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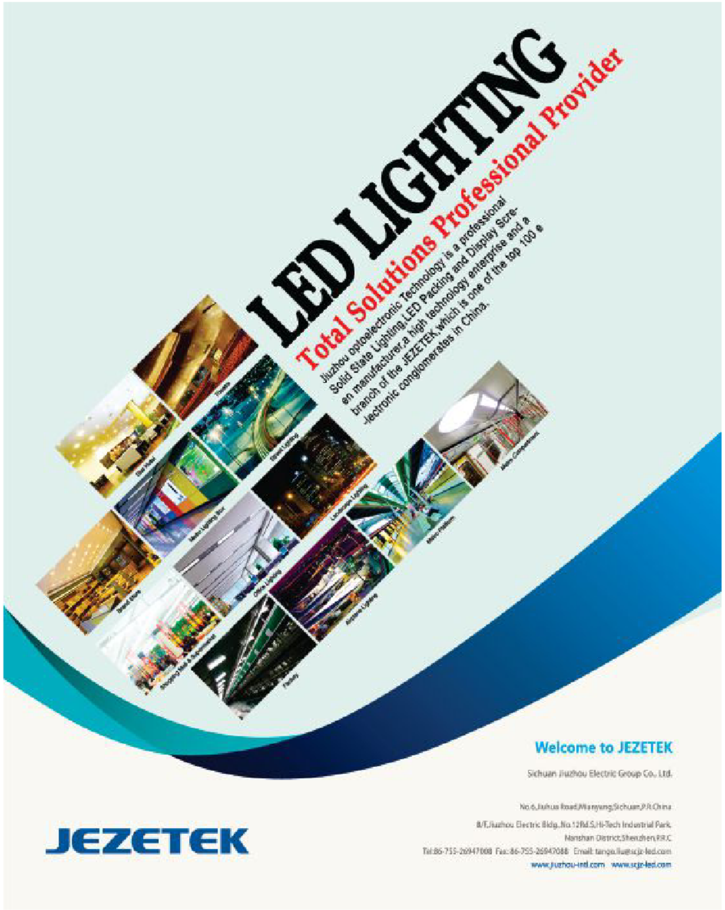

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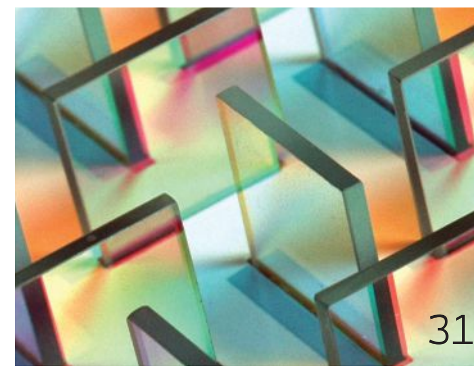

Left: PSLAB; Top Right: James Newton; Bottom Right: Chris Wood

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On the Cover:
Starlight, an LED installation at the Museum of the City of New York. Photo by Pavel Bendov.

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SPECIFICATION CONUNDRUMS

"As the lighting industry tries to keep pace with the march of technology, do manufacturers need to change the time frame during which they have to guarantee a product's availability?"

Product specification has always been a complex process. One of its most challenging aspects is the amount of time that it takes from when a project is initially designed and the product selections are made to when those products are purchased and installed. Depending on myriad factors, that gap can be as short as a few months or as long as years. During that time, product technology can evolve significantly.

This is happening more than ever, as lighting moves from traditional sources to LEDs. And as a result, it is complicating the specification process in a way that could compromise the designer–client relationship and discourage people from adopting new technology.

How then should the lighting industry approach this issue, in which multiple systems are at play and trying to catch up to one another? First let's start with luminaires and related lighting components. Not so long ago, manufacturers could issue lamp and ballast catalogs knowing they would remain relevant longer than a single product season. If manufacturers knew they were going to cease making a luminaire or a light source, they had time to announce it to their customers. Today, with so many new companies entering the lighting industry, the main problem isn't whether a manufacturer will post announcements of product availability, but whether or not the company will even still exist in six months.

As the lighting industry tries to keep pace with the march of technology, do manufacturers need to change the time frame during which they have to guarantee a product's availability? This is about the short and the long term. Perhaps a new, more-transparent reporting process should be introduced, one that mandates that manufacturers provide quarterly product updates via dedicated areas on their websites. That way, lighting designers could reference these lists on a regular basis and have fair warning if a fixture or a lamp that they have used for some time is on, or at risk of being on, the product endangered species list. This type of information should also be made readily available as part of a manufacturer's display at major lighting trade shows such as Lightfair, where there is the greatest opportunity for manufacturers to communicate directly with the lighting specifier.

The dilemma of product availability over the long term challenges the fundamental aspects of the design–construction process as currently practiced. If, over the course of a project's bidding process, it is discovered that a specified product is no longer available or might be taken out of production, the system should allow time for the lighting designer to weigh in on an alternative, instead of the decision defaulting to the contractor or client. And if the ripple effect of the change is significant, shouldn't the designer, for the sake of the project's integrity, get a chance to submit a redesign? How you do all of this without affecting the cost of the project and the length of the schedule certainly would not be easy. Still, knowing that there is a time delay between original design concept and completed structure, you'd think there would be greater acknowledgment by all parties involved that the process does not always allow for the latest products—despite everyone's best efforts.

One thing that might help would be for the industry to set product generation time frames that correlate to the actual purchase and installation date instead of the original specification date. Unlike consumer electronics, where planned obsolescence is an unwritten understanding between consumer and manufacturer, buildings and their systems need to last more than just a few years. If a building owner wishes to switch to a newer generation of products, the manufacturer could offer a replacement incentive in the form of a new purchase discount.

For now, until the industry re-imagines the specification process to match technology cycles, the process must become more transparent. Otherwise, future lighting achievements and solid-state lighting's continued progress will continue to be at risk.

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PHIL GABRIEL 1939–2014

A great advocate of the profession and of lighting education, his efforts on behalf of the lighting design community will be missed.

text by Elizabeth Donoff
photo by John Kealey

Lighting designer Phil Gabriel passed away on Aug. 9. Trained in architecture and interior design at Pratt Institute in Brooklyn, N.Y., in the early 1960s, Gabriel started his professional career in New York working in the offices of architects Marcel Breuer and Edward Barnes among others. While a student at Pratt, he entered and won an Illuminating Engineering Society student lighting competition, and at the awards dinner, Gabriel met lighting designer Howard Brandston. The meeting served as the start of their life-long friendship.

"Knowing Howard Brandston over those years and being in and out of his office and seeing how he worked, this formed a model for me of how to practice," Gabriel said during a One-on-One interview for ARCHITECTURAL LIGHTING that appeared in our Jan/Feb 2014 issue.

In the early 1970s, Gabriel moved to Canada and opened his own firm, Gabriel/design (now Gabriel Mackinnon). Over time, the office developed a project portfolio that included a diverse range of work, including schools, theaters, museums, hotels, stores, churches, and historic restorations. His design philosophy focused on solutions "where the light reveals a space without drawing attention to itself."

Gabriel was committed to his profession and educating the next generation of lighting designers. He was a fellow of the International Association of Lighting Designers (IALD) and president of the association in 1998–1999. He was also a fellow and past president of the National Capital Section of the Illuminating Engineering Society.

Education, in his mind, was the essential cornerstone to the future longevity of the profession. He was passionate about lighting education and served as president of the IALD Education Trust, helping to establish the Trust's Ambassador Program that connects lighting design students at the university level with lighting design professionals.

"Any profession has a strong academic educational base; that's what holds it together," he said during our interview. "Lighting is so young and dispersed. We need university degrees in lighting design. We can't continue to be satisfied with people coming out of architecture, interior, and theater schools with only a tiny bit of lighting experience. There are only 20-plus programs worldwide that offer some kind of lighting degree, and just seven in the U.S. We need to help grow their programs. It is essential to the future of our profession."

A memorial service for Gabriel was held on Sept. 23 at the National Gallery of Canada. Donations in his honor can be made to the IALD Education Trust at *iald.org/trust*. •

STEVEN ROSEN APPOINTED IALD EDUCATION TRUST PRESIDENT

text by Elizabeth Donoff

In mid-July, the International Association of Lighting Designers (IALD) Education Trust announced that its board of directors had met and, by special vote, appointed Steven Rosen, principal and creative director of Salem, Mass.–based lighting design firm Available Light, to succeed Ron Naus as its president for the remainder of the 2014–2015 term. Naus, president of B-K Lighting and TEKA Illumination, was serving as IALD Education Trust President when he suddenly passed away on May 31. •

To read the full version of this article at archlighting.com, go to bit.ly/1lX0PHY.

U.S. DEPARTMENT OF ENERGY'S SOLID-STATE LIGHTING PROGRAM CONTINUES TO PROVIDE LATEST LED LIGHTING INFORMATION

text by Elizabeth Donoff

The U.S. Department of Energy's (DOE) Solid-State Lighting (SSL) program continues to serve as an important testing and information resource for LED lighting products for the lighting design and specification community. Through its many initiatives such as R&D Workshops, CALiPER testing program, Gateway Demonstrations, and LED Lighting Facts, lighting specifiers can access the latest information on LED advancements and installations.

Throughout this year, the DOE has issued several reports and lighting facts sheets. Here is a snapshot of some of the key ones:

- *CALiPER Report 22: LED MR16 Lamps* (Originally issued June 2014, Updated Sept. 2014); 1.usa.gov/YYwvTm
- *Energy Savings Forecast of Solid-State Lighting in General Illumination Applications* (August 2014); 1.usa.gov/ZrAlif
- *Dimming LEDs with Phase-Cut Dimmers* (Originally issued October 2013, Updated August 2014); 1.usa.gov/1uKnNTo
- *CALiPER Snapshot: Outdoor Area Lighting* (July 2014); 1.usa.gov/1uKnPL0
- *CALiPER Snapshot: Indoor LED Luminaires* (May 2014); 1.usa.gov/1uKnPL0
- *Lighting for Health: LEDs in the New Age of Illumination* (May 2014); 1.usa.gov/1r2lxGE
- *CALiPER Report 21.2: Linear (T8) LED Lamp Performance in Five Types of Recessed Troffers* (May 2014); 1.usa.gov/1mfYY1t
- *CALiPER Report 21.3: Cost-Effectiveness of Linear (T8) LED Lamps* (May 2014); 1.usa.gov/1ATeKjL
- *CALiPER Report 20.2: Dimming, Flicker, and Power Quality Characteristics of LED PAR38 Lamps* (March 2014); 1.usa.gov/1rfn4JZ

All of these reports, including those from past years, are available at the DOE's SSL program website: *ssl.energy.gov*. •

United Kingdom–based tea and fine foods purveyor Fortnum & Mason tapped Speirs + Major for the lighting design of its first new store in London in more than 300 years. Completed this past November at the St. Pancras International transportation center, the 2,000-square-foot interior pairs retail space with a tea salon. The lighting highlights the architectural elements and showcases products while welcoming customers to break for tea and a light meal. Read the full story online at bit.ly/1ATb95t.

Top: Courtesy IALD; Bottom: James Newton

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REPORT

CONTROLLING INTERESTS

California's Title 24, Part 6's new standards mandate flexibility in controls and greater lights-out time.

text by Bill Millard
illustration by Tang Yau Hoong

With the latest version of Title 24, Part 6, the California skyline is about to surrender some of its 24/7 nocturnal glow. The goal is for offices, corridors, stairwells, library stacks, parking garages, and other intermittently used structures to cease producing widespread lighting waste and light pollution. Retrofitted buildings will have to incorporate task-appropriate technologies; in new construction, sensors, timers, and dimmers will be standard equipment. Commissioning and acceptance-testing requirements will thwart loophole-hunters by linking certificates of occupancy to functionality.

