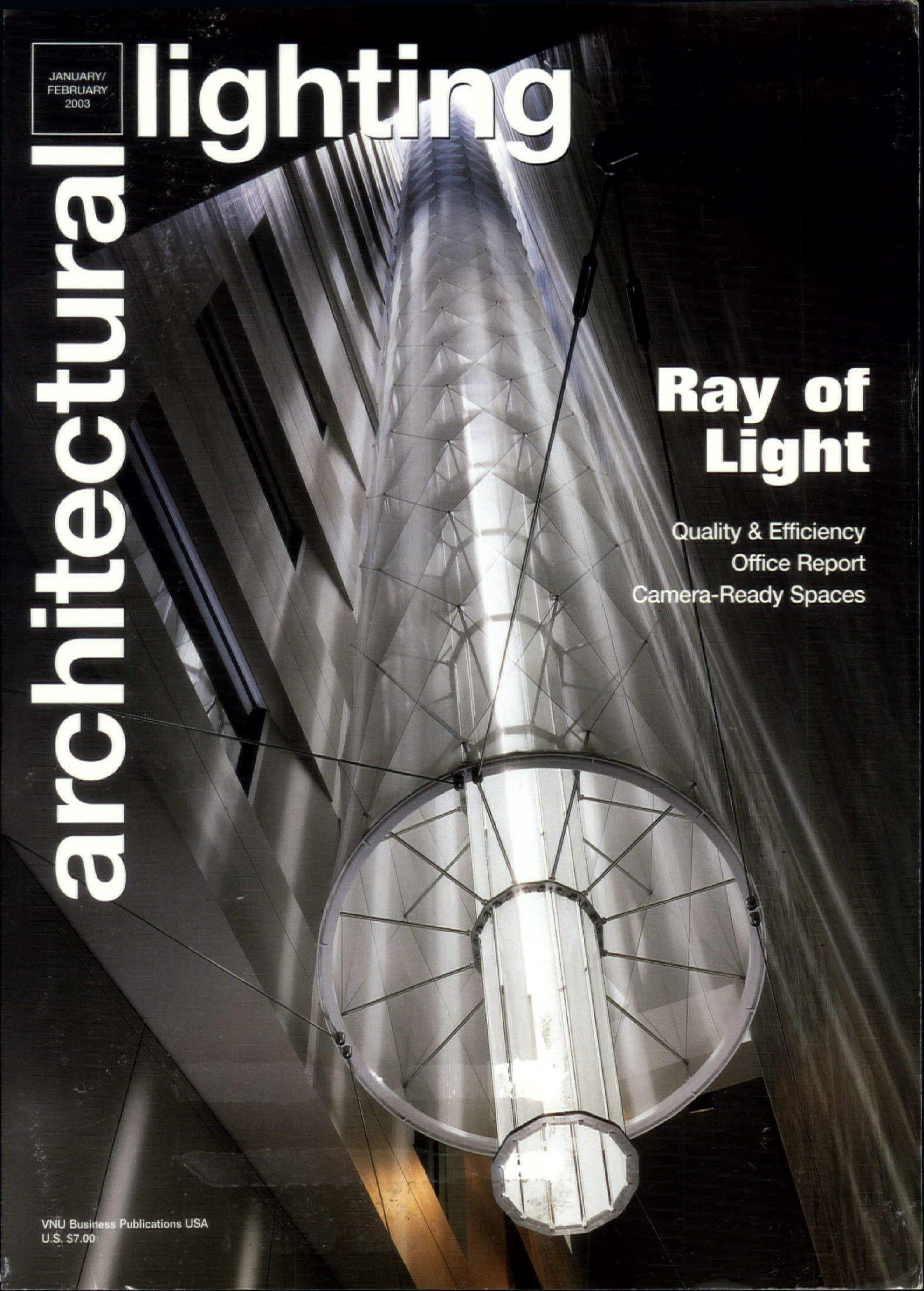

JANUARY/
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2003

architectural lighting

Ray of Light

Quality & Efficiency
Office Report
Camera-Ready Spaces

VNU Business Publications USA
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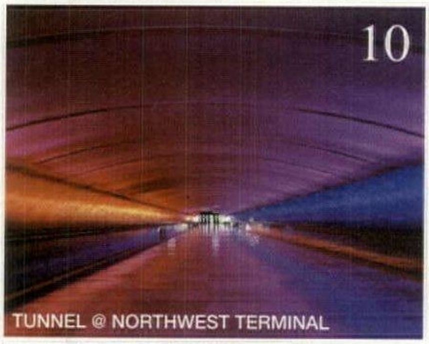

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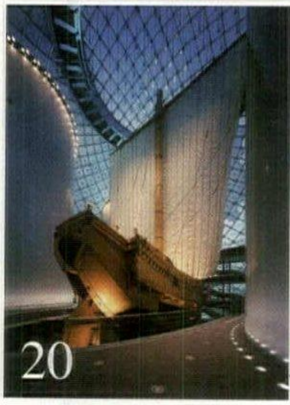

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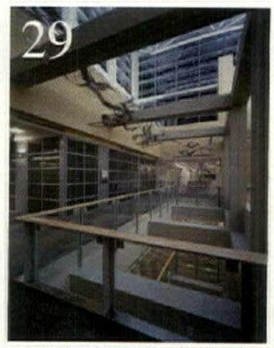

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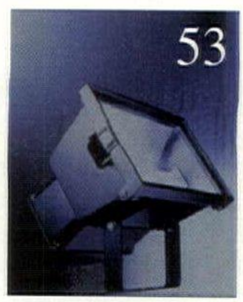

OUTDOOR & LANDSCAPE

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editor'snote

In the pages of *Architectural Lighting,* you'll always find announcements about our readers, their firms and manufacturers. Industry news about promotions and staff additions and new events. Keep on sending them and we'll keep running them so that our audience remains informed about their industry. Here, though, I'd like to make some announcements of our own—our promotions, staff additions and new events—so that you stay abreast of the happenings at *Architectural Lighting*.

Promotion: Alice Liao was recently named Managing Editor of *Architectural Lighting*. For those of you who have been fortunate to work with her, she is so much more than my "right hand," she is more like the backbone of the operation. Her dedication, persistence and tireless efforts to make this the *best* lighting magazine are unparalleled, and her talent, skill and flair for style, admirable (and even enviable).

Additions: We've added two new people to our editorial advisory board—Jim Benya and Craig DiLouie. We're honored to have both of these professionals lend their insight, experience and opinions to *Architectural Lighting*. I've known Jim for many years, and for those of you who don't know him, he's a professional lighting designer and consultant, a registered professional electrical engineer, Fellow of the IESNA, a professional member of the IALD and—I'm not done yet—is lighting certified by the the NCQLP. He has received more than 100 lighting design awards and his work has been featured in books and magazines. In addition to playing an advisory role, he will byline articles to be featured regularly in the magazine (see page 25). Craig, as you may recall, was the former publisher and editor-in-chief of *Architectural Lighting*. Craig is now principal of ZING Communications, Inc. (www.zinginc.com), a marketing communications and consulting firm specializing in the lighting and electrical industries, and the owner and operator of Searchspec.com, a lighting product search engine. In addition to authoring four books, Craig has appeared frequently in our magazine as a contributing editor and will continue to write for us.

Christina Trauthwein, Editor-in-Chief

I'm also excited to introduce Paul Vrabel, LC as a contributing editor to *Architectural Lighting*. I was fortunate to meet Paul last autumn in Virginia (thanks to Ralph Mosher of MaxLite who arranged that meeting!) and know that we will all benefit from his wisdom. Paul is a project manager with ICF Consulting, supporting a number of federal, state, utility and international energy-efficiency programs, and specializes in high-quality, energy-efficient lighting design (see page 42). I want to point out here that you'll notice upon reading both Paul's and Jim's articles, there are striking similarities—and even some information that is the same. Normally, this doesn't happen, and let me assure you, was not the case of poor editorial planning. It just so happens that the scope of Paul's general topic was echoed by Jim when we asked him to write an introduction to our "Office Lighting Report" (see below). Unbeknownst to us, of course, until it landed on my desk. We decided to keep both, as energy-efficient design is not just a relevant issue, but one they're both passionate about—and it doesn't hurt to drive the point home clearly.

Now about that "Office Lighting Report," that's something new too: Design Focus Reports. As you already know, each of our issues spans the different segments of our industry—retail, office, hospitality, residential, institutional, etc.—and offers "something for everyone." However, in an effort to offer more to our readers, we've decided to create "reports" within each issue to target those segments. We start with office lighting in this issue and plan to cover retail, hospitality and residential in future issues. In each section you'll typically find case studies, tips, techniques and products tailored to the topic. The "Office Report" begins on page 25.

Events: As you may already know from reading press releases and announcements here in our magazine and others, Architectural Lighting Magazine is working in partnership with Sonny Sonnenfeld and Paul Gregory to produce Architectural Lighting Master Classes (ALMC) to be held in New York City, February 20-21 at John Jay College. ALMC is in its second year and was started, according to Sonnenfeld, "as a way to give back to the industry and the lighting profession valuable information and education" that was given to him through his abundant experiences with architects and designers when he was employed by Century Lighting years ago. "It's so important that architects realize just how critical architectural lighting is to their projects," said Sonny, when I recently interviewed both he and Paul. "It all begins with the architect, yet often it is the architect who doesn't fully grasp how lighting can contribute to his project to make it a better, more interesting, more functional space that is responsive to the owner's needs." Not to mention more beautiful. Explained Sonny, "It truly is our belief that once the architect understands that, he will go out and hire an architectural lighting consultant who has the vision, the ability and the technical know-how to help him achieve his goals and ultimately, his success."

In Paul's opinion, the architect, today more than ever, is being pulled in more directions and their jobs have become more complicated. "It's the responsibility of the lighting designer to assist the architect in providing a clear picture of what the viewer will actually see." There are so many consultants on a job—from structural to color to marketing to lighting—that the complexity grows each week and orchestrating becomes more difficult for the architect. "The lighting designer has the ability to present a clear image of what light will reflect off of the architect's beautifully designed space and into the viewer's eye," noted Paul. "It's become so complicated with so many different types of finishes and surfaces and textures. The lighting designer, as one of the visual artists, has to keep in mind what is being presented to the viewer." With multiple players who have considerable amounts of responsibility, it all has to be tied together with "one emotional vision," as Paul calls it. "I think that many architects now take more time to step back and restate the unifying goal," he said, "stating the concept and emotion that the space should evoke and making sure that everyone is working in the same direction," Paul continued. "Often times, the architect is inside the space, feeling the volume, proportions and surfaces. The lighting designer adds another dimension, approaching the space from the outside looking in—and it's the combination of these two points of view that can achieve real greatness."

ALMC seminars are targeted to architects to make them aware of the importance of creative architectural lighting and how it can help them realize their vision of the space. And through that creativity, stay ahead of the competition, which is stronger than even before. That's why the seminars, with speakers including Ann Kale and Jonathan Speirs, who is also a creative adviser to the program, and a keynote address by architect David Rockwell, are "inspiration-based" rather than typically "technical" and why ALMC is billed as an event for "creativity exploration." As for lighting designers, who are also encouraged to attend ALMC, the seminars provide not only inspiration but also reinforcement and reassurance that innovative design is alive and well. "We hope to re-establish their beliefs that you must start with a concept, nurture it and sell it to the architects and designers to achieve greatness," said Paul. "People desire well-lighted spaces where they and the people around them look good. The engineering community lights so many spaces and their thrust is so often focused on energy efficiency and economy. This class is a great way to broaden their interests and think in a creative way. We really want to encourage creativity." ■

Cover photo: © Paul Warchol

UNIVERSAL ACQUIRES ESI

Universal Lighting Technologies Inc. has acquired selected assets from the bankruptcy estate of Energy Savings, Inc. (ESI). The acquired assets include intellectual property, materials inventory, machinery and tooling. Universal Lighting Technologies did not assume any liabilities of ESI. For more information, phone (800) BALLAST and follow the menu prompts for ESI, fax your request to (615) 316-5162 or email esiquestions@universalballast.com.

CORRECTIONS

In the November/December 2002 issue of *Architectural Lighting*, the website listed for Specialty Lighting was incorrect. Currently, Specialty Lighting does not have a website. Also in the same issue, Focal Point's phone number is *not* (800) 333-3333, but (773) 247-9494. Finally, Zumtobel Staff Lighting is located at 3300 Route 9W, Highland, NY 12528-8020, website: www.zumtobelstaffusa.com.

Architectural Lighting regrets the errors.

LIGHTSHOW/WEST 2003 ANNOUNCES KEYNOTE SPEAKER

LightShow/West 2003, which debuts September 24-25 this year at the Concourse Exhibition Center in San Francisco, has announced that Howard Brandston, FIES, Hon. FCIBSE, FIALD, LC will be the Keynote Speaker for the inaugural event.

With a career spanning over 40 years, Brandston has designed illumination for more than 2,500 commercial, institutional, residential and government projects and is a recipient of many awards, including the American Institute of Architect's Honors Award and the Illuminating Engineering Society of North America's Society Medal.

LightShow/West is an architectural, commercial and high-design lighting regional trade show and conference that is produced by Atlanta-based ExpoNation LLC. For more information, visit www.lightshowwest.com or contact Chris Gibbs, VP at (770) 953-4445, chris@lightshowwest.com.

NEWS people

Lutron Electronics has named **Dave Odess** to VP, international sales.

Cooper Industries has appointed **David J. Feldman** president of the Cooper Lighting division.

Hubbell Inc. has appointed **Scott H. Muse** to group VP at Hubbell Lighting, Inc.

James F. Haworth has been elected president and CEO of JJI Lighting Group, Inc. **Boyd Armstrong** has been appointed VP, controller for JJI Lighting subsidiaries Vista Lighting and Morlite Systems.

Advance Transformer has named **Ron Bezdon** director, business development; **Kent Crouse**, director, product design engineering; **Bruce Rhodes**, product manager M.E.; and **Jeff Smith**, purchasing manager.

Andrij Burchak has been promoted to national sales and marketing manager for D'ac Lighting.

Universal Lighting Technologies has named **John Cairo** COO.

Leviton's Lighting Control Division has appointed **David Buerer** associate product manager.

Birchwood Lighting has named **Steve Koch** director of account development.

TJ Sterling has joined Nora Lighting as marketing consultant.

Sea Gull Lighting has named **Spencer Bolgard** VP, corporate sales.

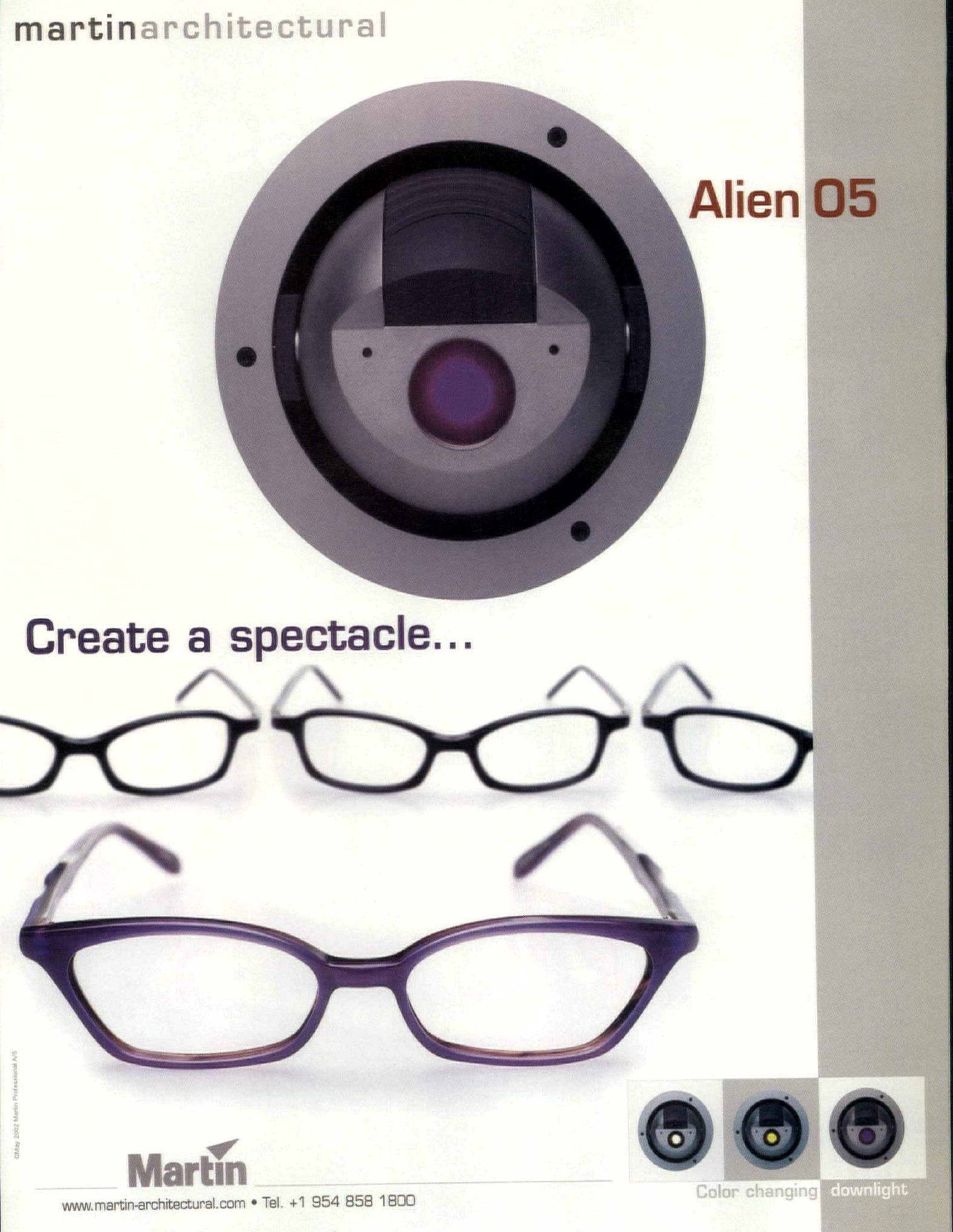
Cheryl Ford has been named manager of commercial engineering for Osram Sylvania's General Lighting business unit.

Altman Lighting has named **Guy Currier** director of marketing.

Super Vision International has appointed **Robert A. Birchler** plant manager.

The International Association of Lighting Designers has named **Charles G. Stone II, IALD, LC** president elect; **Michael Souter, IALD, FASID, LC**, director of membership; **Jeffrey Miller, IALD**, director of external affairs; **Robert Prouse, IALD, LC**, director of education; and **David Bird, IALD**, director at large. **Larry French, IALD, LC** and **Dawn Hollingsworth, IALD, LC** were elected to serve on the membership committee.

Please help us keep the industry informed by sending us the latest on the new faces, new appointments and promotions at your company. Press releases can be faxed to (646) 654-5816 or emailed to aliao@vnubuspubs.com.



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Terminal Bliss

BY CHRISTINA TRAUTHWEIN, EDITOR-IN-CHIEF

Light, art and sound combine to create stimulating effects

For those of us who travel often, we can all agree that the "airport experience" is usually *not* the highlight of the trip. In fact, these days, it's usually quite frantic, frustrating and let's face it—downright boring. But then again, when's the last time your journey included Detroit? For a refreshing change of pace, check out McNamara Terminal at the Northwest WorldGateway. Passengers moving between Concourse A and Concourses B/C will be treated to a soothing—yes, that's right *relaxing*—sensory experience, thanks to a state-of-the-art pedestrian tunnel. In fact, it just may be that the stunning new terminal was a significant catalyst in the airport's prestigious recognition as one of the top five airports in the world, as ranked in a recent passenger satisfaction survey.

The spectacular 700-ft.-long, below-grade space is the result of the ingenuity and creativity of a team of architects, engineers, glass artisans, lighting designers, music composers and light-and-sound programmers who collaborated to create an interactive and awe-inspiring sculpture through which passengers travel. And it's this careful orchestration of light, motion and sound that transforms the passageway from subterranean reality to celestial fantasy.

Right: On either side of the 700-ft.-long tunnel, 60-ft.-diameter, 14-ft.-high rotunda spaces create a luminous and dynamic environment. The tunnel, opposite, provides an ever-changing, constantly evolving experience that enhances passengers' experiences through visual effects that evoke emotions.

Photos: © Justin Maconochie

Detroit-based architect/engineer SmithGroup, Inc., who led the design of the tunnel, promises that travelers will enjoy a "one-of-a-kind" experience on their three-minute journey through the underground tunnel, which serves as a transitional connection between 60-ft. diameter, 14-ft. high rotundas that flank the tunnel and direct movement up to the daylit areas of the concourses. "The rotundas are virtually punctuating the ends of the tunnel and in terms of perception, provide dynamic flow yet contrast the monumental rendition of the tunnel," said lighting designer Rodrigo Manríquez, IALD, LC of SmithGroup, Inc. Fluorescent sources subtly backlight the perimeter of the rotunda glass walls and provide a general luminous quality to the translucent/semi-specular film applied to the glass panels. Color-changing metal halide fixtures are located above a dropped circular soffit and produce dynamic rhythmic patterns of light on the translucent fabric ceiling. For passengers on the move, the rotundas create an initial point of entry to the tunnel and signal them that something exciting—and extraordinary—is about to happen.

TUNNEL VISION

"As for the tunnel, we wanted to make this functionally transitional space into an experience," said Manríquez. "It's more than just moving from point A to point B, but rather a sensory event." According to Manríquez, this was a response to Northwest Airlines' desire to dramatically elevate their customers' experience and to alleviate the normal concerns that one might experience entering a long, narrow, windowless space.

"The design of this space was intended to create the impression of being in a surreal environment," explained Manríquez. "To achieve a sense of movement as passengers transition through the space, lighting provides an ever-changing experience—one that is both entertaining and soothing." He added, "In terms of lighting order, we focused on the overall composition and one's subjective response to that composition. The tunnel is continuously morphing in terms of visual effects, brightness and color saturation on the entire envelope. It's really moving you through as you move through."

According to Manríquez, the main essence of the tunnel is not just about the lighting but the way the different materials are reacting to the lighting in terms of refraction and reflection. "The lighting design really responds on two levels," he explained. "It creates a hierarchy of visual elements within the dramatic architectural enclosure while also accenting the fine detail of the art glass walls through refractive highlights." Essentially, the walls—intricately carved and sandblasted—become the brightest element within the tunnel.

Explained the lighting designer, "We did this by using cutting-edge, custom-designed LED technology and materials to create an ever-changing color intensity and brightness on the walls," which feature a hand-drawn continuous mural evoking many aspects of nature. Thousands of small linear LED fixtures are mounted behind the 264 curved panels that line the inside of the tunnel—each 7 ft. tall by 5 ft. wide and weighing 425 lbs.—and allow an almost infinite number of colors to be programmed and controlled in segments as small as 1 ft. along the length of the tunnel. With this system in place, the LEDs can be programmed to vary the color within each glass panel, along the length of the tunnel, across the width of the tunnel or any variation thereof.

"The ceiling is the second brightest point in the tunnel," said Manríquez, "but instead of being directly backlighted, the stretched translucent fabric (which is also used in the rotunda spaces), is indirectly illuminated from a soffit above the ceiling plane to provide an enclosure to the envelope and create a diffuse glow in the overall composition." Said Manríquez, "This unusual material allows the ceiling to continue the arched shape of the tunnel, but more importantly, allows the changing light to emit through the material diffusely."

