon the changes that many of you are now experiencing on-line and in-person. We made noticeable improvements across all educational opportunities. We have the IES Ready Reference mobile app available in three languages, the IES GO Podcast and FIRES—all launched during the 2019-2020 fiscal year. Brienne Willcock joined our staff as education coordinator, and was pivotal in the launch of the IES eLearning portal—have you checked it out yet?

All of our technical committees have worked, and continue to work very hard to reaffirm, update or amend every existing standard and the *Lighting Handbook*. Upon completion, for the first time in three generations, the IES *Handbook* content will be vetted and approved by IES/ANSI technical committee consensus. Perfect timing too, as all of our standards will be in the Lighting Library when it launches in August 2020. The Lighting Library will take our standards to a digital format, enabling users to access them from any device and utilize our documents in a whole new way.

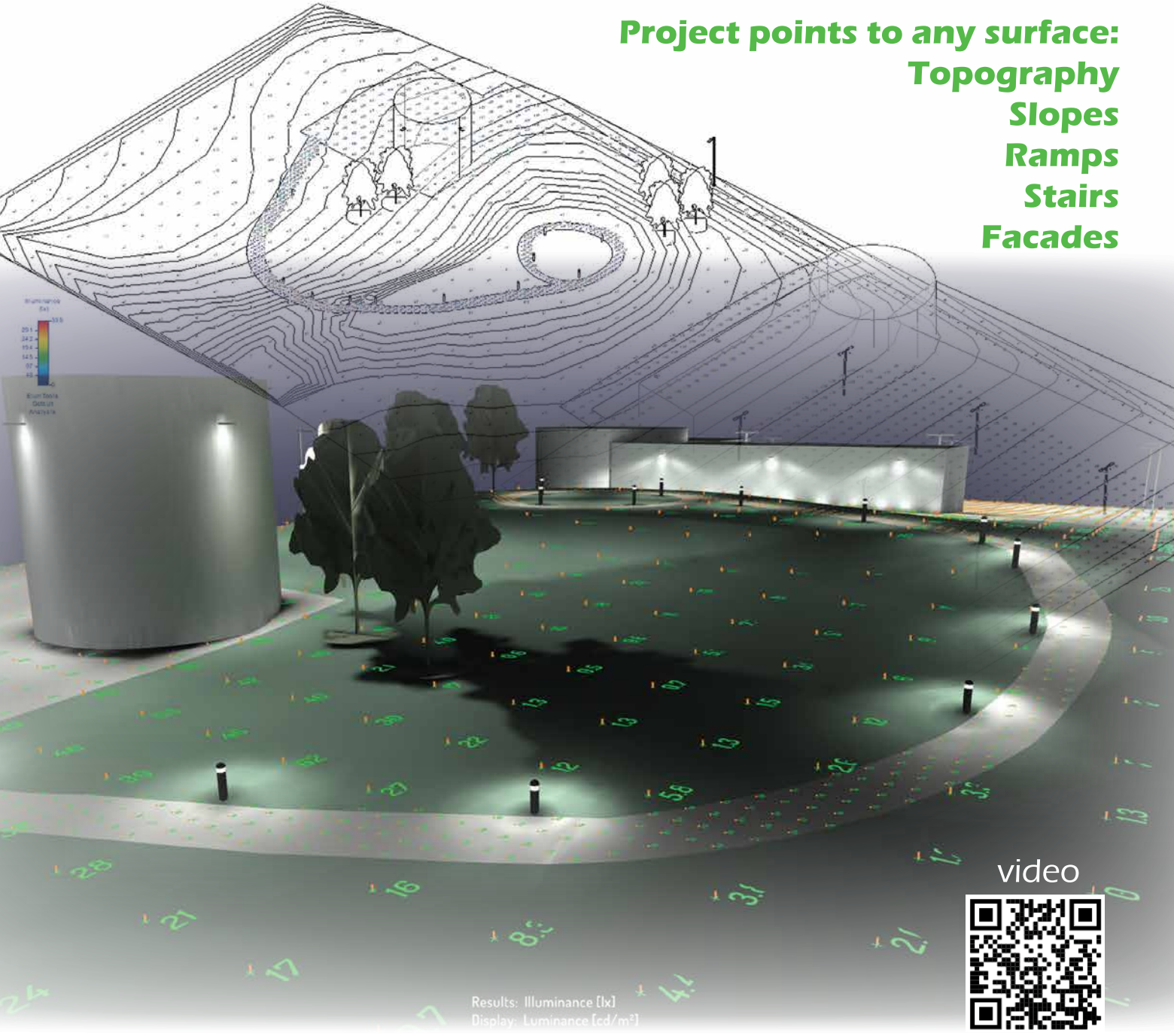
> "The opportunities to step outside of 'what I know' were chances that I relished to lessen my ignorance and discover skills and attributes I didn't know existed

**Our membership is growing,** most notably in the retention of Sustaining Members. A new Sustaining Membership model was rolled out that increases benefits for the company itself, not just for the employees, so if your company is not an IES Sustaining Member yet, they should be. Of course, without our individual members our Society would be a very different entity. So many of us were introduced to IES, and sometimes the lighting industry, by an impactful colleague, friend or mentor. Many of us then "pay it forward" by sharing our love of the Society and the industry by inviting others, mirroring how we were introduced to IES.

My personal thanks to Fred Oberkircher and Nick Bleeker for inviting me to consider the Annual Conference Committee Chair role years ago. Without their encouragement I wouldn't have begun participating at the Society level.

Every drop of water creates a ripple in the pond, which can then feed a river. Every member of our Society and the lighting industry has the ability to create a ripple and impact our Society. Every effort builds until the community is strong with the voice of a mighty river.

# Create True 3D Analysis for Exterior Applications!

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# INSIGHTS

JFK Upgrade • UV Hybrid • Lifetime Award

Photo: TWA Hotel/David Mitchell

Geometric 1960s-style pendants define the new TWA Hotel's underground ballroom.

## Flight of Fancy

*Six miles of LED tape illuminate JFK's first on-airport hotel*

John F. Kennedy Airport's new TWA Hotel—located within architect Eero Saarinen's renovated and restored 1962 TWA Flight Center in New York City—harkens back to the golden age of flying, pairing a contemporary guest experience with the glamour that defined the Jet Age.

Saarinen's iconic concrete-and-glass flight center serves as the hotel atrium, with bars, shops and trendy eateries connected to guest rooms and the airport's main terminal by red-carpeted tubular jetways. A new 50,000-sq-ft subterranean conference center and lounge—located 40 ft below a mock runway and vintage airplane refurbished as a cocktail lounge—connects the twin hotel buildings that now flank the flight-center atrium.

Cooley Monato Studio (New York City) designed the lighting for the hotel and event spaces, while also paying homage to the landmark building's midcentury roots. Museum-style exhibitions are illuminated by subtle BeveLED Mini fixtures (USAI Lighting), which use white-light LED technology set to 2700K to emulate a warm, white glow typical to the era. Lay lights in the meeting rooms and ballroom clerestory create the impression of diffused daylight, while custom 6-ft diameter decorative pendants provide ambient light for the 21-ft high ballroom. Finally, nearly six miles of low-wattage linear LED tape integrated into architectural details provides indirect illumination while maximizing ceiling heights.

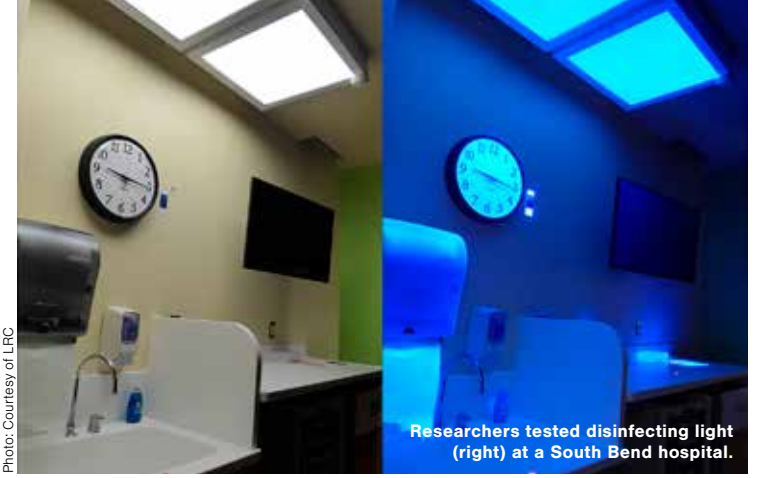


Photo: Courtesy of LRC

Researchers tested disinfecting light (right) at a South Bend hospital.

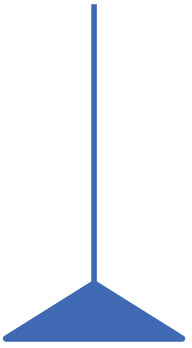
## LRC Evaluates Hybrid System to Reduce Infections

Recent findings from the Lighting Research Center's (LRC) assessment of a hybrid lighting system for mitigating healthcare-associated infections (HAIs) should "form the foundation for the next generation of this technology," says LRC professor Dr. Mark Rea—a critical next step given the rising number of patients who contract HAIs in U.S. hospitals.

Published in *Lighting Research & Technology* in February, the findings support the LRC's expectation that decontamination of room surfaces will improve when the human element is removed and replaced with an alternate "no-touch" method, including short-wavelength light, ranging from ultraviolet (UV) to blue light (200 nm to 410 nm).

LRC researchers' tested the theory with a new hybrid lighting system (developed by GE Current, a Daintree company) designed to provide both visible white light and disinfecting UV-A. The system was retrofitted into a modern hospital newborn intensive care unit (NICU) at the Memorial Beacon Children's Hospital in South Bend, IN.

The researchers found that eight-hour exposures on counter surfaces were effective for suppressing pathogens identified by the CDC as highly problematic for healthcare facilities, and the team is currently planning future demonstrations in another hospital with greater bioburden.





$3.5 BILLION

Estimated lighting fixtures market in the Middle East and North Africa in 2020, according to the Centre for Industrial Studies

## Borden Receives LIT Lifetime Award

Alfred R. Borden, founder and principal of The Lighting Practice, has received the LIT Design Awards' 2019 Lifetime Achievement Award. Borden opened The Lighting Practice's Philadelphia office in 1989, and has since been credited for the relighting of numerous iconic buildings and landmarks, including the Empire State Building, Madison Square Garden, Philadelphia City Hall, Thomas Edison Memorial and the Trinity Centre.

An IALD Fellow, Borden also became one of the first Certified Lighting Designers in 2016. Borden is also committed to supporting his local community in Philadelphia. Since 2002, he has worked with "Lights for the Cure" to help building owners turn their building façades pink for the Susan G. Komen cause.

## THEY SAID IT...

"How many times are women offered the only pink construction helmet on a job site? How many times are male coworkers turned to first in a meeting, even though they are not the lead on the project? In the workplace, how often have you heard women referred to as 'girls?' "

**Megan Carroll and Kelly Roberts, "Power in Numbers," p. 54**

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## MERGERS & MORE

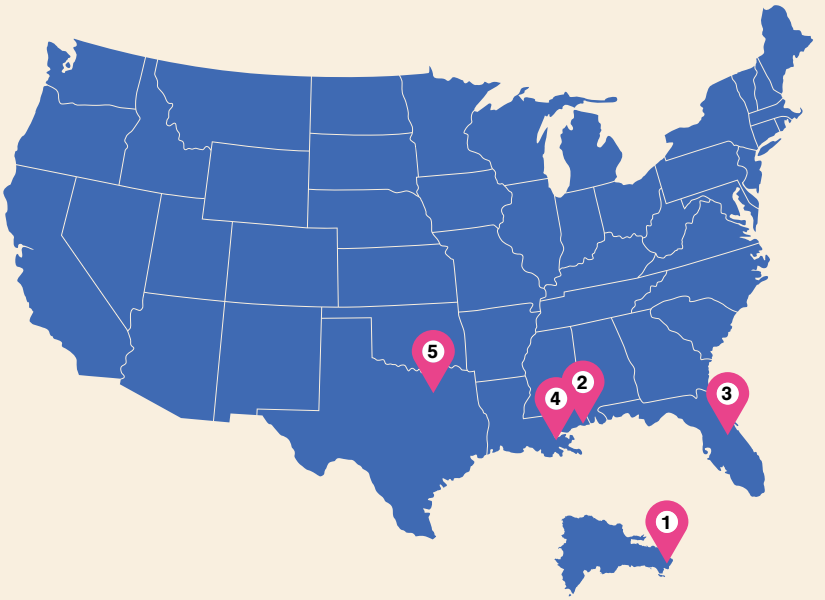
- **NBBJ**, a global architecture and design firm, has acquired experience design studio **ESI Design**.
- **Savant** has announced strategic partnerships with **Ring X Line** and **NETGEAR**.