For designers, contractors, and owners, this means some substantial up-front costs, and for the controls industry, some expanding opportunities. For other states and the federal government, it's an experiment to watch, and perhaps to emulate, especially if controls manufacturers nationwide and regulators in other jurisdictions look to California as a bellwether. "We're under state mandate, by 2020, [for] residential [energy use] to be net zero, and 2030 [for] commercial to be net zero," says Chip Israel, CEO and founder of Lighting Design Alliance in Long Beach, Calif.

Some Californians view this change as welcome, even overdue; others, as unsettling. "In the professional community, people are reasonably well prepared," observes Darrell Hawthorne, principal of Architecture & Light in San Francisco. The lay community, in contrast, has struck him as "not prepared." Uncertainty over what the code would require drove a scramble for early permits before it took effect. "We saw a big spike of work right before the [July 1] deadline [for the 2013 version of Title 24, Part 6] going into effect," Israel says. Contractors unfamiliar with lighting designers' "controls narrative," he adds, have found the requirements particularly confusing; the clearer the design rationale and the better the communications among designers, owners, and on-site personnel, the smoother the adjustment.

Approval is not universal. Sean O'Connor, principal of Sean O'Connor Lighting in Beverly Hills, Calif., minces no words in articulating the concern shared by many: "The new Title 24, Part 6 is completely unrealistic, both in terms of LPD [lighting power density], added costs to clients, and availability of product to meet some of these requirements. … More than any other standard to date, the new T24 requirements for equipment are not able to be met by more than a select few manufacturers, and those manufacturers' products may not be architecturally compatible or may be too high-end or too low-end for a project. We are not in a good place to do our job, and our clients suffer because of it."

Hawthorne, though, points to the big picture, where the gains outweigh the transitional speedbumps: "This is a huge surge forward in terms of energy efficiency [and] the development of more sophisticated lighting controls." Those who have worked to shape the standards and those who chafe under them agree on one point: the new Title 24, Part 6 disrupts business as usual. Professionals who are ready for its emphasis on controls and system integration stand to benefit as California leads the way toward an era of stricter uses and management of lighting.

WHAT IT DOES—AND DOESN'T—MEAN

Every three years, California Building Standards Commission officials update Title 24, the state building code, of which Part 6 (under the California Energy Commission [CEC]) governs energy use, including building envelope measures, mechanical systems, and process power loads as well as indoor and outdoor lighting (governed by Section 130 of Part 6). Along with ASHRAE Standard 90.1 and the International Energy Conservation Code (IECC), Title 24, Part 6 is one of the nation's three major systems for measuring and controlling buildings' energy performance.

The core rationale for the 2013 version of Title 24, Part 6, which replaces the 2008 standard and took effect on July 1, 2014 (after a six-month shift in the original Jan. 1 deadline), is as simple as picking low-hanging fruit. "If no one's there, why do we need to be using this much energy to light spaces that don't need it?" asks Kelly Cunningham, outreach director at the California Lighting Technology Center (CLTC), a research, development, and training facility based at the University of California, Davis.

Commentators point out that the most important changes in the new Title 24, Part 6 pertain to the power consumption of luminaires in unoccupied or intermittently occupied spaces and the processes for certifying that new or retrofitted buildings are in compliance. Cunningham emphasizes a key distinction, commonly misunderstood: "The code is not dictating a reduction in light levels by X percent; it's power." For new residential projects, CEC classifies every luminaire as high-efficacy or low-efficacy, with separate switching for the two types; a luminaire that can accept a low-efficacy lamp or has not been certified does not qualify as high-efficacy. LED luminaires for indoor residential use need a color rendering index (CRI) of 90 and a correlated color temperature (CCT) of 2700K to 4000K to qualify as high-efficacy. The code requires a minimum of 50 percent high-efficacy lighting, measured by total wattage, in kitchens; at least one high-efficacy luminaire in bathrooms; high-efficacy lighting with vacancy sensors in garages, laundry rooms, and utility rooms; either high-efficacy luminaires or controls in hallways, bedrooms, living, and dining rooms; and for outdoor lighting, either high-efficacy luminaires or, for low-efficacy luminaires, non-overridable controls.

Gary Flamm, a consultant who supervised the CEC's Building Standards Development Unit and served as lighting lead contact until his retirement last February, observes that residential spaces are harder to regulate than nonresidential. "While you can assign a watt-per-square-foot allotment to non-residential, you cannot make that corollary to residential, because residential does not have uniform lighting." The widespread assumption "that there are limits to illumination in residential lighting is simply not true," Flamm says. As Hawthorne notes, "The CEC has treaded very lightly about how they have regulated lighting in residences."

Contractors unfamiliar with lighting designers' "controls narrative," Chip Israel says, have found the requirements particularly confusing; the clearer the design rationale and the better the communications among designers, owners, and on-site personnel, the smoother the adjustment.

For nonresidential buildings, in contrast, detailed specifications call for combinations of five strategies—dimmers, sensors, timers, manual controls, and demand-response capability—in different typologies and conditions. Among salient points in the code, areas larger than 100 square feet need multi-level controls or continuous dimming, meeting a set of uniformity requirements for each luminaire type; each luminaire needs to be connected to at least one of five types of controls (manual continuous dimming with on/off switching, lumen maintenance, tuning maximum light levels at a level lower than full power, automatic daylight controls, or demand response controls). Classrooms are an exception to the multi-level requirements; if they have a connected general lighting load less than or equal to 0.7W per square foot, they need at least one control step between 30 percent and 70 percent of full power.

Another new aspect of the stricter regulations is the proportion of floor area required to be in daylighting zones; it has now risen to 75 percent (higher than the 2008 code's 50 percent) and applies to buildings greater than 5,000 square feet (formerly 8,000). Indoor


45°
361°
5.00" 127mm
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2.50" 64mm
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"It is critical that specific issues that are encountered be brought to the attention of the CEC to say 'I have this building, and this application, and it is not technically feasible for me to do all five of these lighting controls.' The CEC will not know that if it is not brought to their attention." —Gary Flamm

parking areas and secondary spaces have also now been added to the areas needing occupancy sensors (along with offices above 250 square feet, conference rooms, multipurpose rooms, and classrooms); sensors must cut power by 50 percent when corridors, stairwells, warehouse aisles, and library stacks are unoccupied; security and egress lighting-allowance maxima drop from 0.3W to 0.2 W per square foot when buildings are occupied.

Demand-response-capability requirements expand considerably in the updated Part 6. The 2008 version confined these requirements to retail buildings with sales floor areas greater than 50,000 square feet. The new code calls for all nonresidential buildings greater than 10,000 square feet to be able to respond to a signal cutting lighting power at least 15 percent below maximum. This provision pertains to functionality only, Flamm adds; activating this function is a separate private arrangement between system owners and utilities or other central signaling sources, such as home offices for chain commercial buildings. The CLTC summarizes the regulations online at *cltc.ucdavis.edu/title24*.

HOW THEY GOT THERE

Although from some perspectives the new code looks draconian, it's by no means arbitrary. The process of code revision includes three phases that overlap each other on the triennial cycle, Flamm says. In a pre-rulemaking discovery phase, efficiency advocates propose ideas to modify current standards, and CEC staff consider unresolved issues from previous versions. These parties then negotiate a feasible scope of work for the period. Advocates vet their ideas in public workshops with stakeholders, including manufacturers, consultants, electrical engineers, building department representatives, and designers, followed by staff workshops and recommendations to the five commissioners. The federal Administrative Procedure Act stipulates a 45-day public comment period before a formal rulemaking proceeding; 10 days of addressing issues of cost, technical feasibility, and energy savings; another posting of "15-day language" for comment; and finally a CEC vote, provided no legitimate complaints have arisen.

"The energy-efficiency advocates always want to go a lot further than the Energy Commission feels like it has the resources to go," Flamm says. The negotiations sometimes produce rules that draw poor reactions and are later dropped, such as the 2008 code's requirements for programmable clock thermostats in residential and light commercial settings.

Considering "unintended consequences that may happen if the right stakeholders are not looking over California's shoulders, not on purpose, but because nobody knows everything," Flamm says, he recommends that more professionals get involved in the rulemaking process, offering feedback to the CEC through its website, *energy.ca.gov*. Flamm agrees that the code does not always match every project circumstance. "It is critical that specific issues that are encountered be brought to the attention of the CEC to say, 'I have this building, and this application, and it is not technically feasible for me to do all five of these lighting controls.' The CEC will not know that if it is not brought to their attention."

The CEC looks at two chief criteria when considering a provision, Israel says: fair practice and metrics derived from existing well-designed projects. The new standard also affects incentive programs offered by California's public utilities (the three majors being Pacific Gas and Electric Co., Southern California Edison, and San Diego Gas & Electric) for energy-conserving upgrades. "Title 24, Part 6 is set as the baseline in terms of what you can incentivize," Cunningham says. "You have to be beyond code in order to receive an incentive from the investor and utilities." She notes that certain technologies need to be graduated out of the incentive portfolio as the code already mandates that they be implemented. Further complicating the process is the fact that the majority of the building stock does not comply with the code that just went into effect July 1. "They're not even up to the 2008 code," Cunningham says. Another important change, she adds, is having state codes align with national codes, so that there is more consistency between the required criteria.

Cunningham also notes that end users who have seen demonstrations of premium systems sometimes overestimate the complexity of the new requirements. Title 24, Part 6 "offers quite a few ways to comply with the controls portion of the code without doing what one might imagine as the Cadillac kit—the networked control system with all luminaires dialed into a sophisticated software to monitor energy use."

THE CERTIFICATION PROCESS

The nonresidential Title 24, Part 6 rules are rigorous enough to require a certification process for test technicians—the California Advanced Lighting Controls Training Program (CALCTP)—requiring recertification each time the codes change in the future. This new requirement "will cost approximately the same rate as an electrician in terms of their hourly cost to add to the job," Cunningham says. "But the hope is that it reduces cost later when things aren't harvesting the amount of energy."

CALCTP is also a way for the CEC to catch up on implementing the certification process. "It's no longer the responsibility of the local building official," Hawthorne says. He speculates that a gap may appear between the intentions behind the acceptance-testing provision and the results in the field, depending on how rigorously the standards are applied.

"Why the CEC has gone about it the way they have, I have no idea. They have a whole fleet of people out there that were the logical candidates to become the people to do this, and it's the people who do inspections for the Division of the State Architect. The [CEC] could have folded it into that program. Instead, they're doing it privately. They're creating a whole other business group." Consequently, the greatest potential unintended consequence of the new code, Hawthorne says, is a scenario where contractors have a financial motive to influence or abuse the certification process, perhaps setting up "a kind of dummy business" with acceptance testing essentially amounting to self-certification. "It's taken the authority [or] obligation for verification out of the public sphere and put it into a private contracting sphere," Hawthorne says. "I think that the CEC needs to develop a program in which inspecting agencies, not independent contractors, are responsible for that, [but] they just didn't have the time or the ability to do that. They're walking into new territory."

Such scenarios conceivably represent as substantial a stimulus for California's legal profession as the dimmability requirements create for manufacturers of controls and LEDs. CALCTP addresses the possibility explicitly: its Acceptance Testing Policies Manual includes a section on "conflict of interest and appearance of impropriety." It is too early to tell whether such practices are arising, but Hawthorne describes it as the largest potential unintended consequence of the new program.

WHERE CALIFORNIA GOES, WILL THE NATION FOLLOW?