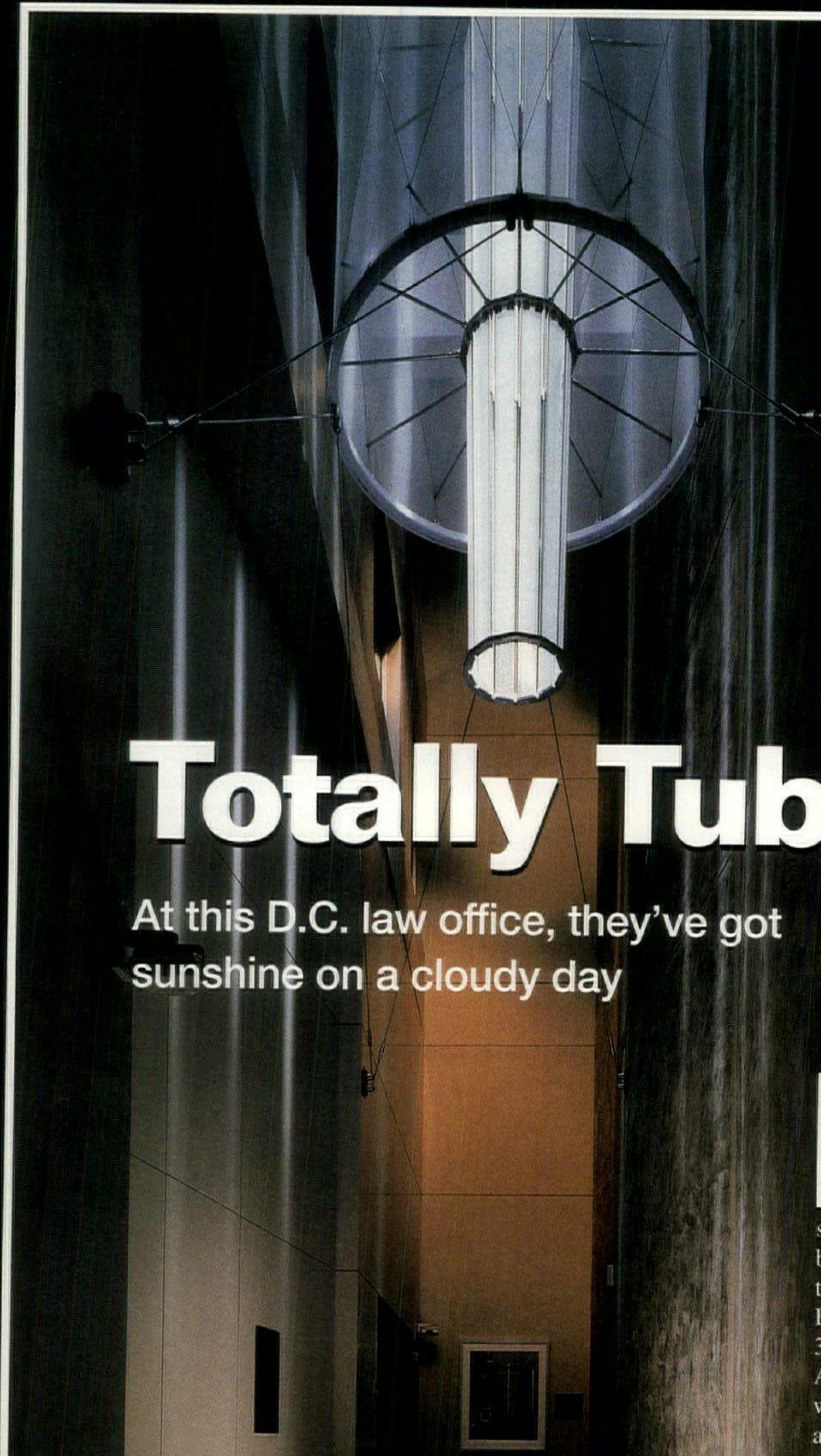
According to the lighting designer, it is the reflection qualities provided by the specular aspects of the terrazzo floor that add the third luminous element. "It is these three surfaces and how they are illuminated and interact with each other that create an artistic and stimulating visual aesthetic," said Manríquez. "There is a deep saturation of color, subtly executed."

LED sources—housed in strip and panel fixtures—are the sole source of general and accent lighting. Altogether, the lighting system uses more than 400,000 LEDs, which boast a maintenance-free life of approximately 11 years under continuous operation and guarantee low energy costs per overall square footage.

A 30-minute series of sound-and-light shows combine with the tunnel's glass mural to offer an experience for visitors that changes in mood, pace and intensity. "It's really cool," said Manríquez. "Inevitably, color has some sort of mood-enhancing reaction and the subjective responses are interesting. The tunnel essentially becomes a work of art large enough to envelop the passenger, making them participants of the art and evoking emotion. Witnessing the public's reactions is, well, very affirming."

DETAILS

PROJECT McNamara Terminal at the Northwest WorldGateway **LOCATION** Detroit, MI **ARCHITECT/ENGINEER/LIGHTING DESIGNER** SmithGroup, Inc. **GLASS FABRICATOR** Fox Fire, Inc.—Laurel Clark-Fyfe **LIGHT & SOUND MILLS** James Productions, Inc. **PHOTOGRAPHER** Justin Maconochie **LIGHTING MANUFACTURERS** Color Kinetics



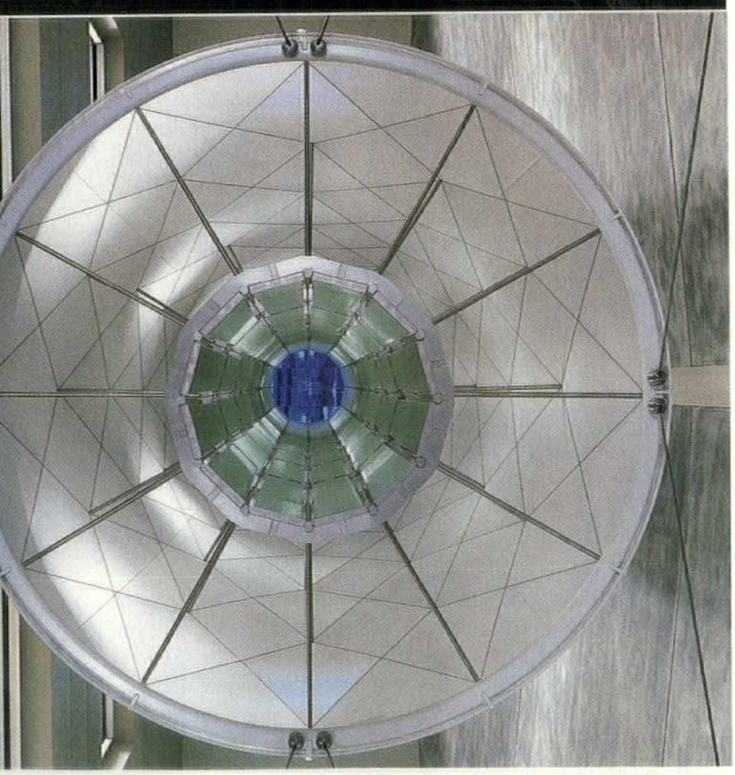
Totally Tubular

At this D.C. law office, they've got sunshine on a cloudy day

BY JEAN NAYAR, CONTRIBUTING EDITOR

It's amazing what a ray of sunshine can do to brighten a busy person's day. And it's even more amazing that a Washington, D.C.-based law firm would spearhead a groundbreaking effort to bring a little sunlight—or sometimes the semblance of it—to its employees. But the partners of Morgan Lewis, a 300-person law firm on Pennsylvania Avenue in the nation's capital, saw a wide range of benefits in doing so. As a result of their pioneering spirit, an astonishing five-ton sculptural solar light pipe—the largest solar light fixture on earth—enriches their 14-story downtown office building in diverse and intriguing ways.

Photos: © Paul Warchol

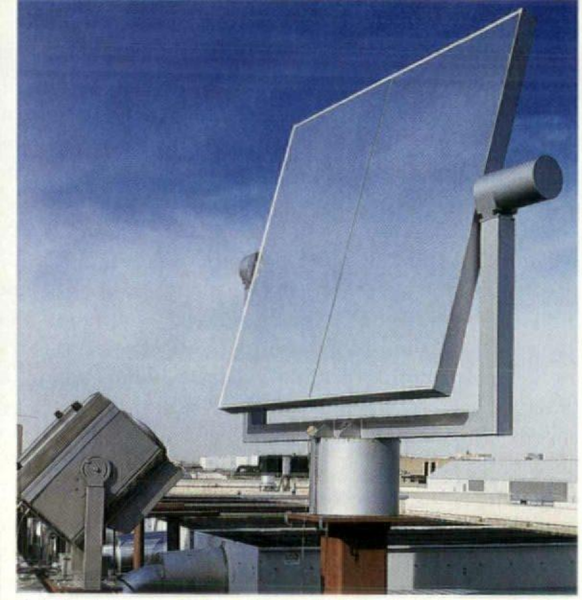


"The clients were stalwart," said daylight expert and architect Davidson Norris, one of the creators of the extraordinary light pipe. "To see a group of hard-bitten attorneys invest this much in something they realized was risky," Norris mused, pausing for an incredulous moment. "They were terrific, they were bold," he concluded. But Norris isn't the only one who sees these lawyers as daring forward-thinkers. The partners of Morgan Lewis, which is one of the ten largest law firms nationwide, like to think of themselves as cutting-edge professionals and as such, saw the light fixture as a means of symbolically representing their visionary business approach to all who enter their building's atrium, where the light pipe, a 120-ft.-long glowing work of functional art brings a luminous, glittering shaft of sunshine to every floor of the firm's work space. "The purpose of design is often as much about symbolism as it is about function," said Matthew Tanteri, a lighting designer with New York-based Ann Kale Associates who worked closely with Norris and Norris's partner, James Carpenter, on the night lighting of the light pipe. "This light fixture closely aligns with the law firm's attitude—it's radiant and enlightened," he said, underscoring the metaphoric undertones inherent in the light-producing device.

Although the client's willingness to venture into uncharted territory may have made the fixture possible, extreme need—more than iconic symbolism—was the driving force behind its conception and design. Morgan Lewis' offices, which are located in a building that was originally designed in the 1960s and was later renovated by the Washington office of Studios Architecture, centered around an unusually narrow atrium. During the course of the renovation, Studios Architecture called upon the eight-year-old daylight consulting firm, Carpenter Norris Consulting, to devise a way to bring daylight down to the base of the atrium. Although the atrium was already topped with a skylight, its unusual proportions, which Tanteri described as "similar to those of a cereal box," allowed daylight to reach only the uppermost floors, leaving the majority of the lower levels in gloomy darkness.

As daylighting consultants, Carpenter and Norris design specialty light harvesting and redirecting devices for a broad variety of settings and conditions—from Richard Meier's courthouse building in Phoenix to labs and educational facilities to urban parks, where a preponderance of tall buildings can prevent daylight from reaching the street level. In this case, the team was asked to design an element that would engage the people working in these offices as they looked out into the dark, dreary atrium. "It wasn't an effort to bring light onto work surfaces," explained Norris, "we weren't asked to make an economic pay-back argument for what we were doing." Instead, their job was to create a stimulating centerpiece that would serve

The five-ton, 120-ft.-long solar light pipe brings sunlight down to the base of a dark, narrow 14-story atrium. The solar fixture harnesses direct sunlight via a heliostat and shoots it along the length of a tapered cone made of prismatic glass. A cylindrical scrim of Lycra diffuses the sunlight. The entire structure is held in place by four yacht fittings at the top and secured by cables to the walls at the base. As light penetrates the prismatic glass cone, it refracts and reflects off the stainless-steel and aluminum fittings, creating vertical bands of light on the walls and a starburst pattern on the floor. "As you look down into the atrium, you see these bright spots, like silvery fish in an ocean, which give depth and richness to the overall effect," said one of the light pipe's designers, Davidson Norris.



A heliostat mounted on the roof of the building tracks the sun over the course of a day. The heliostat reflects the sunlight onto a secondary mirror, which redirects the light down a 120-ft.-long, cone-shaped cylinder. On overcast days or at night, a controller on the heliostat senses a low-light level, then signals it to tip into searchlight mode. Two 2000W xenon searchlights provide illumination when sunlight is not available, sending light along the same path as that of the sun. The light from these sources periodically cycles through the spectral colors—from the deep purple at sunrise to silvery white at noon—so that occupants know that the light penetrating the light pipe is artificial.

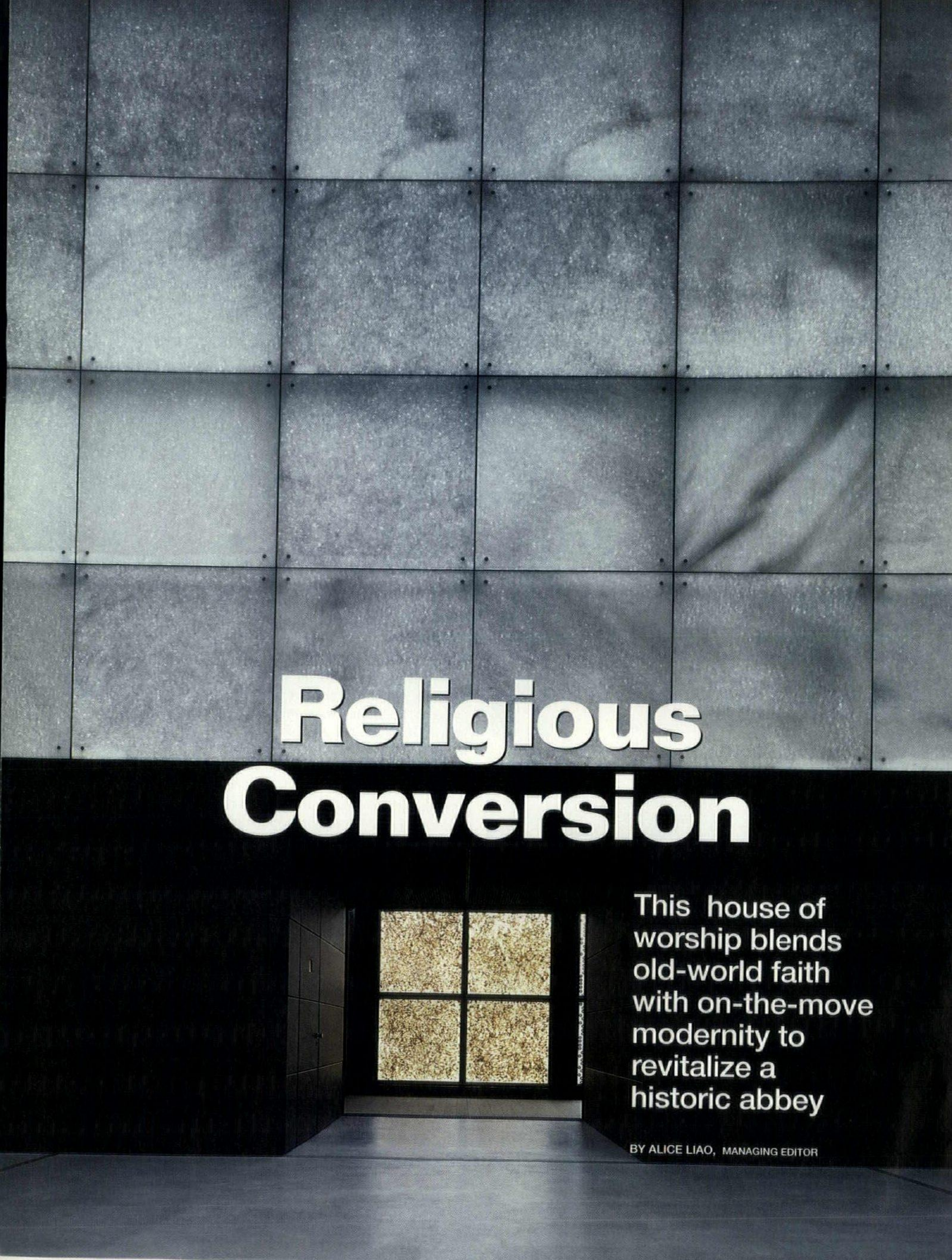
as an anchor for the physical environment and bring in the psychological benefits that only the sun can offer.

NATURAL CONCLUSION

"Studies show that sunlight is a powerful stimulant," said Norris, who teaches a sustainable design course at New York's Columbia University. "When you can bring its dynamic qualities to employees working in windowless spaces, you go a long way toward making a more tolerable work environment." The physical and psychological benefits of daylight are layered and diverse, but they are often difficult to quantify since research on its effects is still quite limited. Nonetheless, evidence suggests that access to natural light provides people with certain environmental data they need to orient themselves throughout the day—such as the time of day, the season of the year and whether it's sunny or rainy outside—which everyone senses intuitively based on their experience with the position of the sun and quality or intensity of its light at different times and under different atmospheric conditions. Well-documented, too, are the benefits of sunlight in alleviating mood disorders thought to be associated with a lack of light.

"We wanted to make available to the employees the many attributes of sunlight," Norris explained, "light that's intense, bright, alive, dynamic and variable." To capture and direct the light of the sun into the narrow slot of the law office atrium, which is 60 ft. long, 150 ft. high and only 8 ft. wide, Norris and Carpenter devised a fixture that depends on a heliostat, which is mounted on the roof of the building and tracks the sun in its path through the sky over the course of a day. The heliostat reflects the sunlight onto a secondary mirror, which is actually made up of 24 individually adjustable sub-mirrors and housed in a weather-tight structure on the roof. (The part of this structure that faces the heliostat is made of a single pane of anti-reflective glass to increase sunlight transmission; the rest is made of standard low-e double glass.) The secondary mirror redirects the light down a 120-ft.-long, cone-shaped cylinder, which is made of diamond-shaped panes of prismatic glass set within a stainless-steel and aluminum support system. As the sunlight travels down the cone and hits its angled pieces of serrated glass, it refracts outward and bounces off and through the translucent fabric skin of an outer cylinder, which surrounds the cone and softens the bright light traveling through it. The outer cylinder is actually a tension structure made of Lycra fabric stretched over stainless-steel compression rings that are held in place by steel arms radiating from the cone-shaped core. The entire fixture is suspended from four sailing yacht fittings at the top and secured at the base with woven stainless-steel cables.

According to Carpenter, who, along with Norris, produced a miniature mockup of the fixture by shaping a piece of 3M's prismatic film into a cone and surrounding it with a nylon stocking, the dimensions of the atrium dictated the fixture's form. "The form was a given because the space was so narrow," he said, adding that "its sloped surface gives the direct beam of vertical sunlight a target to hit all along the length of the cone, allowing it to bend and refract horizontally to illuminate the entire shaft." Carpenter, a glass sculptor whose contribution to the built environment was honored by the AIA in 1991, designed the cone with a 1-degree slope so that the light would be evenly distributed along its length. Although the cone is 6 ft. in diameter at the top and only 18 in.



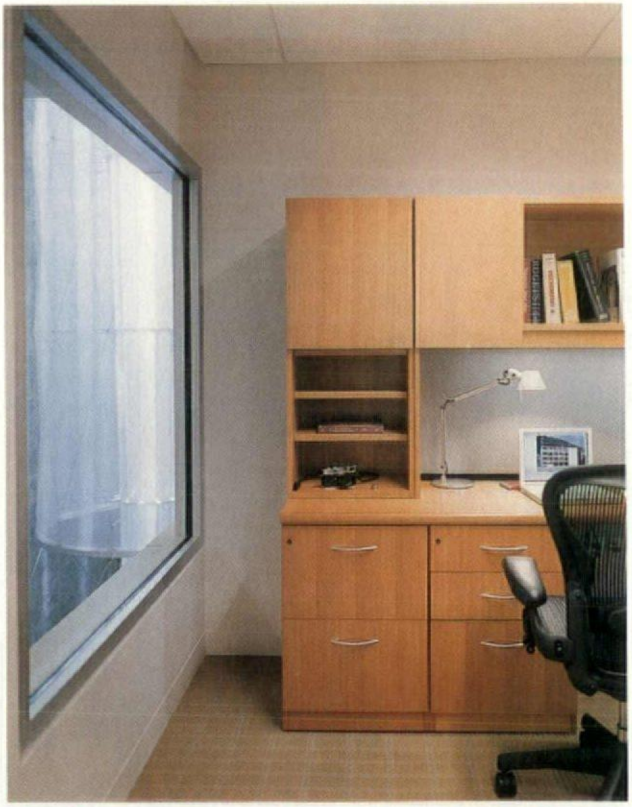
Religious Conversion

This house of worship blends old-world faith with on-the-move modernity to revitalize a historic abbey

BY ALICE LIAO, MANAGING EDITOR

in diameter at the bottom, its extremely shallow slope gives it the illusion of appearing to be a straight cylinder when viewed from the ground—like a reversal of the forced perspective created by the taper of Greek columns.

Since the heliostat tracks the sun throughout the course of the day and redirects the sun's light through the cone-shaped shaft, employees on every level gain a true sense of the sun's movement and variable quality as the day wears on. But the heliostat can only track the sun when the sky is clear. As a result, Carpenter Norris relied on Tanteri's expertise to integrate an artificial light source into the fixture that would produce qualities similar to those of the sun on overcast days or at night. "The sun is an amazing light source whose color temperature increases with altitude," said Tanteri, who teaches daylighting in the Master of Lighting Design program in the architecture department at Parson's School of Design. "At sunrise and sunset, its low temperature of about 1000K gives it a warm red glow like a candle. When it's higher in the sky and travels through less air mass, the color temperature increases to about 5000K, making it appear much cooler. It also has an extremely narrow beam spread, only about 1/2 a degree and it's so intense, about 100,000,000 candelas/in. sq., that it can only be safely viewed through a neutral density filter. It's hard to find a source that's anything like it. On top of that, we needed to find one that would have a reasonably long lamp life, have color-change capability and be dimmable, too." Tanteri evaluated a host of sources and luminaires and finally opted to employ two 2000W xenon searchlight sources from Italy that could be programmed to dim, change color and switch on through a computer-controlled DMX 512 interface.



The light pipe evenly distributes light along the length of the building's 8-ft.-wide atrium, providing workers with a sense of daylight and its variable qualities at comfortable, non-glare brightness levels throughout the day. Luminance levels range from 30-15 footlamberts depending on solar altitude and sky conditions. Wind on the heliostat causes the light to ripple subtly, like sunlight sparkling on water or filtering through leaves of a tree.