9%

Projected compound annual growth rate of the North America LED lighting market between 2019 and 2024, according to Research and Markets



# EVENTS




**1. April 18-25:**
The 65th Annual Maritime Regional IES Conference will take place at the Luxury Bahia Principe Ambar Resort in Punta Cana, Dominican Republic. The conference will include events, speakers and presentations for continuing professional education.
www.maritime.ies.org

**2. April 19-22:**
NAILD Innovation 2020 will be held at the Scarlet Pearl in Biloxi, MS. Hosted by the "Get a Grip on Lighting" podcast, the convention brings together distributors and manufacturers, offering opportunities for one-on-one engagement, networking, speakers, roundtable discussions and board panels.
www.naild.org

**3. April 27-29:**
The 2020 IES Research Symposium, "Light + Quality: Meaningful Metrics Beyond Energy," will take place at the Hilton Orlando Lake Buena Vista in Orlando. The symposium will consolidate the current evidence on how lighting quality issues affect measurable human responses and define future research priorities.
www.ies.org/events/research-symposium

**4. August 6-9:**
The IES Annual Conference will take place at the Hilton New Orleans Riverside hotel in New Orleans. The event will offer a range of educational programming on the art, design, science and research of lighting. A broad selection of CEU credits will be available.
www.ies.org/events/annual-conference

**5. October 18-21:**
The IES Street & Area Lighting Conference will take place at the Hyatt Regency Dallas in Dallas. The conference brings together outdoor lighting professionals including managers, technical and marketing specialists, lighting consultants and engineers from electric utilities, municipalities, cooperatives, energy service companies and manufacturers. Attendees will benefit from opportunities to network with industry peers, seminars with speaker Q+As, breakout sessions to discuss issues in-depth, an exhibit hall and special events.
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# HOW THEY DID IT

***AE Design*** *used a wood, brick and paper motif to create sizzle at a new Denver restaurant and earn an* **IES Illumination Award of Merit**.

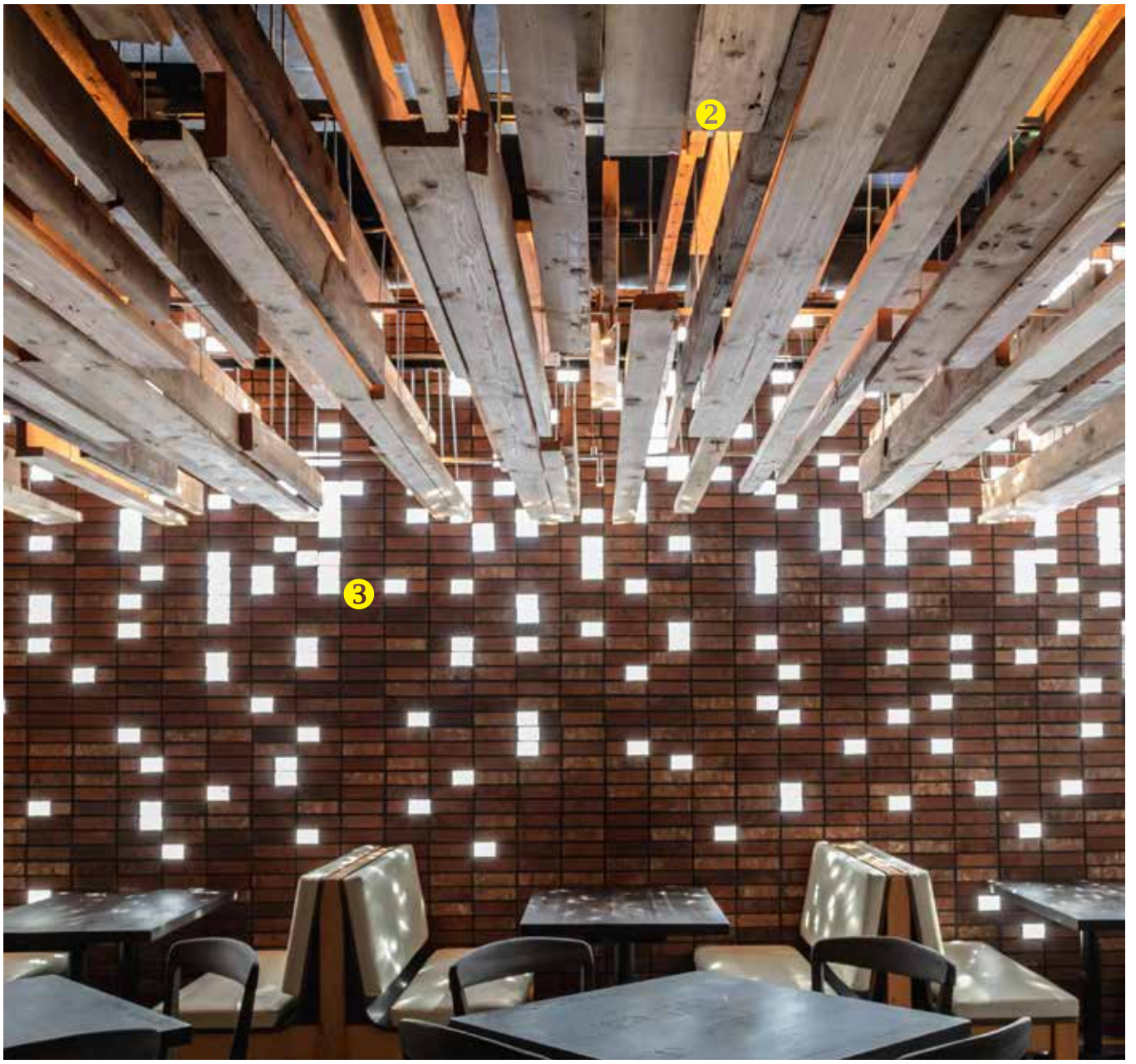
## Uchi Denver

**1.** Decorative paper pendants create a sense of intimacy while maintaining the simplistic design goal.

**2.** Track lighting hidden between wooden slats highlights tables and indirectly illuminates the reclaimed wood ceiling.

**3.** Glowing glass "bricks" supplement indirect illumination from the ceiling. One control system ensures fixtures coordinate to transition from a brighter lunchtime atmosphere to an intimate and moody dinner setting.


Photos: Visual Interest



# ENERGY

Willard Warren

## **Grid Friendly** An efficient transfer depends on power quality and flow

In the December 2019 issue of *IEEE Spectrum* magazine, Scott Hinson of Pecan Street, a research firm in Austin, wrote about campuses that install on-site Distributed Energy Resources (DERs), with microgrids that generate solar power during the day to transfer some upstream to the local grid to reduce energy cost, and to store battery power as a standby in the event of a grid outage.

However, multiple factors impact the efficiency of the power transfer. To start, the utility grid transmits a regulated Alternating Current (AC) with a sinusoidal waveform of 60 cycles per second, while the solar power generated by the microgrid is Direct Current (DC), which must be inverted to 60-cycle AC, in phase with the grid voltage, to transmit solar power to the grid.

Power is expressed in watts, which is equal to the voltage (volts) times the current (amps) times the Power Factor (PF). When the current of the microgrid is "in phase" with the voltage (**Figure 1, left**), the PF is 1.0, allowing for the maximum efficiency of power transfer. When the current and voltage are out of phase (**Figure 1, center**), the PF decreases, reducing the efficiency of the transfer.

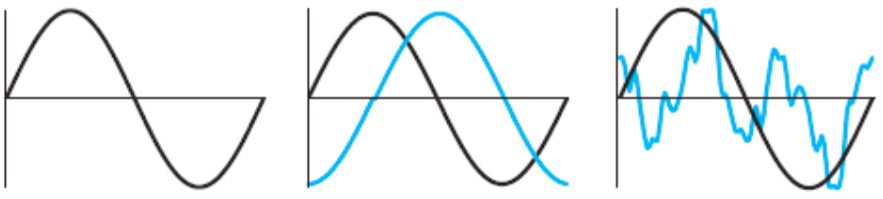
Furthermore, the load served by the microgrid contains small appliances, entertainment systems, LED lighting and computers—all of which have capacitive (leading) or inductive (lagging) loads which reduce the PF, causing the current to fall out of phase with the voltage and requiring it to be balanced, and also generating total harmonic distortion (THD) (**Figure 1, right**), a corrupting effect, unless filtered out before being transmitted upstream.

> The utility grid transmits a regulated alternating current, while the solar power generated by the microgrid is direct current

**THD IS ONLY ONE** of the glitches that can occur with a variety of electrical loads that are not just pure resistive. One such glitch occurred in New York City when LEDs were new. A large building sign with letters spelled out by 2,500 LEDs was being installed on a circuit which had—on paper—a suitable load capacity. When the sign was turned on, it tripped the breakers due to the high inrush of current. We now have to de-rate LED dimming circuits.

Therefore, when you're designing the lighting for a campus that has a DER/microgrid, be aware that there may be issues of power quality and battery resiliency, and don't load lighting circuits to the max. Further, when electric vehicles become more popular and commuters return home to their residential campus and plug in their chargers, hoping to save cost by going solar, remember this take on the famous line in the movie *Jaws*: "You better get a bigger battery!"

Figure 1. The relationship between the voltage (shown in black) and current (shown in blue) waveforms influences power factor. In the ideal scenario, both are in phase (left). When both are out of phase (center), power factor is reduced. Harmonic distortion (right) occurs when current flows at different frequencies than voltage, further reducing the power factor.



Willard L. Warren, PE, LC, Fellow IES, DSA, is principal of Willard L. Warren Associates.

# Design Freedom
## *Emergency Lighting Without Limitations*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Ruth Taylor

## **Connected Lighting, Two Years In** Updates from a living lab

The Next Generation Lighting Systems (NGLS) evaluations of indoor connected lighting systems, which we reported on two years ago ("Connected Lighting: Lessons from a Living Lab," *LD+A*, May 2018), continue to yield new lessons and insights. Importantly, we continue to learn about system maintenance, performance and user experience.

Organized by the U.S. Department of Energy's (DOE) Lighting R&D Program in partnership with the IES and the International Association of Lighting Designers, NGLS evaluates today's connected lighting systems in real-world installations. Through this research, we look to identify challenges in installation and operation that hinder the adoption of energy-saving connected lighting systems. By doing so, we hope to reveal needed product improvements and articulate best practices that can reduce configuration complexity and enable system performance to meet expectations.

The fundamental idea of NGLS is simple: by considering human factors—that is, by observing and evaluating the interaction of people and lighting control systems—we can find real "pressure points" limiting market penetration. In this way, NGLS provides a valuable complement to conventional demonstrations, mock-ups and testing laboratories.

Two years in, NGLS has installed 14 connected lighting systems in classrooms at The New School, Parsons School of Design, in New York City, including two installed last summer. These systems are being continually evaluated in what amounts to a "living lab," with the feedback from installers, evaluators and classroom users being widely shared.

> The goal is to find 'pressure points' that can limit market penetration

NGLS evaluators at work at Parsons School of Design, where 14 classrooms are outfitted with a connected lighting system.

**We have several important findings** to report since our last article. The two systems installed most recently use Bluetooth mesh technology for connectivity, whereas most of the previous installations used a Zigbee, or similar IEE 802.15.4-based, protocol. Like our first installations, these latest ones also encountered problems during installation and setup, but there were some encouraging developments in terms of simplifying the configuration process. We've also collected considerable feedback as facility staff and electrical teams have faced a variety of maintenance issues. Additionally, we're conducting extensive performance testing on both occupancy detection and daylight harvesting.

As we reported previously, installation and maintenance "ain't so simple." While the installed systems are all marketed as easy to install, configure and operate, both installers and users have found a variety of challenges in getting the systems to work as expected. Although NGLS required contractors to install and

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An installer uses a cell phone to configure the system. All but two of the systems ultimately required factory assistance during installation or following setup.

configure the systems, relying only on manufacturers' published instructions (print or visual), all but two of the systems ultimately required factory assistance during installation or following setup. Most often this assistance involved a phone call—sometimes just a simple reference to a video or a brief explanation, although at other times, calls were lengthy, or intensive site-based intervention was needed.

Maintenance issues have arisen in the Living Lab as replacements for faulty or missing components need to be integrated into already installed systems. Often a specific sequence is required to delete or add new equipment, and any deviation from the sequence can throw off the operation of the system. Firmware and software incompatibility can also be more than a nuisance. And since local distributors do not stock system components, repairs and upgrades have typically proven time-consuming.

Language continues to be a challenge in both initial installation and ongoing maintenance: designers, installers, manufacturers and those operating the system all use a wide range of terms to describe the same thing. Even the terminology of the various manufacturers differs enough to confuse many contractors who install a variety of systems. Consistent vocabulary; visual, app-based instructions; and readily available phone support will certainly help alleviate many of these problems.

**Regarding the user experience,** the diversity of wall controls continues to frustrate users who are unfamiliar with the configuration, logic and mechanics of the different devices. Simpler controls are learned with just a few repetitions or a brief explanation. Wall controls with more capabilities—and complexity—often leave users unaware of what they can do and how to activate those functions. Anecdotal evidence suggests that once users master the on/off, they may not dig deeper.