These changes appear in a context of urgency and opportunity. California has long led the nation in controlling energy use per capita. Buildings account for 39 percent of the U.S.'s primary energy consumption, and lighting is the highest portion (28 percent) of that total. Evolution in lamp technology has made inroads, but the greatest potential gains come from reducing waste use: reducing operating hours, reducing watts used when lights are on, reducing the associated cooling load, and in turn maximizing the purposeful use of sunlight. In lighting power use, as in vehicular emissions standards, California may remain more stringent and progressive than the rest of the nation while nudging national standards forward. •

IN FOCUS

STARLIGHT

A precise constellation of LEDs takes shape and becomes the focal point for the Museum of the City of New York's lobby.

text by Aaron Seward

At the completion of the Museum of the City of New York's (MCNY) recent $90 million renovation, museum director Susan Henshaw Jones sensed that something was missing. It lacked, she felt, the right amount of "spirit" in its public space. To get to the heart of the problem and find a solution, she called on architects Chris Cooper and Wendy Evans Joseph of New York–based Cooper Joseph Studio, who had previously designed a

Eduard Hueber/Arch Photo

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Starlight's matrix of more than 10,000 individual LEDs creates a contemporary pattern of light that juxtaposes with the architectural details of the Museum of the City of New York's Colonial Revival style building.

Pavel Bendov

pop-up site for the museum at the South Street Seaport.

When the architects visited the museum's landmarked Colonial Revival building on the Upper East Side, they found that, while the recent work had indeed provided fine gallery spaces for the institution, it had neglected to take advantage of the historic building's primary asset: a sweeping, semi-circular marble staircase that ascends from the lobby to the second floor in a soaring rotunda decked with fluted columns and pilasters, ornamental wrought-iron railings, and topped by a 19th century chandelier.

This is where Cooper and Joseph decided to make their mark. "We said, 'Let's take the historic chandelier out and replace it with a two-story dynamic sculpture that animates the space and pulls you up the stairs,'" Cooper says. "We decided to paint the rotunda all white to neutralize the historic detail and then put seating under the installation and a café on the second floor. Those simple moves changed the whole core of the museum."

In deciding what the dynamic sculpture should be, Cooper and Joseph were constrained by a tight budget. "We were enamored with the concept of a precise matrix of points of white light that would create a 3D moiré effect," Cooper says, but "we had a limited budget for our ambitions. That helped us edit it down from programmability and changeability; it also took out the idea of color and kept it simplistic."

With that design brief in hand, the two designers went in search of a fabricator. A reference from Tod Williams Billie Tsien Architects led them to Kenzan Tsutakawa-Chinn of Studio 1Thousand, an LED-based lighting design consultancy based in New York. Tsutakawa-Chinn intrigued Cooper and Joseph because he was interested in seeing the project through from engineering to installation. "That's very unique," Cooper says. "There are not many people who are interested in design and installation. He's also interested in the optical effects of light, not just the mechanics, so he was able to talk to us about that as well as the fabrication."

Cooper Joseph and Studio 1Thousand worked back and forth over the course of three months on the design of what became known as Starlight. The $100,000 budget determined the number of LEDs possible, and the architects used that number to refine a 3D grid pattern, circular in elevation, of 10,486 LEDs. They used Rhino to model the geometry and Autodesk 3ds Max for renderings and animations. The result fills an area 22 feet tall by 15 feet wide by 3 feet deep, and is composed of 219 "vines"—seven deep by 31 wide—or groups of three cables, atop each of which is suspended, in a precise 5¾-inch geometry, a series of triangular circuit


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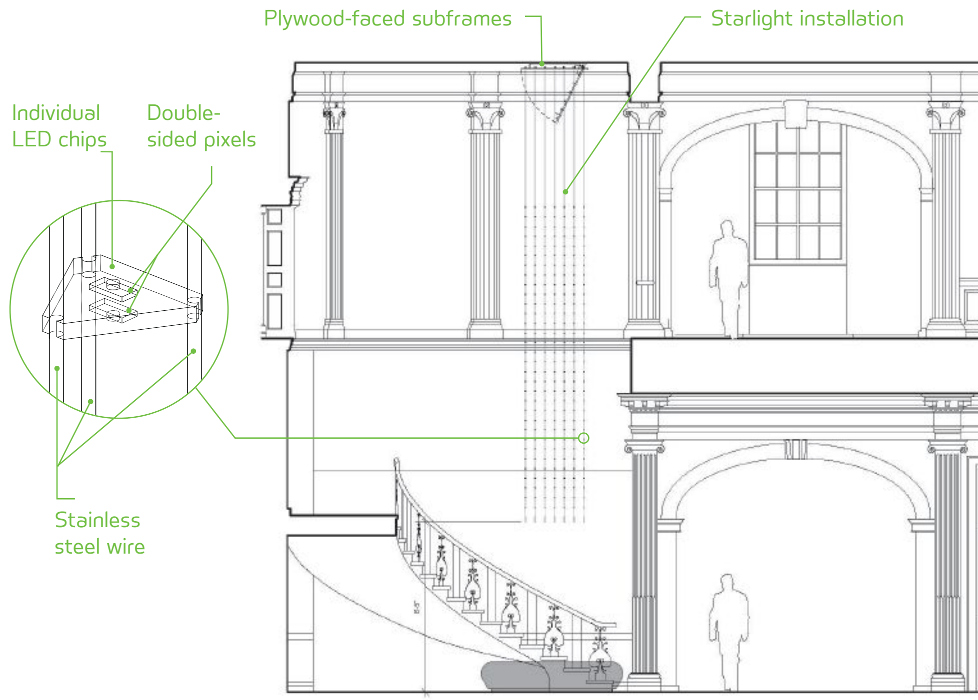
LED Detail; Section at Lobby



boards with LEDs on the top and bottom. Two of the cables in each vine bring power down to alternating circuits, reducing the amount of drag on the 12V DC coming down the line. The third handles the return current. Stainless steel counterweights, 4 ounces each, hold the vines in tension. Overall, the light sculpture uses 1,131W and puts out 71,304 lumens of 2700K white light.

In the early stages, the team played with the idea of using diffusers around the LED circuit boards, but the strategy was soon discarded. "Chris was concerned that we were going to see all this construction, the little triangles," Tsutakawa-Chinn says. "My point was that once you see the light, you're not going to see anything around it for 3 or 4 inches," and Studio 1Thousand constructed a prototype to prove that point. It was then determined that the most important aspect of the piece was to ensure that the geometry of the matrix was rigidly adhered to in the final installation, so the team set a tolerance of 0.007 inches.

Starlight's LED strands were assembled by Rush Design, Studio1Thousand's fabrication partner, in Rush Design's Portland, Maine, and Brooklyn, N.Y. workshops. The team built a series of motherboards, each containing 220 of the triangular LED circuits, and ran them at 100 percent for two weeks, tossing out the ones that failed. LEDs from different bins were used on the motherboards so that any variation in color that did exist would not be noticeable. "When you see a field of lights that big, if there's any variation you would see it from one region to the next, even [if it's only] a five to seven percent change in color," Tsutakawa-Chinn says. "If it's mixed, you won't notice it. The eye is a magnificent tool that [can] handle many variations." The circuits were then soldered onto the vines.

Installation of the sculpture occurred in two phases: first the supporting structure and then the chandelier elements. The structural engineers called for suspending the chandelier's supporting frame from Lindapter clamps affixed to the wide-flange, steel sections in the ceiling. Originally constructed in 1932, the building's structural members were encased in concrete as a form of fire protection. That meant that a certain amount of concrete had to be chipped away to make room for the clamps. Once this was done, the frame was attached to the clamps and a second frame, which hinges down to the ceiling, was attached to it.

The team then drilled holes in the second frame to suspend the sculpture. According to Tsutakawa-Chinn, the installer drilled a first set of holes, but then, after scrutinizing them from the ground, didn't like where they fell. He then drilled another set of holes about 1.25 inches to the left. "He puts the whole thing back and says, 'We're good,'" Tsutakawa-Chinn says. "It took us about a week and was pretty straightforward: just attached it to the base plate, let the whole thing drop, and then attached the weights to the bottom."

Technical exactness mixed with a dose of on-site intuitive installation methods, provided one of the most rewarding moments during the install. "We're in the café space at 11:30 at night, bleary eyed, crazy from installing and not sleeping, when we notice that the center line of the chandelier lines up with the center line of windows behind it. It also lines up with the wrought-iron railings and with a seam in the floor tiles. All four of those things were lining up perfectly," Tsutakawa-Chinn says. "The guy installing [the chandelier] had no idea. He had kind of drawn the theoretical center [of the piece]. [It's] one of the craziest things I've ever seen." •

Details **Project:** Starlight, Museum of the City of New York, New York • **Client:** Museum of the City of New York, New York • **Architect:** Cooper Joseph Studio, New York • **Lighting Designer:** Studio 1Thousand, New York • **Additional Consultants :** Rush Design, Westbrook, Me. (Starlight fabricator) • **Installation Size:** 22 feet tall by 15 feet wide by 3 feet deep, and 15 feet in diameter • **Project cost:** $100,000 • **Code Compliance:** Not applicable • **Watts:** 1,130W (total)