SUNRISE, SUNSET

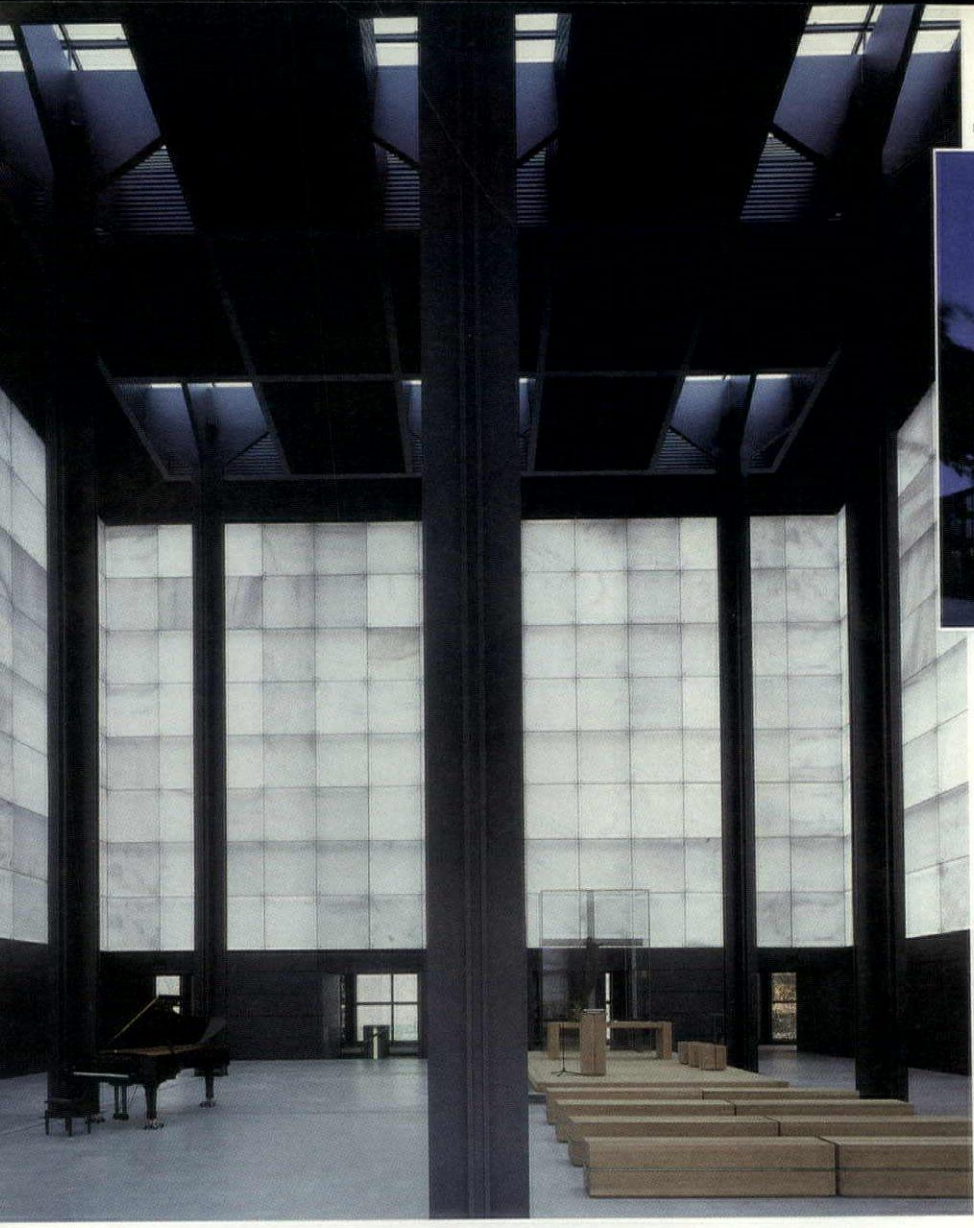
After he settled on the sources, Tanteri had to get their control system to "speak to" the control system of the German-made heliostat's photo cell. "When a cloud comes over the sun, the photo-cell senses a low light level and after a programmed period of time, say 10 minutes, the computer signals the heliostat to tip down and switch the searchlight on," he said. In this way, the employees experience a consistent glow of light with the variability of natural sunlight as it moves and as clouds pass in front it from time to time. Although employees receive sunlight-like light on overcast days or at night, when the heliostat reflects the light of the xenon searchlights, the designers programmed a subtly changing cycle of sunrise to sunset colors, making it obvious to employees that the illumination is artificial at these times. "We didn't want to fool people into thinking it was a sunny day outside when it wasn't," said Tanteri, who also was involved in ensuring that the light pipe would have a comfortable and perceivable brightness when viewed in the context of surrounding interior luminances.

Fixed at the north-south axis of the building in precise alignment with the true south solar axis upon which Washington, D.C.'s founding fathers organized the city's urban grid, the solar light fixture melds history, astronomy, meteorology, physics and art into a glorious single-pointed focus. Norris sees the fixture as a potential solution to what he and Carpenter call the "black hole problem," or getting light into a space where daylight should be available but isn't. He also sees it as a way to solve a recurrent dilemma of building owners. "They often want atria to provide the added value of interior daylight, but atria chew up a lot of rentable square footage," said Norris. "Light pipes would let you put light into a space without sacrificing so much space."

Carpenter on the other hand, sees the light pipe as a practical artwork with potential to transform a person's perception. "I'm interested in having people become more aware of the phenomenon of daylight and the changing nature and complexity of the visual content around them that daylight reveals," said Carpenter. "Like a work of art, a structure like this has the ability to focus people's attention and get them to see something in a different way than they ever have before, but if it can do so simultaneously in a functional way, then so much the better." ■

DETAILS

PROJECT Solar Light Pipe **LOCATION** Washington, D.C. **CLIENT** Morgan Lewis **SOLAR LIGHT PIPE DESIGNER** Carpenter Norris Consulting **NIGHT LIGHTING DESIGNER** Ann Kale Associates —Matthew Tanteri **FABRICATION AND INSTALLATION** Carpenter Norris Consulting **STRUCTURAL ENGINEER** David Kufferman, PE **ARCHITECT** Studios Architecture **PHOTOGRAPHER** Paul Warchol **LIGHTING MANUFACTURERS** Space Cannon Illuminations; Bomin Soar



PHOTOS: © KLAUS FRAHM

Opposite and left: At the heart of the Christ Pavilion, the Christ Hall features nine cruciform columns that support the roof of a large glass cube. During the day, the Hall, whose walls are lined with translucent marble, glow with a blend of electric and natural light. Softening the steel surfaces of the columns, 90W halogen spotlights with 6-degree beamspreads are situated at the tops of the columns and project light downward.

Above: At Expo 2000 in Hanover, a glass crucifix lighted with 70W ceramic metal halide fixtures beckons. After the show, the cross was moved to a parish center in Hanover.

They say that divinity can be found in even the simplest of creatures, the most ordinary of objects. In art, the evocation of the sublime through the depiction of bare, humble effects is an age-old endeavor, in which light is often the key ingredient in suggesting the presence of a higher being. Such is the case, one could argue, with the Christ Pavilion, whose threadbare steel skeleton braced luminous spaces that provided visitors to Expo 2000 in Hanover with a sanctuary for spiritual repose. In fact, according to Meinhard von Gerkan, principal of gmp - Architekten von Gerkan, Marg und Partner, the architectural firm responsible for designing the pavilion, "Lighting was a major design element in the project." He said, "The spatial atmosphere of all areas of the project is created by the modulation of light." For lighting designer Manfred Draxl, who worked closely with von Gerkan in using light to imbue the geometric structures with a quality of quiet contemplation, the lighting solution not only complements the architecture of the building, but transforms it into a kind of "lighting sculpture," a dramatic beacon at night.

This transformation is especially resonant as the Christ Pavilion was relocated at the show's conclusion to Thuringia, Germany, where it was resurrected as part of the revitalization of the Volkenroda abbey, Germany's oldest maintained Cistercian monastery. Although the monastery, which was founded in 1131, underwent a successful restoration in the early 1990s, garnering recognition as a cultural monument and a 1996 Henry Ford European Conservation Award, the reconstruction did not include a nave or cloister, the heart of much of the abbey's religious activities. To compensate, the Christian Churches of Germany conceived of the Christ Pavilion, a building whose debut at Expo 2000 would invite sponsorship while furnishing, as von Gerkan noted, "a contemplative counterpart to the vanity fair" of Expo 2000, but whose ultimate role would be to complete the abbey.

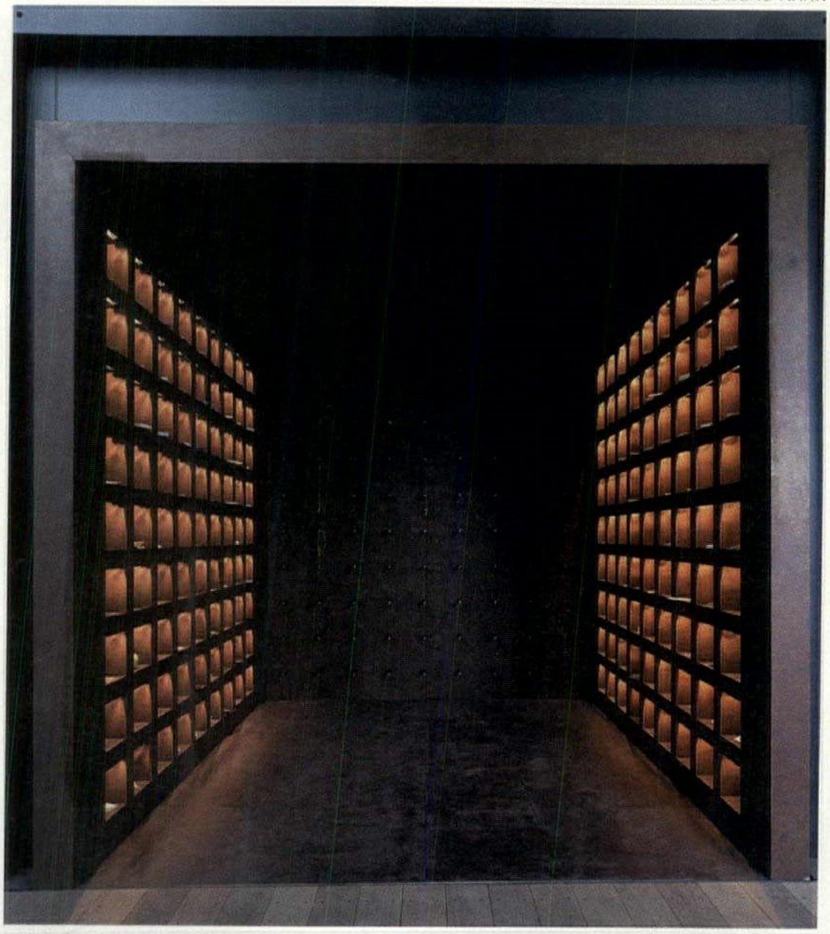
Three components comprise the resulting pavilion complex: the 18-m.-high Christ Hall in which religious services are conducted, a surrounding cloister and a subterranean crypt, which, however, was not transplanted in the move to Volkenroda. The architecture—an assured blend of steel, glass and marble contained within a modular framework of coated steel—responds to the demands of the dual locations by showcasing the "Sigma node," an innovative joint that allows large sections of the building to be connected firmly without additional welding, screw-fixing or riveting and thus, facilitates on-site assembly and dismantling. Von Gerkan also commented that the predominant use of steel and glass in the project was prompted in part by the generous financial support given by those respective industries.

LIGHT OF *DEI*

To preserve the clean, streamlined architectural aesthetic, the lighting scheme is masterfully integrated with the building's

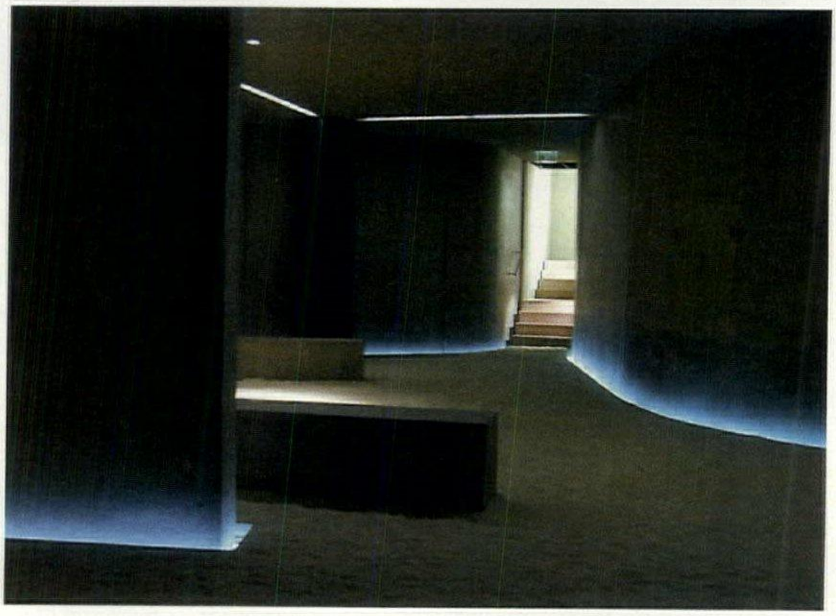
Right: Of the nine cabinets developed to inspire spiritual reflection and promote faith, "communitas" enjoyed great popularity at the Expo. Here, visitors are invited to place something in the 162 compartments in exchange for their contents. The niches are backlighted with 162 halogen fixtures, which in turn, enhance the wood finish.

Below & opposite: The crypt, which was located directly beneath the Christ Hall, is solemn in atmosphere. Tracing the axes of the Hall above, fluorescent striplights are recessed in the ceiling to simulate slits of daylight. Around the bottoms of columns, blue fiber-optic lighting adds to the sense of mystery.



design and incorporates 20 different types of custom fixtures that were developed by Draxl and von Gerkan to ensure precise performance. Concealing fixtures often at the ceiling plane or in coves, their solution relies primarily on indirect illumination and diffuse washes of light to highlight the translucency of materials, accent structural features and set an emotional pitch that speaks to the function of each space.

In the Christ Hall, the centerpiece of the complex, where nine cruciform columns are enclosed within a cube of glass walls lined with translucent marble cut from the Greek island of Naxos, electric light and daylight are blended to fill the room with a brightness that is calming and serene. Here, 90W halogen spotlights with a six-degree beam spread hug the top of each column and splash light down onto the vertical planes, softening the steel surfaces. To supplement the daylight and contribute ambient illumination, 54W fluorescent wall-washers concealed just above the ceiling plane along the perimeter of the space bathe the crystalline facades in a white glow.



The voluminous Christ Hall is embraced on three sides by the cloister, a 3.4-x-6.8-m. walkway that also serves as an exhibition area. Its walls are formed of double-glazed windows filled with objects both natural and man-made that range from seedpods to syringes and forks. During the day, sunlight permeates the walls whose opacity is determined by the objects they contain and creates striking patterns and varying levels of brightness. At night, the cloister is luminous with the light of wall-washers equipped with 80W T5 fluorescent lamps and tucked along the edge of the ceiling. "The use of asymmetric wall-washers here was critical," said Draxl. "The reflector curves were calculated so as to ensure that only the opposite wall was illuminated and not the floor, which in turn, would distract visitors."

A significant aspect of the Christ Pavilion also housed in the cloister is a series of "cabinets" designed to invite religious reflection and promote faith. These spaces include a sound room, where visitors in individual booths are lulled by music, and a scripture library, where shelves are lined with translations of the Bible in different languages. There, wall-washers recessed in the ceiling graze the book spines for visibility while below, display cases, illuminated with fluorescent striplights, show off articles and texts related to Christian scholarship. A popular cabinet, "communitas," consists of 162 compartments that invite visitors to leave

PHOTO: © KLAUS FRAHM

items in the niches in exchange for their contents; objects left can remain for a few hours or sometimes even longer. The compartments are backlighted with 162 halogen fixtures, which also enhance the wood finish of the display and in turn, hint at the deeper implications of the simple act of "give and take."

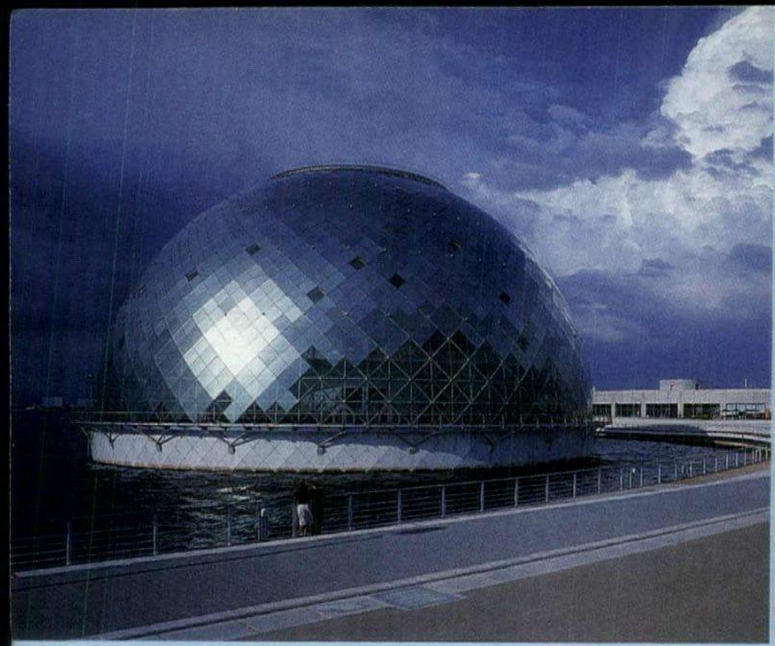
CROSS SIGNAL

Although not included in the move to Volkenroda, the crypt, which was located below the Christ Hall, provided a dramatic counterpoint to the spaces at ground level. Where electric light combined with daylight to instill in the Christ Hall a feeling of expansiveness and loftiness, in the crypt, the sense of being underground parallels the sensation of turning into oneself for profound contemplation. In this subterranean, subtly cave-like space, lower ceilings made of concrete are etched with dimmable T5 fluorescent striplights that delineate the axes of the room above and appear as narrow slits of daylight. Side-emitting fiber-optics recessed in the floor ring the bottoms of columns in blue light, heightening the sense of mystery and solemnity, while ceiling-mounted accentlights lamped with 20W halogen sources draw attention to noteworthy artifacts such as a 12th century Romanesque font.

In transitioning the pavilion from Hanover to Volkenroda, the design team implemented a few adjustments to adapt the project to its permanent home. A single 300W halogen fixture was installed in each of the cabinets, all of which were reinterpreted by local artist Andreas Felger. Gone is the exterior colonnade that held flags lighted by ceramic metal halide fixtures, and a water basin, which functioned as a visual divider for the complex at Hanover, is now a reflecting pool. The large glass crucifix, which glowed with the light of 70W ceramic metal halide fixtures mounted at its cross beam and at night, served as a compelling signature for the pavilion, is also missing, having been re-erected at a parish center in Hanover. However, set against the history-rich tapestry of Volkenroda, the Christ Pavilion in its current incarnation, luminous and thoroughly modern, is perhaps a powerful enough signal of the continuing viability of Christianity in today's world. ■

DETAILS

PROJECT Christ Pavilion **LOCATION** Hanover, Germany; Volkenroda, Thuringia, Germany **CLIENT** Evangelisches Büro für die Weltausstellung Expo 2000 **ARCHITECT** gmp - Architekten von Gerkan, Marg und Partner—Meinhard von Gerkan, Joachim Zais, Gregor Hoheisel, Sona Kazemi, Stephan Rewolle, Jörn Ortmann, Ulf Düsterhöft, Monika van Vught, Matias Otto, Olaf Schlüter, Andreas Hahn, Thomas Dreusicke, Helge Reimer **EXHIBITION** Peter Radomski, Magdalene Weiß **LIGHTING DESIGNER** Conceptlicht Austria, Mills/Hall - Manfred Draxl **STRUCTURAL ENGINEER** Büro Binnewies **LANDSCAPE ARCHITECT** Wehberg, Eppinger, Schmidtke **PHOTOGRAPHERS** Klaus Frahm; Jürgen Schmidt **LIGHTING MANUFACTURERS** Hoffmeister Leuchten GmbH & Co. KG; Metallkonstruktionen Birke; iGuzzini; Halotech

Ship Building

Controlled daylight from a futuristic glass and metal dome combines with a ship-shape lighting design to make this museum a seaworthy venue for marine history

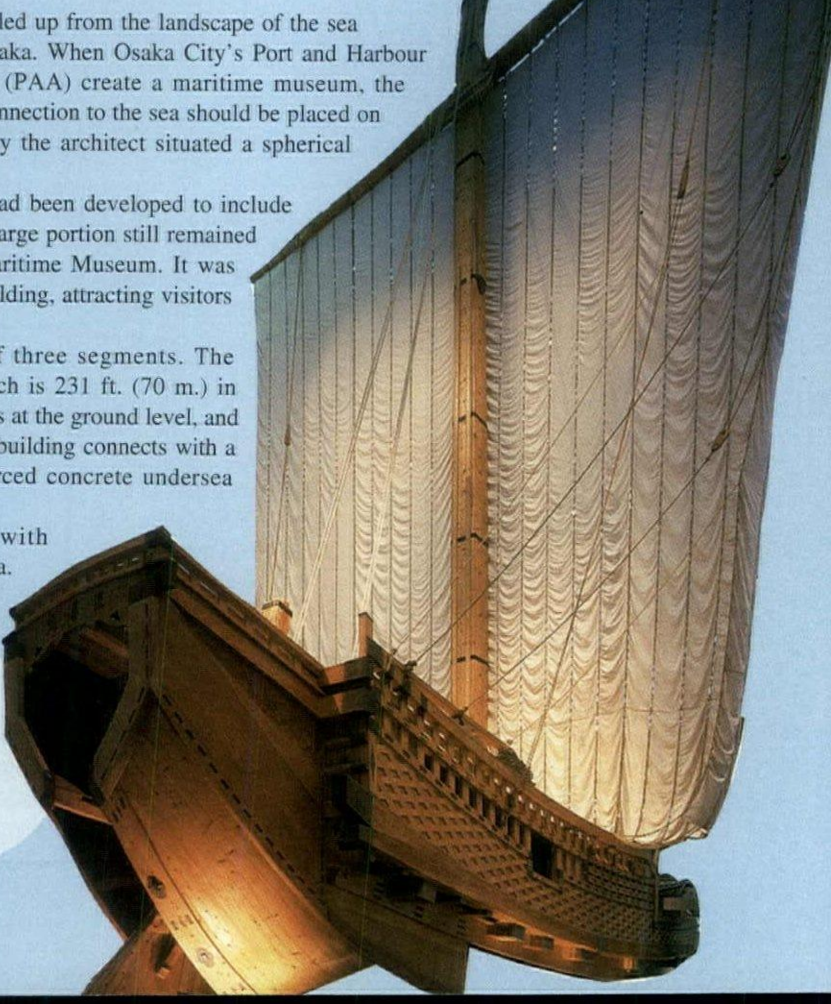
BY WANDA JANKOWSKI, CONTRIBUTING EDITOR

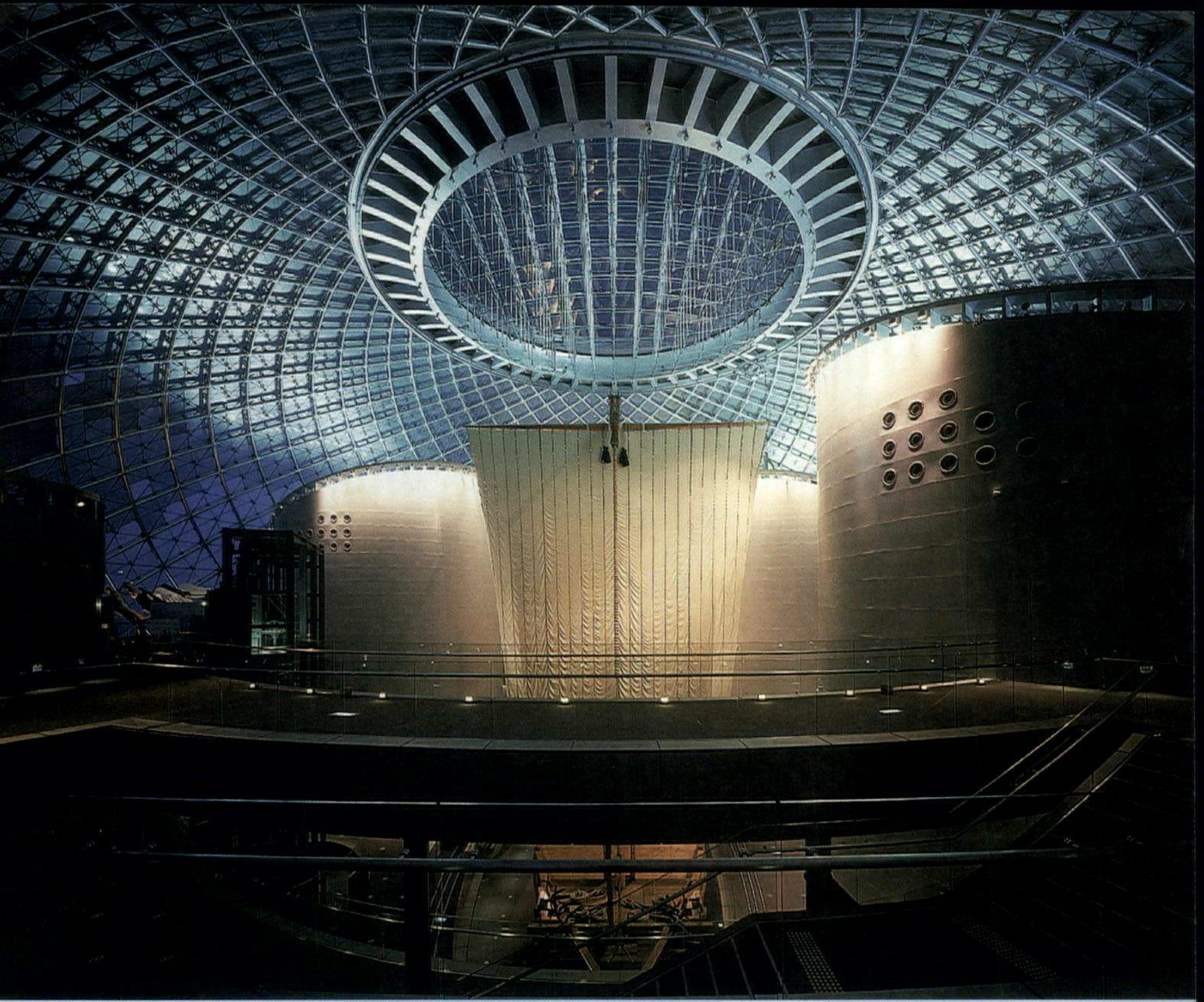
In Osaka Bay, a shining futuristic dome has bubbled up from the landscape of the sea to capture and preserve the maritime past of Osaka. When Osaka City's Port and Harbour Bureau requested that Paul Andreu Architects (PAA) create a maritime museum, the architect felt that a structure celebrating man's connection to the sea should be placed on water. Hence, the concept sketches submitted by the architect situated a spherical dome in the mouth of Osaka Bay.