**In terms of performance evaluation,** NGLS requires systems to:

- Dim manually (to 10% or less of initial light output) in two zones
- Provide "vacancy" sensing for automatic shutoff
- Dim automatically to "harvest" available daylight

All systems can dim manually, many to below 5% as measured

**The Systems: A total of 14 systems are installed in working classrooms at The New School, Parsons School of Design, in New York City**

| System | External Controls Partnership? | Sensor | Wall Control Type | Wall Control Power | Communication Protocol | Luminaire |
|---|---|---|---|---|---|---|
| 1 | Yes | Integrated | Rocker | Kinetic | Proprietary RF | Pendant |
| 2 | Yes | Integrated | Rocker | Kinetic | Zigbee | Pendant |
| 3 | Yes | Remote | Multi button* | Battery | Proprietary RF | Pendant |
| 4 | No | Integrated | Rocker | Kinetic | ZigBee | Pendant |
| 5 | No | Remote | Rocker* | Line | Zigbee | Recessed |
| 6 | No | Integrated | Rocker | Line | IEEE 802.15.4 based | Recessed |
| 7 | Yes | Remote | Rocker* | Battery | Low Voltage | Recessed |
| 8 | No | Integrated | Multi button* | Line | IEEE 802.15.4 based | Retrofit kit |
| 9 | No | Integrated | Multi button | Line | Zigbee | Retrofit kit |
| 10 | No | Integrated | Rocker | Kinetic | Zigbee | Retrofit kit |
| 11 | Yes | Integrated | Multi button | Battery | Proprietary RF | Retrofit kit |
| 12 | No | Integrated | Multi button | Battery | Bluetooth LE | Retrofit kit |
| 13 | Yes | Integrated | Multi button* | Battery | Bluetooth Mesh | Recessed |
| 14 | Yes | Integrated | Rocker | Kinetic | Bluetooth Mesh | Pendant |

*control functions are configured onsite; others are pre-configured at factory

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### Troubleshooting Installation, Configuration and Operation

| | | Installation and Configuration Punch List Statistics | | | | Additional Operational Issues AFTER Startup | | | | Additional Operational Issues AFTER System Upgrade | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Type of Punch List Item | | Assistance Required to Resolve | | Type of Operational Issue | | Assistance Required to Resolve | | Type of Operational Issue | | Assistance Required to Resolve |
| System | Operational Months | # of Punch List Items | Hardware Issue | Software Issue | Phone/Onsite | # of Issues | Hardware Issue | Programming Issue | Phone/Onsite | # of Issues | Hardware Issue | Programming Issue | Phone/Onsite |
| 1 | 28 | 0 | | | | 2 | | ✓ | Phone | N/A | | | |
| 2 | 28 | 1 | ✓ | | Phone | 1 | ✓ | | Phone | N/A | | | |
| 3 | 28 | 1 | ✓ | ✓ | Phone/Onsite | 2 | ✓ | ✓ | Onsite | 0 | | | |
| 4 | 28 | 0 | | | | 1 | ✓ | | Phone | N/A | | | |
| 5 | 28 | 3 | ✓ | ✓ | Phone/Onsite | 1 | | ✓ | Phone | 3 | ✓ | ✓ | Phone/Onsite |
| 6 | 28 | 0 | | | | 1 | ✓ | | Phone | 0 | | | |
| 7 | 22 | 4 | ✓ | ✓ | Phone/Onsite | 3 | ✓ | ✓ | Phone/Onsite | N/A | | | |
| 8 | 24 | 1 | ✓ | | Phone | 0 | | | | 2 | | ✓ | Phone |
| 9 | 24 | 0 | | | | 1 | | ✓ | Phone | 1 | | ✓ | Phone/Onsite |
| 10 | 24 | 0 | | | | 0 | | | | N/A | | | |
| 11 | 24 | 0 | | | | 0 | | | | 0 | | | |
| 12 | 24 | 1 | | ✓ | Phone | 0 | | | | 0 | | | |
| 13 | 6 | 1 | | ✓ | Phone | 0 | | | | N/A | | | |
| 14 | 6 | 1 | ✓ | ✓ | Phone | 1 | ✓ | | Phone | N/A | | | |

at several typical locations. Some systems exhibit flicker, determined visually. Reconfiguring the zones (as might be required to maintain performance when spatial needs change) varies from easy to moderately difficult. Presence detection is proving more problematic, at least for some of the systems.

For most of the systems, basic vacancy functionality worked well, including a sensitivity test detecting minor hand motion. However, when using the same hand motion to assess the extent of sensor coverage, several of the systems turned off while the space was occupied. When manufacturers provide coverage patterns in their literature, that information can inform better sensor placement to avoid some of these problems, if it's followed during layout and installation. Many people report that sensors end up disabled if users dislike their operation. We will monitor the persistence of the sensors as the lab continues.

The opposite problem—lights staying on in an empty space—also occurs in the lab, with a loss of energy savings. Here the problem may be a defective device or incorrect programming. Determining which is the culprit is a nagging maintenance issue—although once solved, systems typically perform as expected.

Assessing daylight harvesting quantitatively is a work in progress. The NGLS team is refining its measurement protocols to assess both whether systems dim automatically and how efficiently they do so. So stay tuned.

The NGLS indoor evaluations live on. Additional daylighting evaluations are on the agenda. We'll also install new systems to evaluate some enhanced system capabilities, such as energy monitoring, control of multiple spaces and integration with different types of luminaires. And we're planning a focused study of tunable white lighting control systems, in collaboration with DOE's Commercial Buildings Integration Program.

For more information on the NGLS, visit *www.energy.gov/eere/ssl/next-generation-lighting-systems*.

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Ruth Taylor currently serves as a program manager on the Advanced Lighting Team at Pacific Northwest National Laboratory, where she manages the Next Generation Lighting Systems evaluations and contributes to several other projects focused on the application and development of solid-state lighting.

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# POLICY

Alex Baker

## A Few Minutes With Title 24 What would Rooney or Seinfeld say about code changes?

I was a fan of "A Few Minutes with Andy Rooney" on *60 Minutes*. Andy was born in Albany, NY, the capital of the Empire State, near my neck of the woods. Many of his commentaries would begin as human-interest stories and end as an airing of grievances about something societal and often trivial. To be sure, Mr. Rooney would sometimes venture into serious subjects, however, many of his segments were meandering and fun, rarely anything of consequence. He was two minutes of Seinfeld before Seinfeld was Seinfeld, if you will, served as a nice dessert to follow the heavy news meal of the preceding hour. Cutting from B-roll back to him seated behind his cluttered oak desk, he'd often close his segments with one frank statement that might resonate and stick with you, maybe even beyond the commercials that followed.

**In February I took a trip** to another state capital, Sacramento, and its charming neighbor, Davis. California is a gorgeous state and home to one in 10 IES Members who I have the pleasure of representing with state government. I hear Sacramento has an airport but last I checked getting there from Albany involves connections through Philadelphia, then Atlanta, LAX and Guam, so as usual I rented a car at SFO. This was a good decision, as I got to test out the 2020 Chevy Camaro SS convertible to which I was inexplicably upgraded at no cost, odometer 000011.

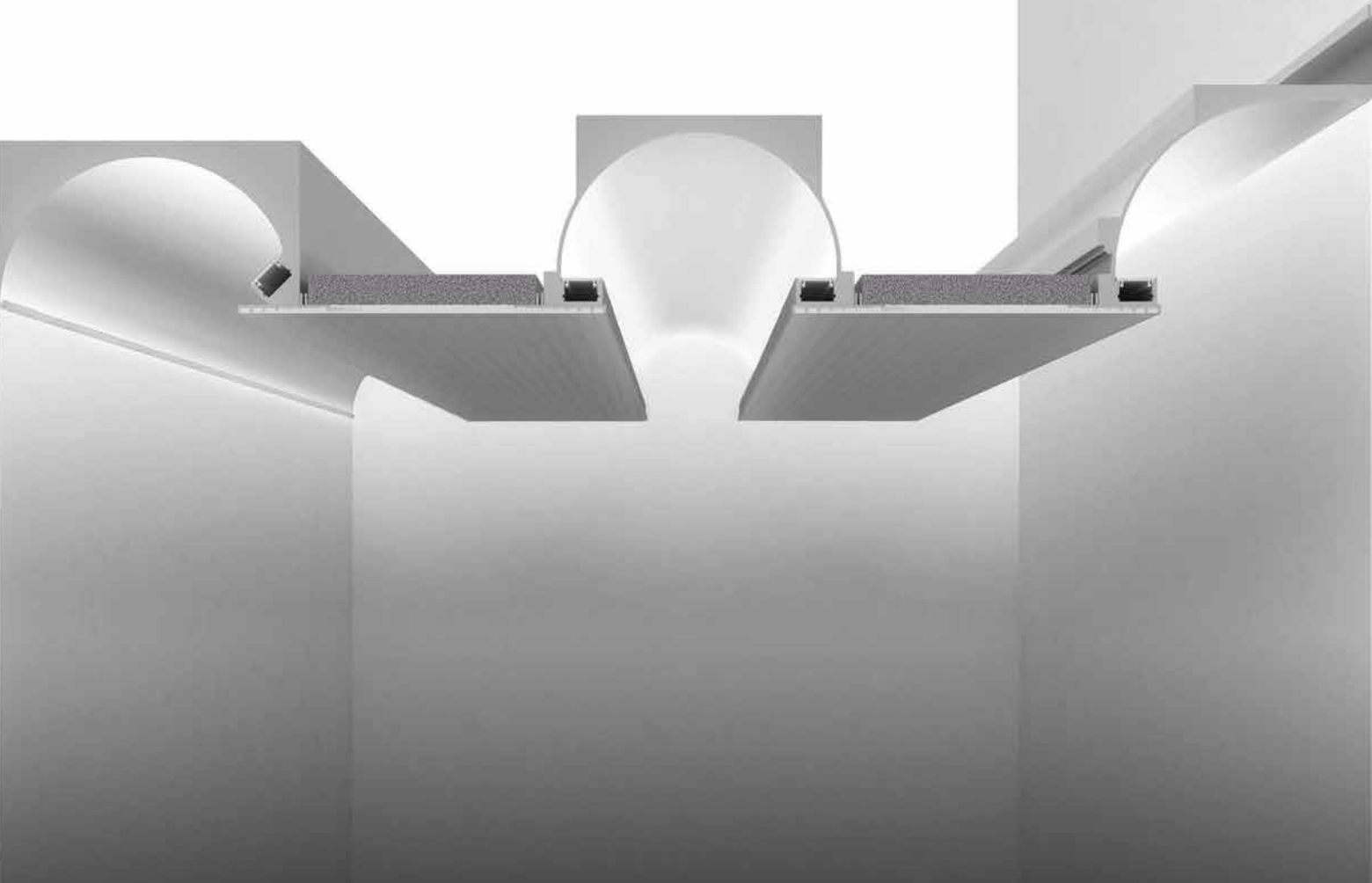
There I was I was cruising to Sactown with the top down, reflecting on a discussion I organized in San Francisco in early January with my IALD counterpart Emily Bowers. Gathered at the PG&E Energy Center, about 30 California IES and IALD Members shared their concerns and frustrations with Title 24, Part 6, California's Building Energy Efficiency Standards. Members expressed concerns about the cost effectiveness of some measures given the market's transformation to LED. We heard a lot about non-compliance resulting from conflicts with local safety codes, a lack of coordination with AHJs, and a shortage of suitable certified luminaires with which to execute their designs. The discussion helped to inform IES inputs entered into the California Energy Commission's Title 24 docket in late March, kicking off the beginning of the 2022 code development cycle.

Passing mile after mile of fruit and nut trees I eventually pulled into Davis for the first California Energy Alliance (CEA) meeting of the year, held this time at the California Lighting Technology Center. Here the conversation also centered on Title 24, with concerns shared by many that the code is now micromanaging milliwatts, implementing too many changes to achieve minor impacts, and that code changes occur so frequently (every three years) that designers cannot develop a working knowledge before it changes again. We also discussed acceptance testing, the wisdom of switched receptacles, the necessity (or not) of utility revenue-grade circuit-level metering and recent progress on the CEA's Outcome Based Code Initiative.

> "Does the TV or thermostat really need an indicator? Why?

Later, Dr. Morgan Pattison stopped in to give a presentation. Discussing the importance of dark skies, Pattison shared a story of his visit to West Virginia where he was able to experience a nighttime so dark that he could not see his hand in front of his face. If you really think about it, he asked, how often do we achieve such darkness in our lives anymore? Yet the more we learn about light, the more we understand the importance of darkness.

**These thoughts stuck with me** as I later retired to my hotel room in Davis. I drew the blinds, doused the lights and crawled into bed, falling asleep without delay thanks to jet lag. Mother Nature called in the middle of the night, and as we know, she doesn't go to voicemail. As I stood up, the wired smoke



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detector above my head flashed two green 5-millimeter bullet LEDs every 5 seconds, like an airport beacon. No one could mistake its status; these stark, startling beams were bright enough to project my shadows onto the floor. Looking forward, the TV's red LED indicator illuminated its own table stand, resulting in a laser beam effect that added a sense of drama and intrigue to my journey. Meanwhile, the air conditioner's green LED provided good fill, and a festive color contrast.

As I rounded the corner of the bed, the vacancy sensor near the room's entrance had me on target with a green LED responding to my approach. Now scotopically adapted of course, it guided me as I opened the bathroom door and identified my target. The bathroom was almost over-lit by a cool white LED nightlight. As I entered, the occupancy sensor, having waited all night for me, energized at least 4,000 lumens in this tiny nearly all-white room with the swiftness of solid-state lighting. Squinting and blurting something unpleasant I'm sure, Title 24 crossed my mind as I slammed my hand on the sensor to shut it off.

Exiting the bathroom, the microwave's green clock and the green LED on the thermostat sparkled. Behind the TV the typical cable box's totally enclosed red LED (its soul?) shined through the box's vents onto the wall, alongside an external red LED. My headphones were charging nearby, adding a little blue to the scene. I paused for a moment to observe the theatrics of this hotel room, my scotopic Yuletide disco, like so many others before it.

Drifting to sleep I thought, does the TV really need an indicator? The thermostat? Why? The light on my headphones tells me it's charging. That's useful. The air conditioner blows air; its power indicator states the obvious. That nightlight was bright. Shouldn't that be a vacancy sensor? How much power and emissions for these billions (trillions?) of indicators? I wish it was dark in here...

There are many remaining energy savings opportunities and the smart people we're working with at the CEC are wide open to our members' ideas. I'm upbeat about making some meaningful code changes for the better.

Alex Baker is manager of government affairs and public policy for the IES.

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# SAFETY

Jerry Plank

## **NEC Updates** Change is inevitable … are you ready?

Charles Darwin is credited with saying, "It is not the strongest or the most intelligent who will survive, but those who can best manage change." My question to you is: Do you embrace change or does change define you? Changes to safety codes are as certain as tidal waters and for some, they can be as irritating as a toothache. In this article, I list the changes made to the National Fire Protection Association's 2020 edition of NFPA 70, the National Electrical Code (NEC), as they pertain to lighting products.