Left: Courtesy Studio 1Thousand; Right: Courtesy Cooper Joseph Studio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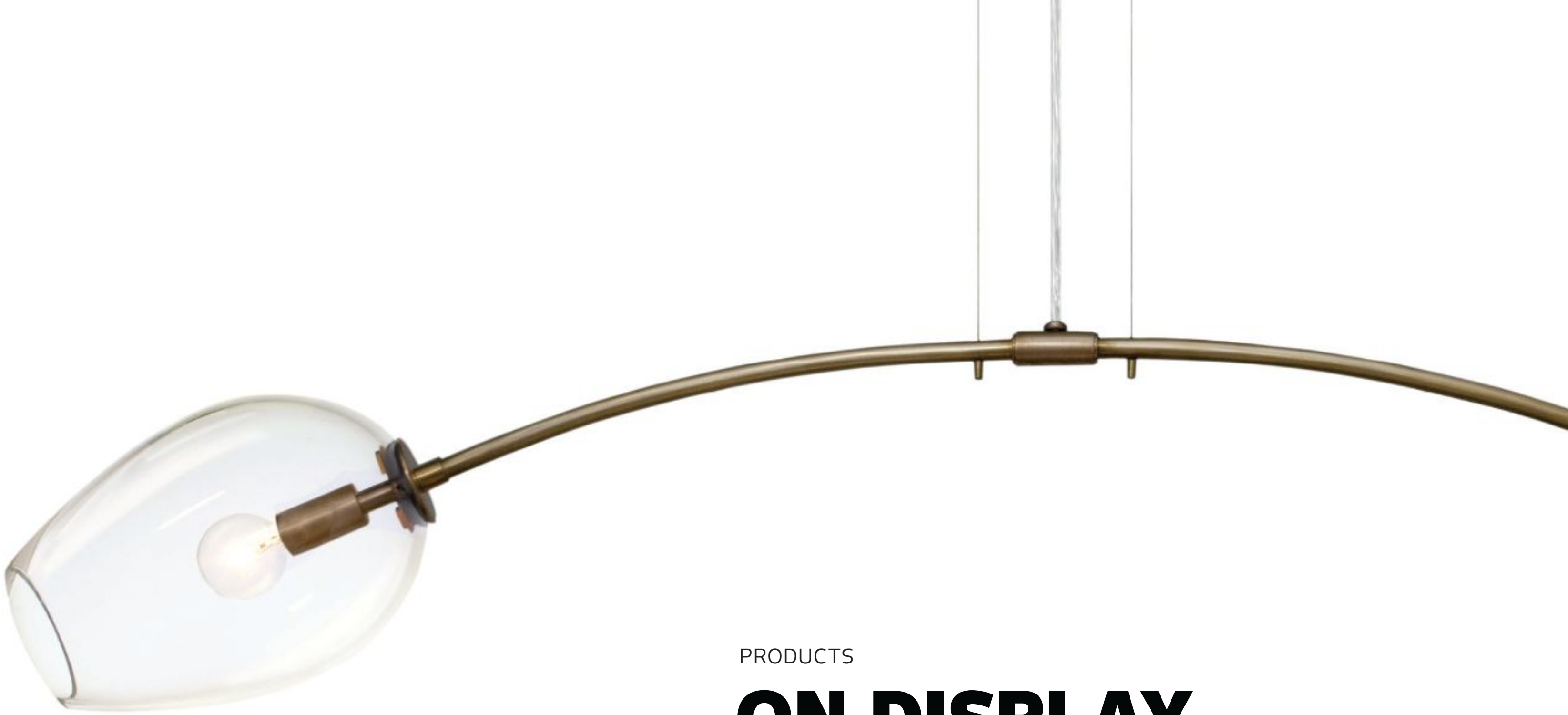
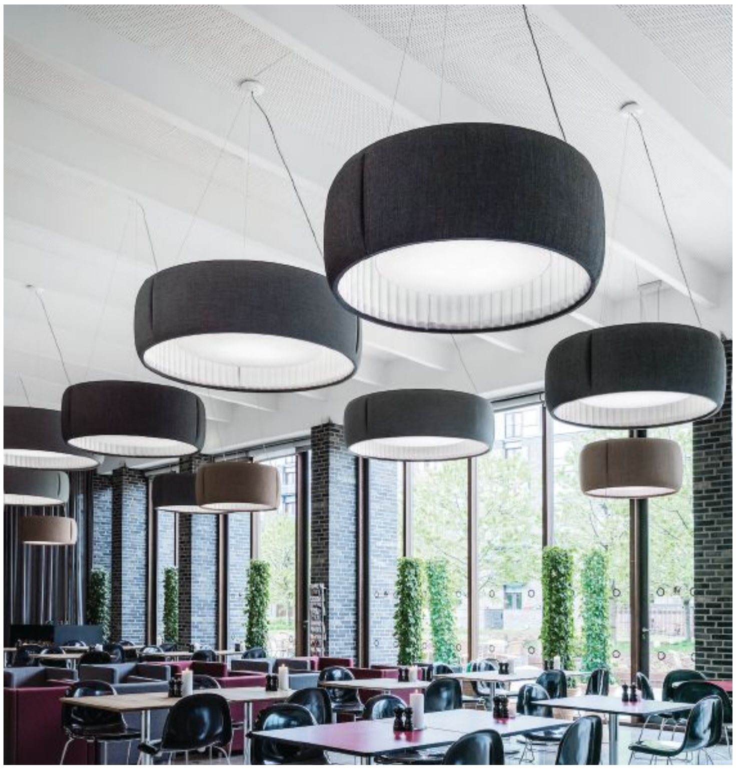


PRODUCTS

ON DISPLAY

High-efficacy directional light and appealing forms suit these luminaires for use in retail and hospitality applications.

text by Hallie Busta



Silenzio, Luceplan • A suspended drum shade upholstered in Kvadrat's 90% wool, neutral-toned Remix 2 textile absorbs sound while serving as a showpiece in hospitality spaces. Three 20W LED, 105W halogen, or 23W/27W fluorescent E27-base lamps illuminate this indoor luminaire, which is offered in diameters of 35.5", 47", and 59". The shade can be specified in a variety of colors. • *luceplan.com*

Dome Arc Chandelier, jGoodDesign • An arched brass rod supports two hand-blown glass diffusers to soften the look of this industrial material pairing in jGoodDesign's Dome Arc Chandelier. An E12 base supports incandescent, LED, and fluorescent lamps. The luminaire is offered in a range of sizes and finishes with glass options including amber, black, bronze, clear, and steel blue. • *jgooddesign.com*

Super Pulse Start Ceramic, Venture Lighting • The Super Pulse Start Ceramic lamp series offers high-efficacy, warm 3000K light to help designers showcase colorful products in retail spaces. The line includes MR16, T6, PAR30, and T12 variations from 2800K to 4200K and a CRI range from 66 to 90. For use in track, downlight, high-bay, and wall-mounted fixtures in retail applications. • *venturelighting.com*

Scotch Club, Marset • Barcelona, Spain–based designer Xavier Mañosa and Turkish studio Mashallah re-imagine the 1970s disco ball as a luminaire. Scotch Club includes pendant, wall-sconce (shown), and ceiling-mounted versions. Each features a ceramic shade whose 72 internal facings work with a lacquered metal reflector to diffuse light. The wall-sconce takes two 18W E26 CFLs or two 18W G24 LEDs. • *marsetusa.com*

MX Recessed Multiples and Track Luminaires, Intense Lighting • For spot and accent lighting in retail spaces requiring directional light, this family of LED recessed multiples and tracklights is available in 2700K, 3000K, 3500K, and 4100K with a CRI of 82, and 2700K and 3000K at a CRI of 92. Each 14W trackhead delivers 1,000 lumens and all models offer 12-degree spot, 24-degree narrow flood, and 36-degree flood beam angles. • *intenselighting.com*

E15 LED Track Spot, Bruck Lighting • An extruded-aluminum housing doubles as a heat sink for this dimmable, track-mounted spot fixture by Bruck. The E15 LED uses a Xicato cold remote-phosphor module with a two-step MacAdam ellipse for 2700K, 3000K, 3500K, and 4000K at a CRI of either 80-plus or 97-plus. The spot is offered in 700-lumen and 1,000-lumen variations, each consuming 15W, and with 20-, 40-, and 60-degree reflectors. • *brucklighting.com*

Steampunk Sconce, Boyd Lighting • An oval-shaped glass diffuser and riveted bracket puts a modern spin on Victorian-inspired design in Boyd Lighting's Steampunk Sconce. The candelabra base is lamped with a T6.5 60W incandescent that is left exposed to illuminate hallways, living areas, and entryways. The glass can be leafed with yellow and white gold and aluminum. The fixture measures 17⅝" tall by 4¾" wide by 4" deep. • *boydlighting.com*

TECHNOLOGY

LEDS UNDERSTANDING OPTICAL PERFORMANCE

SOLID-STATE LIGHTING CAN OFFER UNPARALLELED PERFORMANCE IF ACCOMPANIED BY THE RIGHT LENSES AND REFLECTORS.

This is the fourth article in AL's multi-part series examining the critical issues in solid-state lighting. Visit *archlighting.com* for the previous articles in the series, which discussed dimming, flicker, and color.

text by Alice Liao
art by Chris Wood

Even the most efficient light sources would be rendered useless without high-quality optics. A compact fluorescent lamp, for example, can lose up to 70 percent of its light if paired with an inappropriate optic, says Nadarajah Narendran, director of research at the Lighting Research Center (LRC), in Troy, N.Y. Likewise, the touted efficacy of LEDs wouldn't exist without the right optics.

Designing lenses and reflectors for solid-state lighting requires more than scaling them down from legacy sources. Yes, LEDs have smaller form factors than their conventional counterparts, but they differ in how they emit light. Incandescents illuminate in 360 degrees but LEDs are directional, illuminating only 180 degrees. This stems from the design of an LED package, typically comprising: one or more semiconductor chips, or die, mounted atop heat-conducting material; a primary optic—a lens or encapsulant—that encloses the die; and components to regulate heat and power. When current is applied, the chips produce light through electroluminescence.

Conventional lamps emit light via radiance or fluorescence. The source is surrounded by glass, metal, and acrylic reflectors that capture the omnidirectional light, guide it into the specified distribution, and work with lenses and optical accessories, such as louvers and baffles, to further shape the beam.

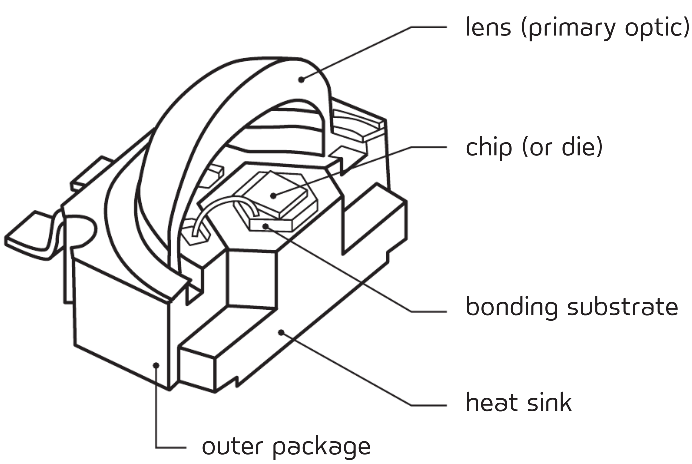
Although the output from LEDs is more concentrated, the distribution is too broad for most applications, and the light lacks intensity over distance. Therefore, LED lamps and fixtures typically incorporate one or more secondary optics, which can consist of lenses, reflectors, total internal reflection (TIR) optics (a lens and a reflector), and diffusers that collect the light, magnify its intensity, direct it to a target surface, and then blur it to enhance beam and color uniformity.

Choosing the appropriate optic depends on the application. Reflectors and TIR optics, which are common in LED MR16s and directional lighting, both have their advantages and disadvantages, says Frank Shum, vice president of LED products for Soraa.

REFLECTORS

Reflectors are simpler to implement and less expensive to manufacture

Typical LED Package



than TIR optics. How well they collimate light—or propagate light into parallel rays—depends in part on their shape. Faceting or segmenting the surface can improve beam uniformity, as can applying different textures or finishes. If needed, lenses can further diffuse the light.

But reflectors don't solve everything. Light from an LED can evade parabolic reflectors, for example, and become spill light or, worse, glare. Moreover, many reflectors are vapor-coated with aluminum, a conductive material that can cause electrical shorting. Manufacturers can separate the reflector and LED circuit board with an insulating material, but the farther an LED package is to the reflector's input aperture, the less a reflector can "capture as much of the light as possible and re-direct it," says Catherine Leatherdale, product development specialist at 3M.

New specular films, such as 3M's recently introduced D50 series, are closing that gap. Made from polymeric material, these films can be applied onto a plastic substrate and are non-conductive, highly reflective, and, in some cases, optically superior to aluminum. Alternatively, a specular polymer can be custom molded into reflectors to control the light precisely, enhance surface reflectance, and sit close to the LED.

TIR OPTICS

Designed around the phenomenon where light traveling from one medium to another of lesser optical density hits the interface at an angle and reflects with 100 percent of the beam energy, TIR optics, or TIR lenses, consist of a refractive lens nestled inside a reflector and are typically cone-shaped with optical efficiencies as high as 92 percent. The lens directs light from the source's center to the reflector, which sends it out in a controlled beam. An additional surface over the assembly provides another opportunity to modify the light.

Generally injection-molded from polymers, TIR optics are sculpted to a precise beam pattern with a variety of surface treatments—such as rippling, pillowing, or polishing—to diffuse the light, widen the beam spread, or shape distribution. Injection molding, however, limits lens size and wall thickness, typically to 0.5 inch. The larger the optics, the greater the risk of shrinkage and distortion. Maintaining a higher temperature and pressure on the machines for a longer time period can reduce the risk, Shum says, but at a cost.