Although reclaimed land on the edge of the bay had been developed to include high-rise office buildings and an exhibition center, a large portion still remained unused and was ideal as the home of the Osaka Maritime Museum. It was hoped that the museum would become a landmark building, attracting visitors from the city center.

The museum complex is actually composed of three segments. The museum's onshore semicircular entry building, which is 231 ft. (70 m.) in diameter, houses a restaurant, souvenir shop and offices at the ground level, and storage and plant rooms in two basement levels. This building connects with a 198-ft.-long (60-m.) and 43-ft.-wide(13-m.) reinforced concrete undersea tunnel, which leads to the domed museum proper.

PAA's architectural design was executed with engineering input from the firms of Arup and Tohata. Arup was responsible for the structural, mechanical, electrical and seismic engineering of the dome and internal structure. Tohata undertook the engineering of the entrance building, the submerged tunnel and the dome substructure. The lighting of the tunnel and dome interior was designed by Kaoru Mende and Ryuichi Sawada, Lighting Planners Associates, Inc.





Like a snow globe filled with scenes of interest, at night, the Osaka Maritime Museum's glass dome allows the interiors of the museum and its central ship display to be glimpsed between the rings of exhibit levels from the exterior. A stunning architectural achievement whose structural design was recognized in 2002 with a Special Award from the Institution of Structural Engineers, UK, the glass and steel dome appears as a shining ball on the watery landscape by day (opposite left). The glass and steel dome is fixed at its equator level to a circular reinforced concrete wall. The dome's criss-crossed grid of steel tubes are butt-welded to cast steel nodes and braced by high-strength, pre-stressed rods.

Flat square glass panels are used to plate the dome. To achieve the rounded shape, the length of the panels is varied. Their size is also decreased with height. Asaki Glass provided the special square glass panels called Lamimetal that form the dome's shell. The laminated glazing includes a sheet of perforated metal sandwiched in the interlayer. Four types of punched metal, each with a different size of openings, are used. The size of the perforations controls the amount of sunlight passing through. Where the solar gains are small, the glass is clear, and where solar gains are at a maximum, the Lamimetal is almost opaque. During the day, the Lamimetal reflects the light, causing the dome to resemble a glowing sphere. In the evening, the dome's transparency increases, and the interior of the dome becomes visible to outside onlookers (opposite right).

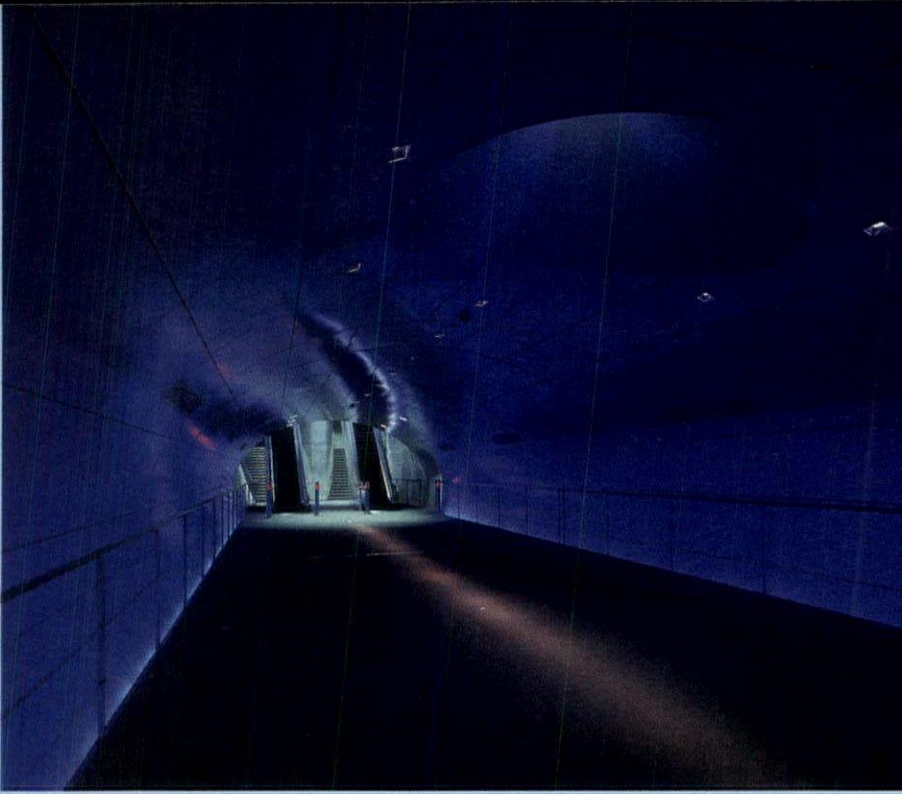
Near the top of the dome, the tubular grid connects to a ring beam. The glass cap within the ring beam is supported by an orthogonal array of cable trusses. Since Osaka Bay is at risk from both earthquakes and tsunami, the steel structure and glass panels have been designed to withstand seismic forces, and the glass also is made to resist wave loading.

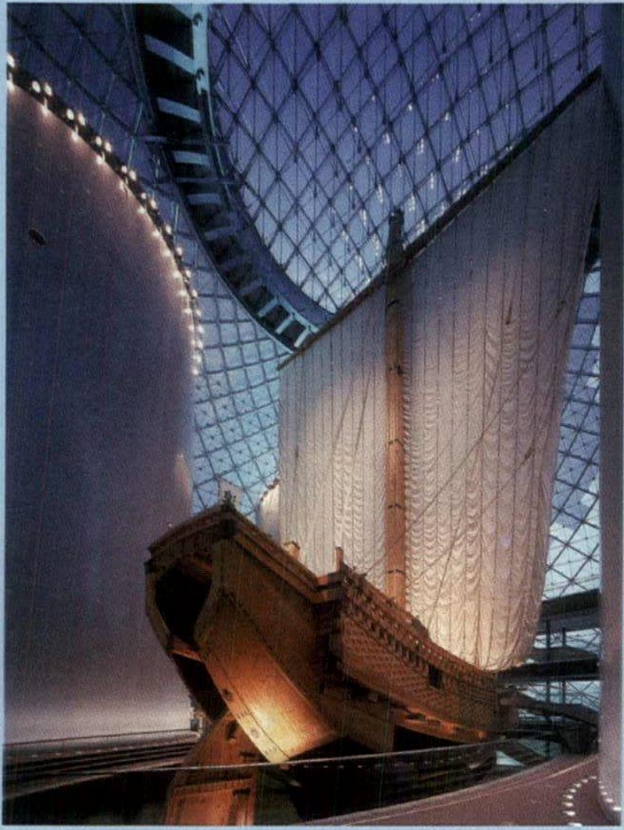
Only single glazing was needed throughout most of the dome because the winter in Osaka is short. However, the top cap within the ring beam is double-glazed to control heat gain. In the two layers of the shell just below the ring beam, a single pane of glass covers each unit of the grid. The glazing of the levels below is divided into four panes with the center point positioned where the tension rods cross. Lower down, where the glazing is subject to the wave load, thicker glass is used with backing in I-sections running along both the perimeter and the diagonal to provide line support against positive pressure.

The preassembled dome was installed by lifting its 1,200 tons with an enormous floating crane. The site area itself measures 120,398 sq. ft. (33,443 sq. m.) with 74,408 sq. ft. (20,669 sq. m.) of gross floor area, 70 percent of which is inside the dome.

Visitors arriving at the entrance building access the underwater tunnel via elevators. Inside the tunnel (right), the illumination is simple, but effective. Light levels become subdued, diminishing from 250 lux at the entrance to 50 lux in the tunnel. Traffic flow is aided by aisle illumination from halogen track lights. A mood of anticipation and excitement is created by uplight from fluorescent tubes positioned in the bottom sides of the passageway. "The fluorescents are blue-filtered to remind visitors that they are passing through the water of the bay on their way to viewing elements of maritime history," said Mende.

As visitors end their journey through the tunnel, they enter the dome underneath the spectacular focal point of the museum, the Higaki Kaisen, a reconstructed timber trading boat from the Edo period of the 17th to 19th centuries (below). Visitors can take the elevator up to Level 4 and work their way down, viewing exhibits along the way. The





levels ring the perimeter of the dome, leaving the central atrium open to allow for the viewing of the tall ship from several vantage points. On Level 1, visitors can view the bottom of the ship, while the stern and side of the ship can be enjoyed from Level 2. The deck and sail can be examined most closely from Level 3.

In addition to the historic ship replica, the exhibits are varied, mixing fixed presentations and interactive displays. Level 1 houses the Theater of the Sea and the Sea Adventure Pavilion, where visitors learn about seafaring life. Level 2 includes exhibits on the ship replica, shipbuilding technology and historic ship races. Level 3 focuses on the development and history of Osaka as a port. Level 4 features an introduction to the benefits of Oceanic Cultural Exchange, such as art acquisition, the sharing of navigational skills and the expansion of trading commodities.

At night, the dome itself is uplighted from within using 400W metal halide floodlights, while focused spotlighting of the ship's components allows the ship to be seen from a distance through the dome's exterior. "The cylinder of multi-level rings in which the ship is centered holds a variety of fixtures," explained Mende, "including spotlights that focus on the ship's sail and deck as well as illuminate aisles and exhibits." Spotlights equipped with 150W compact metal halide lamps are housed in the upper levels to focus on the ship. Uplight for the ship's bottom is provided by 70W compact metal halide wall-wash units.

Downlights equipped with 100W halogen lamps are located throughout the second to fourth levels to provide ambient light, while a combination of 7W compact fluorescents and 12V, 90W halogen lamps is used to illuminate the area around the main stairs on the fourth floor. Exhibits in the multi-leveled rings are lighted with 150W compact metal halide spotlights and aisles, with downlights fitted with 32W compact fluorescent lamps. "The aisles are illuminated at about 100 lux to allow the viewer's attention to be directed to the exhibits, which are bathed in approximately 150 lux of light," said Mende. ■

DETAILS

PROJECT Osaka Maritime Museum **LOCATION** Osaka, Japan **CLIENT** Osaka Port and Harbour Bureau **ARCHITECT** Paul Andreu Architects, Japan Design Office **ENGINEERING DESIGN** Ove Arup—Robert Baker, Jo da Silva, Pat Dallard, Mark Facer, Andre Gibbs, Scott Groves, Shigeru Hikone, Ryoichi Hirose, Martin Manning, Arata Oguri, Dan Philips, Jin Sasaki and Tohata Architects & Engineers **LIGHTING CONSULTANT** Lighting Planners Associates, Inc.—Kaoru Mende and Ryuichi Sawada **MECHANICAL CONTRACTOR** Taiki + Seiken Joint Venture **ELECTRICAL CONTRACTOR** Toenek + Sanpo Joint Venture **LIGHTING MANUFACTURERS** Erco; Yamagiwa; Matsushita; Philips

design **focus** report

Office Lighting

Since the first energy crisis, office lighting has been the primary subject of energy conservation standards, codes, practices and product innovation. According to the Department of Energy, there are approximately 750,000 commercial office buildings in the U.S. This building stock accounts for about 13 percent of all the energy used for lighting, making it equal to the total of all industrial lighting. In fact, it is hard to discuss lighting and energy and *not* talk about offices.

The biggest thing affecting designers today is energy code. Energy codes continue to become more stringent. Code developers have taken the latest technologies into account, and the latest versions of the next-generation energy codes assume widespread use of "super T8" technology and other more efficient technologies discussed below. By 2005, most of the U.S. will be governed by codes that limit office buildings to 1.1W/sq.ft. or less.

But there are other factors affecting designs today. One of the most prominent is the U.S. Green Buildings Council's LEED system for rating sustainable design. In lighting, the LEED system awards points for daylighting, indoor environmental quality and energy efficiency. Building projects must achieve 15-percent less energy use overall than 90.1-2001 to even qualify for LEED rating, and energy savings over and above 15 percent get additional points towards the LEED award. In other words, for buildings that aspire to a LEED rating, lighting designs will often need to be 25-40 percent *less* than 90.1.

The same thing applies to buildings designed to meet other efficiency criteria. In New Jersey, utility companies continue to provide rebates for designs that are better than code. In California, the Savings by Design program provides design assistance and funding to encourage designers and owners to achieve LEED-like performance. And in Oregon, all state-owned buildings are required to implement cost-effective measures that reduce building energy consumption at least 10 percent. Including LEED, these requirements are almost more important than codes because financial and political incentives make energy-efficient design absolutely necessary.

It is possible to design lighting systems that perform this well—but it's not easy. For many architects, engineers and designers, it means some new thinking. Here are six recommendations that will help achieve office lighting designs that meet these demanding energy requirements:

By 2005, most of the U.S. will be governed by codes that limit office buildings to 1.1W/sq. ft.

Use Skinny Tubes. To begin, most of the lighting systems should employ the highest possible source efficacy. Today's top products are the "super T8" and T5 lighting systems. The standard 4-ft. T5 lamp and ballast system operates at about 89 mean lumens per watt (MLPW) and the 4-ft. "super T8" is about 92 MLPW. You might also consider the T5/HO system (79 MLPW). The only other light source that comes close is metal halide pulse-start lamps 320W and larger. Forget compact fluorescent lamps, low-wattage metal halide and other sources, except for special areas. *Skinny tubes rule.*

To identify a "super T8," look for lamps that are at least 3100 initial lumens and have a barrier coat design and high lumen maintenance. Suggested lamps include the Sylvania "Xtreme," the GE "HL" and the Philips "Advantage" T8 lamps. You might also consider the 30W T8 lamp and ballast system, although keep in mind its limitations (see below).

Use Efficient Electronic Ballasts. Yes, there is now an "efficient electronic" T8 ballast that uses 7-9 percent less power than a regular electronic ballast. These ballasts are available in both programmed start (for long lamp life, especially when motion sensor controlled) and instant start (for long hours of continuous operation). Instant-start ballasts include Advance "Optanium" series, Universal Triad "HE" series or similarly rated ballasts. Programmed-start ballasts include Sylvania "Xtreme," Advance "Optanium Programmed Rapid Start" or GE/Universal "Accustart." Note that the 30W T8 lamp is instant-start only—one of several reasons you might prefer the standard 32W lamp. The T5 and T5/HO system electronic ballasts are generally programmed-start and all models are about the same efficiency.

For other lighting systems, you may not yet find the same improvements. As a rule, use electronic ballasts for all fluorescent and HID lamps if you can. However, as in almost every case, the electronic ballast ensures the highest MLPW, both by inherent efficiency and, in the case of metal halide lamps, by better lamp power management.

Use Efficient Luminaires. Next, you must get every lumen you can out of the fixture. Efficiency is given with each photometric report and offers a quick way to compare products. Remember to check the Coefficient of Utilization report as well, as the shape of the distribution curve may also be important. This is especially true for indirect and direct/indirect lighting systems, where the straight-up candlepower is not as effective as candlepower off to the sides.

A couple of years ago, a major packaging manufacturer introduced a 32W compact fluorescent downlight that was arguably the most attractive and best-shielded open downlight on the market. But this particular downlight was only about 40-percent efficient and the typical efficiency of competing products was 55-60 percent. For the same light level, one would have to increase lighting power in downlighted spaces by 50 percent. When you're designing buildings at 0.9 w/sq.ft. and less, this is not acceptable and you will need to use the more generic and efficient downlight in most of the building.

Create Efficient Spaces. Color, texture and the use of natural materials are all part of good architecture and interior design. Yet for efficiency of lighting, a white box is much better. The ordinary give and take between architecture and lighting must accept some new limitations in order to produce extremely efficient results.

First, consider the ceiling. If an indirect or direct/indirect lighting system is being used, the ceiling must mostly be white, flat and high-reflectance. Save the wood panels and open structures for the lobbies and a few other places in the building. Ceiling-plane reflectance of 80 percent or more is essential. In a small space, the difference between very light finishes and a relatively dark interior design means adding about 0.5 w/sq.ft. in a darker room, which is a profound amount when your design is only 0.8-1.0 w/sq.ft.

In a small space, the difference between very light finishes and a relatively dark interior means adding about 0.5W/sq. ft. in a darker room.

Also consider other room surfaces. Upper walls are second in importance and should be light-colored. Rich finishes and other surfaces of low reflectance can be used below eye level with a minimum negative impact on interreflectance. The floor can have a significant impact in a downlighted space, such as a gym, but it is less important in offices where furniture covers much of the floor plane.

Use All Other Lighting Sparingly. There are many spaces and tasks for which the skinny lamps just don't work. Consider (roughly in descending order of preference) T5 twin lamps, high-wattage compact fluorescent lamps, low-wattage metal halide lamps and even the occasional halogen IR lamp. Try to avoid ordinary probe-start metal halide lamps, low-wattage compact fluorescent lamps and ordinary halogen and incandescent lamps.

Often the biggest battle is in designing premium spaces such as boardrooms, lobbies and other high-end corporate space. Interior designers and architects will want to employ richer, darker finishes and tungsten light sources. Use of low-efficiency lighting should be very carefully restricted—as a general rule, no luminaire should be rated more than 100 watts. Encourage the designer to try to find efficacious decorative lighting—even table lamps are available today with hard-wired compact fluorescent lamps.

Controls Could Be King. Remember, energy is power times time ($E = P \times T$). Use control systems to reduce on-time or power or both. These are energy savings just as much as any of the five other recommendations, although they don't show up in a watts-per-sq.-ft. conversation. That is because energy codes and incentives tend only to reward power savings, and since most codes require automatic shut-off controls for lights, the savings are required and don't count towards LEED or code compliance.

However, advanced controls including daylighting controls and other approaches exceeding code can still be used to determine energy savings that can in turn be used for LEED or incentive credit. California Title 24 still offers effective power reduction values for automatic daylighting control, and the savings from daylighting or other controls exceeding code can be counted towards energy savings in the LEED system. ■

—James Benya

James Benya is a professional lighting designer and principal of Benya Lighting Design, West Linn, OR. For more information, visit www.benyalighting.com.

Author's Note: *Sixteen years ago, I joined* Architectural Lighting *as a contributing editor and columnist. After a few really great years, the editor-in-chief moved along and so did I. But* Architectural Lighting's *current editor-in-chief, Christina Trauthwein, never forgot how well we worked together, and after many years, I've now decided to rejoin* Architectural Lighting *as a regular columnist in 2003. While my primary concern remains responsible and sustainable lighting design, I will provide, in future issues, as much information and philosophy about all other aspects of lighting as well.*

Editor's Note: *Not only are we thrilled to have Jim bylining articles for us again, we're also honored to have him serve on our editorial advisory board, beginning with this issue. I know Jim's insight, experience and knowledge will be invaluable to our readers—and his candor and wit, refreshing.*

Power Trip

PHOTOS: © 2002 TIM GRIFFITHS

"This wasn't just going to be a big warehouse where people come check in and check out," said Hank Weaver of Burgess Weaver Design Group in Seattle, formerly with HOK . "We wanted to make sure that this was a fun place to work." Designed and built on a meager budget and harried schedule—13 months from design to occupancy—the 200,000-sq.ft. service center for Web security specialist Symantec could have been just another low-budget, tilt-up office building perfunctorily illuminated with little regard for employee comfort or aesthetic value. Instead, HOK teamed up with James Benya of Benya Lighting Design to mold a luminous environment that would promote employee satisfaction and productivity. "We knew that we wanted a lot of daylight," said Weaver. "And being that lighting has such a huge impact on the interior environment, we also knew that we needed to get someone early to begin discussing lighting concepts." The result not only provides Symantec staff with a visually inviting, light-filled working environment, but does so at a low cost—less than $4/sq. ft. was spent on lighting—and with great energy efficiency—the connected lighting power is 0.75W/sq. ft. "That's part of the great story about this building: It's attractive, fun and it's well lighted," said Benya. "It was also built at the price of an ordinary building."

Benya accomplishes this feat by incorporating state-of-the-art lighting technology in a design that exercises both ingenuity and restraint. "Underlighting is the key to truly sustainable design," said Benya. "If you don't need it, don't put it in." Taking this tact enabled Benya to innovate, making atypical decisions and in turn, keeping costs down. "Every time we put a light in, we asked ourselves, 'Can we do any better?'" he said. "In a way, this allowed us to buy a better light fixture with the same budget, because we didn't have to buy as many." The lighting solution also avails itself of the abundance of natural light that is available from the building's numerous windows, generous expanses of glass and a central skylight—all of which were included to break up architectural mass.

Although the project consists of a variety of spaces and facilities that required different responses, Benya points to four lighting systems that were critical in increasing energy efficiency. In the open office areas, which account for nearly 50 percent of the building, the lighting scheme takes advantage of the 10-ft.-high ceilings by employing indirect fixtures lamped with T5/HO sources in rows spaced 15 ft. apart. "When you install indirect lighting systems and the original plan called for recessed lighting, you can often raise the ceiling 6 in.," said Benya. "The higher you make the ceiling, the further apart you can put your rows of fixtures. The further apart the fixture rows, the cheaper they are. That's the secret to doing this quality of work for a very ordinary budget."

Producing 35 fc of general illumination, which according to Benya, is "very, very pleasant," the indirect system works in tandem with electronic dimming ballasts and daylight sensors that are located along the perimeter of the space and were purchased with additional funding from the local utility. With a third of the building exposed to sunlight, the use of daylight controls in the open office area and throughout the building amounts to a significant reduction in energy use. Benya noted, "We're saving a lot of lighting during the day, so we actually operate well below that 0.75W/sq. ft., which doesn't take into account the dimming effects." Ensuring energy efficiency in the private offices, these spaces are all equipped with motion sensors and indirectly lighted with T8 fluorescents.

Corridors and hallways also showcase the latest in T8 lamps, which are contained in wall-bracketed outdoor signlights that bathe the vertical surfaces in soft light and add visual interest. "We wanted to have a little bit of the industrial motif, while washing the walls: The signlights do a wonderful job," said Benya. "And with the T8 system, 8 ft. of fixture only uses 48W, which meets those sustainable goals. We really cut the wattage without giving up much light." In public areas where the signlights were not feasible, pendant downlights lit with compact fluorescent sources pick up the industrial look.