The NEC is updated every three years and most states adopt the most recent edition within the first few years of publication. It should be noted that the NEC is an installation code, and as such is used by equipment manufacturers, electrical contractors, electrical and lighting designers, local municipal inspectors and other building officials. Article 90.1 enumerates the purpose of the NEC, which clearly states that it is not intended to be used as a design guide or an instructional manual for untrained persons. Items of interest to the lighting practitioner in the new edition of NFPA 70 are as follows:

1. **Article 100** has a new "Informational Note" under "Labeled" that now allows the Listed product to be identified as Listed by an NRTL (Nationally Recognized Testing Laboratory) on the smallest unit container should the product be too small for such label.
2. **Article 110.3** clarifies that equipment shall be Listed or labeled by an NRTL and installed and used per any instructions that may be included in the Listing or labels. The term "labeled" pertains to equipment that is evaluated in the field by an NRTL and bears the mark of compliance to an ANSI safety standard.
3. **Article 210.8(A)(11)** requires all dwelling unit receptacles rated 150 volts to ground or less be GFCI (ground fault circuit interrupter) for indoor damp and wet locations.
4. **Article 210.12(C)** requires guest rooms, guest suites, patient sleeping rooms and limited-care facilities to have AFCI (arc-fault circuit interrupter) protection, which supply 120-V, 15- or 20-ampere branch circuits supplying outlets and devices.
5. **Article 210.12(D)** requires any dwelling units, dormitory units, and guest rooms and suites where the branch circuit has been extended, modified or replaced to have AFCI protection.

> "Changes to safety codes are as certain as tidal waters and for some, as irritating as a toothache

6. **Article 220.12** and **Table 220.12** indicate non-dwelling unit general lighting loads, per area, for branch circuit load calculations.
7. **Table 220.42** has removed hospitals from the list, which means that hospitals shall have lighting load demand factors of 100% of the total volt-amperes.
8. **Article 314.27** now requires an outlet box provided with two switched legs for future installation of a ceiling fan, in habitable rooms of dwelling occupancies by the homeowner, be suitable to support the ceiling fan and have the physical structure access to provide supports per the instructions or be provided with a suitable outlet box that can support a ceiling suspended paddle fan.
9. **Article 400.12** clarifies that flexible cords and flexible cables shall not be used as a substitute for fixed wiring in a structure.
10. **Article 402.3** adds type FFHH-2, a new type of heat-resistant rubber-coated fixture wire.
11. **Article 404.7** clarifies that general-use switches be provided with markings to indicate on/off positions and that the upper position is generally required to be the closed, on position.

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12. **Article 404.9** clarifies that faceplates with appropriate grounding be provided for all switches including such as dimmer and control switches.
13. **Article 404.14** now states that all switches mounted in a room are required to be Listed, however, a case can be made for a control switch that has a special low-voltage control or dimming, or energy function that would not be eligible for a general-use Listing under current published safety standards.
14. **Article 404.22** has been revised to prohibit current at any level on the grounding conductor during normal operation. An exception is made, allowing electronic control switches that introduce current on the equipment ground conductor, however, this is only applicable when Listed for the purpose and marked to indicate replacement or retrofit applications only.
15. **Articles 410.2** and 410.16 address revisions to the definitions in clothes closets and storage spaces.
16. **Article 410.36** has been revised to allow for Listed lighting outlets to facilitate the installation rather than just Listed outlet boxes. Article 314.27(A)(2) has also been revised for ceiling fans that may or may not have integral lighting units.
17. **Article 410.44** exception no. 1 for grounding has been deleted for luminaires made of insulating material.
18. **Article 410.69** has been revised with a future effective date of January 1, 2022, which will prohibit field-connected control conductors from utilizing the same colors as branch circuit grounding conductors and the equipment grounding conductor.
19. **Article 410.116(C)** clarifies that non-fire-rated luminaires are not permitted in fire-rated ceilings.
20. **Article 410.118** is a new requirement to indicate that a luminaire cannot be used to access outlet, pull or junction boxes that are not associated with the luminaire.
21. **Article 410, Part XVI** has been added addressing horticultural lighting equipment previously Listed per *UL1598, The Safety*

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*Standard for Luminaires*. A new standard has been developed, *UL8800, The Safety Standard for Horticultural Lighting Equipment and Systems*.

22. **Article 518.6** has been added, requiring that illumination shall be provided for all fixed service equipment, switchboards or motor-control centers installed outdoors that serve assembly occupancies. Additional lighting outlets are not required where adjacent light sources provide illumination.
23. **Article 520.25(B)** deletes the obsolete resistance and reactor-type dimmers from being used in any new construction in theaters, audience areas of motion pictures and television, and similar locations.
24. **Article 520.68(A)(2)** reduces cord or cable in protected applications to hard usage (junior hard service).
25. **Article 600.2** has been revised to include four new definitions pertaining to electric signs and outline lighting.
26. **Article 600.35** added a new section requiring that retrofit kits for general use or sign-specific applications shall be Listed for the purpose and labeled by an NRTL to *UL879A, The Safety Standard for LED Sign* and Retrofit Kit to harmonize investigations conducted by the various NRTLs.
27. **Articles 680.2, 680.35** and 680.45 have been clarified by adding Immersion Pools, which are used for ceremonial or ritual immersion of users and intended to be drained or discharged after use to be treated like any pool or spa with regard to addressing electrical shock hazards, which require equipotential bonding.
28. **Article 680.2** and **680.50** added a definition of splash pads, which shall now be required to comply with Part II (permanently installed pools) and equipotential bonding requirements.
29. **Article 680.23** has been revised to allow for a shorter length of cord to service the wet niche luminaire from a spa bench in spas that can be drained for servicing rather than on the spa deck or other dry location.

**While care has been taken** to outline the above as accurately as possible, owing to variances in interpretations, and local codes and practices, it is the sole responsibility of the reader to review and make the determination of compliance to a particular NEC Article per the electrical equipment's suitability in any application.

Change to the NEC is difficult for some to accept and to those that disagree with the changes made in the NEC, here is your opportunity to jump in and help the process. Get involved, get educated about the issues and become a proactive member of the fire and electrical shock community. Jump in the water—it's not as cold as you think.

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Jerry Plank, LC, is the CEO/founder of Wilger Testing, an accredited third-party laboratory testing for product safety and performance.

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# BUSINESS

Randy Reid

## Today's National Lighting Bureau Two new programs respond to one overarching need

The National Lighting Bureau (NLB) was created in 1976 during the energy crisis. At that time, many maintenance people were removing two F40T12 lamps from their 4-lamp troffers, reducing energy from 181 total system watts to about 100 system watts. The NLB was formed by John Bachner who wrote many articles giving businesses and government ideas to save energy without sacrificing 50% of their light.

Fast forward to 2019: Mr. Bachner retired as the executive director after 43 years and I came in. We kicked off with a strategic planning session led by industry veteran Bob Horner. The strategic discussion revealed one major need and two significant opportunities. The need was centered around the importance of recruiting new companies and organizations to the bureau. The first opportunity was the necessity to strengthen our existing awards program to better focus on quality of light as well as collaboration. As a result, the Tesla Awards were born. The second opportunity was to create a tool to differentiate companies who stand behind their warranties from companies that have a warranty in name only. This became known as our Trusted Warranty Evaluation Program.

In 2019 the bureau focused its attention on those two opportunities and that success reduced the need to recruit. The industry must like the new programs because we are achieving a huge rush of new members. Since membership is growing on its own, we were able to focus on the opportunities.

**First, we launched the Tesla Awards** and had 28 submittals. The awards will be presented on Wednesday, May 6 at LightFair in Las Vegas. The second initiative, the Trusted Warranty Evaluation Program, was designed to acknowledge and reward luminaire manufacturers who have documented warranty processes and follow those published processes. It is also designed as a tool that lighting designers, electrical distributors, contractors and end users can utilize when determining which lighting products to specify, purchase or install.

All lighting and lighting component companies who sell in the U.S. and Canada are eligible to participate regardless of where their company or warranty department resides. The program is designed to reward companies that adhere to the NLB's stated criteria. No company that sells products in the U.S. or Canada and can meet the criteria will be excluded.

The luminaire manufacturer must first request an audit from the NLB website. The auditors will schedule a visit to the warranty administration location and typically spend an afternoon auditing that warranty program. The certificate will be awarded to companies based on an in-person audit of their warranty program. During the audit, the manufacturer will be asked to produce documentation to meet the below requirements:

> "The need was centered around the importance of recruiting new members to the bureau

**Formal Warranty (points awarded: 0, 1, 2 or 3**) – Companies will be awarded one point for each of the following criteria:

- The company shall have a documented warranty that can be found on the manufacturer's primary landing webpage within three clicks or within one click using the search function.
- The company shall have internal documented warranty procedures that keep its management abreast of warranty issues.
- The company shall either have an employee/department that is tasked with managing warranties or a third party that manages the warranty and the warranty document will show contact information.

**Warranty Language (points awarded: 0, 1 or 2)** – Companies will be awarded one point for each of the following criteria:

- The language of the warranty shall be clear and concise. If the warranty is prorated, it must be marked prorated

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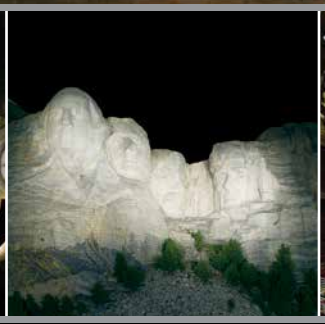

and properly defined.
- The start date of the warranty must be specified.

**Length in Business or Warranty Insurance (points awarded: 0 or 1)**
- One point will be awarded if a company has been in business longer than the length of the warranty or if the company maintains adequate insurance to cover its warranty obligations.

**Technical Evaluation (points awarded: 0, 1 or 2)**
- Auditor will spot check two randomly chosen SKUs for reliability testing.
- One point will be awarded for each SKU for which reliability testing was completed.

**Claims Review Evaluation (points awarded: 0, 1, 2 or 3)**
- Auditor will randomly choose three claims from the past 12 months and evaluate the trail from the first notification until the claim was complete.
- One point will be awarded for each claim in which the OEM acted expeditiously as determined by the auditor.

**Certificates will be awarded** to companies based on the completeness of the documentation to validate their warranty program. A minimum of eight points is required to receive the certificate. If deficiencies are noted that prevent the manufacturer from acquiring eight points, the manufacturer will have 30 days to correct. If not corrected within 30 days, the manufacturer will have to wait six months to resubmit.

The cost is based per company, not per product. Companies with U.S.-based warranty departments: $1,800 for the first year for in-person audits; $1,000 for years two and three for remote audits. Companies with non-U.S.-based warranty departments: $1,500 plus cost of travel for the first year for in-person audits per company; $1,000 for years two and three for remote audits.

The NLB published the draft version of the Trusted Warranty Evaluation Program for industry feedback. We responded to each comment and the comments were about 90% in support of the program. For more information about the Trusted Warranty Evaluation Program or joining the NLB, go to *www.nlb.org*.

Randy Reid is the executive director of the National Lighting Bureau, a past president of the IES and the president of LumEfficient.


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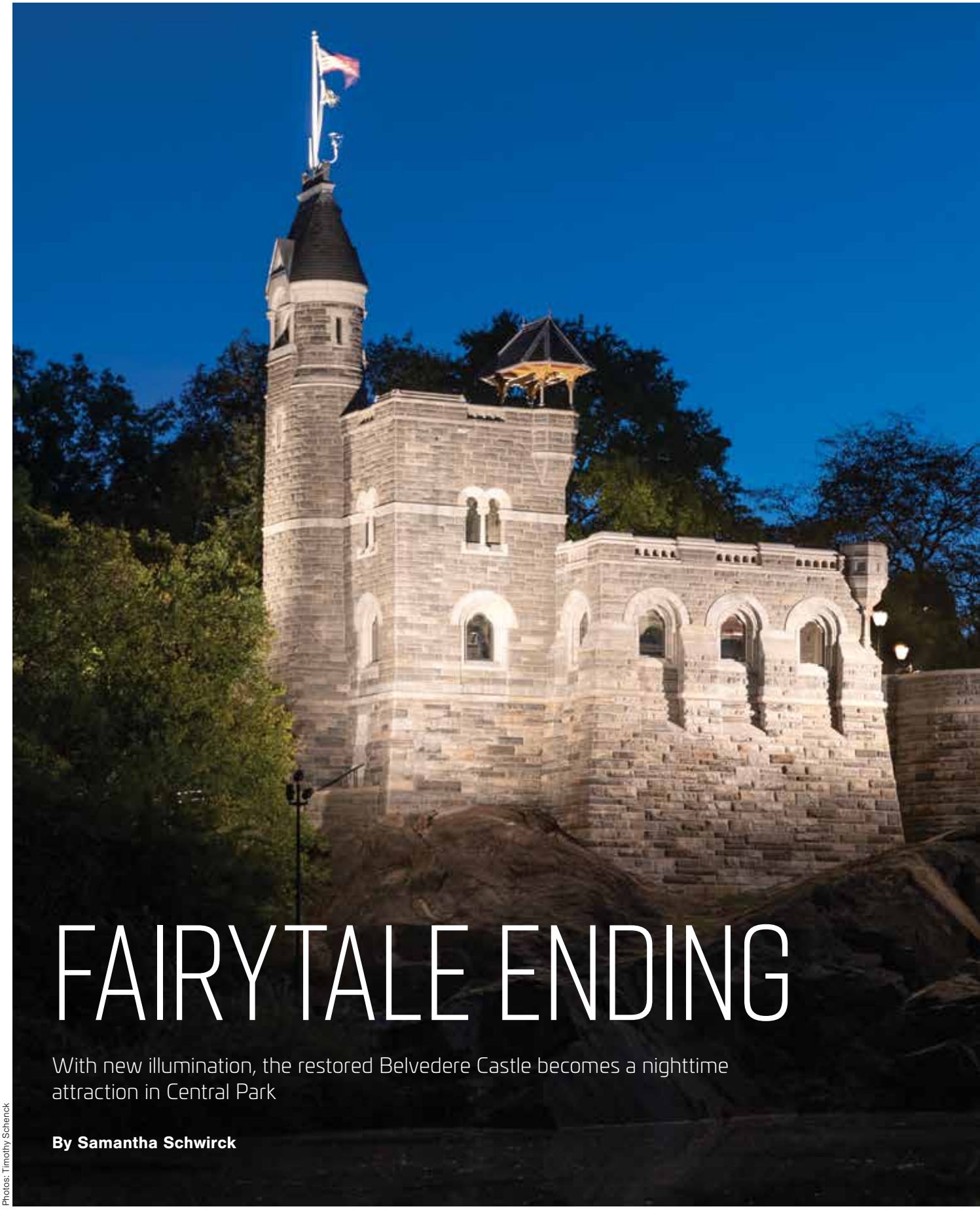

# FAIRYTALE ENDING

With new illumination, the restored Belvedere Castle becomes a nighttime attraction in Central Park

**By Samantha Schwirck**

Photos: Timothy Schenck

Floodlights raised above obstructing foliage avoid shadowing on the castle's exterior.