TIR optics capitalize on characteristics unique to LEDs. Unlike incandescents, which radiate heat outward, LEDs send heat out their base, allowing TIR optics to fit snugly over their domed top. As a result, says Chris Bailey, director of the Lighting Solutions Center at Hubbell Lighting, "LEDs afford an opportunity for the designer to extract light directly from the source and precisely direct it through key vertical and horizontal planes."

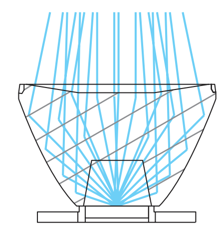
Though prevalent in outdoor and industrial lighting, TIR optics are still gaining in indoor applications. While ideal for beam control, they don't work for all applications, Bailey says. For example, coupling is not necessary in architectural recessed lighting, where the emphasis is on diffused illumination, low glare, and a gradient distribution.

SIZE MATTERS

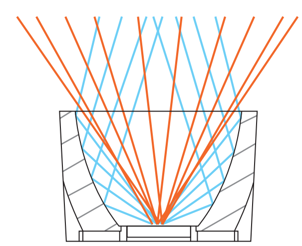
Shum says that the size ratio of an LED or LED package to an optic determines the beam angle. That is, narrower beams require smaller light sources or larger optics. Choosing the former affects output while choosing the latter can stress the limits of injection molding or system design if the lamp is small, as in the case of an MR16.

However, source sizes are increasing, driven by a need for higher luminous flux and convenience. To attract fixture designers to their products, LED manufacturers have introduced modular, high-output, chip-on-board (COB) LED arrays, which are becoming more common and can output 600 to 20,000 lumens at 6W to 200W, Bailey says. COB LEDs consist of multiple die that are wired to operate

Total internal reflection (TIR) lens



Legacy reflector



as one electrical device and assembled onto a ceramic package with a single emitting surface. Designed to produce a specific color temperature and lumen output, they take the guesswork out of creating a well-integrated LED.

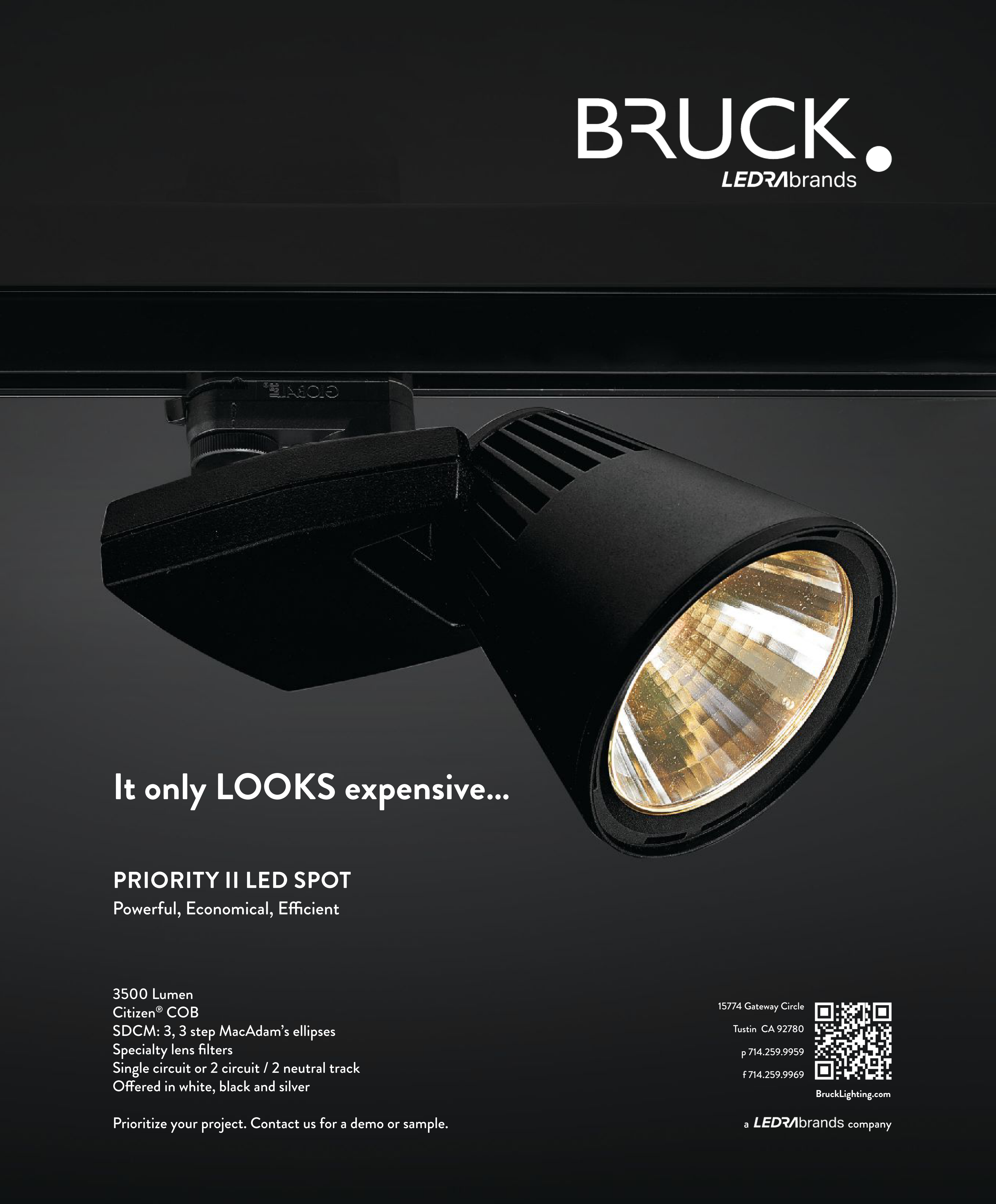
But controlling the output from COB LEDs is more difficult. Their size increases the cost of injection molding the appropriate optics, and their flat surface does not lend well to coupling, which is key to the efficiency of TIR optics. Consequently, COB arrays fare better in applications where beam control is less critical, such as wide-distribution floodlighting or downlighting, Bailey says. But their optical and electrical needs are also simpler. Typically, one optic is sufficient and "electrical connections can be made using simple plug-and-play," he says.

High-flux density (HFD) LEDs are also growing in popularity. They also consist of multiple die, but each is smaller than those in a COB array and can handle more current, Bailey says. The result is more light output from a smaller lighting-emitting surface. The die are in a domed surface, which easily accommodates a TIR optic and therefore offers more output control. These high-powered LEDs come in 4W to 60W and output anywhere from 400 to 6,000 lumens, Bailey says.

NEW CHOICES

Although the laws of physics have limited the availability of small LED lamps with tight beam angles, progress is being made. Soraa's Point Source Optics, which features a folded prismatic optic designed by Shum, led to the company's LED MR16 lamp with a 10-degree beam spread. The folded optic reflects the light emitted from a single LED package multiple times before propagating it out, and blurs the light near the beam's central axis—as opposed to its outer edges—creating a smooth, well-defined beam. Shum says this larger diameter optic can be injection molded because its diameter to height ratio is 6:1, whereas typical TIR optics have a ratio of 1.25:1. The Soraa Snap System allows users to magnetically snap a variety of lenses and optical accessories to the MR16 and shape, widen, or narrow the beam and eliminate glare.

Also tackling the issue of source size, Reading, Mass.–based Fraen Corp. has developed a multi-TIR nested lens for use with any COB LED product to create a narrow beam spread. Though the larger footprint of the COB LED would typically require a proportionally larger optic to fully control its illumination, the compact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nested lens design produces a collimated beam with little spill light. And, of course, a smaller optic means a smaller luminaire.

TAKING THE HEAT

The increasing lumen output of COB and HFD LEDs also means more heat. As these sources become more common, proper thermal management will become more critical in ensuring the performance and life of a diode, as well as the fixture's circuitry. In fact, because of the increased heat, LEDs today are encapsulated with silicone instead of epoxy, which was used in the early days of LEDs when outputs were measured in milliwatts. Epoxy degrades above 80 C, whereas silicone can withstand temperatures of up to 200 C, Narendran says.

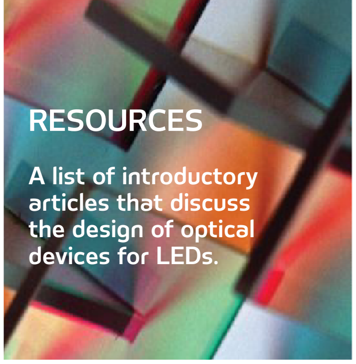
While coupling can improve optical efficiency, exposure to heat and light—particularly from the high-energy blue portion of the spectrum—can cause the materials to degrade over time. Lenses and reflectors can yellow, leading to color shifting and performance discrepancies between fixtures, Narendran says. A uniform lighting design on day one may "start producing different colors, which, in turn, will affect the aesthetics of the space," he says. Hazing can also occur, reducing the optics's ability to direct the lumen output.

Not surprisingly, heat-resistant materials are garnering interest from LED optics and fixture makers. One material of choice for TIR optics is PMMA (polymethyl methacrylate) acrylic, favored for its clarity, UV stability, and high transmissivity, Hubbell Lighting's Bailey says. However, long-term heat exposure may cause deformations.

Manufacturers have also turned to glass, which, Narendran says, "is a good candidate because it's much more robust than polymers." It also offers high transmission, but can be heavy, fragile, and expensive to manufacture.

Polycarbonates that address the specific needs of LEDs are another strong contender. Bayer MaterialScience's Makrolon LED-grade materials are designed to tolerate long-term heat exposure, transmit light effectively, and have good clarity. A diffusion additive can also be added to polycarbonates to mitigate glare.

As manufacturers continue to explore the opportunities unique to LEDs, the push for higher efficacies will introduce new heat-resistant materials and more customized optical solutions. According to Marco de Visser, manager of marketing communications for Dutch 3D printed optics maker Luxexcel, the latter has already begun; 3D printing technology is speeding up prototyping and printing optics to order. Such developments will further emphasize solid-state lighting's importance as a source of not only efficiency but also beautiful and controlled light. •



RESOURCES

A list of introductory articles that discuss the design of optical devices for LEDs.

TIR Lens Guide, by LEDiL, 2012. Available at: *bit.ly/LEDiLTIR*.

"Quality of Light: Perfect Spectrum, Perfect Beam," by Soraa, 2013. Available at: *bit.ly/1tpsmDb*.

CALiPER Report 22: LED MR16 Lamps, by the DOE, Office of Energy Efficiency & Renewable Energy, Building Technologies Program, Sept. 14, 2014. Available at: *1.usa.gov/YYwvTm*.

Secondary Optics Design Considerations for SuperFlux LEDs, by Lumileds Lighting, 2002. Available at: *bit.ly/1mgWgZB*.