The response to the building from its occupants has been overwhelmingly positive. While the project's achievements can be attributed to the creativity of both HOK and Benya, Benya is quick to add that the lighting design owes its success in part to an "exceptional electrical contractor." "This is an everyday project that happened to take some really great twists and turns," said Benya. "Everyone involved just agreed to do this one better." ■

—Alice Liao

DETAILS

PROJECT Symantec Corp. **LOCATION** Springfield, OR **OWNER** Symantec Corp. **ARCHITECT** HOK—Hank Weaver, Jarrod Arbini **INTERIORS** HOK Los Angeles—Pam Light **ENGINEER** HOK San Francisco **LIGHTING DESIGNER** Benya Lighting Design—James Benya, IALD **ELECTRICAL CONTRACTOR** L.H. Morris—Dave Kalstead **GENERAL CONTRACTOR** Matt Construction **PHOTOGRAPHER** Tim Griffiths **LIGHTING MANUFACTURERS** Osram Sylvania; Finelite; Delray Lighting; Nulite; Engineered Lighting Products; The Watt Stopper; Lutron; Winski Associates

Presentation Mode

The lighting design for this High Tech Client Presentation Center in Santa Monica, CA reflects the progressive personality of this strategic consulting firm, garnering it a 2002 Award of Excellence/IES Lumen West and a 2001 GE Edison Award Of Merit for lighting design firm Patrick Quigley & Associates' Erin Erdman and Lisa Fischer. "The client wanted the design of the space to be edgy but sophisticated," said Erdman, "and the lighting design had to reinforce that approach." A compelling interior design fashioned from a white-on-white theme is further reinforced by white decorative fixtures and completely concealed, architecturally integrated fixtures. Explained Erdman, "We worked with the architectural design and incorporated all of the lighting so that it became a seamless element in the space. And in the few places we added decorative fixtures, we selected ones that would deliver some punch." Erdman commented that the lighting design team worked closely with the architect, HOK, to develop the family of fixtures to ensure that the forms, shapes and materials were related to achieve the overall impression of a uniform environment in the four-floor, 52,000-sq.-ft. space.

In the "breakout space" outside the main videoconference room (right, top) and adjacent to the reception area, a dropped circular ceiling sparkles with randomly placed low-voltage downlights fitted with glass teardrop trims. Fluorescent striplights mounted above the dropped ceiling uplight the open structure above and emphasize the floating ceiling. This is a theme carried throughout the project to define breakout spaces and gathering areas. "We wanted these spaces to be fun and this was where we felt we could add that decorative element," said Erdman.

Dimmable fluorescent lamps backlight white acrylic wall panels that are used throughout the lobby spaces and in all of the conference rooms as well. "These 'glowing white planes' create ambient light and a thematic element throughout," said Erdman.

"One of the things I value most when designing office lighting is having interaction with the end-user because lighting is so subjective, regardless of 'standards' and 'footcandle levels.' I like to meet with the client in their existing office and evaluate their lighting with them so that we can look at the same space and determine their preferences. This way I can understand them, I can assess how they perceive lighting. And that's critical. When they say, 'I want a bright space' I'll know how they define bright."

—Erin Erdman

The videoconference room (left, in background) requires illumination for various programs including "collaboration sessions," presentations and videoconferencing. Linear fluorescent fixtures designed specifically for videoconferencing are placed 4-ft.-on-center and meet the high vertical footcandle (80fc) and glare-free lighting criteria so that when the presenter is modeled on the camera, dark shadows are eliminated. Dimmable compact fluorescent downlights and wall-washers provide flexibility. "This conference room had to be designed for traditional use as well," explained Erdman, "where people do not want to sit under 80fc, but rather 40 fc, to be able to focus on a speaker and take notes." Since the videoconference fixtures provide a lot of ambient light, the lighting designers washed all the surfaces around the room to help the contrast ratios with the camera. Two recessed MR16s are located over the podium to highlight the speaker.

Open offices (right, bottom) are illuminated by indirect pendants suspended from a dropped tile ceiling that forms an architectural spine to create symmetry in the space. The pendants were required to be aesthetically "minimal," so T5/HO lamps were chosen for their high lumen output in a small package. Above, a plane of illuminated translucent acrylic panels provides another layer of depth and texture and again, reinforces the design motif. These backlit panels reduce the contrast ratio across the layered ceiling. The office lighting (about 30 fc) meets heavy VDT use and written task requirements while meeting strict energy restrictions of California's Title 24. ■

—Christina Trauthwein

DETAILS

PROJECT High Tech Client Presentation Center **ARCHITECT** Hellmuth, Obata + Kassabaum - Los Angeles—Susan Grossinger, Brett Shwery, Barbara Ostroff and Louis Bretana **LIGHTING DESIGNER** Patrick B. Quigley & Associates—Erin Erdman, Lisa Fischer **ENGINEER** V & M Electrical Engineering, Inc.—Vladimir Tsidulko **PHOTOGRAPHER** Hedrich-Blessing—Scott McDonald **LIGHTING MANUFACTURERS** Focal Point; Portfolio; Leucos; Translite; Mark Lighting; Con-Tech; Louis Poulsen

Banking on Sustainability

The PNC Firstside Center in Pittsburgh has the distinction of being the first building in the country to earn a Silver LEED (Leadership in Energy and Environmental Design) Certification for its outstanding use of sustainable design. Designed by local architectural firm L.D. Astorino Companies, the 647,000-sq.-ft. facility is an environmentally friendly building that equally considers the employees within the walls and the exterior environment. The sustainability starts from the ground up—the building was constructed on a brownfield site (i.e., used property). While most of the "green" design elements are not obvious (for example, over half of the materials used in the construction were recycled), the most obvious sustainable component is the prevalence of natural light. The building lets the sunshine in through an atrium and lightwells, which bring light deep into the building's core.

For principal in charge Elmer Burger, the design concepts that went into PNC Firstside were not good ideas simply because of the sustainability issues involved: They were "just good design." Because the company has a churn rate of 30 percent every five years as people change duties, flexibility in the space was critical. As to lighting, the goal for the building was to keep the general illumination to a minimum and supplement when needed. "We wanted the light plane to have enough uniformity without being distracting," Burger said. "We downplayed illumination in circulation areas to reach a pleasant blend of electric and natural light. Whenever possible, we tried to rely on natural light." Although the building's LEED certification required that there be no light pollution at night, which commonly emanates from external accent lights, this was not an issue for PNC, since it is a 24-hour, functioning building—the building itself becomes accent lighting.

The footprint of the building is 125,000 sq.ft., which enables entire business units to be located on a single floor—that's the plus side. The downside, however, is that the floor plate is 230 ft. deep, making it that much harder to bring in natural light. To meet these challenges, Burger developed a two-pronged response. His solution subdivides the building via lightwells that penetrate several floors and opts for systems furniture with lower heights. Instances where the furniture had to be taller are addressed through the use of glazing, which ensures privacy, but lets in the sunlight. "When dealing with natural light, simply throwing open the shutters and allowing the rays to shine in is not enough," said Burger. "It actually helps to bring the light in through other means." Solar shade devices are mounted on the exterior to serve as light shelves and "bounce" the light into the building's interior.

Although a ceiling height of 11 ft. may seem pretty generous, according to Burger, in 35,000 sq.ft. of open office areas, anything lower would have been oppressive. In these spaces, pendant fixtures provide softer, indirect illumination, and supplemental lighting is supplied by individual tasklights at the workplane. With visual comfort a key concern, the designers worked closely with a fixture manufacturer to ensure optimal light levels. Initial tests yielded unsatisfactory results. However, since the entire building would be a "boon" for any lighting manufacturer, Burger said that the manufacturer was very cooperative and helped create a brand new luminaire to suit the building's needs. "We were able to mock up particular conditions in some existing PNC space to gauge the length of pendants and the distance we needed," Burger said. "What we found was that the light distribution was not what we wanted, so the manufacturer changed the contour of the reflector just to suit our needs."

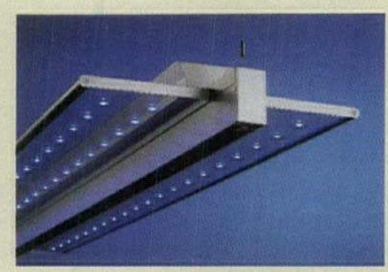
Aside from drastically cutting PNC Firstside's energy costs—almost half that of a similar, non-sustainable facility in Philadelphia—the sustainable design has positively impacted the employees' working conditions. Now, 90 percent of Firstside's employees have access to natural light as well as views of Pittsburgh's cityscape or the riverfront. Employee departure has dropped 60 percent in one year and productivity, though difficult to measure, has seemingly increased by a reduction of 1,200 sick days per year. As the PNC Firstside facility demonstrates, green design not only sustains the environment, it sustains the employee within. ■

—Mark A. Newman

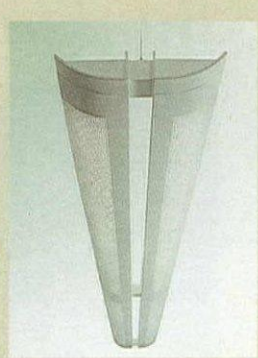
DETAILS

PROJECT PNC Firstside Center **OWNER** PNC Financial Services Group **LOCATION** Pittsburgh, PA **ARCHITECT & ENGINEER** L.D. Astorino Companies—Elmer Burger, AIA, principal in charge **PHOTOGRAPHER** Edward Massery Photography **LIGHTING MANUFACTURERS** Advent; Finelite; Hessamerica; Kurt Versen; SPI Lighting; Tech Lighting; Wila

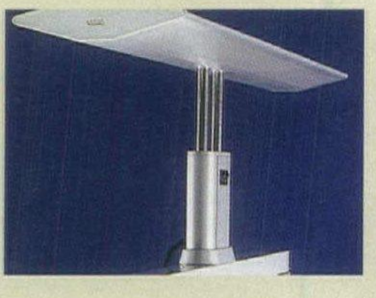
Getting the job done...



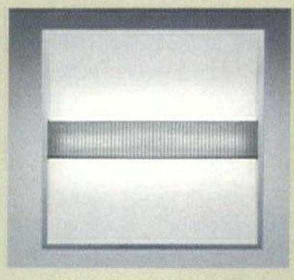
Featuring acrylic glass screens housed in steel and aluminum fixtures, **Orgatech's** Lightguide Collection provides near-perfect 90/10 luminosity with T5 or T5/HO fluorescent lamps. Fixtures have a steel wire suspension with adjustable Y grippers, connecting leads and an integral electronic ballast. Dimming and presence-detection ballasts are also available. Lightguide offers four different models, including the 1.625 -in.-high Prisma, which is available with colored decorative elements and Lightstar (shown), which sports blue or white LEDs that are mounted in twin laminated clear-tempered glass panels and controlled from an inset rocker switch. **Circle No. 90**



The Neo-Ray indirect/semi-indirect Twin-Beam from **Cooper Lighting** is characterized by two separated T5/HO housings that together create an $8^{5}/_{8}$-x-$1^{3}/_{4}$-in. profile. Offered in 4- and 8-ft. lengths for individual and continuous-row runs, fixtures are suspended via aircraft cables or a single stem available in various lengths. The two-piece housing is die-formed, cold-rolled steel and the perforated optical reflectors are die-formed, high-reflectance white painted steel. Precision-formed aluminum end caps are mechanically attached with no exposed fasteners. Fixtures are UL-listed Class P with T5/HO or T5 electronic ballasts. Wall-mount version is available. **Circle No. 91**

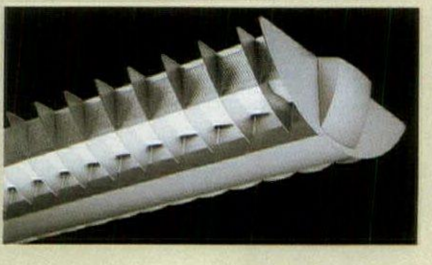


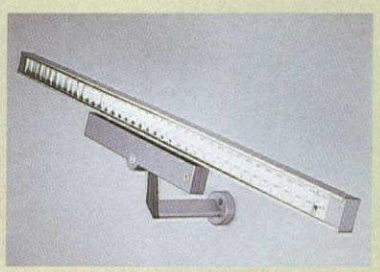
Luxo's Glider Series furniture-mounted movable indirect lighting system features an $1^{3}/_{4}$-in. deep elliptical lamphead design and metal perforations along the longitudinal housing edges for soft downlighting. Glider's lensed top produces indirect illumination. Two rods extending from an integral cylindrical switch housing support the lamphead. Housings offer a choice of bolt-on or vertically adjustable clamp-on brackets for mounting to most furniture or shelf systems. Glider uses 39W T5/HO linear fluorescent lamps. Finish is matte white polyester powdercoat. Metallic silver housings with silver or black brackets are available. C/UL-listed. **Circle No. 92**



Zumtobel Staff Lighting's new ML (Mellow Light) series of recessed and surface-mounted fluorescent luminaires features the patent-pending Light Chamber, which provides uniform brightness, translucence and visual depth; the proprietary rectangular Micro Grid Diffuser and optional inlays available in yellow, green and blue. Recessed models are available in 2x2, 1x4, 2x4 configurations and for lay-in, slot-grid, gypsum board and Armstrong Optima Vector ceilings. Surface-mount versions are offered in a 1x4 configuration and for continuous-row runs. ML accepts 40W, 50W, 80W T5TT, 28W T5 and 24W and 54W T5/HO fluorescent lamps. **Circle No. 93**

Sporting acrylic opal diffusers that shield the lamp, the Peerlite Cerra Baffle direct/indirect fixture from **Peerless Lighting** accepts T5 and T5/HO lamps and is available in one- and multi-lamp configurations. Single-lamp versions meet RP-1 guidelines for office lighting; three- and four-lamp T5/HO models can be used in high-mount and retail applications. Cerra Baffle is offered with 80/20, 40/60 and 5/95 distribution patterns, may be used in continuous-row runs and measures 10 in. wide and 3 in. deep. White polyester powder coat is standard; optional custom colors available on spline and endcaps. **Circle No. 94**





From **Tobias Grau**, the GO series includes GO Ceiling (shown), a ceiling fixture with one attachment point and an adjustable head that allows the light to be directed, and GO Suspension, a linear fixture that measures 2.8 m. in length and produces a 30/70 light distribution. GO Ceiling Mono uses one 54W and GO Ceiling Duo uses two 54W fluorescent lamps. GO Suspension uses two 54W fluorescent lamps. **Circle No. 95**

The Value of Lighting Quality
Lighting Fixture Specifications
Lighting Controls for Offices
Private Office Layouts
Open-plan Office Layouts
Office Corridor Layouts

OFFICE LIGHTING knowhow

This guide gives you the KnowHow to provide "energy effective" lighting for offices – lighting systems that save energy while creating a comfortable and productive work environment. Energy conserving lighting products are common, but not all products are appropriate for all applications. Lighting fixtures and controls must be carefully selected and located to provide the proper balance of energy savings and lighting quality. Providing an adequate quantity of light (measured in footcandles) is not enough. Lighting quality means comfort, good color, uniformity and balanced brightness relationships – factors that contribute to long term work performance. Shadows, glare, flicker or chaotic patterns of light or fixtures are distracting to employees and should be avoided.

"Lighting systems for offices must be cost effective and provide a comfortable, productive and energy efficient workplace."

Building Owner, Cummings Properties

PENNY WISE AND POUND FOOLISH

Employees' salaries are the costliest part of running a business. If poorly designed lighting distracts the average occupant for only 1% of the time, this is equivalent to a $5 per square foot annual loss. Good quality lighting is an essential part of occupant comfort and satisfaction, providing productivity benefits in the short run and potential employee retention in the long run. The design strategies and technologies herein can provide office occupants with a safe, comfortable and cost-effective lighting system, and reduce energy and maintenance costs.

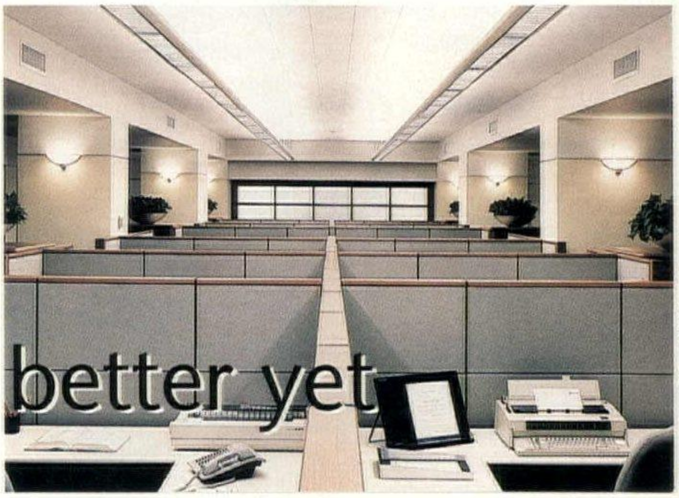


Photo courtesy of Linear Lighting Corporation

In open-plan offices, lighting the walls and ceiling provides a major improvement in lighting quality.

QUALITY ISSUES FOR OFFICE LIGHTING

	Private Offices	Open-plan Offices	Office Corridor
Control of direct and reflected glare	Very Important	Very Important	Somewhat Important
Light on walls and ceilings	Very Important	Very Important	Important
Physical relation of fixtures to users	Very Important	Very Important	Somewhat Important
Uniformity / Reduce shadows and flicker	Important	Important	Somewhat Important
Room surface characteristics	Important	Important	Important
Color rendering and color temperature	Important	Important	Somewhat Important
Daylighting	Important	Important	Somewhat Important
Lighting controls	Important	Important	Somewhat Important
Quantity of light on task (footcandles)	40-50 fc	40-50 fc	5-10 fc

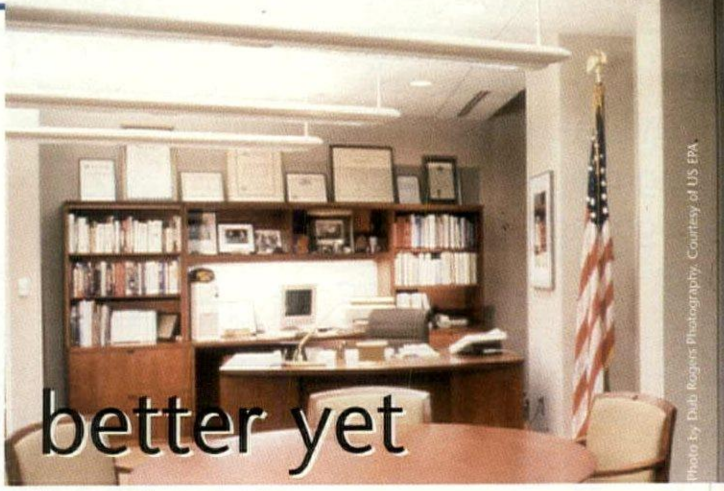
● Very Important ◐ Important ○ Somewhat Important

* Adapted from the Lighting Design Guide. IESNA Lighting Handbook, 9th Edition

ACHIEVING BETTER & BETTER YET RESULTS

This *knowhow* guide shows you basic lighting solutions that will deliver Better quality and more energy-efficient lighting systems for offices than traditional approaches. The Better Yet solutions identify further improvements and efficiencies. To realize even greater energy conservation and higher lighting quality than can be covered in this short guide, see page 8 for advanced lighting references.

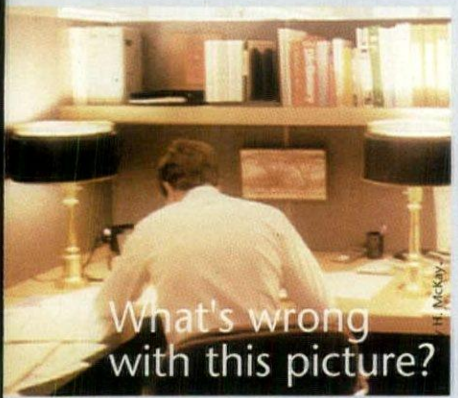
the value of quality lighting



Medium-Sized Private Office

OFFICE QUALITY ISSUES: GLARE

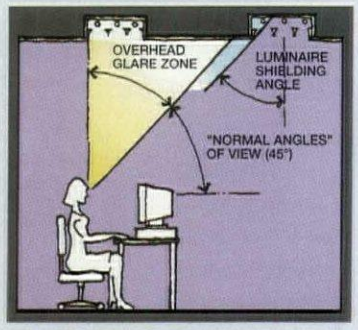
Glare occurs when bright light sources interfere with the viewing of objects or surfaces that are less bright. The contrast between very bright and less bright may be uncomfortable or disabling, both of which are undesirable in an office environment. Fixtures located to the front or side of the employee cause direct glare. Overhead glare is caused by excessive brightness directly above. Reflected glare occurs on computer screens from images of fixtures located behind the employee. Reflected glare can also occur on glossy paper from lights directly in front. Most glare can be controlled either by increasing the brightness of the surroundings or decreasing the brightness of the sources, or both.



If lighting quality isn't achieved in the initial design, occupants will try their own remedies, with serious consequences for energy consumption.

Some contrast-reducing suggestions:

- Increase room surface brightness by illuminating walls and ceilings, and using lighter colored materials.
- Increase the brightness around the glare source by using semi-specular or white louvers, or by indirectly illuminating the ceiling. (See fixture type 'E').
- Shield the lamps from view with baffles, louvers, lenses or overlays.
- Reduce the brightness of the lamps by using more lamps of lower brightness. Use more fixtures if necessary.



PREVENTING OVERHEAD GLARE

While many lighting fixtures are designed to shield the view of lamps from "normal" viewing angles (eyes straight ahead), fixtures with exposed lamps (downlights, fluorescent parabolic troffers) can still produce glare which impedes office work.

TO AVOID OVERHEAD GLARE

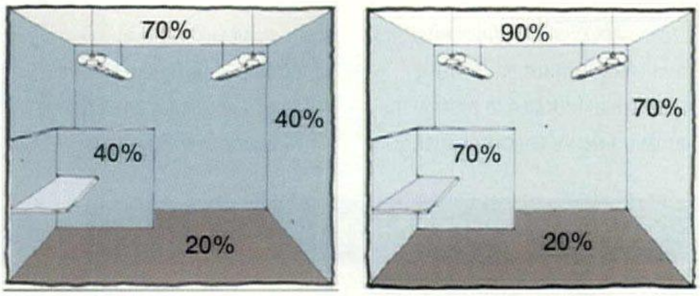
1. No more than three T-8 lamps in a 2'x4' fixture.
2. No specular (shiny) reflectors visible from any angles.
3. No specular louvers or baffles (semi-specular or white only).4. No T-5 lamps visible from any angle.

LIGHTING WALLS AND CEILINGS

To provide a productive working environment, lighting must be designed for long term comfort. Lighting the wall and ceiling reduces contrast, shadows, glare and distractions — all of which are directly related to a worker's performance. While the desktop and the worker's task should be the brightest surface in the room, the walls, ceiling and partitions should be about 1/3 as bright. Rooms with darker colored walls or partitions, which absorb light, may never achieve a good balance of brightness.

REFLECTANCES

Light is absorbed every time it is reflected off a room surface. Light colors reflect more light than dark colors. Select ceilings that are white and reflect at least 80% of the light. Select light colored vertical room surfaces in work areas (walls, panels, overhead bins) which reflect 65% or more. All major surfaces should be matte, not shiny, to improve uniformity and avoid reflected glare.



A small increase in room reflectances produces a big improvement in efficiency. The lighter room provides 55% more light on the work surface for the same energy or uses 70% less energy to provide equivalent brightness. The lighter room also provides better brightness ratios, comfort and daylight distribution.

"Even if it costs me $1.00/sf more to light the walls and ceiling, better quality lighting only has to achieve a 1 percent improvement in my employee's performance to provide a 3-month simple payback. Now that's an investment that makes sense."

Owner and Employer, J.R. Gainfort

UNIFORMITY

Light should be distributed relatively uniformly in a work environment, avoiding "hot spots," shadows or sharp patterns of light and dark. In larger offices or open-plan spaces, use more than one type of light fixture, each with specific distribution characteristics, to light the task and room surfaces most effectively. Select fixtures specifically designed for wall washing, to light walls from top to bottom. Avoid locating fixtures closer than 3' from walls. If they are too close, they create harsh patterns and dark upper walls, resulting in a cave-like appearance.