Once upon a time, the designers of Manhattan's Central Park imagined a miniature castle looking out over what would become the park's sprawling 55-acre Great Lawn. That dream became a reality just three years later in 1869 with the completion of Belvedere Castle, a hybrid Gothic- and Romanesque-style tower whose name fittingly translates to "beautiful view" in Italian. Built without doors or windows, the castle was intended to be a decorative viewing platform, but was later used by the National Weather Service to collect meteorological data and, most recently, to house a visitor center and gift shop.

A period of neglect and deterioration following the Weather Service's relocation in the 1960s prompted two restoration projects, both spearheaded by the Central Park Conservancy. The first focused on removing graffiti and rebuilding pavilions, enabling the Belvedere to reopen to the public in 1983. The second—a $12-million restoration that kicked off in 2016—went a step further by revamping interior and exterior illumination, extending views of the historic castle through the night.

Indeed, there is much to highlight about the restored Belvedere, including new, clear-pane windows that evoke the original open-air design; a zero-emission, energy-efficient geothermal system for cooling and heating the interior; and new waterproofing and drainage systems. The project also involved rebuilding the walls

repointing the exterior and interior stonework; paving the terraces with new bluestone pavers; and reconstructing a decorative wood tower.

For lighting designers Michael Hennes and Renata Gallo (Cline Bettridge Bernstein Lighting Design, New York City), illuminating the meticulously restored features while respecting the castle's historic value brought distinct challenges. "We wanted to let the structures shine without making the light fixtures themselves into focal points," Hennes says. "The biggest challenge was lighting the façade. The building is a true castle with solid stone walls, so considering the walls and the castle's landmarked status, attaching any fixtures to the building was not an option." Additionally, the stone construction did not permit an easy way to run power, further limiting the option of adding lighting directly to the structure.

Consequently, the team chose to floodlight the castle, which literally created a rocky road to success. "Because the castle is built onto a schist outcropping [an exposed rocky surface], we were limited on where floodlights could be placed," Hennes says. "At most of the mounting locations, we also had to contend with dense foliage."

To avoid shadowing by the plants, the team attached the floodlights to poles raised above the obstructing foliage. The fixtures use 3000K LED lamps to bring out the warmth of the stone surfaces, and varied beam spreads and aiming options were coordinated to achieve uniformity. "We used multiple fixtures at some locations to allow us to get the even light coverage," Hennes explains. "In the end we worked with four pole locations around the castle, and each of those sat at a different elevation, so we had to balance the lighting so that it would appear consistent around the building."

Left: Pole fixtures on the connecting plaza match the luminaires used throughout Central Park.

The floodlights also contain a snoot accessory to minimize glare. "These allowed us to evenly floodlight the castle without bringing attention to the fixtures, which appear quiet in the landscape," Hennes adds.

Across the central plaza, the open-air wood pavilion contrasts the solid stone castle, with indirect light reflecting off the ceiling to illuminate

Left: In contrast to the solid stone castle, reflected light illuminates interior details of the open wood pavilion.

Right: A new control system balances light levels across the site, ensuring 1-2 fc on the plaza does not overpower adjacent structures.

### At A Glance

- Lighting design and construction lasted approximately two years.
- All fixtures use 3000K LED lamps.
- Floodlights provide 2-5 fc of vertical illumination on the façade.

interior details while keeping sources concealed. Numerous solutions were considered for lighting on the plaza itself; however, the final decision was driven by preservation research revealing poles had existed there as early as 1900. The same pole and post luminaires used throughout Central Park were specified, with 3000K sources to blend in with the rest of the site's new lighting.

"All of the fixtures are LED so that minimizes energy consumption and maximizes life over other traditional light sources," Hennes says. "In addition, LEDs are dimmable, so we were able to link them to a dimming system which allowed us to fine-tune the brightness of the lighting composition." For the plaza fixtures, the system (Lutron LCP) ensures light levels are comfortable without overpowering illumination of adjacent structures. "It [the system] was a cost-effective solution providing preset light level scenes that could be automatically controlled by an astronomical time clock," Hennes adds.

Inside the castle, low-voltage cable systems with 3000K LED lamps replaced existing glary, wall-mounted fixtures with bulky surface conduits. The louvered fixtures' minimal appearance allows the architecture to remain the primary focus. The interior lighting consumes 78% less energy than mandated by ASHRAE/IES 90.1-2013; while the exterior clocks in 49% under the same standard. With new illumination that ushers the site into the 21st century and provides a renewed sense of place for the historic destination, Belvedere Castle now has its very own happily ever after. ◎

**THE DESIGNERS** | Michael Hennes, LEED AP BD+C, Member IES, is associate principal of Cline Bettridge Bernstein Lighting Design in New York City.

Renata Gallo is a senior associate at Cline Bettridge Bernstein Lighting Design.

Photos: Jason Keen

# A TIME TO GROW

An addition to a university stadium embodies the 'transitional path' of the students who use it

**By Katie Nale**

It's not easy being a college athlete. On top of a full workload and a grueling training schedule, most players also deal with the added stress of figuring out what's next. "The athletes are in a very transitional time period. They're preparing to likely do something completely different in a couple of years and move on to a whole new chapter," says Matt Alleman of SmithGroup (Los Angeles). As the lead lighting designer for the addition to Indiana University's Memorial Stadium (Bloomington, IN), Alleman was not naive to the sense of progression felt throughout the space. A facility for athletic training, rehabilitation, academic support and sports medicine research, the 65,000-sq ft Excellence Academy features a strategic interplay between lighting and material that embodies the growth and development of the student athlete.

To achieve this, Alleman, who worked on the project between January 2016 and August 2018, employed the concept of "framing the path," designing the space to guide students toward the stadium—a practical and symbolic move representative of looking toward the future. The design keeps with the school's simple and iconic profile, while also adhering to strict energy requirements.


A "hierarcy of light" around the entryway beckons students through the doors to the stadium. The two staircase towers act as nocturnal lanterns.

Approaching the stadium, the first structures to meet the eye are the metal stair towers framing the entry. While the towers are topped with a solid roof, the sides consist of mesh, creating an outdoor experience open to the elements. At night, the towers transform into glowing lanterns, establishing a beacon on campus. "It started by making sure that we were lighting the interior environment, making sure it was bright on the inside," recalls Alleman, who used continuous vertical fixtures and indirect ceiling coves to create a uniform interior brightness. "However, that wasn't quite enough, so we had to add some really specific gradients of brightness around [the towers]." Additional base-up gradients also ground the iconic entry towers while guiding pedestrians into the building.

Beyond the towers, the radial structure of the stadium is underlined by the building's exterior and interior lighting. Outside, radial structural beams highlighted by column-mounted sconces create a rhythm down the concourse, while inside, student spaces sport indirect cove fixtures that illuminate radial ceiling beams. Cove lighting in the hallways illuminates an undulating wood ceiling element that subtly directs students to the playing field beyond. The cove application required careful integration to conceal lighting in both horizontal and vertical directions.

Rhythmic concourse lighting blends with the existing stadium structure.

A "connection to the existing" was important in the overall design of the addition, so as not to stray from the school's established aesthetic. "We didn't want there to be a line in the sand," says Alleman. Sophisticated detailing with simple sources helped the addition blend with the look of the existing stadium. "In terms of the two stair towers, we were using very simplistic fixture typologies," says Alleman, who emphasized the importance of integration and making light sources invisible to create the glowing element seen throughout the stadium. The hidden sources also respond to the university's desire to have a system easy to maintain into the future without sacrificing a sophisticated look. "We combined the two—the sophisticated expression with the simplistic typology. We also had to balance the different layers and react as adjustments were made throughout the project to keep the original [brightness] hierarchy intact," Alleman recalls.

In addition to keeping with the established look of the stadium, Alleman was also tasked with meeting strict energy requirements. On top of reaching LEED Gold, the project also came in 40% under IES/ASHRAE 90.1-2016 requirements for a number of interior spaces. "We were very strategic in terms of what types of accents we were using. We made sure those accents could also serve as functional lighting for the space, so we were able to get double utility out of them," says Alleman,

### At A Glance

- Light sources are controlled via photo-sensor and time-clock.
- A luminance ratio of 5:1 exists between the entry and its adjacent context.
- The project received a 2019 IES Illumination Award of Merit.

who also noted how tricky it can be to ward off criticism on projects of this scale. “Sometimes the better the design looks, the more feedback the school gets because if it looks too good, people wonder why [the school] is expending all of this energy on nighttime lighting. That was something [the owners] really wanted us to pay attention to.”

By coming in under IES ASHRAE/90.1-2016 for those interior spaces, as well as achieving a lighting power density of 0.14 watts per sq ft for the concourse lighting, Alleman was able justify a more sophisticated-looking design. “We wanted the university to really have a substantive response to any lighting questions they may get,” he recalls. ◎

Left: Radial light coves orient views toward the stadium outside.

Right: Cove lighting frames an undulating wood ceiling element.

**THE DESIGNER** | Matt Alleman, IALD, LEED AP, is a principal with SmithGroup.

# PROJECT IN PICTURES

## Jewelry Repair

Carousels go round and round, but the design intent for the **Looff Carrousel** couldn't be more straightforward. The stated goal from the City of Spokane, WA, was that the lighting not overshadow the carousel. Christopher Ochocki, a senior consultant at **PLA Designs**, described it this way: "Looff Carrousel is the jewel, the new building is the jewelry box and the effects lighting are the accents on the jewelry box." The luminaires and control system (from **ETC**) bring about the desired aesthetic.

Photos: ETC

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Housed in **a dome,** the carousel itself is lit by ETC Source Four PARs, 288 ft of linear LED strips and automated wash fixtures. The installation was not without challenges. "Because of the architecture of the building, we had to use DIN rail-mounted gateways in a ceiling access panel to get DMX to the places we needed it," says Ochocki.

The complex runs off an ETC Paradigm processor controlling the general architectural lighting in the **carousel space, party rooms, gift shop and other support spaces.** "In addition to designing 10 effects sequences in the dome and queueing area that are randomly triggered, we created a red, white and blue theme for July 4th and a rainbow theme for Pride Week," says Ochocki. "We had fun with it."

Billed as Spokane's most popular amusement, the 110-year-old carousel has been rehoused, repainted and relit. Its new home is the product of a years-long drive to restore both the **carousel and Spokane's Riverfront Park.** The building has been called the "display case for one of Spokane's most precious jewels."

The design included an ETC touchscreen with a color picker to allow those renting the space to choose from **a range of standard colors and presets,** as well as create their own custom colors for the dome and other effects lights. Finally, there are inputs for a stage lighting console to have real time control of all the fixtures in the space.

# 3D Printing: Can It Work for Lighting?

Lighting industry news in recent years has been awash in stories proclaiming both the death of the lighting industry as we know it and its potential rebirth through new value-added technologies and applications. One such technology that has made its way to the forefront is additive manufacturing, better known as 3D printing. Additive manufacturing has been declared by some as the future of manufacturing and as a game-changer for the global economy.

AUTHORS

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A number of industries have already adopted 3D printing on a large scale, including automotive, aerospace and medical technology. In just the past few months, aircraft manufacturing giants Boeing and Airbus both announced that the Boeing 777X and Airbus A350 XWB will have 600 and 1,000 3D-printed parts, respectively. Similar news has appeared from the automotive and medical and dental industries as well, indicating the maturing of the 3D printing industry. But can 3D printing work for lighting?

First, what is 3D printing? In general, it is a process by which 3D objects are formed by the addition of materials one layer at a time, thus the name "additive" manufacturing. Presently, there are several 3D printing processes, including vat photopolymerization (e.g., stereolithography), material extrusion, material jetting and others. The print process chosen depends on the type of material to be used for printing, whether it be polymer, metal, ceramic or some combination.