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SOLID-STATE UPDATE

THE LATEST IN LED LUMINAIRES, DRIVERS, AND MODULES.

text by Hallie Busta

iQ-LED, Q-Tran • For use in dry and wet locations—and offered in three IP ratings of 20, 54, and 68—Q-Tran's iQ-LED tapelight is available in 2500K, 2700K, and 3000K at a CRI of 80-plus. The low-voltage 24V DC tapelight consumes 4.4W per foot and has a light output of 260 lumens per foot. It can be specified in lengths of up to 21' for a single power supply, which can be cut into 4' increments, and with extrusions in lengths of up to 8'. Lead wires are offered in custom lengths. The tapelight comes in various widths, heights, and with an array of mounting clips. The strips are ETL-listed and are compatible with magnetic and electronic Q-Tran power supplies. • *q-tran.com*

LMH2 LED Module, Cree • Cree's LMH2 LED Module with sunset dimming emulates the dimming capabilities of an incandescent light source from 1800K to 2700K along the blackbody curve while maintaining a CRI of greater than 90. TRIAC-compatible, the model can be specified for retrofit applications that use conventional dimmers as well as in new construction using zero-to-10V or DALI controls. Dimmable to 1%, the module's lumen output ranges from 850 lumens to 3,000 lumens. For use in residential and hospitality lighting applications • *cree.com*

Kipp LED V3, Louis Poulsen • Louis Poulsen's 104W Kipp Post LED outdoor fixture, part of the Kipp outdoor product family, is now offered in 3000K and 4000K, with the latter delivering 7,129 lumens. Conceived by Danish designer Alfred Homann in 1997, the contemporary luminaire emits symmetrical light downward from an internal diffuser and is intended for use on minor roads and in parks. Dimmable with a zero-to-10V driver. The post-mounted luminaire's die-cast aluminum frame can be finished in black or natural painted aluminum. Its head measures 30.4" wide by 18.1" tall. • *louispoulsen.com*

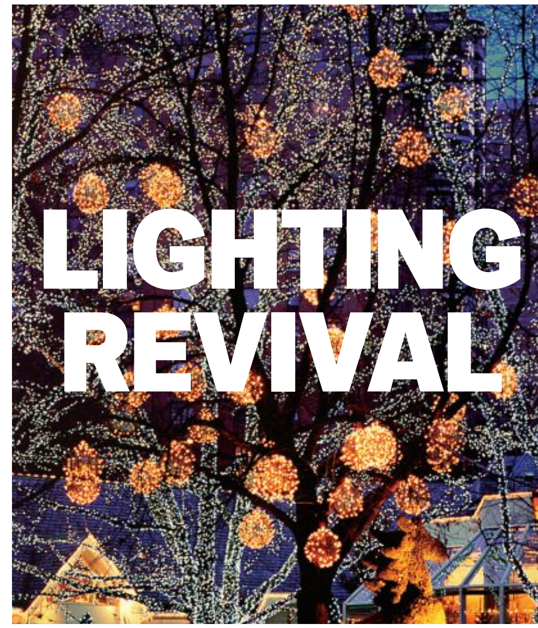
Optotronic Constant Current Step-Dimmable LED Power Supplies, Osram • This LED driver offers five fixed-output current options per model with a simple output current and bi-level powerline step-dimming from 100% to 50% for powering LED light engines in high-bay, industrial, and direct-indirect applications. The driver is offered in 50W and 30W models, with neutral and ground hot wires and 120V to 277V AC input. The driver is UL Class 2–listed and is suited for use in dry and damp locations. Each supply measures 11" long by 1.2" wide by 1" deep. • *osram-americas.com/optotronic*

Denon LED Flush Mount, Acuity Brands/Lithonia Lighting • Lithonia Lighting has updated its line of flush-mounted fixtures with seven models for small spaces such as closets and hallways. Each has an AC-driven LED board with zero inrush and is dimmable down to 10%. Among the additions is the 14"-diameter Denon indoor fixture (shown), which provides 2700K, 3000K, 3500K, and 4000K at a CRI of greater than 80 and delivers 1,650 lumens. Finished in brushed nickel and antique bronze. • *lithonia.com*

Seem 2 and Seem 4 LED, Focal Point • Focal Point's series of narrow-slot LED fixtures is designed for shadow-free illumination in applications requiring high-output, integrated light. Seem 2, which measures 2.5" wide, and Seem 4, which measures 4" wide, are available in 1'-length increments and can be installed in a variety of ways, including suspended, wall-mounted, recessed, and wall-to-ceiling corner. A molded, frosted acrylic lens blocks views of the LED light source. Both models are offered at 3000K, 3500K, and 4000K with lumen outputs varying by fixture type. • *focalpointlights.com*

ZipOne LED 707, Vode Lighting • Vode Lighting has designed a minimalist, modular LED luminaire for use in low-profile task, undercabinet and overcabinet, and cove and accent lighting. The linear ZipOne LED 707 offers illumination from 2700K to 4000K and delivers 88 lumens per watt, up to 900 lumens per foot, and a CRI of 85 at 4000K. The slender fixture measures 0.3" deep by 1.14" wide, and comes in 2', 3', 4', 5', and 6' lengths with an asymmetric profile to reduce glare. Optional end-caps allow for seamless washes of light when the lengths are mounted end-to-end. • *vode.com*

Courtesy Focus Lighting



LIGHTING REVIVAL

The renovation of the iconic New York City restaurant Tavern on the Green celebrates its lighting design, both past and present.

text by Elizabeth Donoff

There are restaurants, and then there are restaurants—those fine-dining spots one goes to celebrate special occasions and family milestones. In New York City, one such icon for the past 80 years has been Tavern on the Green. Located in Central Park at West 67th Street, this past April, the restaurant experienced a rebirth after a top-to-bottom multiyear renovation that restores the restaurant back to its glory days as the "Jewel of Central Park."

The restaurant's history is a rich and storied one. The main building, a brick structure in the Gothic Revival architectural style, was originally designed by architect Calvert Vaux in 1870 to house sheep who grazed in the nearby sheep meadow. In 1934, the former sheepfold was converted into a restaurant as part of Robert Moses's park improvements. (The sheep were relocated to Prospect Park in Brooklyn.) In the 1940s and 1950s, the restaurant's footprint was increased with a large outdoor terrace and the Elm Tree Room.

Then in 1976, New York businessman Warner LeRoy took ownership of the restaurant and transformed it into the destination spot many remember today. He owned several notable restaurants, such as the Russian Tea Room and Maxwell's Plum, and his family ties to the film industry made all of his restaurants, including Tavern on the Green, a popular spot with celebrities.

Under LeRoy, a series of building additions—one of the most notable being the conservatory-style Crystal Room—were made that increased the building's footprint to 31,000 square feet. After his death in 2001, the restaurant changed hands several times and encountered financial and legal difficulties. It closed in 2009, but the following year, the City of New York, wanting to find a way to reclaim this important city

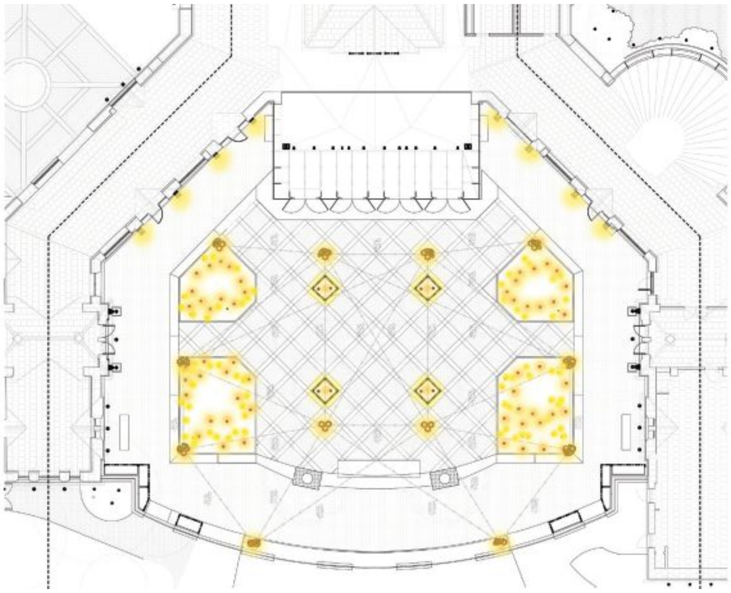
Courtyard Elevation

landmark, opened the space as a visitor's center. It then functioned in this capacity until 2012.

During this period (2010–2012), the New York City Department of Design and Construction called upon Swanke Hayden Connell Architects (SHCA) to conduct a conditions assessment of the facility to determine if the landmark could be brought back to life to once again serve as home for fine dining. SHCA's analysis determined that many of the more contemporary building additions were not structurally sound and that it would be more cost effective to demolish them instead of renovate them. With this, the restaurant's footprint was cut in half to 14,436 square feet. As described by Elizabeth Moss, associate principal and director of historic preservation at SHCA, the original Vaux-designed building underwent a complete gut that included replacement of all the doors and windows, new mechanical systems, brick repointing, the reconstruction of two missing dormers that had been removed during previous additions, a new roof, and the construction of a new glass pavilion in a part of the space where the Crystal Room once stood.

Lighting was key to the restaurant's success in the past, and to ensure that the new restaurant would have a similar sense of atmosphere and spectacle, the new owners, the Emerald Green Group (the restaurant group selected by the city

Courtyard Plan



"We spent a lot of time studying the elevation to determine what were the important architectural elements to illuminate," says Christine Hope, senior designer at Focus Lighting. To create the look of moonlight on the roof, an exterior-rated floodlight with a blue filter and a metal halide pattern projector are used (top left). Inground uplights and wall sconces highlight the architectural details of the brick façade. The illuminated London Plane trees wrapped in Christmas lights prior to the renovation (previous page).

Top left and opposite right: Francine Fleischer; Opposite bottom: Courtesy Focus Lighting

A new glass pavilion overlooks the courtyard terrace whose signature lighting element is a canopy of miniature chandeliers and custom-designed, pole-mounted lanterns.

In the dining area adjacent to the open kitchen, the new lighting and interiors recall the warmth and sparkle of the Crystal Room.

This image and opposite: Courtesy Focus Lighting

In the private dining areas, a green-and-white finishes palette recalls the colors of nature. Antique mirrors above the seating banquettes aid in creating a reflection surface for the lighting elements (left). In the bar area (right), as well as throughout the restaurant, LED low-voltage uplights are hidden on top of the beams to provide ambient light and to highlight the architectural detail work on the ceiling.

to run the facility), brought on Focus Lighting to oversee the lighting redesign. Working alongside Focus was Broadway lighting designer Ken Billington, who had originally lit the terrace's London Plane trees 20 years before, wrapping them in Christmas lights.

From the start, Focus Lighting knew this was going to be a challenging project because of the iconic nature of the place. "The lighting was really important. It had to do all the normal things restaurant lighting does, but it couldn't just be okay," says Paul Gregory, founder and president of Focus Lighting. "It had to be unique and special because it was going to be compared to the last space."

Christine Hope, senior designer at Focus Lighting, furthers the point: "We wanted our lighting to take a more authentic and classic approach, one that related to the aesthetic of the restored building."

Focus embarked on a lengthy process of determining just the right nuanced effect for the exterior lighting and the interior dining areas, which entailed referencing historic photos, making an extensive series of mock-ups, and evaluating different light sources and the way in which they interacted with the material palette, finishes, people, and the food. Throughout the interiors, the lighting designers used a combination of LED and MR16 sources at a color temperature of 2700K to emulate the warm glow of candlelight.

But perhaps the boldest lighting moves take place in the courtyard, which proved one of the greatest challenges. First, there was the iconic imagery—the illuminated trees. Second, these trees no longer existed—they had been at the end of their life and removed. And third, the Central Park Conservancy set conditions that none of the newly planted trees could be pierced in any way by lighting elements that would prematurely age them.

The new courtyard lighting, a series of miniature chandeliers strung to mimic the silhouette of a circus tent's roof, creates a canopy of light against the sky every bit as effective and evocative as the illuminated trees that once were there. To provide additional lighting, Hope designed a pole-mounted custom glass lantern. At the top of the poles, floodlights and projectors create a dappled moonlight effect on the roof.