TASK LIGHTING

Compact fluorescent desk lights allow workers to control their own lighting to accommodate their individual visual needs. "Articulated" task lights, which allow adjustment in all three planes, are extremely effective without being expensive and are preferable to undercabinet lights for illuminating the task. In particular, they offer flexibility for different workers and different task requirements, and allow for lower levels of ambient light from the ceiling-mounted light fixtures. See Figure 1(a)

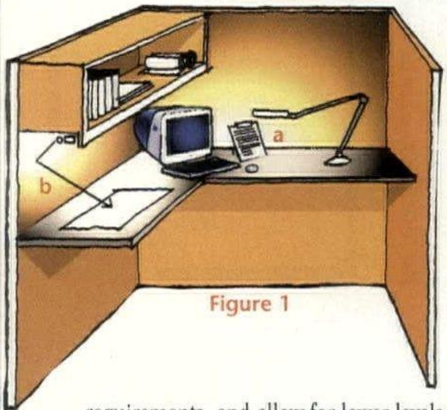


Figure 1

UNDERCABINET LIGHTS

Wall cabinets and cabinets attached to furniture partitions create disturbing shadows on the vertical surfaces they overhang. A low quantity of lighting should be provided to remove this shadow and maintain a balance of brightness. Undercabinet lights with opaque fronts are available commercially or sold as part of the furniture system. Standard side-socket fluorescent channels may be used, if shielded by the cabinet edge. In either case, a single T-8 lamp generally provides too much light, so it should be coupled with a 50% output ballast which reduces the amount of light, reduces energy consumption and balances the brightness. Since undercabinet lights provide light from directly in front of the worker, creating reflected glare, they tend to perform poorly as "task" lights but are useful for removing shadows. See Figure 1(b)

POWER LIMITS FOR OFFICE SPACES*

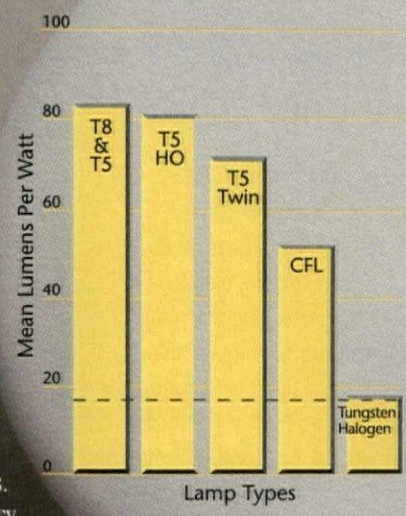
	Watts / SF
Private Offices	1.5
Open Plan Offices	1.3
Office Corridor	0.7
Reception/Lobby	1.8
Conference/Meeting	1.5
Active Stairs	0.9
Active Storage	1.1

Note: Local task lighting must be accommodated within these power limits.
* From ANSI/ASHRAE/IESNA Standard 90.1-1999

Lamp / Ballast Efficacies

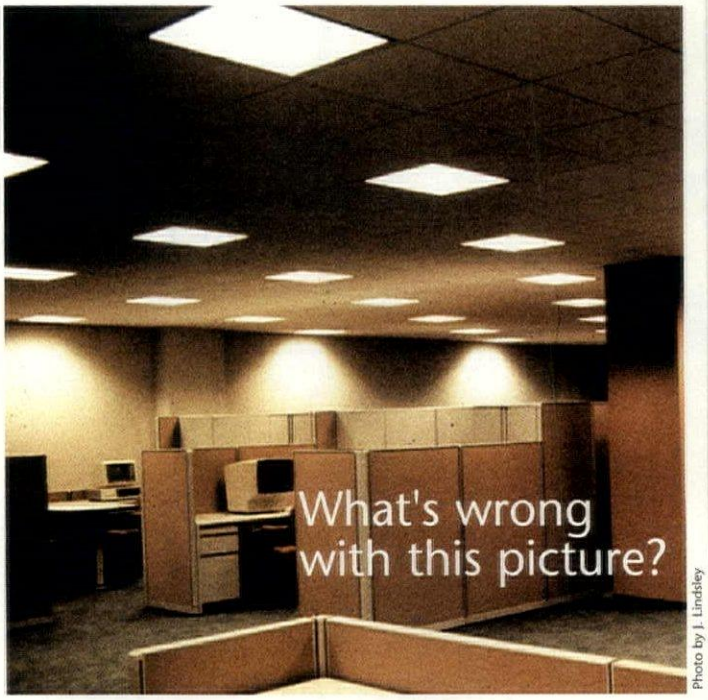
USE ENERGY EFFICIENT SOURCES

Fluorescent lighting today is not only more energy efficient, but rivals incandescent in quality, comfort and aesthetics. Lamps are available in a variety of superior colors providing a natural appearance for people and room colors. Electronic high frequency ballasts eliminate the flicker and noise of older model ballasts. The graph compares efficacies (mean lumens per watt) of common fluorescent lamp/ ballast combinations with the efficacy of a tungsten halogen (incandescent) lamp.



"Pendant fixtures save installation time and cost, since they only require one power feed at the end of each row."

Electrical Contractor, Rise Engineering



Avoid staggered layouts and locating fixtures too close to walls.

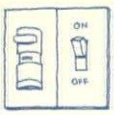
private office layouts

Making an informed choice

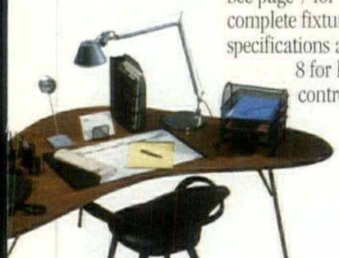
Designs using pendant direct-indirect fixtures (layouts 3 & 6) are the most efficient of all three systems, and provide significantly better comfort and visibility for task performance by reducing shadows and lighting the ceilings and upper walls. 2' x 4' fixtures (layouts 2 & 5) offer the lowest first cost, but provide lower comfort and quality. Although 2' x 2' fixtures (layouts 1 & 4) are often preferred for their shape, they are less efficient and more costly than 2' x 4' fixtures, with no increase in lighting quality.

CONTROLS

Use wall-mounted occupancy sensors (WOS) with "manual-on" for private offices. Slave-wire a standard switch ($), for second zone, to provide two levels of light.

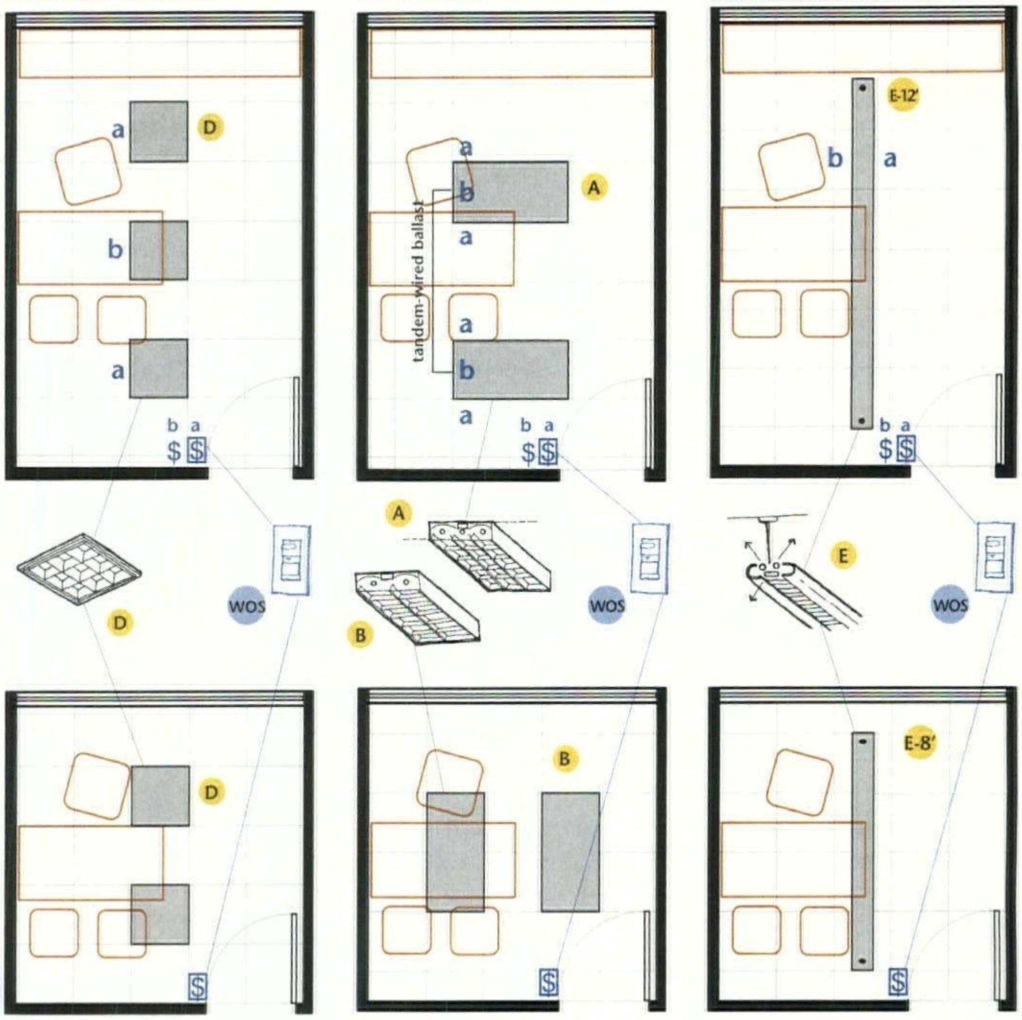


See page 7 for complete fixture specifications and page 8 for lighting controls.



medium private offices (150 square feet shown) 2'x2' ceiling grid

LAYOUT 1 **ACCEPTABLE** — LAYOUT 2 **BETTER** — LAYOUT 3 **BETTER YET**



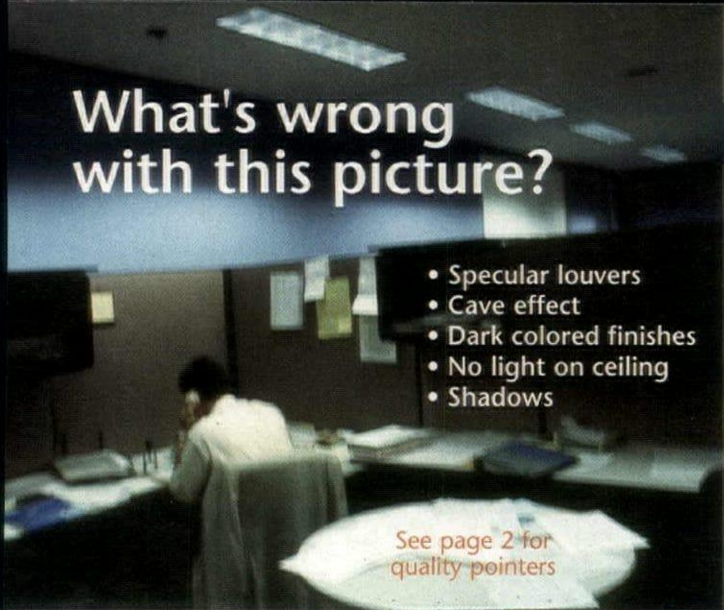
LAYOUT 4 **ACCEPTABLE** — LAYOUT 5 **BETTER** — LAYOUT 6 **BETTER YET**

small private offices (100 square feet shown) 2'x2' ceiling grid

COMPARISON CHART FOR PRIVATE OFFICES

	Layout 1	Base Case Layout 2	Layout 3	Layout 4	Base Case Layout 5	Layout 6
Uniformity	★★	★★	★★★	★★	★★	★★★
Comfort & Quality	★★	★★	★★★★	★★	★★	★★★★
Maintained Footcandles on Desk (fc)	35-45	45-58	45-50	35-40	40-58	40-55
Ambient Connected Load (W/sf)	1.2	1.2	1.1	1.2	1.2	1.1
Potential Energy Savings[1] (%)	0-20%	0-20%	10-25%	0-20%	0-20%	10-25%
First Cost Increase[2] (material & labor)	+55-65%	Base case	20-30%	+5-15%	Base case	+0-5%
Applicable Square Foot Range[3] (sf)	125-150	135-185	115-180	80-100	90-110	85-140
OVERALL VALUE	ACCEPTABLE	BETTER	BETTER YET	ACCEPTABLE	BETTER	BETTER YET

1 - Savings estimates are based on research of current lighting practices in the New England region. 2 - First cost compared to layouts 2 and 5 respectively. 3 - Layout applies to any office within this size range while meeting light level recommendations and without exceeding energy codes, with 8'-0" to 8'-6" ceiling heights.



COMPARISON CHART FOR OPEN-PLAN OFFICES

	Layout 7	Layout 8	Layout 9
Uniformity	★★	★★	★★★
Comfort & Quality	★★	★★★	★★★★
Maintained Footcandles on Desk[1] (fc)	40-45	50-60	50-80
Ambient Connected Load (W/sf)	1.2	1.1	1.0
Potential Energy Savings[2] (%)	20-35%	25-40%	30-45%
First Cost Increase[3] (material & labor)	+20-30%	+0-5%	+35-45%
Applicable Square Foot Range[4] (sf)	1700-2200	1600-2600	1400-2800
OVERALL VALUE	ACCEPTABLE	BETTER	BETTER YET

1 - Footcandles do not account for partial height partitions, which will reduce actual footcandles.
2 - Savings estimates are based on research of current lighting practices in the New England region.
3 - Cost increase over one 3-lamp 2'x4' fluorescent parabolic every 64 s.f.
4 - Layout applies to any office within this size range while meeting light level recommendations and without exceeding energy codes, with 8'-0" to 8'-6" ceiling heights. Add rows of fixtures for larger rooms.

open-plan office layouts

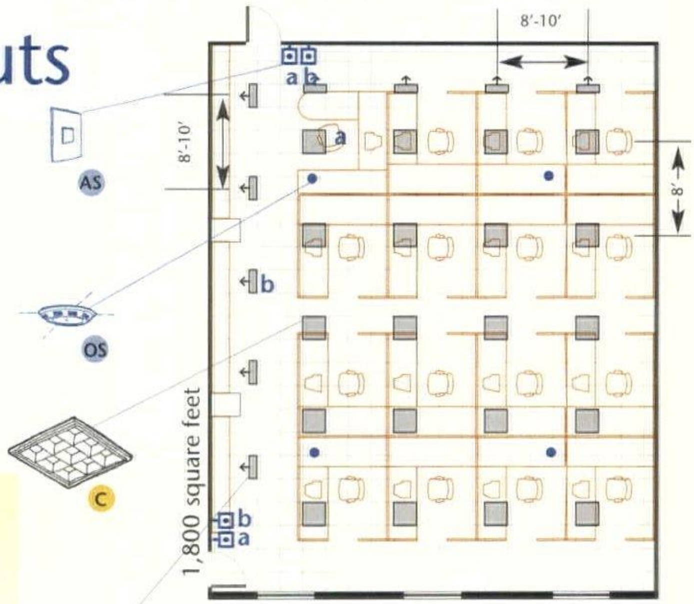
Making an informed choice

The design using pendant direct-indirect fixtures (layout 9) is the most efficient of all three systems, and provides significantly better comfort and visibility for task performance by reducing shadows and lighting the ceilings and upper walls. In addition, these fixtures need not relate directly to the workstations, due to the indirect lighting component. 2' x 4' fixtures (layout 8) offer the lowest first cost, but provide lower comfort and quality. Although 2' x 2' fixtures (layout 7) are often preferred for their shape, they are less efficient and more costly than 2' x 4' fixtures, with no increase in lighting quality.

CONTROLS

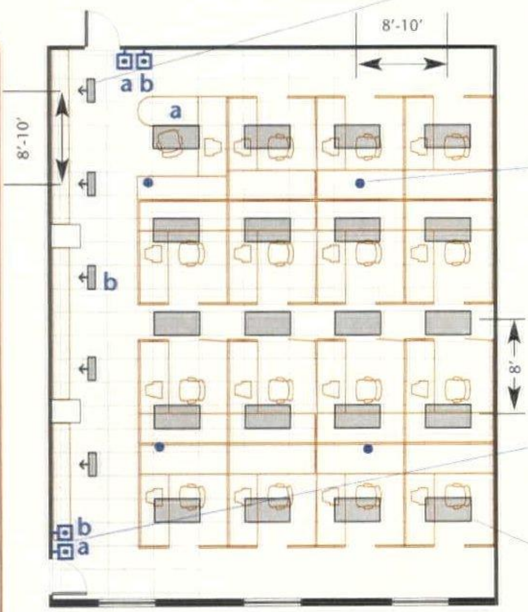
Control different fixture types separately, in 'zones'. For open-plan offices, use ultrasonic ceiling-mounted occupancy sensors (OS), with manual-on automatic switches (AS) for each control zone. The four occupancy sensors shown are wired in series, to sense motion in the room as a whole. When the entire room is unoccupied, all lighting zones will be turned off.

See page 7 for fixture specifications. See page 8 for lighting controls. Go to www.designlights.org/officewiring/ for schematic control wiring diagram.

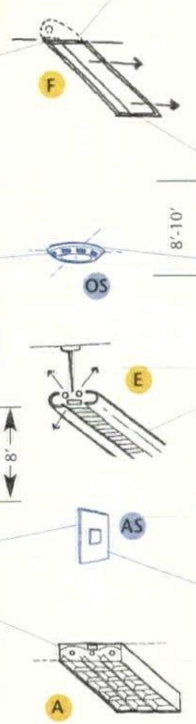


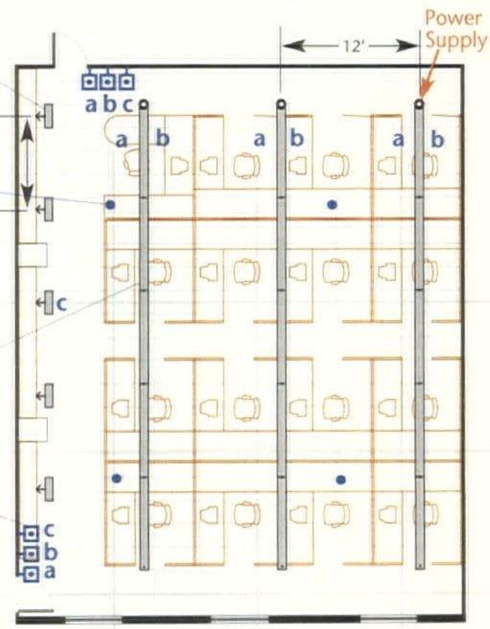
LAYOUT 7 2'x2' ceiling grid
ACCEPTABLE

QUICK TIP: Actual footcandles at the desk will be 15 to 20% lower if furniture partitions taller than 54" are used. Furniture-mounted overhead storage bins further reduce light levels. If bins are used, consider providing fewer footcandles from the ceiling and providing local task lighting (see page 3). Remember to reduce the number of lamps, not the number of fixtures.



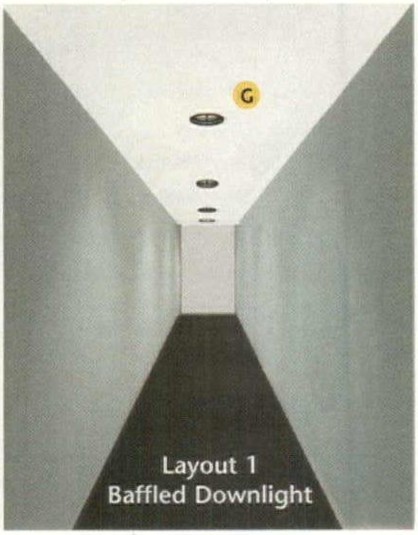
LAYOUT 8 2'x4' ceiling grid
BETTER



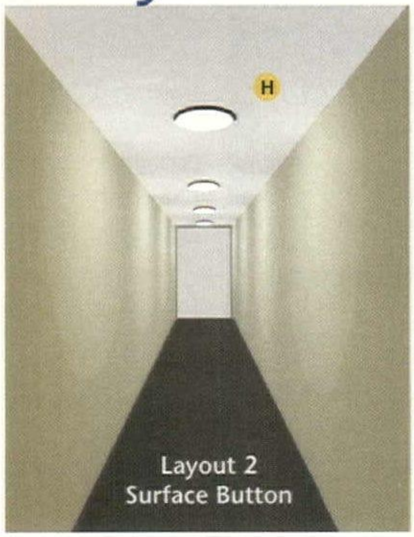


LAYOUT 9 2'x4' ceiling grid
BETTER YET

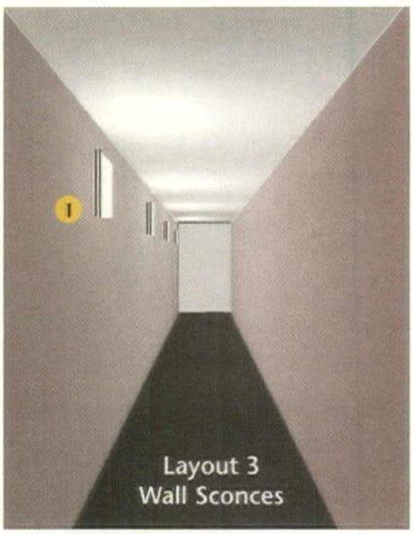
office corridor layouts



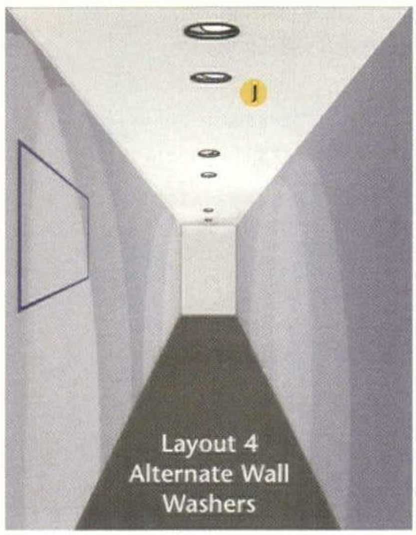
Type "G" located 10' on center



Type "H" located 10' on center



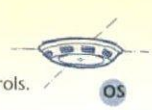
Type "I" located 10' on center



Type "J" 3' on center,
15' between pairs

CONTROLS

Use ceiling-mounted occupancy sensors designed for corridors. See page 8 for Lighting Controls.



SUMMARY CHART FOR OFFICE CORRIDORS

	All Layouts
Maintained Footcandles (fc)	5-10
Potential Energy Savings[1] (%)	35-45%
First Cost Increase[2] (material & labor)	+0-40%
Connected Load[3] (W/sf)	0.7

1- Savings and cost estimates are based on research of current lighting practices in the New England region. 2-Costs compared to one 2-lamp, 2'x2' fixture every 45 sf.

OFFICE CORRIDOR FIXTURE SCHEDULE

- G: Cross-Baffle Downlight 26W
- H: Glowing Disk 26W
- I: Wall Sconce 26W
- J: Wall-Wash Downlight 26W

All fixtures use compact fluorescent lamps.
See page 7 for complete fixture specifications.

SPACING

Layouts shown are based on 30 Watts maximum every 10 feet of corridor with 8'-0" to 8'-6" ceiling heights, for corridors between 4'-3" and 5'-3" wide. For corridors 5'-4" to 6'-4" wide: locate fixtures 8 feet on center, or select higher wattage compact fluorescent lamps; do not exceed 12' on center spacing between individual fixtures; for Type J, reduce spacing between pairs to 12' on center.

lamp and ballast specifications

The following specifications apply to all of the fixture types shown on page 7.

Lamp Criteria:

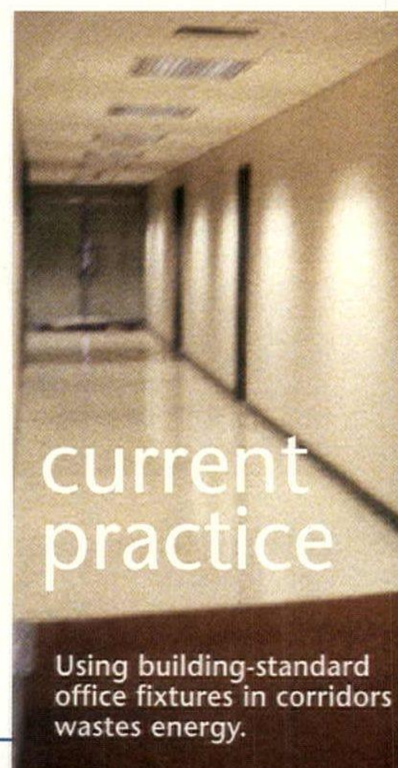
- Minimum Color Rendering Index (CRI) of 80.
- Color temperature of 3500 Kelvin. Note: Generic color code "835" means CRI of 80+ and color temperature of 3500.
- Mean lamp lumens (at 40% of rated life) at least 94% of initial lumens.