If 3D printing is working now for a number of uses, the next question becomes: Why 3D printing for lighting? Where is the value in additive manufacturing of lighting parts and fixtures and what problems can be solved? It has become clear that the erosion of both price and fixture quality has hit the lighting industry hard. LEDs have become a commodity product, and the majority of LED fixture manufacturing has moved overseas. This has forced U.S.-based manufacturers to seek ways of reducing costs without compromising quality. Recent trends in the lighting industry include lighting fixtures with built-in radios for wireless connection to control light and color, and with sensors for detecting a variety of factors like occupancy, daylight, toxic gases and others to make built environments more intelligent. Such trends call for custom light fixtures.

With a 3D printing solution, the value proposition becomes mass customization, rather than mass production, and the ability to customize fixtures that better match with the built environment and improve visual appeal and function. Scientists at Rensselaer's Lighting Research Center (LRC) envision the future of architectural lighting practice involving on-site, on-demand printing of cost-effective, custom light fixtures. In theory, these custom fixtures can be made at a reduced cost because they are manufactured close to the construction site, have fewer integration steps, and have a reduced need for transport and storage. Additionally, fixture designs can be changed rapidly to match last-minute architectural design changes.

Overall, the vision is to change architectural lighting practice by changing the current supply chain and production model. With additive manufacturing, fixture production would move to local manufacturing businesses offering local jobs, which would reduce requirements for transportation and storage, cut carbon emissions and result in better quality, custom light fixtures. In fact, a few lighting

manufacturers have already begun to market 3D-printed light fixtures, primarily for decorative lighting. In terms of market size, this year the 3D printing industry is expected to grow above $21 billion, tripling since 2016,[1] while the lighting fixture market is expected to grow above $35 billion this year.[2]

This brings us to the primary question to be addressed: Can 3D printing work for lighting? When LEDs first came onto the scene 20 years ago, one big obstacle was that LED chip manufacturers from the semiconductor industry didn't understand the requirements for successful lighting fixtures, and lighting manufacturers didn't understand the operational needs of LED chips. Many years of collaboration, communication and research were necessary to bring these two disparate industries together.

Today, 3D printing and lighting are on a similar track. At the LRC, we have been investigating the feasibility of currently available 3D printing materials, technologies and processes at supporting the thermomechanical, electrical and optical needs of lighting fixtures. The LRC also established last year a collaborative alliance of lighting and 3D printer and material manufacturers, known as the Additive Manufacturing for Lighting Consortium (*https://www.lrc.rpi.edu/programs/solidstate/3DConsortium.asp*), to direct this research and develop a roadmap toward customizable, value-added lighting fixtures. With the goal of understanding the potential of 3D printing for lighting, the LRC has published some preliminary findings for two types of lighting components: heat sinks and secondary optics.

### *Heat sinks*

Metal heat sinks are commonly used in LED systems to keep LED junction temperatures low for optimum system performance. Studies have shown that the heat sink is one of the highest cost components in a light fixture today, reaching nearly 40% of the total fixture cost. LRC studies have shown that thermal conductivity properties of aluminum heat sinks are excessive for most indoor light fixtures. Additive manufacturing of composite material heat sinks could potentially reduce the weight and cost of an LED system, optimize the thermal management and produce better visual appeal.

A 3D-printed decorative wall sconce developed and manufactured at the LRC (designed by Oshadhi Madihe Eshwarage, LRC).

# $21 billion
## Estimated size of the 3D printing industry in 2020

**Source:** *ComputerWorld*

LRC researchers studied whether custom heat sinks with suitable thermal properties could be printed to keep the LED junction temperature below 85°C to ensure optimum system performance. In this study, we investigated composite polylactic acid (PLA) filaments with thermally conductive fillers and used a processing method called fused filament fabrication (FFF) to test the thermal conductivity of heat sinks that were 3D printed in our laboratory.

A 3D-printed heat sink atop a fixture printed at the LRC (left), and a rendering of a novel heat sink design (designed by Olivia Privitera, LRC).

In general, we found that presently available materials have a thermal conductivity adequate for low- to mid-power LED fixture applications with low heat densities. However, the tested composite materials had thermal conductivity values that were two to four times lower than required for most high-power LED systems. Alternatively, 3D-printed metal heat sink performance was similar to that of traditionally manufactured aluminum heat sinks. We also found that the print orientation and print layer height affected the heat sink's performance.[3]

Another aspect to be considered for optimum thermal management is the geometric shape of the heat sink. 3D printing offers the advantage of creating novel geometric shapes than can enhance heat dissipation through convection. Some of these shapes cannot be made with traditional manufacturing methods. Furthermore, 3D-printed heat sinks can enhance the aesthetics of the light fixture, unlike traditional metal heat sinks.

### *Secondary optics*

LED light fixtures require secondary optics for beam shaping. Typically, optical components are either reflective or transmissive, and the properties of the optical component affect fixture efficiency and beam quality. At the LRC, we 3D printed several reflective and transmissive secondary optics and used them in LED systems to understand: 1) how short and long-term optical properties are affected by using 3D-printed optical components; 2) light transmission and scattering properties as a function of print resolution and print orientation; and 3) reflected and transmitted light as a function of time.[4] For reflective optics, two types of reflective PLA material and a single type of copolyester with no styrene (CoP) were used to print optics samples in different thicknesses by varying the extrusion width or the number of extrusions.

The results showed that reflectance increased as the sample thickness increased and that the reflectance remained nearly constant over more than 2,000 hours of testing at a 50°C ambient temperature. For transmissive optics, the results showed that both print resolution and print orientation affected the light

transmission and scattering of the samples, with increased print resolution and in-plane print orientation increasing light transmission and decreasing light scattering. However, transmissivity decreased by approximately 1.5% for every mm in thickness. In general, high performance reflective optics can be printed using presently available commercial materials, but better materials are needed for making reliable transmissive optics. We also found that 3D printing is ideal for creating novel optics that cannot be easily made using traditional manufacturing methods.

The future success of 3D printing for lighting will require research, collaboration, and education. Within the Additive Manufacturing for Lighting Consortium, the LRC and its members have begun a pilot research project to print and test several components, including heat sinks, transmissive optical lenses and mechanical holders for integrating fixture components, and compare their performance with similar traditionally manufactured components. The results thus far show comparable performance for 3D-printed parts and those made using traditional methods. In terms of education, the LRC has expanded its outreach education programs to inform workshop attendees of the state of the 3D printing industry and how lighting fixture manufacturing can benefit (*http://www.lrc.rpi.edu/education/outreachEducation/InHouseInstitute.asp*). The LRC has also recently partnered with Eaton Corporation on a project to develop a complete, additively manufactured, LED-integrated luminaire under funding from the U.S. Department of Energy.

In conclusion, rapid advancements in 3D-printable materials and methods show promising results for making custom parts for light fixtures. The LRC and its consortium members have already produced improved materials and processes and made parts that can compete with those made using traditional manufacturing methods. At the present rate of progress, we anticipate 3D printing will become an integral part of the manufacture of cost-effective, custom light fixtures within the next few years. ◎

**With a 3D printing solution, the value proposition becomes mass customization, rather than mass production, and the ability to customize fixtures that better match with the built environment**

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# POWER IN NUMBERS

## Why we still need women's groups to build tomorrow's leaders

**By Megan Carroll and Kelly Roberts**

Women in Lighting + Design, affectionately known as WILD, is a group that builds networking opportunities and inspires conversations about the state of inequity in the lighting industry. The group's mission is to "provide an inclusive and open environment for professional and personal growth by offering community, mentorship and knowledge sharing."

When WILD began meeting in the '90s, the bars-and-cigars mentality of wooing clients and making connections was not easily accessible for women, and the need for a unique community was clear. Women and their allies needed a comfortable place to discuss issues at the office and at construction sites, and to gather strength and support for those day-to-day fights. Over the last three decades WILD has grown from small random potlucks in homes and offices, to a connected group convening for discussions on professional growth, workplace sexism, financial health and parental planning, among other concerns. Chapters are located all over the country, including WILD in New York City; Ladies of Lighting in St. Louis, Denver and Philadelphia; and WILD West, with new interest and locations growing every day. Some meetings are "mixers" open to anyone interested in attending, with the goal of sharing, informing and creating awareness about whatever's being talked about in the larger community, while some meetings are clearly tagged for women only, depending on the specific topic.

WILD's growth has brought about a new question: is a "women in lighting" community still needed? This question assumes that the growth and cultural changes we're experiencing mean women have reached equal footing in the industry. This is growth women and the industry should be proud of, as it came from dedicated work both individually and as a community. There are also more women in lighting than ever before, leading companies and our networking organizations like the IES and the DLF. There are more women in our graduate programs than ever before, ready to jump into the industry and drive change. And yet, how many times are women offered the only pink construction helmet on a job site? How many times are male coworkers turned to first in a meeting, even though they are not the lead on the project? How many times have women been overlooked for a promotion because they have children at home and need more flexible hours? In the workplace, how often have you heard women referred to as "girls?"

These inequities may not even be apparent to the perpetrators. That's because it's easy for

others to assume that if a problem is not visible to them, or does not affect them, it does not exist. However, WILD begins the conversations that allow members to share their challenges and discuss solutions. We are learning that different communities need different resources and support. WILD allows us to take the strength and lessons learned from each other and bring it with us into the workforce and into our lives. So the answer to the question—"Is a community for women still needed?"—is an emphatic *yes*.

We need a women in lighting and design community to disrupt the status quo and continue pushing forward—and events and initiatives across the country offer examples of how to do so. For instance, during last year's LEDucation conference, women from various professions within the lighting community, including design, education, engineering, marketing and sales, gathered at a WILD roundtable workshop to explore three significant issues they face every day. The topics—equal pay, family leave and leadership—drive to the core of Women in Lighting + Design's push for change in the industry. Here are a few highlights from just one discussion titled "Building Leaders of Tomorrow."

- **Words**. "Girls" vs. "women." Girls are typically too young to be allowed in the workplace, yet when a young woman refers to herself as a girl or uses that word to describe a group of young women, is it acceptable because she used it or, in other words, it's self-referential? The consensus was that it may still be damaging and, perhaps more importantly, that word choice must be considered carefully—regardless of the source.
- **Boundaries.** Claim them, establish them, make them known. Don't offer an apology for thinking, for doing, for asking—the adages "just say no" and "just do it" apply.
- **Mentoring.** Ask for help. Find your coach and ask a person you admire for their counsel and to mentor you.
- **Leadership**. Establish authority. Don't be a "Silent Sally"—step up and speak out, with respect to all.
- **Community.** The discussion and these changes have to take place with everyone, in every setting—work, life and school—because this issue impacts everyone, regardless of age, race or gender.

**When WILD began meeting in the '90s, the bars-and-cigars mentality of wooing clients and making connections was not easily accessible**

Today, with the plethora of social media options to connect, meet up and learn, some young women find it easy to "follow" a role model and virtually hone their leadership skills. That's a wonderful new mode of networking and it serves a purpose. However, the value of having a real-life mentor—who can focus on your specific needs, who knows you personally, and who can provide genuine, objective insights, motivation and support in real time—is by far a richer, more meaningful and more memorable relationship. Mentors don't necessarily need to be part of your daily workplace. They can be former colleagues, someone you met or heard speak at industry events, like WILD meetings, trade shows and conferences, or in another division if you happen to work for a large corporation—just ask. Make a career plan and establish clear needs with an end goal so together you can create a plan.

Women in Lighting + Design is connecting more and more women and their allies across the country every year. Through this community the industry learns about each other's experiences and struggles. WILD provides the opportunity to turn each experience and success into building the success of others. Whether your women in lighting community is a few people, or many people, WILD has a place for you. We encourage members to reach out to each other, create connections, and empower one another to take the next steps in careers and lives. Together we can lead the industry forward—for when women succeed, everyone succeeds. ◎

For more information about Women in Lighting + Design, to sign up for the WILD newsletter, or to learn how to connect with WILD on LinkedIn and Facebook, go to: *https://womeninlightingdesign.wordpress.com*. Don't see a Chapter in your area? Consider reaching out to womeninlightingdesign@gmail.com to learn how to start one.

**THE AUTHORS** | Megan Carroll, LC, Member IES, is senior specification sales manager, New York Digital, Acuity Brands, and a WILD New York City Committee Member.

Kelly Roberts, LEED BD+C, Member IES, is the studio director for WALD Studio in New York City, and a WILD New York City Committee Member.

# IES INSIDER


## EP Program Helps Find the 'Range'

*By Yulia Tyukhova, IES Emerging Professionals Committee Chair*

In the book *Range* by David Epstein, the author argues that people should be exposed to a variety of activities such as playing multiple musical instruments before mastering the guitar or piano. This gives individuals a "range" and makes them better at applying knowledge to an unfamiliar situation before narrowing their focus. When the idea for the EP program was explored by Daniel Salinas and Fred Hasler (both behind the program's inception with the help of many individuals such as Kimberly Mercier, Lisa Reed, Kevin Flynn and others), they found, among other things, that new professionals have a limited understanding of career choices in the lighting industry. Consequently, one of the EP program's many objectives is to demonstrate the career paths and leadership in the industry. Essentially, it is about showing the "range."

The very first EP event happened in Austin, TX in 2011 at the time when the IES Annual Conference (AC) coincided with the Halloween celebration, and Austin transformed into a city of fantastic creatures, movie characters and superheroes. It was a perfect start that captured the energy and enthusiasm of new professionals. It was also my first conference and one of the most memorable ones (not only because crickets at one of the local restaurants were quite crunchy). What started as an event with a few attendees and a single sponsor in 2011 grew to an impressive list of 35-plus sponsors and 100-plus students and EPs in 2019.