At the new Tavern on the Green, nature is once again wrapped in light and sets the stage for the daily dining performance. •

Details **Project:** Tavern on the Green, New York • **Client/Owner:** Emerald Green Group • **Architects:** Richard H. Lewis; John Lee Beatty (Broadway set designer); Swanke Hayden Connell Architects (core and shell building restoration) • **Lighting Designer:** Focus Lighting, New York; Ken Billington, KB Associates, New York • **Landscape Architect:** Robin Key Landscape Architecture, New York • **Project Size:** Building footprint was originally 31,000 square feet, reduced to 14,436 square feet during the renovation • **Project Cost:** Withheld • **Code Compliance:** Set to receive LEED Silver designation • **Watts per Square Foot:** 1.7 (overall); 1W (exterior); 3.5W (interior) **Manufacturers** **Exterior Lighting:** **BK Lighting** (Stem-mounted adjustable 8W LED MR16 courtyard pathlights and stake mounted adjustable 8W LED MR16 bullet fixtures at courtyard) • **Canopy Designs** (Crystal chandelier pendants at courtyard) • **Dabmar** (16W PAR38 LED floodlight with blue color filter for roof facing courtyard) • **HK Lighting** (70W 4200K metal halide pattern projector for courtyard roof dapple) • **Lumid** (Custom blown-glass and metal-ribbed exterior lanterns at courtyard light poles with Philips 60W Halogena lamps) • **Eaton's Cooper Lighting/Lumiere** (Inground adjustable 8W LED MR16 accent lights at building façade) • **Luminii** (Surface-mounted flexible LED striplight) • **Primus Lighting** (Custom-configured suspended 2400K LED festoon lighting for courtyard canopy) • **Visual Lighting Technologies** (LED fiber optic illuminator at courtyard planters) • **Vision Quest Lighting** (Custom point of light for courtyard light poles) • **U.S. Architectural and Sun Valley Lighting** (Light poles at courtyard) • **Interior Lighting:** **Boca Flasher** (LED lightstrip at ceiling truss beams and dining room coves) • **Cree** (Recessed LED downlights at open kitchen) • **Juno Lighting** (Mini LED recessed adjustable accent lights at entry arch) • **Lucifer Lighting** (50W MR16 recessed downlights) • **Philips Lightolier** (50W MR16 adjustable track-mounted accent lighting at bar trusses) • **Specialty Lighting** (50W MR16 recessed accent lighting in center dining room) • **Tech Lighting** (50W MR16 track-mounted adjustable accent lighting in glass dining room) • **Tokistar** (LED lightstrip at bar fascia, banquettes, liquor riser, and wall panels)

HAUTE ILLUMINATION

For The Jane restaurant in Antwerp, PSLAB's bespoke chandelier turns a historic sanctuary into an otherworldly dining experience.

text by Elizabeth Evitts Dickinson
photos by Richard Powers

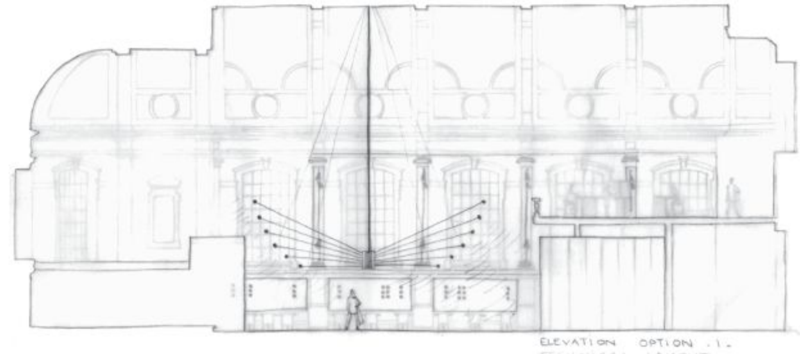
A few years ago, when Michelin star chefs Sergio Herman and Nick Bril decided to open The Jane restaurant in a 19th century chapel that was once part of a military hospital in Antwerp, Belgium, they immediately knew that the majestic space required an assured hand with interior design. The chapel had been shuttered in 1993 and had remained vacant, but it sat in a neighborhood called the "T Groen Kwartier" (the Green Quarter), which was experiencing a revitalization with new housing and shops aimed at attracting young couples and families. Herman and Bril were struck by the 4,350-square-foot space, which included a main sanctuary with a mezzanine and a ceiling that rose to a height of 38 feet in places.

"We wanted to create a timeless and international feeling," Herman says, as well as create a dramatic "rock-and-roll vibe" that would contrast the historic structure. This meant highlighting the soaring interior while also making the room warm enough for a dining experience. "It was important that you would feel enclosed, secure, and intimate, but that you still would be able to feel the enormous space and to see the amazing ceiling," he says. "The room needed a big, powerful element, without a doubt."

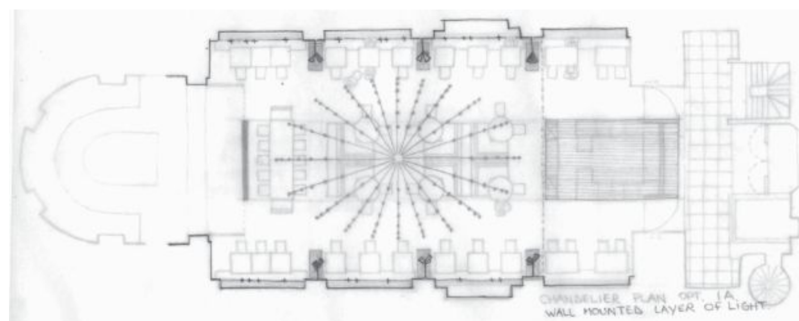

Xtra - VoltABook_Italic_7/10

The restaurant's main lighting feature is the 30-foot-wide by 40-foot-tall chandelier with 150 black-lacquered steel rods outfitted with a crystal globe at each rod's end (left). "The globe[s] had to be really well thought out in order to bring the [desired effect] out," PSLAB founder Dimitri Saddi says. "We did many tests on proportions and also weight, because the crystal added weight at the end of the 5-meter (16-foot) rod. We did four different mock-ups of the glass shades." The building (exterior shown below) was once the chapel for a military hospital.

Sketch of the longitudinal section



Sketch of the floor plan



Drawings courtesy PSLAB

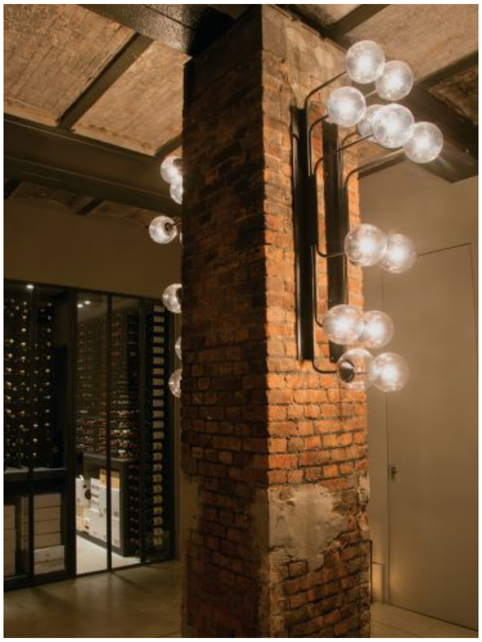
Herman and Bril, in collaboration with Dutch design practice Piet Boon, found that powerful element in a jaw-dropping chandelier—which measures 30 feet wide by 40 feet tall and hangs 9 feet from the floor—designed and fabricated by Beirut-based lighting workshop PSLAB.

Weighing in at 1,763 pounds with 150 black-lacquered steel rods bursting with light at the ends, the installation explodes out of the barrel-vaulted ceiling like a physical manifestation of the Big Bang. Coupled with 500 new stained glass panels by Antwerp-based design group Studio Job, where religious iconography is replaced by images of apple cores, ice cream cones, and croissants, and an interior of considered materials—natural stone, leather, and oak—the chandelier adds to the cosmic sensation that you're dining in a contemporary church ministering to the fine art of haute cuisine. Herman is known for re-interpreting traditional dishes using molecular gastronomy and this playful juxtaposition of historic sanctuary and sexy, secular design suggests that here food is the religion.

The dramatic luminaire is the result of a rigorous creative process from a design/build firm known for bespoke lighting. "PSLAB creates something in the market that is not already available and that's what we were looking for," says Rienk Wiersma, Piet Boon lead designer. "We challenged PSLAB to fill the space with something that would work as a kind of a ceiling, but that would not hide the actual ceiling above."

No matter where you are in the restaurant, the chandelier takes center stage, yet it does not overpower the space. This was particularly important on the mezzanine level with its 30-person marble-clad bar. PSLAB had to make sure that the chandelier did not obstruct the view of bar patrons looking down onto the restaurant below. Dimitri Saddi, founder of PSLAB, says they weren't specifically tasked with designing a chandelier, rather they were charged with figuring out the best solution for the interior. "We thought that the only way was to create something that would live in the space in a 360-degree manor, but it was important for this object to work whether looked at from the bar above, or the restaurant below," Saddi says.

It wasn't immediately clear that the lighting strategy should take the form of a chandelier, but by simultaneously conceptualizing and prototyping their design ideas, the final form of steel rods interplaying at varying heights, and affixed by one point to the ceiling, quickly emerged. The prototyping process confirmed that the light source needed to be positioned at the rod tips. "If the ends didn't have a reflective



A wall sconce, outfitted with halogen lamps, glass globe shades, and a metal armature is affixed to a brick column outside the wine cellar (far left). Between table areas in the dining room, bronze table lamps using two 25W halogen lamps provide a glow reminiscent of candlelight (left). In the mezzanine bar area (opposite), low-voltage halogen trackheads are affixed to thin, black steel beams that run the width of the space, while maintaining a view to the entire restaurant.

point, it would miss that magic," Saddi says. "It had to break out into a sparkle."

That "sparkle" required experimentation and more prototyping. Saddi says they wanted to use an LED source for low maintenance, but that they also needed the light to have the warmth of an incandescent. Hand-blown glass globes were the solution. "The globe had to be really well thought out in order to bring the [desired effect] out," he says.

The solution for the glass globes meant that the rods had to be sturdy enough to hold the globes' weight at the tips. They considered using solid metal, but the weight of the rods coupled with the weight of the glass would have made the entire installation far too heavy. The end solution employs a hollow rod fitted with a stainless cable inside. So while the 150 arms of the chandelier look like solid steel to the casual observer, in truth, the arms are hollow and "the cables are what's holding it all together," Saddi says.

Mock-ups play a pivotal part in PSLAB's design and fabrication process. As a design/build firm with more than 100 employees across five ateliers (Beirut; Stuttgart, Germany; Bologna, Italy; Helsinki; and Singapore), designers are tasked with drawing concepts that can be made on site. "When you are a design/build company, your team must not only draw something, they have to take responsibility for the drawing to make sure it can be executed," Saddi says. "It's not like you're passing the task on to another company. You have to sit in the office and ask your colleagues, 'Is this feasible?'"

For the final mock-up, PSLAB always designs a one-to-one scale version, "because you cannot understand what you are doing until you experience it fully," says Saddi. PSLAB fabricated one quarter of the chandelier and affixed it to the side of their building in the Mar Mikhael neighborhood of Beirut. Wiersma then flew to see it. "It was just after sunset; standing outside and looking up at that chandelier felt like a thousand candles on a table," he says.

Because of the way PSLAB designed the final piece, installation took just a single weekend on site in Antwerp. "Every five arms were designed, labeled, and packed together so it became a kit, which is much easier to install," Saddi says.