Ballast and Lamp-Ballast System Criteria:

- High-frequency electronic, using instant start or program rapid start circuitry.
- Harmonic distortion shall not exceed 20%.
- Ballast factor minimum 0.88 for T8.
- Mean system efficacy (mean lamp lumens times # of lamps divided by ballast input power): Minimum 83 lumens/watt for 4' long T8.

"Corridors should offer a break from the office environment. Apply color and variety and make sure the walls are lighted. Using standard office fixtures in corridors not only won't meet the energy code, it misses a great opportunity to refresh the office worker with a change, and to reduce eye fatigue."

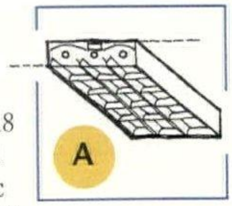
Director of Lighting Design, The RETEC Group



lighting fixture schedule

These fixture specifications include fixtures that ensure a balance of performance, energy savings, comfort, lighting quality, quantity and maintenance, at a cost-effective price. Many standard products meet these generic specifications. Even small variations from these specifications may result in undesirable effects. For example, specular louvers or reflectors may increase light levels and reduce reflected glare, but will also increase overhead glare and decrease desirable room surface brightness.

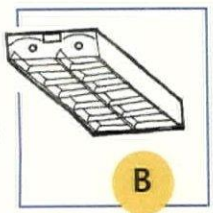
A. 2' x 4' THREE-LAMP PARABOLIC TROFFER



LAMPS: (3) 32W T8, 835 color

DESCRIPTION: Recessed fluorescent troffer 2' by 4' with white baked enamel interior, semi-specular low-iridescent parabolic louvers with 18 cells, minimum 2-3/4" deep. Use white painted louvers in private offices. Three-lamp electronic instant-start ballast, nominal 91 input watts. 71% minimum fixture efficiency. Note: 3-lamp or 2-lamp ballasts with inboard-outboard switching and tandem wiring.

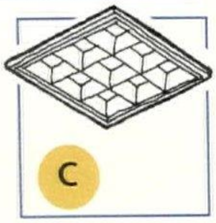
B. 2' x 4' TWO-LAMP PARABOLIC TROFFER



LAMPS: (2) 32W T8, 835 color

DESCRIPTION: Recessed fluorescent troffer 2' by 4' with white baked enamel interior, semi-specular low-iridescent parabolic louvers with 12 cells, minimum 2-3/4" deep. Use white painted louvers in private offices. Two-lamp electronic instant-start ballast, nominal 61 input watts. 73% minimum fixture efficiency.

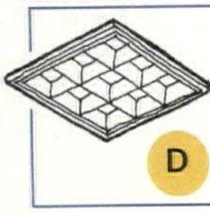
C. 2' x 2' THREE-LAMP PARABOLIC TROFFER



LAMPS: (3) 31W T8 U-Tube 1-5/8" leg spacing, 835 color

DESCRIPTION: Recessed fluorescent housing with white baked enamel interior, semi-specular low-iridescent parabolic louvers with nine cells, minimum 2-3/4" deep. Three-lamp electronic instant-start ballast, nominal 91 input watts. 64% minimum fixture efficiency.

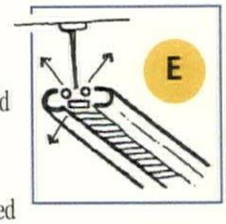
D. 2' x 2' TWO-LAMP PARABOLIC TROFFER



LAMPS: (2) 31W T8 U-Tube 6" leg spacing, 835 color

DESCRIPTION: Recessed fluorescent housing with white baked enamel interior, semi-specular low-iridescent parabolic louvers with nine cells, minimum 2-3/4" deep. Use white painted louvers in private offices. Two-lamp electronic instant-start ballast, nominal 61 input watts. 61% minimum fixture efficiency.

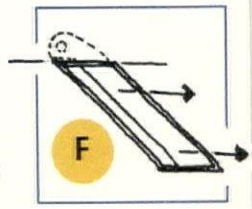
E. 2-LAMP PENDANT DIRECT / INDIRECT



LAMPS: (2) 32W T8, 835 color

DESCRIPTION: Stem mounted fluorescent luminaire in lengths of 8'-0" or 12'-0". White baked enamel finish. Minimum 30% uplight. Minimum 40% downlight. Cross baffles 1-3/4" deep x 2" on center. Semi-specular low-iridescent or white painted cross baffles. Total 4-lamps per 8' long fixture. Four-lamp electronic instant-start ballast, nominal 110 input watts. Minimum fixture efficiency 80%. Also available in 12' lengths and continuous rows. Mount a minimum of 6'-8" above finished floor. Minimum 12" stem, 18" preferred.

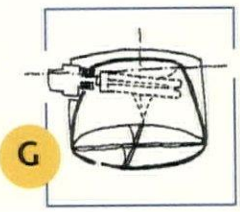
F. 1' x 2' LINEAR WALL WASH



LAMP: (1) 40W TT, 835 color

DESCRIPTION: Nominal 1' x 2' recessed fluorescent wall wash located 2'-3' away from wall or furniture being washed. Semi-specular or white painted louver. Spaced 8' to 10' on center. Electronic instant-start ballast.

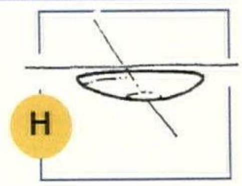
G. COMPACT FLUORESCENT CROSS-BAFFLE DOWNLIGHT



LAMPS: (2) 13W TT, 830 color

DESCRIPTION: Nominal 8" diameter recessed downlight with white painted parabolic shaped cross baffles, minimum 2-1/2" deep. Two-lamp electronic ballast.

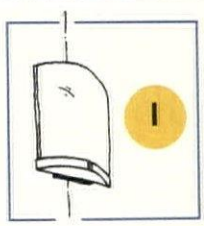
H. COMPACT FLUORESCENT GLOWING DISK



LAMPS: (2) 13W TT, 830 color

DESCRIPTION: Surface-Mounted bowl with white opal glass or acrylic diffuser. Two-lamp electronic ballast.

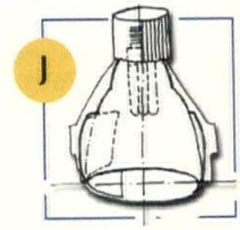
I. COMPACT FLUORESCENT WALL SCONCE



LAMPS: (2) 13W TT, 830 color

DESCRIPTION: Decorative wall sconce with glowing front face. Extension from wall must be less than 4" or the bottom must be mounted at least 6'-8" above the floor for ADA compliance. Two-lamp electronic ballast.

J. COMPACT FLUORESCENT WALL WASH DOWNLIGHT



LAMPS: (2) 13W TT, 830 color

DESCRIPTION: Nominal 7" or 8" diameter recessed fixture with asymmetrical wall-wash distribution by means of kicker reflector or lens. Semi-specular low-iridescent reflector cone. Two-lamp electronic ballast.

lighting controls

Energy savings are achieved by control strategies which reduce both the connected load and the hours of operation especially during the mid-day "peak demand" hours. Automatic controls may be required by your state code.

Occupancy Sensors

Private Offices

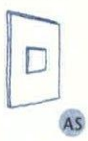
Install ultrasonic manual-on wall mounted occupancy sensors (WOS), set for maximum sensitivity and a 10 minute delay in private offices. *Ultrasonic sensors are more sensitive to subtle motion like typing and less likely to turn lights off in an occupied room.*

Use wall-mounted sensors in a small office with a direct line of sight between sensor and occupant. Specify sensors to be factory-set for manual-on operation. *This prevents lights from turning on unnecessarily during corridor activity, ample daylight, brief occupancy or when a task light is sufficient.*

Alternative approach: Install a manual-on, two-level wall mounted sensor or a single pole switch wired in series with an occupancy sensor. *Two-level switching allows people to have greater flexibility and control, and still automatically turns lights off when the space is unoccupied.*

Open Offices

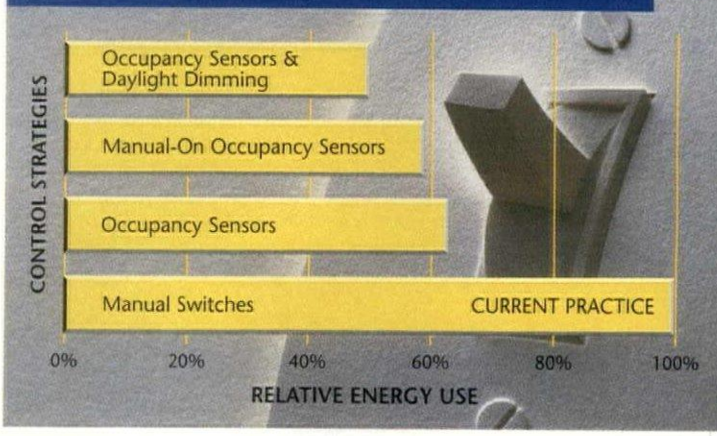
Install ultrasonic ceiling mounted occupancy sensors (OS), set to maximum sensitivity with a 15 minute time delay. Connect sensors to an automatic wall switch (AS), wired so that lights must be manually turned on at the switch, but are turned off by the sensor when the space is unoccupied. In spaces with vertical partitions, files or any other objects that create "walls" higher than four feet, reduce the sensor "coverage area" given in manufacturer's literature. Verify sensor spacing and location directly with sensor manufacturer.



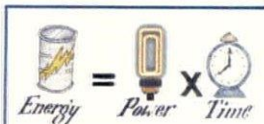
Corridors

Install ceiling mounted ultrasonic sensors, specifically designed for linear corridor distribution. Set to maximum sensitivity and 15 minute time delay. *The narrow linear distribution patterns increase sensitivity at a distance, activating lights long before a person reaches an unlighted area.*

Comparison of Lighting Controls



Daylight-related Controls



Lighting controls are essential for limiting the quantity and duration of power consumed.

Install switching or automatic dimming for those fixtures in the "daylighted zone", usually within 12' from a window wall in daylighted offices. Alternatively, in rooms smaller than 400 square feet, provide separate switches for the light fixtures in the daylighted zone and connect them to a separate occupancy sensor. In daylighted zones greater than 400 square feet, consider electronic fluorescent dimming ballasts, for continuous dimming down to 20% or less, automatically controlled via photosensors. Only smooth, continuous dimming should be used for office spaces to prevent distraction to the employees. Avoid "stepped dimming". The smoothness of the dimming depends on the quality of the dimming ballast more than the controls.

Going a Step Beyond

Careful design and the use of strategies such as daylighting, task-ambient lighting, and advanced technologies can achieve even greater energy efficiency and higher quality lighting than the basic solutions covered in this guide. More information is available from the Advanced Lighting Guidelines, at www.newbuildings.org, and from Tips For Daylighting With Windows at http://windows.lbl.gov/daylighting/designguide/designguide.html.

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Long Island Power Authority

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- Narragansett Electric
- Granite State Electric
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THE ROBERT BRUCE THOMPSON

Annual Student Light Fixture Design Competition

RBT

The Competition

Bruce Thompson was a twenty-five year veteran of the lighting industry. He had a broad background in the profession having worked in theatre, retail, as a factory representative, and concluding his career in manufacturing as vice president of sales and marketing. Throughout his career Bruce emphasized design and innovation. He was also an accomplished light fixture designer. He established this independent competition to encourage creativity and education in light fixture design and manufacturing. The competition organizers are looking for innovative ideas for fixtures that are functional as well as inspiring!

Awards

Three prizes will be awarded annually:

FIRST PRIZE: The Thompson Prize is a cash award of $5000, plus a trophy.

SECOND PRIZE: The Award of Distinction is a cash award of $2500, plus a plaque.

THIRD PRIZE: The Award of Merit is a cash award of $1000, plus a plaque.

The First Prize recipient will be flown to LightFair International to receive the award. The winning designs will be announced at LightFair International during the New Products Showcase. A panel of 5 judges will evaluate the entries. Applicants will be informed of the winning entries by April 15. Prizes will be awarded according to the judges' discretion.

Competition Rules

- Entrants must be full time students, enrolled in an accredited academic degree program in the United States. Approved programs include architectural engineering programs, architecture programs, interior design programs, theatre, or industrial design programs. Because of the high level of competition, it is recommended that entrants be undergraduate seniors or graduate students.
- Only individuals may apply. Group projects are not acceptable.
- The fixture must be designed within the past year and while the entrant is a student.
- A faculty member at the student's school must sponsor the application.
- A copy of this application must accompany all entries, one entry per student per year.
- Include 8 collated copies of all application material. Application material will not be returned to the applicant.
- The student's proposed light fixture design should be illustrated on a maximum of four 11"x17" sheets. These sheets should include a dimensioned plan and section of the lighting fixture, a perspective sketch or rendering of the product, and a perspective sketch of the product in use. An optional candlepower distribution curve, without values, may be included to illustrate an understanding of the light distribution. Graphic illustrations may be drawn by hand or computer-rendered. Both presentation and conceptual design will be considered in the judging process.
- In addition to the above requirements, include a maximum 250-word description of the product and its use.
- Optional: In addition to the above requirements, the student may build a model and include up to 5 images of the model, i.e., photographs or digital images. The purpose of the model is to demonstrate aesthetics and design. It need not be a functioning model. It may be constructed out of any material. Model images must be included in the maximum of four 11" x 17" sheets.
- The student is encouraged to consider the following criteria in the design process:
  1. Innovative character of the overall design
  2. Innovative and responsible use of materials
  3. Breadth of practical application
  4. Practicality of manufacturing
  5. Aesthetics
  6. Ease of use and maintenance
  7. Light distribution and visual comfort
  8. Energy efficiency

Entries should be postmarked by March 3, 2003, marked "Light Fixture Design Competition" and sent to:

PATRICIA GLASOW C/O AUERBACH+GLASOW, 225 Green Street, San Francisco, CA 94111 • lightcompetition@aol.com

COMPETITION

THE ROBERT BRUCE THOMPSON

Annual Student Light Fixture Design Competition

RBT

APPLICATION

The Design Problem

Design a light fixture that could be used to light a reading table in a library, mounted to the top of the table. Your fixture should use high efficiency fluorescent lamps, such as T5 or T2 linear lamps, compact fluorescent lamps, or even metal halide lamps. The ballast should be integral to the fixture. Self-ballasted lamps and other retrofit lamps are not acceptable. Identify all major interior and exterior components and materials. Describe how the light from your fixture supports the activities that take place at the library table. Describe how your fixture does or does not adapt to different architectural styles.

Name ____

Address ____

City, State Zip ____

Telephone ____

Email ____

College/University ____

Major ____

Faculty Sponsor ____

Documents Submitted ____

I am a full-time student at the above-listed institution, and I warrant that this submission is my original work and that it does not infringe on the intellectual property rights of any third party. I retain the copyright in these documents and this design, but I irrevocably grant a perpetual, royalty-free license to The Robert Bruce Thompson Charitable Trust to use this entry, either partially or in its entirety, to promote the Student Light Fixture Design Competition in any way the Trust sees fit.

____

Student Signature Date

____

Faculty Signature Date

Quality & Efficiency Can Coexist

BY PAUL VRABEL, LC

What comes to mind when someone mentions energy-efficient lighting? Over the years, the term "energy-efficient lighting" has developed some negative connotations. There are those who cringe when they hear the term and some even try to avoid the subject all together. However, energy-efficient lighting does not need to be ugly, ineffective or poor quality.

A new term gaining popularity is "high-quality, energy-efficient lighting," but what does this mean? Basically, a high-quality, energy-efficient lighting system minimizes energy (operations) and maintenance costs while meeting aesthetic and human visual performance requirements. Before going into detail defining high-quality, energy-efficient lighting, let's take a step back and review the history of energy-efficient lighting.

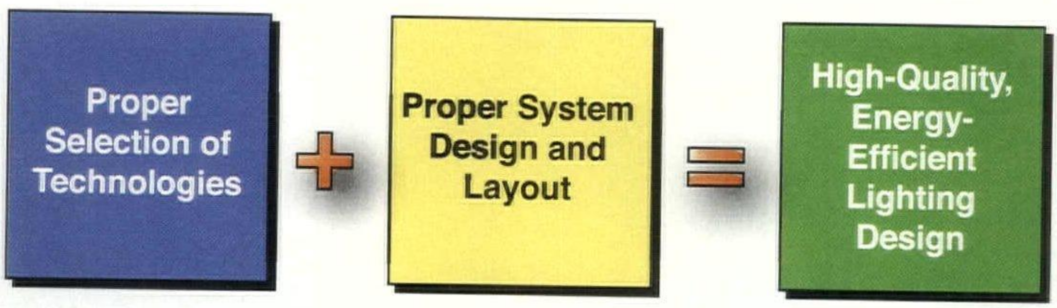
ENERGY-EFFICIENT LIGHTING

First, let's define and understand the difference between efficiency and conservation. Efficiency defines a system that meets or exceeds user expectations (compared to a standard system) while using less energy, thus it is more efficient at delivering the same or better performance. Conservation connotes sacrifice, giving something up to achieve energy savings. Some of you may recall President Carter addressing the nation during the '70s oil crisis about energy conservation while sitting in front of a fireplace with a heavy (and very warm-looking) sweater. This is a popular image of conservation. As lighting professionals, we want to promote energy-efficient lighting and not energy conservation.

Second, understand that we cannot avoid energy-efficient lighting. Demand is on the increase from commercial to hospitality to residential. Facility engineers want it, consumers are buying it, codes are requiring it and manufacturers are responding to demand. Facility managers want a system that uses the least amount of energy while meeting occupant needs and consumers are buying compact fluorescents (CFL) in record numbers. These trends, coupled with the California energy crisis, plus the little publicized eastern U.S. energy problems, have increased the demand for tighter energy codes. As qualified professionals, we have the opportunity—and the professional duty—to respond to these needs.

The history of "energy-efficient lighting" has left the public with some bad impressions. Since the fluorescent lamp was introduced at the 1937 World's Fair, people have had certain ideas about energy-efficient lighting. Yes, the fluorescent lamp was more efficient but it had a "cool-bluish" appearance and the ballast hummed and sometimes caused flicker. Thus began the negative connotations of energy-efficient lighting.

The '70s oil crisis awakened America to the need for reduced energy consumption, and soon followed utility demand-side management programs that offered rebates for "energy-efficient" lamps, ballasts and other technologies—some of which still had poor quality. The late '80s and early '90s saw a flurry of new energy-efficient lighting technologies. CFLs became the light source of choice for commercial recessed downlights but not without some misapplications in which "too-long" CFLs protruded from the bottom of the downlight. Common misapplications of efficient technologies resulted in poor lighting system performance.



Although many of these technologies have improved and now offer superior quality, energy-efficient lighting continues to have a bad rap. So what happened? The answer lies in a simple principle: Proper selection of technologies *and* proper system design and layout lead to a high-quality, energy-efficient lighting system. Haste to improve energy efficiency resulted in the practice of simply grabbing energy-efficient technologies off the shelf, combining them with other "energy-saving" strategies and forgetting about the need for proper system layout and design to meet occupant needs.

Today, more companies and end-users understand the benefits of and want high-quality, energy-efficient

As a lighting specialist, how would you define high-quality, energy-efficient lighting?

lighting. Two utility rate-payer funded organizations, The New York State Energy Research and Development Authority (NYSERDA) and the Northeast Energy Efficiency Partnerships' DesignLights Consortium (DLC), have come to understand the need and are promoting high-quality, energy-efficient lighting design by incorporating quality design practices along with efficient technologies in their program offerings. NYSERDA uses the term "*effective, energy-efficient lighting*" and is working with distributors, designers, manufacturers, building owners and other market actors to promote and provide education on "effective, energy-efficient lighting." Sarah Dagher, DLC program manager, stated, "The main premise behind DesignLight Consortium's (DLC) vision is 'To encourage thoughtful design of lighting in commercial spaces so that they are comfortable, productive, aesthetic and energy-efficient.'" The efforts of these two organizations are promising.

Therefore, to talk "energy-efficient lighting" is only half the story because the term only describes the technology. Mention to your clients how proper technologies and design can help maximize energy efficiency and quality. As designers, architects and lighting specialists, we have the opportunity to influence the changing world of energy-efficient lighting primarily by educating clients on high-quality, energy-efficient design.

KICKING IT UP A NOTCH

As a lighting specialist, how would you define high-quality, energy-efficient lighting? There are many technologies and design criteria that come to mind. Below are just some of the more widely applicable:

Energy-efficient Technologies. Many energy-efficient technologies are known in the design community and were introduced in the '90s or earlier. Many of these technologies are currently in their second or third generation of improvement. For example, CFLs are now available in wide range of shapes and sizes to meet most applications.

Lamps, ballasts and luminaires. Linear F32T8 lamps and CFLs are the workhorse of energy-efficient lamps. These technologies have come a long way—they are *not* those fluorescent products your grandmother had in her kitchen. In addition, "advanced" T8s have less lumen depreciation and improved color rendering. As with all fluorescent technology, make sure to select the proper color temperature and color rendering required for the specific space and task. Given that color properties could vary among manufacturers, specifying CFLs from the same manufacturer and not mixing manufacturers' products in any given project might be a good idea. The Federal ENERGY STAR program has strict laboratory-verified performance requirements for screw-based CFLs and residential light fixtures, so look for the ENERGY STAR label to identify quality products.

T5 linear fluorescent lamps are becoming more popular in commercial, residential and industrial applications. These sources are equal to or more efficacious than T8 lamps. The high-lumen package of T5/HO lamps lends them to rival or surpass the efficiency of HID systems for high-bay applications. Because of their smaller size, T5 lamps are also popular for direct/indirect suspended luminaires. Be careful though: Because of their small size and high lumen output, T5 lamps need to have the proper shielding to avoid direct glare.

High-quality, energy-efficient lighting design for an open office plan utilizes direct/indirect luminaries. Photo courtesy of DesignLights Consortium.

Pulse-start metal halide (PSMH) is another exciting lamp that for equal light output uses 30-percent less wattage. For example, a 250W standard metal halide system uses about 294W with ballast losses whereas a 175W PSMH system uses only 208W with ballast losses. In addition to considerable energy savings, PSMH offers a shorter restrike (2-4 minutes), reduced lumen depreciation and improved color stability. Numerous ballast options are also available for different applications and will affect the energy savings; check with your supplier to determine the optimal ballast.

Accent and spotlighting should at least use halogen or halogen IR technology where CFLs or other sources do not meet performance requirements. Halogen IR is slightly more efficient than standard halogen and is available in several wattages. Low-voltage halogen lamps are not more efficacious than line-voltage sources, but you can use lower wattage low-voltage sources for accents and generally achieve the same desired effect due to improved optical control.

Also, don't forget about properly selecting the ballasts. Electronic ballasts should be specified for almost every application, except in those very few situations where electromagnetic interference may be a concern, such as near sensitive electronic equipment in hospitals. Ballast factor should also be considered. In applications where light levels exceed recommended limits, investigate using partial output ballasts (0.75 ballast factor or less), as they can reduce lumen output and save additional energy.

In general, remember to select luminaires with high efficiency (high percentage of lamp lumens exiting out of the fixture) that have the proper shielding, glare control and light distribution for the given application. Direct/indirect luminaires are increasing in popularity for commercial office spaces because of advanced manufacturing resulting in reduced fixture costs and easier installation and increased use of T5 lamps lending to lower profile luminaires.

Controls. Wattage is only part of the energy equation (watts x time = energy); hours-of-use is the other half. Selecting the right efficient lamp, ballast and luminaire will help minimize wattage consumption, and the right control system reduces unnecessary operating hours. Dimming (manual, timed and daylight), automatic switching and occupancy sensors should all be part of a high quality lighting design. Infrared and/or ultrasonic occupancy sensors should be used in most office spaces. Occupancy-controlled dimming should be used in areas where the lights need to be kept on for safety or security but switched to a lower light level when the space is vacant. Multi-level occupancy-controlled outdoor fixtures are becoming popular for residential applications.