The EP program is a multifaceted opportunity for students, recent graduates (five or less years) and those who recently changed their careers (which is, by the way, never too late) to experience the "range" of career opportunities in the lighting industry, become active IES Members, network and learn. During the EP events at the AC, new professionals attend panels and keynote presentations that feature industry leaders, the IES president's address, educational sessions and the Leadership Forum. They tour luminaire manufacturers and award-winning projects. They visit university labs and socialize at fun places unique to the locale. Most importantly, new professionals

## MEMBER MENTIONS

**Nadarajah Narendran**, professor and director of research for the Lighting Research Center, has been elected to Fellow of SPIE, the international society for optics and photonics.

**Jennifer Bean** has been named senior lighting designer; **Ben Strauss** has been promoted to associate; and

**Carol Williams** has been promoted to senior lighting designer at Sladen Feinstein Integrated Lighting.

Jeff Davis has been appointed president; Mike

Prachar has been appointed chief marketing officer; and Brian Vincent has been appointed chief support officer for **LSI Industries**.

Richard Barna, chairman of **RAB Lighting**, has announced his retirement. **Ross Barna** has been appointed by the company's Board of Directors to serve the dual role of CEO and chairman.

*Bold = Individual or Sustaining Member*



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- SimpleSet NFC Based Programing
- 1% Minimum Dim
- 0-10V Dimming
- CSA, ETL, and UL Class P
- 50,000+ Hour Lifetime[1]
- 5-Year Limited Warranty

### Applications

Indoor Linear

- Troffers
- Suspended
- Retrofit

Advance Xitanium LED drivers are manufactured to engineering standards correlating to a designed and average life expectancy of 50,000 hours of operation at maximum rated case temperature. Minimum 90% survivals based on MTBF modeling.

For up to date warranty information please go to https://www.signify.com/en-us/support/warranties

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## CONNECT WITH US

### IES SOCIAL MEDIA

The IES has come a long way in the digital world over the past few years. Social media is a great tool to help Members stay connected and make the most out of their membership. Connect with us today!

**MY IES** Online Communities

Illuminating Engineering Society

Illuminating Engineering Society

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Illuminating Engineering Society

Don't forget...
For each IES event there may be unique hashtags. Keep an eye out for additional ways Members can network with others.

**#THEIES**

network with accomplished researchers, designers, engineers, architects, business people and others.

However, the EP event is not a one-way street—the program tremendously benefits the Society as well. The EP program engages new talent and contributes to the IES's growth. It is a unique platform for all members of the Society (from recent EP "graduates" to IES Fellows, and everyone in between), to recruit new committee members and volunteers, meet students and potential new hires, mentor professionals, share knowledge and experience, and solve industry challenges together.

The EP program is possible due to the great work of the past and current EP Committee members, sponsors, IES staff and, also, many contributors to the program throughout the years—whether through planning, sponsoring, presenting, advocating for, or otherwise. As we entered a new decade this year, I have confidence that the next 10 years will see further growth and success of the EP program. Let's extend the "range."

## Join or Sponsor

To learn more about the EP Program, visit *www.ies.org/membership/emerging-professionals*. The IES has also introduced a new sponsorship category known as "EPic" that sponsors five EPs or more ($10,000). To learn more about sponsorship, visit *http://media.ies.org/docs/emerging-professionals/2020-ep-sponsorship-brochure.pdf*.

## Obituary

### John Luther Fetters, Efficiency Expert

John Luther Fetters, a longtime member of the IES Columbus Section, passed away in February at the age of 81. A U.S. Navy veteran, Mr. Fetters received a degree in electrical engineering from Cleveland State University in 1968. Over the course of his career, Mr. Fetters worked as an electrical engineer with Bell Labs/AT&T/Lucent, and owned his own company, Effective Lighting Solutions, where he served as chief energy consultant and worked for decades on federal building efficiency improvement projects.

Mr. Fetters was an active member of the Columbus Section of the IES and the Columbus Chapter of the Association of Energy Engineers (AEE). He served on multiple IES committees and lectured widely on lighting efficiency, teaching courses for AEE as well as for the University of Wisconsin, Madison's electrical engineering program. Mr. Fetters was also an author, credited with the publication of *The Handbook of Lighting Surveys and Audits* in 1998.

In lieu of flowers, donations may be made to First English Lutheran Church in Columbus, OH; Lutheran Social Services; Heffer International; or NPR/PBS.

THE NEW AND IMPROVED LIGHTING HANDBOOK WILL BE

# THE LIGHTING LIBRARY

In the beginning, there was fire…

THE LIGHTING LIBRARY

Science | Practice | Applications

ies.org

# NEW MEMBERS

The IES is pleased to welcome **76** first-time individual members.

Alicia Accetturo *WA*
Ryan Baird *NC*
Anna Basile *NY*
Linda Behrer *IA*
Mark Bertagna *GA*
Craig Brozinsky *CA*
Anthony Brudis *MD*
Blake Bullis *OH*
Julianne Cancalosi *NY*
Sara Chambers *NY*
Bruce Clark *IL*
Dustin Conley *GA*
Mandy Cooper *WA*
Fernando Cotto *NJ*
Aurelien David *CA*
Krystal Davis *WA*
Ashley Diltz *NY*
Ari DiMaria *NY*
Jennifer A. Eastman *Canada*
Rick Fassbinder *UT*
Sheryl Fishel *MD*
Emma Foster *NY*
Antonio A. Garza Quintanilla *Mexico*
Martin Georgiev *Canada*
Diego Gonsalvez *WA*
Dan Gotto *WI*
John Holt *CA*
Alan Islas Cital *CA*
Dubbie Johnson *PA*
Clark Johnson *Mexico*
Robert Jones *FL*
Luis Jorge *Canada*
Ricky Khullar *Canada*
Angela La Rocca *NJ*
Stephen Lane *Canada*
Rachel Levy *IL*
Josh Lopez *NV*
Mian Marcotte *NY*
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Sebastien Martineau *Canada*
Matthew McCarron *NJ*
Paul McIntosh *Canada*
Brian Miller *CT*
Jason Morin *OR*
My Nguyen *NY*
Christopher Novosel *MI*
Benjamin Oberhand *VA*
Kristen Odell-Putnam *NY*
Caroline O'Neil *NY*
Joseph Parisella *MA*
Jade Patchett *NY*
Pratish Patel *IN*
Zachary Pearson *NY*
Briona Perry *GA*
Alberto Portolani *FL*
Mike Rechtorik *IL*
Daniel Robinson *MN*
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Matt Russell *GA*
Sara Sahebghalam *OH*
Ryan W. Siddon *NY*
Wojtek Siedlaczek *Canada*
Barry Sonmor *Canada*
Sean Stark *PA*
Molly Stowe *OR*
Sam Tankel *CO*
Jeffrey Thompson *NE*
Emma Tingley *WA*
Deanna Valcour *NY*
Ben Waldrup *VA*
Wade Wallace *TX*
Lori Werling *OH*
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Susanne Williams *FL*
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*As of January 30, 2020

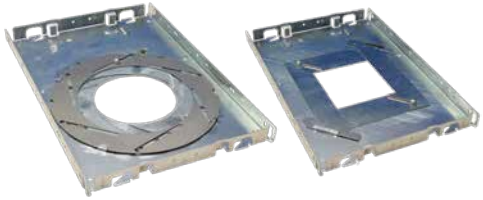
# "Build a better mousetrap, and the world will beat a path to your door,"

*-Ralph Waldo Emerson*

***What happens when we make a good product even better? You get the quality you expect but save money and time for faster profits!***

**Edgelit Panels from A.L.P. LexaLite®** leverage unparalleled expertise and capacity. The thin, flat panels offer versatility for mounting on walls and ceilings as well suspended via cable. Give your fixtures the edge with their broad, even light.

**Inventronics EUM-DT family of IP66/IP67 drivers with UL Class P** are designed around a next-generation platform, using enhanced transformer design and optimized components to lower costs without sacrificing quality or performance.



**Tripar's Shutter Plaster Frames** fit standard IC boxes but are completely adjustable to work with multiple luminaire dimensions and a range of round and square hole openings.

**Vesta® Flex Interoperable Lighting and Controls Solution from Bridgelux** is an innovative family of dual-channel LED drivers and control modules designed to simplify and reduce the cost of connected tunable white luminaires. The universal compatibility of Vesta Flex offers fixture design flexibility without requiring redesign or recertification.

**The All-Purpose KDS-LED from A.L.P.** combines a modern look with snap-together parts for easy, economical installation and maintenance.

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## INVITATION TO SUBMIT

The IES is looking for significant new advancements in
lighting products, research, publications and design tools from the past year


**SAVE THE DATE** **April 13-May 22, 2020** | progress.ies.org | Reviewed by the IES Progress Committee

**FEE** **$50** Processing fee | **$75** after May 2

**ACCEPTED SUBMISSIONS** Presented live at the **2020 IES Annual Conference | New Orleans, LA | August 6**

Published in LD+A magazine | Presented at IES Section meetings | Accessible throughout the year at the IES website

Receive a presentation grade certificate

# IES SUSTAINING MEMBERS

The following companies have elected to support the Society as Sustaining Members which allows the IES to fund programs that benefit all segments of the membership and pursue new endeavors, including education projects, lighting research and recommended practices.*

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BK Lighting
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Capital Electric
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Edison Price Lighting Inc
ETC, Inc.
EYE Lighting International of North America, Inc.
Finelite Inc.
Focal Point, LLC
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Louis Poulsen Lighting Inc
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Lutron Electronics Co
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Ubicquia
VELUX, America, Inc.
Vermont Energy Investment Corp.
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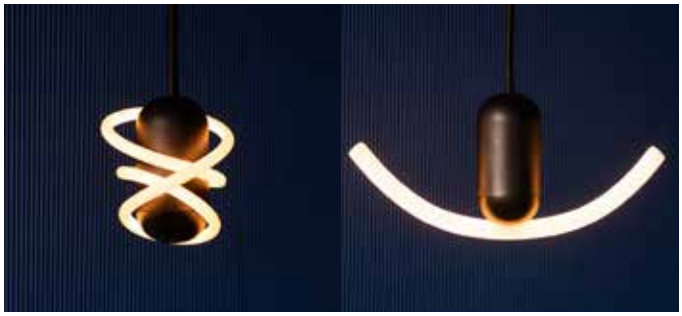
WOW Lighting

*Contributor Sustaining Members are listed at *www.ies.org*.

# PRODUCTS

1.



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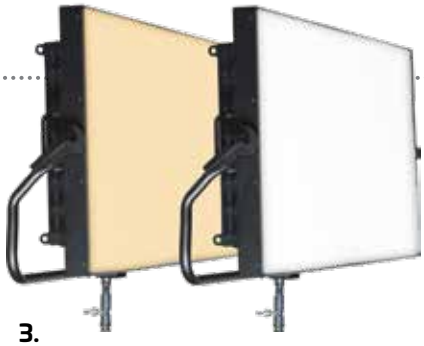


3.

4.

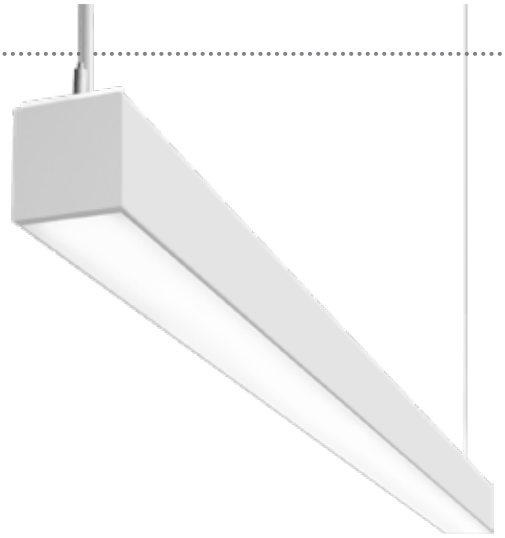
**1. WAC Lighting** announces the Highwire LED Pendant, available in 43-in. and 50-in. sizes. The smaller size includes six 12-in. and two 6-in. downrods and the larger size features three 12-in. and one 6-in. downrod, which can be mounted to a sloped ceiling. The Highwire delivers up to 801 lumens with a 3000K CCT and a 90 CRI. It is available in a black finish. *www.waclighting.com*

**2. AMEICO** introduces BEEM, a graphic LED lightbulb design created for endless configurability and engineered to emit a constant and dimmable warm glow. BEEM bulb designs are made by hand using borosilicate glass for the tubes, flexible LED filaments, industrial ceramic for molded parts and polycarbonate for the Curli model's twisting form. *www.ameico.com*

**3. Chroma-Q** announces the Space Force 2 ft by 4 ft LED soft light panel. A scaled-up version of the 1 by 2, the 2 by 4 joins the Space Force family of replacements for conventional sources used in film and TV studios, live broadcast, vlog and photographic applications. It can be tuned from 2800K to 6000K with a smooth intensity gradation, while up to eight of its distinct cells can be controlled individually for various shades and effects. *www.chroma-q.com*

**4. Alva** introduces Brian, an architectural scale, wet-listed exterior wall sconce. Created for large façades, the sconce is dark-sky compliant, IP66 rated and includes over 100,000 hours of rated lifetime. Design options include no panel, short panel and long panel, and the fixture is manufactured from aluminum with an industrial powder-coat finish. *www.alvalight.com*

**5. Finelite** announces the HPX Luminaire, featuring a 2.5-in. micro-square form for more flexibility with applications. HXP is DLC listed and direct and indirect/direct distributions are available with multiple optic options, allowing HPX to enhance the linear



5.