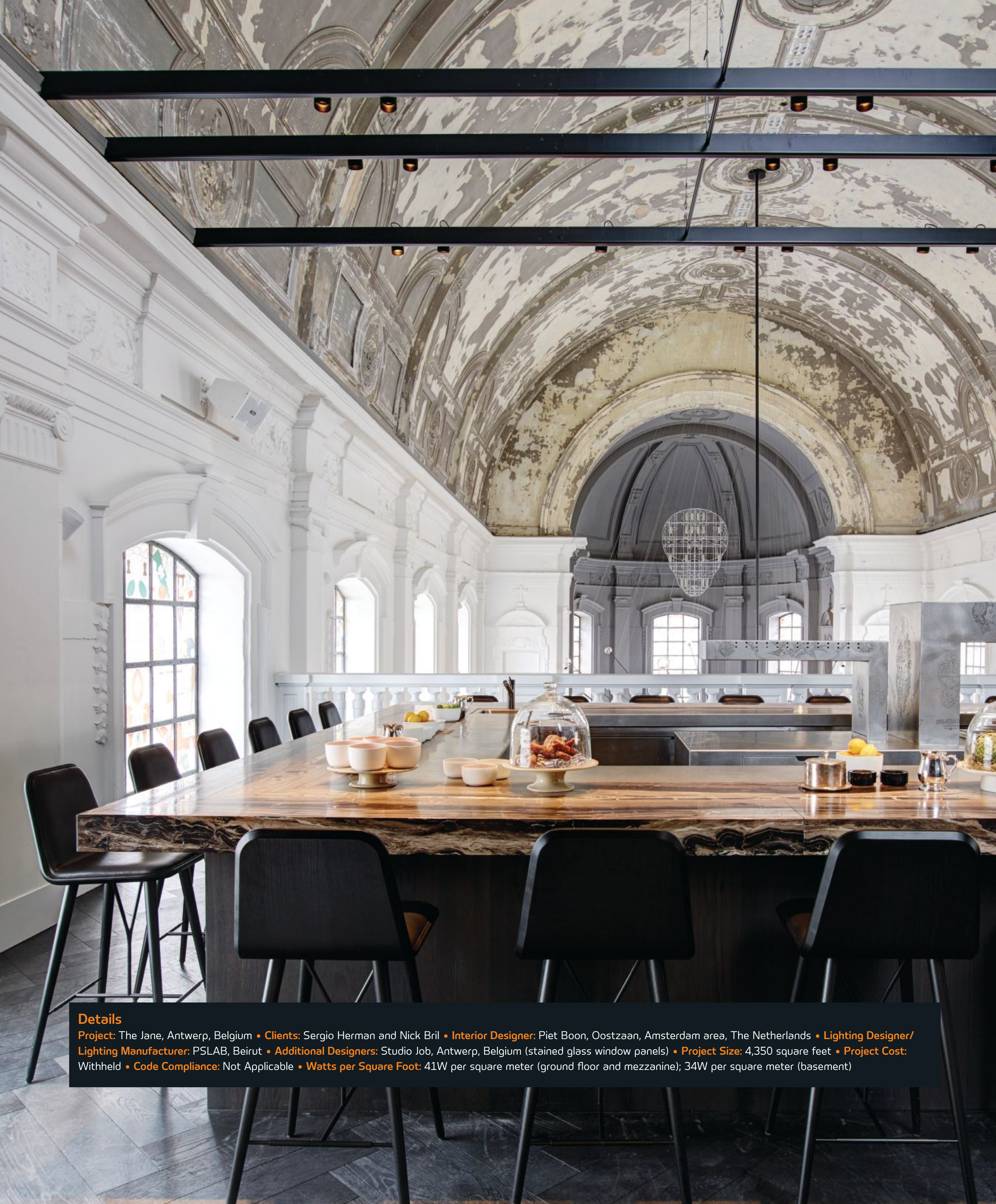
The chandelier may be the most dramatic, but it's not the only lighting element PSLAB designed for The Jane. The lighting experience starts at the entrance, where the original 19th century wooden chapel doors open onto custom ceiling-mounted downlights. Here, white corrugated steel drums have been lined with brass to reflect the 35W halogen lamps. The warmth of the light immediately sets the tone for The Jane.

Brass is used again in custom table lamps in the dining room and picked up in other elegant touches throughout the restaurant, including the cocktail jiggers lining the bar. Located on the mezzanine, the designers had to create lighting for the bar area that would be distinctive, but that wouldn't compete with the chandelier. The solution is a series of thin, black steel beams that run the width of the room and are outfitted with low-voltage halogen trackheads, which create a simple but dramatic effect consistent with the material vocabulary articulated in the chandelier.

On the main floor, the restaurant needed additional lighting to help illuminate the dining room. Here, PSLAB kept it discrete. Vertical projectors mounted to the walls are painted white to camouflage against the walls. These halogen luminaires are outfitted with a narrow beam to directly highlight the dining tables and gently illuminate the food. Maintenance is also a major consideration within a restaurant setting, so PSLAB designed the projectors to lock into place so that the aiming position would not be disturbed when a lamp is changed.

Herman says the effect of the lighting is pure magic. "The first time that you walk into The Jane is something you don't forget," he says. "The site of the chandelier brought tears to my eyes. I recognize the same look on [our guests'] faces." •

This page: courtesy PSLAB



Details

Project: The Jane, Antwerp, Belgium • **Clients:** Sergio Herman and Nick Bril • **Interior Designer:** Piet Boon, Oostzaan, Amsterdam area, The Netherlands • **Lighting Designer/ Lighting Manufacturer:** PSLAB, Beirut • **Additional Designers:** Studio Job, Antwerp, Belgium (stained glass window panels) • **Project Size:** 4,350 square feet • **Project Cost:** Withheld • **Code Compliance:** Not Applicable • **Watts per Square Foot:** 41W per square meter (ground floor and mezzanine); 34W per square meter (basement)

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AD INDEX

Mike Watson

interview by Elizabeth Donoff
photo by Brent Clark

"The next great frontier in lighting is actually getting solid-state lighting to a critical mass of consumer usage and being recognized as the accepted technology so that [the industry] can be positioned for the next great achievement."

With a degree in materials science from Northwestern University, a lengthy tenure at Hewlett-Packard in its optoelectronics division, and 15 years in the wireless and communications arena, Mike Watson, vice president of product strategy at Cree, is well positioned to see lighting through its analog-to-digital transformation. "I love transforming markets," he says. Seeing that goal through means delivering value without compromising lighting quality and performance. A challenging task, but one that Watson believes the lighting industry is ready to embrace.

What is the catalyst that moves markets to embrace different paradigms?
It's a simple equation; value equals benefit minus cost. As long as your value is greater than what you had before, then there's a reason to consider change.

Is there a text that's influenced your thinking about lighting and its business practices?
I'm more affected by things that are tangible and visible. I am enamored with just listening to how light is viewed by people that aren't in the lighting industry.

What makes a great piece of lighting equipment?
It's a hard question because every consumer has a different reason for what they believe is a great piece of lighting equipment.

What do you consider innovation in lighting?
Anything that can improve the aesthetic, the performance, the purpose, or the cost of lighting in a way that adds value to the user.

With the arrival of LEDs, how is industry conversation changing?
It's gone from almost complete resistance to solid-state lighting to foregone acceptance of LED lighting as certainly the immediate and foreseeable future. And there's room for the conversation to move faster and go even deeper.

What has distinguished Cree's approach to solid-state lighting from its competitors?
We don't have to worry about protecting a legacy technology. Consequently, we want the world to switch [to LED] at a different pace than our competitors want the world to switch.

At what point do you see solid-state lighting becoming a legacy technology?
We desperately want to have that problem because then it means you're successful in changing the world. If LEDs are able to achieve 5 percent to 10 percent market penetration, it's foreseeable in the next five to seven years. •

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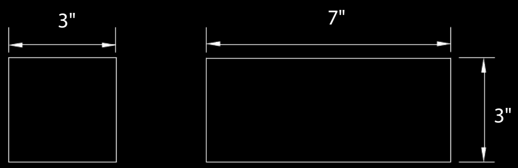

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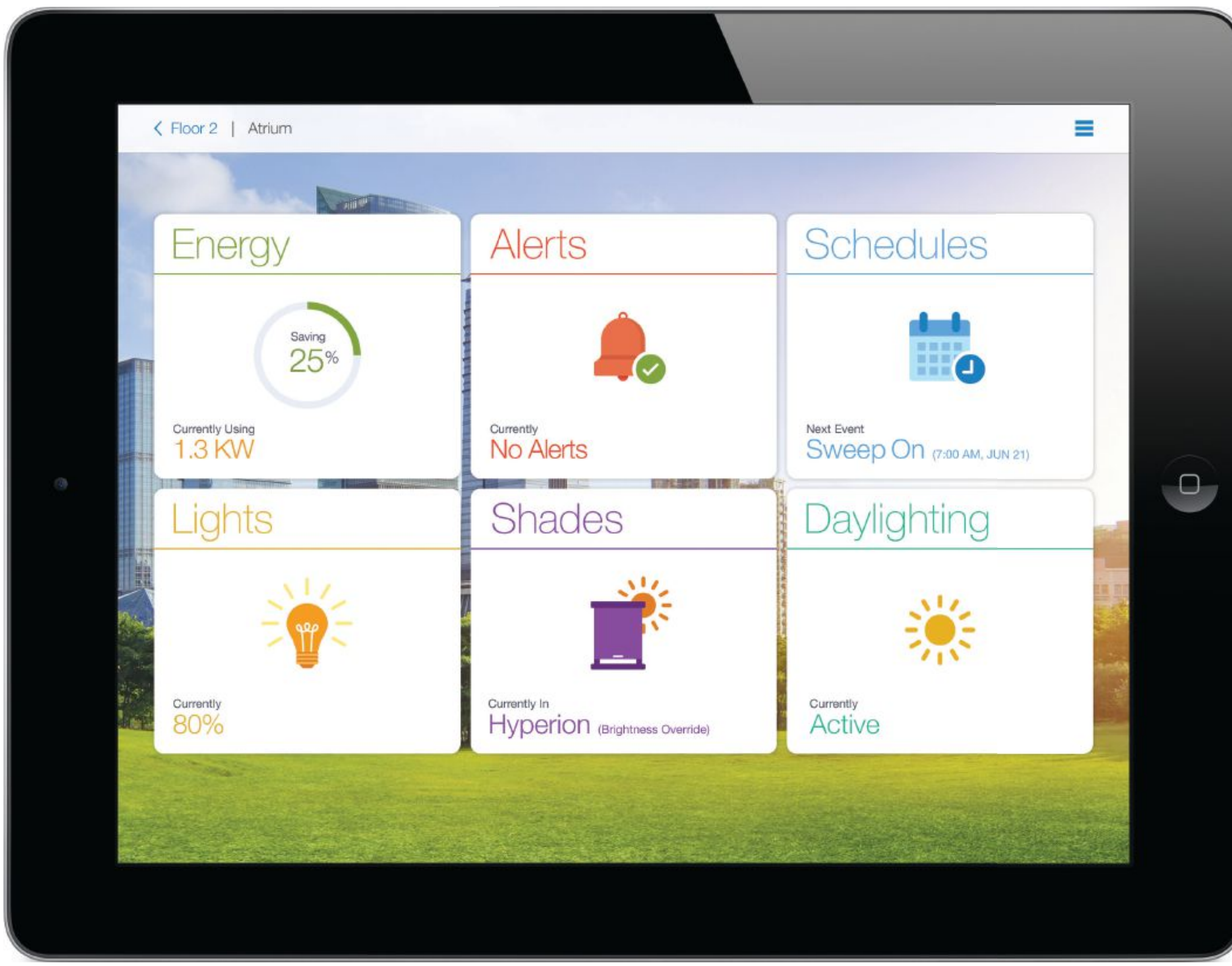

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