6.

lighting aesthetic in office spaces, lower ceiling workspaces, conference rooms, open offices and classrooms. HPX is equipped with an integral driver design and features an LED configuration of 120 LEDs per 2 ft of board. *www.finelite.com*

**6. Luminis** announces the Hollowcore luminaire, suitable for traditional high-bay applications and more contemporary spaces. With a circular LED light engine and an open center concept, Hollowcore delivers up to 13,000 lumens of uniform light with a batwing distribution for minimal cave effect. It is available with a high-efficiency lens or aluminum reflector. An optional independently-controlled uplight component is also available to provide additional upward illumination or to highlight ceilings. *www.luminis.com*

# IN ACTION

Photo: Westerner Park

## COMPLEX UNDER CONTROL

Every year, Westerner Park hosts around 1,500 events and welcomes approximately 1.5 million visitors. The 320-acre complex located in Alberta, Canada, includes multiple venues that put on everything from weddings to hockey games. Aware of the value that lighting brings to the site, the location's managers green-lit a major retrofit to address recurring maintenance issues, as well as to increase light levels and reduce energy consumption. Existing T5 fixtures were replaced with LED high-bay luminaires (**EiKO**) divided into groups controlled by Bluetooth SIG-qualified **Fulham** EliteControl fixture controllers. In each of the site's pavilions, a single wireless energy-harvesting switch allows users to control all of the luminaires simultaneously. The success of the Bluetooth mesh luminaires, now covering 120,000 sq ft, set off phase two of the project, which includes replacing fluorescent fixtures in all of the remaining pavilions.

# PRODUCTS

**7. MaxLite** introduces the JA8-listed G9 Base Lamp for use in miniature decorative luminaires. Available in color temperatures of 2700K and 3000K, the lamp consumes 4 watts of power and emits 400 lumens of light. It is UL listed, enclosed-rated and dimmable. The 2-in. lamp can be used as a replacement for halogen bulbs in chandeliers, bath bars, wall sconces and other decorative luminaires.
*www.maxlite.com*

**7.**



**8.**

**8. 2nd Ave Lighting** announces Grace 10 Light Chandelier. The fixture features 10 faux candlelights crowned with natural linen shades perched on bobeches. The shades are complemented with a bronze finish. A matching downlight supplied by the customer offers direct illumination. The overall height ranges from 40 to 111 in. as the chain length can be adjusted in the field. The Grace is handcrafted and shade colors, metal finishes and fixture sizes can be customized to meet specific needs.
*www.2ndave.com*

9.

**9. ET2 Lighting** announces the Hemisphere Collection of LED pendants. The spun shades feature a glossy aluminum interior finish and a hammered metal interior to increase overall lumen output. High-gloss enamel paints finish the exterior for an ultra-reflective surface. The larger sizes are fitted with commercial grade LED and multi-volt input drivers that dim with both ELV and 0-10-V functions.
*www.et2online.com*

10.

**10. EPCO** announces the General-Purpose Linear LED Luminaire designed specifically for building owners and facility managers that want to modernize and upgrade aging lighting systems. Consuming 50% less electricity than fluorescent lamps, the luminaire includes IP65-rated protection against the ingress of dust, other solid particles and low-pressure jets of directed water. Ready for immediate installation, the luminaire can be surface-mounted or suspended from a ceiling.
*www.engproducts.com*

# CLASSIFIEDS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**The Howard Brandston** Student Lighting Design Education Grant was established to encourage and recognize students who have demonstrated exceptional professional promise through the presentation of an original and ingenious solution to a supplied design problem.

**The Award** is a plaque and a grant in the amount of $1,000. Honorable Mention (if awarded) is a certificate and a grant in the amount of $300.

**Group entries** are allowed. However, if a group entry is selected, each student will receive a plaque or certificate. The monetary grant will be divided among the recipients.

**To be eligible to enter** this competition, applicants must be enrolled as full-time students in an approved academic degree program. Approved programs are those offering a substantial core of illumination studies and are either engineering technology programs accredited by the Accreditation Board for Engineering and Technology; architecture programs accredited by the National Architectural Accrediting Board; interior design programs accredited by the Foundation for Interior Design Research; or theatre programs accredited by the National Association of Schools of Theatre. If there is a question about accreditation, please query.

**The purpose** of the Howard Brandston Student Lighting Design Education Grant is to foster good lighting and to advance the appreciation of lighting as an art.

## Calendar

**Project Due:** IES Office by May 15, 2020
**Project Judging:** June 2020
**Grant Notification:** July 2020
**Recognition:** Recipients will be recognized at the IES Award Ceremony during the 2020 Annual Conference in New Orleans, LA.

Project drawings and application form are available at the IES website at **www.ies.org/brandstongrant**

THE HOWARD BRANDSTON

# 2020

# STUDENT LIGHTING DESIGN EDUCATION GRANT

The companies listed below would like to tell you more about their products and services. To learn more, access the websites listed here.

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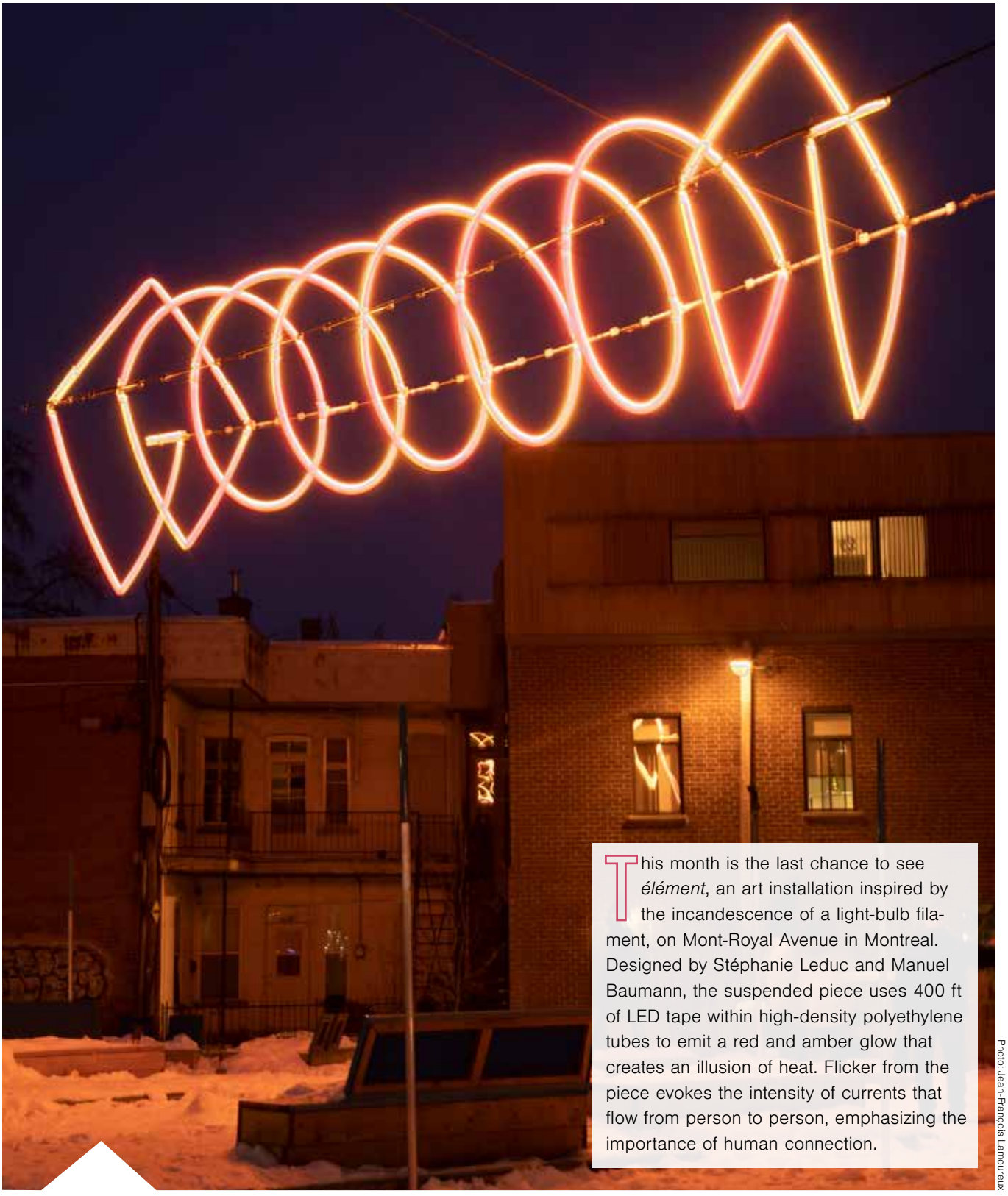
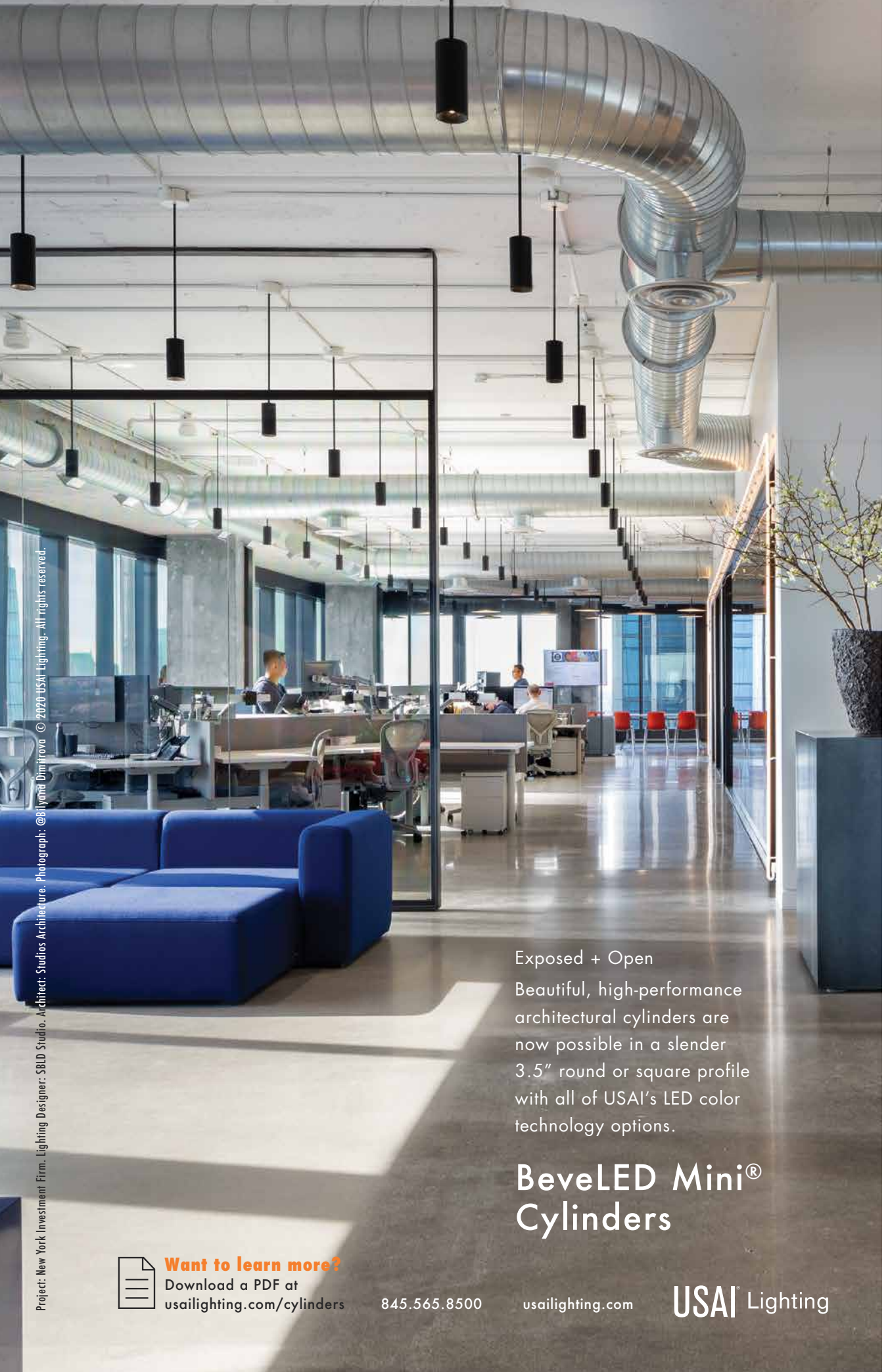


This month is the last chance to see *élément*, an art installation inspired by the incandescence of a light-bulb filament, on Mont-Royal Avenue in Montreal. Designed by Stéphanie Leduc and Manuel Baumann, the suspended piece uses 400 ft of LED tape within high-density polyethylene tubes to emit a red and amber glow that creates an illusion of heat. Flicker from the piece evokes the intensity of currents that flow from person to person, emphasizing the importance of human connection.

Photo: Jean-François Lamoureux

# LAST LOOK

## A Work of Warmth



(un)finished ceilings… celebrated

Exposed + Open

Beautiful, high-performance architectural cylinders are now possible in a slender 3.5″ round or square profile with all of USAI's LED color technology options.

## BeveLED Mini® Cylinders

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USAI® Lighting


Credit: Union Church of Robinson Township, McKees Rocks, Penn.

# Grand Accent

Shown lit from 150 feet below by a single WAC Grand Accent light. Ideal for spotlighting monuments, statues, facades and other fine exteriors, our Grand Accent is constructed of solid cast brass, and offered in both 12V and 120V power. Superior output from 740-2000 lumens in a single fixture and respective power, 50W-150W, adjustable directly on board. Dial between beam angles ranging from 15°- 60°.

Available in 2700K Warm White, 3000K Pure White or 4000K Cool White.

WAC LIGHTING

waclighting.com