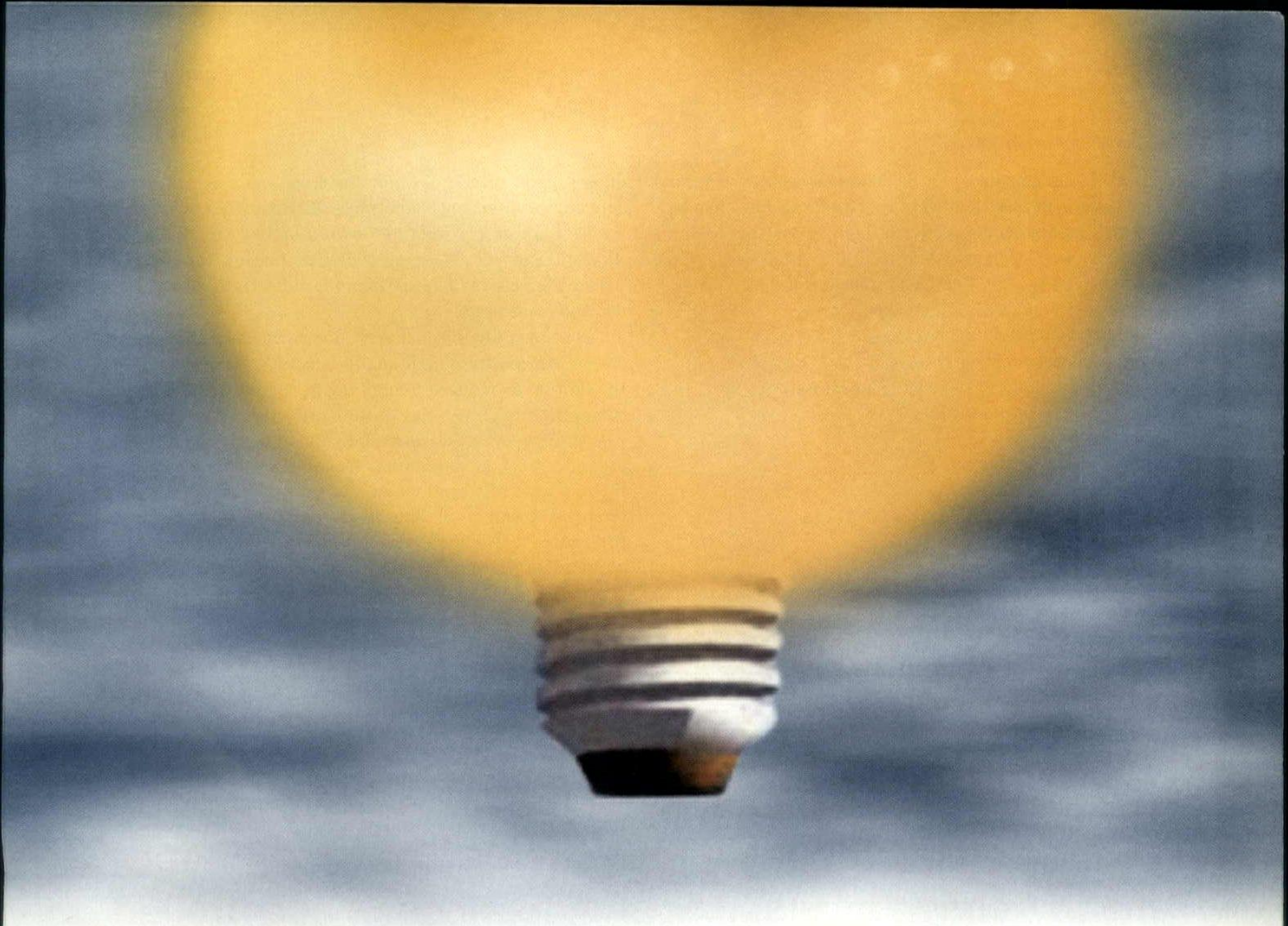
Time-of-use, occupancy-controlled and daylight dimming strategies can save considerable amount of energy and provide benefits to the occupant. The EPA Green Lights Program conducted field studies and found that office buildings can save 60 percent on average with occupancy sensors.

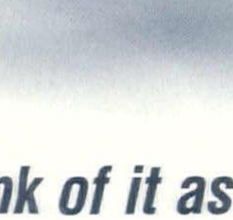
When specifying controls, don't forget commissioning. Most occupancy sensor, dimming and other control problems can be attributed to improper commissioning. Specify the time delays and sensitivity level to maximize energy savings while meeting occupant needs and work with the manufacturer to specify the correct technology with the proper coverage.

High-quality, energy-efficient layout and design. Remember that lighting is for people, whether you illuminate artwork, a task on a desk or a building's architectural features. This sounds obvious, but we sometimes get too caught up in selecting the fixture design and forget about the people and tasks.

Quality design should meet visual task requirements (reading, walking, etc), create visual interest in the space (highlight artwork and architectural features if desired), set mood (energetic or relaxed environment; private or public feeling), be visually comforting and safe (avoid glare) and minimize operations and maintenance costs. To aid lighting professionals, the IESNA *Lighting Handbook* now

(Continued on page 46)





Continuous Dimming

ON/OFF Switching

Exterior

(Continued from page 44)

includes 16 design criteria, in addition to horizontal and vertical illuminance, in its chapter on "Quality of the Visual Environment."

A high-quality, energy-efficient lighting systems balances numerous design parameters to meet the visual needs while minimizing energy use. Common parameters include:

- Horizontal and vertical illuminance levels
- Proper wall and ceiling brightness
- Proper accent lighting
- Optical control for glare and light trespass
- Excellent color properties
- Proper fixture spacing
- Illuminance uniformity
- Controls
- Flexibility
- Daylight integration
- No hum or flicker

An energy-efficient lighting system does not have to be a boring lighting design. Use efficient technologies and lay out the fixtures to balance the above design parameters (without excessive number of fixtures) to yield a visually interesting and effective lighting system that minimizes watts per sq. ft.

For example, in an office, a direct/indirect lighting system can provide flexibility, aesthetic appeal and meet operations, maintenance and visual performance needs. In addition to using properly spaced fixtures with T5 or T8 lamps, independently switch the direct and indirect components. This provides the occupants and facility manager with control flexibility that can lead to energy savings. For example, during after-hour cleaning, the direct lighting can be shut off while the indirect lighting provides adequate illumination for cleaning. The direct component that provides workstation lighting can also be controlled with occupancy sensors, while the indirect component provides lighting for circulation. Furthermore, direct/indirect fixtures should run parallel to windows to take advantage of daylight dimming or switching—a technique that is favored in schools where daylight is abundant and operations budgets are tight.

Task/ambient lighting systems should be employed where applicable. As ambient lighting from the ceiling provides enough light for general circulation needs (about 20-30 fc for offices), desk task lighting (undercabinet, table lamp, etc.) can fulfill additional illumination requirements for specific tasks. A movable task light that allows the occupant to place the light where needed to maximize visual performance can save a considerable amount of energy, while giving the occupant additional control. If there is a concern with occupants leaving the lights on after hours, consider specifying a workstation occupancy sensor.

Other high-quality, energy-efficient lighting ideas for office spaces include occupancy sensors in restrooms and other support spaces, daylight dimming/switching in lobbies, cafeterias and windowed hallways. Alternate the use of wall-washers and direct lighting down a hallway to illuminate artwork and provide required illumination levels. Use colored LEDs instead of incandescent light sources as decorative elements.

Occupants, facility mangers, homeowners and designers can all benefit from high-quality, energy-efficient lighting. In addition to reduced energy costs, high-quality, energy-efficient lighting can potentially improve worker productivity, increase sales and support a comfortable and creative work environment. Designers, distributors and lighting practitioners benefit first of all by staying progressive and responding to the ever-increasing demands for energy efficiency. Higher quality lighting can also demand higher profit margins and differentiate your company from the competition.

SEEING THE FUTURE

The most exciting new technology being developed is white LEDs as a general illuminant. The small size will allow use in accent as well as ambient lighting applications. There is still much research needed but this is a promising technology. Also look for improved daylighting technologies, requests for more daylight integration and increased availability of independently controlled fixtures from the occupant's desktop computer. Photovoltaic systems converting solar energy into electricity are also gaining popularity. Their integration with lighting is natural because lighting loads are fairly easily calculated and integrated to such systems.

In the future, look for improved daylighting technologies, requests for more daylight integration and increased availability of independently controlled fixtures from the occupant's desktop computer.

Energy-efficient and high-quality lighting can coexist. The demand is growing for efficiency, but you have the ability to influence wise design choices that create harmony between energy efficiency and quality design. ■

Paul Vrabel, LC is a Project Manager with ICF Consulting, supporting a number of federal, state, utility and international energy-efficiency programs. Vrabel has a Masters of Science and Bachelors in Architectural Engineering specializing in lighting design The author is always open to discussions on high-quality, energy-efficient lighting, and can be reached at pvrabel@icfconsulting.com.

Editor's note: *Look for more articles from Paul Vrabel, who has agreed to join Architectural Lighting as a regular featured columnist. In future issues, the author will discuss high-quality, energy-efficient lighting for retail, residential and hospitality applications.*

technique

VIDEOCONFERENCING LIGHTING —SIMPLIFIED

BY C. BROOKE CARTER AND SAMANTHA HOLLOMON LAFLEUR

By now, most lighting designers have encountered videoconferencing rooms in typical office projects. Many have applied traditional broadcast lighting techniques such as the four-point approach (back, top, key and fill light) to the rooms, assuming that the camera equipment for mainstream videoconferencing is equivalent to the equipment for professional video recording situations. New studies have revealed a better approach. The basic truth is that cameras and video processing equipment for the common videoconferencing systems have different and automatic systems for creating an optimal image.

The ultimate goal of videoconferencing is for the participants to communicate face-to-face with one another, unimpeded by the technology. By coupling auditory communications with visual cues such as non-verbal gestures, eye contact and body language, the participants can communicate more effectively than via a simple audio-conference call. There is a dynamic relationship between light levels, luminaire distributions, colors and finishes of rooms, presentation boards, room and equipment layouts, and how effectively participants perceive the information through the transmitted image.

Simple, effective designs can be achieved in videoconferencing rooms by taking a different approach: Adding the camera and the video codec to the list of "occupants" and factoring in the specific "visual" needs of this equipment. Collaboration plays an essential role in using this new approach for the effective design of a videoconferencing room.

BUILDING THE SET

While videoconferencing may seem like a completely different technology from that which designers have encountered previously, it is really nothing more than a "souped-up" computer modem. The brains of these systems is the codec, which receives the video signal (in red, green, blue packets) from the camera and breaks it apart, one frame at a time, filtering out any redundant information. The data is compacted and sent in bundles to a receiving codec that pastes the bundles back together into a complete image. Complex patterns, motion and/or drastic perspectives create scenes that force the codec to analyze more data and send large quantities of information. When a codec is sending or receiving too much information for the available bandwidth, the image will suffer by breaking up into dots or pixels, with static or with a weird time delay where the audio comes through ahead of the video. The challenge to the design team is to give as little data to the codec as possible by creating a simple "set" with solid, medium finishes and few architectural details to reduce the amount of data to be transmitted and received. The less work the pair of codecs has to do, the better the image will be.

The wall and ceiling reflectances, the furnishings, the clothing of the participants and their facial characteristics play a role in how the final image appears after the video transmission. As a designer, participate in the selection of the wall colors and finishes, steering the team toward materials with 40-60-percent reflectance. The ceiling should have a reflectance of 70-80 percent. Suggest that the walls be finished in a subdued color of a medium contrast with minimal patterns. Caution the other team members about using dark millwork, white walls, vertical patterns or small repeat patterns. Also, avoid any specular material, as it will be readily distorted by the camera.

As a designer, participate in the selection of the wall colors and finishes, steering the team toward materials with 40-60-percent reflectance.

CAMERA CONTROL

The full design team should negotiate the location of the camera(s) and the conference table. This is a delicate geometry that will create limitations on your lighting solution; there are greater implications than just millwork details. Camera placement will affect participants' comfort, perceived interaction and ability to "fake" eye contact with the far-end viewers. Placing the camera at eye level directly in front of the viewers and slightly above or next to the television monitor will help to simulate effective eye contact.

The video cameras typically used for videoconferencing are *consumer-grade* cameras. This is a broad category defining certain technical features. Two specific details of the camera are of primary concern: white balance and contrast range. Typical consumer-grade cameras have a single factory-preset white balance setting of 3200K with a contrast range of approximately 30:1. Professional-grade video cameras used in broadcast studio settings have a variety of white balance settings and contrast ranges from 40:1 to 100:1. Given the limited white balance setting of cameras used for videoconferencing, light sources that are in this same restricted range will perform well.

(Continued on page 50)

TRICKS OF THE TRADE

The primary function of a conference room is a meeting space; the videoconferencing function is usually secondary. Therefore, the first priority of the lighting designer is to develop an effective ambient layer of lighting for the occupants. Tune the second layer of lighting to balance luminances between the participants' faces and the back wall to achieve good facial modeling of the participants. This layer can often be managed by pairing an indirect ambient lighting source with a wall-washing solution on the back wall, allowing the designer to achieve double-duty from the "ambient" layer fixture(s). As a general rule of thumb, keep all light sources that illuminate vertical surfaces at the same color temperature for the best rendering of colors in the video image. If your budget allows, add a third layer to address note-taking needs at the table. This layer should be dimmable, to allow for a slight increase of light to the horizontal plane without causing shadowing on the participants' faces from this direct component.

• **Lighting considerations:**

√ See like a video camera—design for luminance ratios and control the view.

√ Consider the needs for all participants during the programming and schematic stage.

√ Remember to consider all of the tasks and the tools that will be utilized, including computers, television monitors, marker or presentation boards and the cameras.

√ Use "soft" or indirect lighting to help tighten the contrast range for the camera—minimum 50-percent uplight works well.

√ Locate luminaires to provide maximum uniformity and to be concealed from the view of the video camera.

√ Include automatic or manual dimming controls to provide user flexibility for fine-tuning the image being transmitted.

√ Consider both luminance and illuminance ratios.

√ Provide illuminance ratio of 2:1.

√ Provide appropriate lighting levels: 20-50 hfc on surface in front of speaker; 20-50 vfc on face of speaker; 50-100 hfc on surface in front of participants (depending on task); 20-50 vfc on face of participants; 10-30 vfc on wall behind speaker.

√ Suggest mock-ups with the proposed finishes, video equipment and lighting systems, if necessary.

• **Architectural considerations:**

√ Avoid luminous vertical surfaces such as windows and carefully consider the placements for other luminous surfaces such as computer screens and video monitors.

√ Use neutral color medium reflectance walls, presentation boards, furniture finishes, etc.

√ Place the camera at eye level to simulate direct eye contact.

√ Consider stepped or auditorium seating in large assembly spaces or classroom set-ups.

√ Consider table size and seating arrangements in a conference room setting.

• **Equipment considerations:**

√ Verify the specifications of the camera with the AV specialist. Understand the camera's luminance range requirements and white balance settings.

√ Discuss what transmission bandwidth will be used. With higher bandwidth, the camera will tolerate greater architectural complexity.

The soft, uniform lighting from the indirect lighting system was highl
contrast for the camera to interpret, but no so much
This system resulted in ar

(Continued from page 48)

How does the contrast range of the typical videoconferencing camera differ from our vision? Our dynamic luminance contrast range is 1000:1 in photopic light levels, which means that the camera has only 1/30th of the sensitivity to subtle changes between highlights and shadows in a particular scene than our eyes. Additionally, the camera only sees light reflected from a surface, making luminance values a critical element of your design. If the camera's view includes a surface that is very bright, such as a ceiling or a light fixture that can give off 100 cd/m2, then the darkest surface that the camera will truly see is one reflecting 3.5 cd/m2. This range of luminances skews the camera's contrast range to the high end, leaving it incapable of interpreting surfaces that are less light-reflective, such as a black suit or brunette hair, causing those surfaces to be over-shadowed, pixilated or blurred in the transmitted image.

RECENT STUDIES

Research conducted by Hargroves and McFadden and presented at CIBSE in 1998 allows a reassessment of the lighting tasks and the relationships among the lighting system, the participants and the video equipment. Their research, which aims for the "optimization of the visual quality of the transmitted image," led them to believe that the use of "soft" or indirect lighting produces satisfactory facial appearances, which are further enhanced with the addition of a downlighting element. Furthermore, the utilization of a uniform background of a subdued color provided optimal contrast between the background and the individual, while extreme differences in brightness or saturated highlights was to be avoided. Finally, Hargroves and McFadden determined that as the ratio of horizontal to vertical illuminance increases, the picture quality decreases. Therefore, they supported an illuminance ratio of 3:1 foreground to background to ensure good picture quality.

Inspired by their work, one of the authors, C. Brooke Carter, pursued additional research that focused on lighting for videoconferencing in a distance-learning environment as her Master's thesis at the Lighting Research Center, Rensselaer Polytechnic Institute in Troy, NY. The research experiment was designed to measure the participants' preference between three different lighting systems during actual instructional sessions. Participants in the room and over the videoconference evaluated the lighting systems, which included a direct downlighting system, an indirect lighting system and a direct/indirect lighting system with peak luminous intensity at a 45-degree angle. Additionally, the room featured a mid-tone, uniform background, as recommended by Hargroves and McFadden. The

suitable for the camera's limited contrast range, providing just enough that the image is distorted or difficult to read. illuminance ratio of approximately 2:1.

participants were asked to evaluate the general lighting of the classroom, their ability to perform the classroom tasks under the installed lighting conditions and the appearance of the participants. The lighting systems were designed to provide the recommended horizontal illuminances on the students' desk for classrooms with these task requirements as suggested in the *8th Edition IES Handbook*. The measured illuminances of all three lighting systems delivered 60-80 horizontal fc.

The soft, uniform lighting from the indirect lighting system was highly suitable for the camera's limited contrast range, providing just enough contrast for the camera to interpret, but not so much that the image was distorted or difficult to read. This system resulted in an illuminance ratio of approximately 2:1. This is ideal for highly interactive video-conferencing, as it reduces veiling reflections and eliminates shadows.

The direct/indirect lighting results were mixed: disliked by the instructors, but favored by the students on the far end. The instructors felt that it was difficult for them to see the video monitors at the rear of the room, probably owing to reflections from the fixture. In addition, the direct lighting component, with a large percentage of its luminous intensity at 45 degrees, turned out to be aimed directly at the instructors' eyes when they were standing. Lumen output in the range of angles from 35 to 65 degrees from nadir is often referred to as the "offending zone," where lighting causes discomfort glare. The instructors' reactions are a reminder that despite common theatrical recommendations to use light at 45 degrees as a key light for improved facial modeling, participants are not actors. The facial modeling provided by the indirect system, created by interreflections within the room, was a more comfortable solution for their instructional roles.

The direct lighting system was not favored by any of the participants, receiving comments like "too bright," "too many shadows" and "too many reflections." The images over the video showed an increase in the shadows under the eyes, while "hot spots" developed on the forehead and the rims of the eyeglasses. This created images of excessive contrast that were prone to distortion when transmitted by video camera. The low marks for the direct lighting system were not just related to the participants' images, but were also negative for classroom tasks such as reading the information presented on the video monitors. Additionally, the walls are not evenly lighted, creating what is commonly called a "cave-like" appearance in the classroom, introducing undesirable shadows in the transmitted image.

Finally, the results of Carter's thesis also encourage the application of lower light levels, which helps to create a narrower, more effective luminance range in the room. The instructors, asked to adjust the lighting levels to work best with their classroom situations, tended to set the lighting based on their own appearance in the video monitors. The average lighting levels chosen by the instructors, ranging from 20-50 vfc on their faces, was significantly lower than typical recommendations of between 60-100 vfc from videoconferencing manufacturers. The recorded images demonstrate that at these light levels the quality of the image is effective.

Through a collaborative design process and an understanding of the limitations of the camera and videoconferencing codec, lighting designers can develop more creative solutions without compromising the success of the transmitted image. Furthermore, by focusing on luminance ratios and controlling the camera's view carefully, lower overall light levels can meet the needs of the camera while enabling designers to more easily create systems that comply with current energy standards. ■

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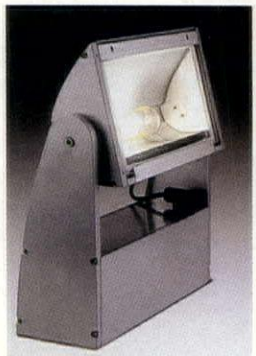
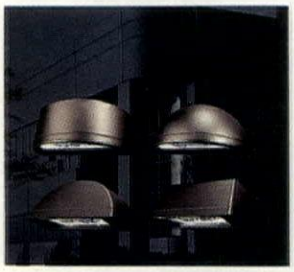
C. Brooke Carter is currently a senior designer with Brandston Partnership in New York City and is an active member of the IES Multi-Media Teleconferencing Committee. She has been invited to write several papers and articles on the subject and has presented her work at several conferences including the IES Annual Papers Conference, 2002 and the SUNY Technology Conference, 2002.

Samantha Hollomon LaFleur, project manager with Hayden McKay Lighting Design Inc. in New York City, serves as secretary on the IES Multi-Media Teleconferencing Committee, which is currently writing a Design Guide for Videoconferencing Lighting. She is the founding chair of the IALD Sustainability Committee, one of the IALD Representatives to ASHRAE/IESNA 90.1 Standard Committee and member of the IESNA Energy Management Committee.

OUTDOOR & LANDSCAPE

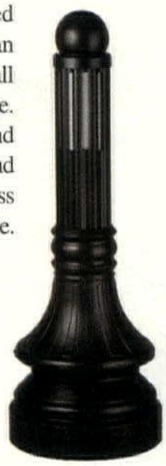


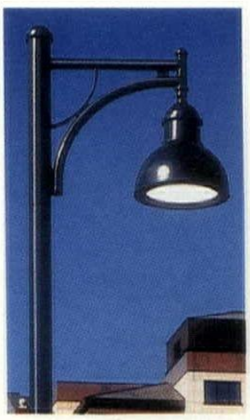
For indoor and outdoor use, **Lam Lighting's** Eclipse asymmetric indirect wall-washing fixture sports a semi-elliptical lighthead mounted to a U-shaped yoke rotatable through 180 degrees and a computer-designed specular metal asymmetric reflector for maximum lumen projection and sharp cutoff. Wedge-shaped top- or bottom-mounted visor for sharper cutoff angles is optional. Fixtures can be mounted to vertical and horizontal surfaces and oriented for up- or downlighting. Eclipse uses 70W or 150W color-corrected and 250W and 400W metal halide lamps. Construction is extruded or cast copper-free aluminum in various finishes. C/UL-listed for wet location use. IP65-certified. **Circle No. 100**



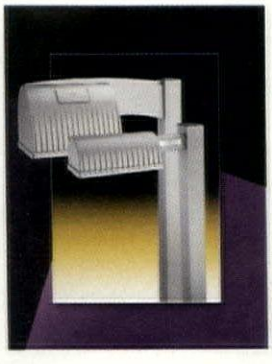
Cooper Lighting's Lumark Impact wall-mounted cutoff luminaires feature optical modules that utilize a 95-percent semi-specular reflective sheet and provide full cutoff Type-II distribution with side and forward throws. Approved by the International Dark Skies Association, Impact provides no light above 90 degrees and is available in wedge, trapezoid, quarter-sphere and cylinder shapes. Housing is two-piece die-cast aluminum. Fully gasketed, die-cast door is mounted with 1/8-in. clear tempered glass lens. EPDM gasketing ensures comprehensive seal while vents prevent moisture accumulation. Lamping is 100W-175W metal halide and 100W-150W HPS sources. Finish is polyester powdercoat in standard bronze. Other colors available. C/UL-listed for wet locations in downlight mounting applications. **Circle No. 101**

Hinkley Architectural's 75009BOL Washington Bollard is equipped with a corrosion-resistant, cast aluminum alloy mounting base and an extruded aluminum bollard shaft with a 6-in. diameter and .125-in. wall thickness. The cast aluminum top is available in cannon ball or dome shape. The fixtures accepts up to 100W metal halide, mercury vapor, HPS and incandescent lamps. A compact fluorescent version with an HPF ballast and socket is also available up to 42W. Optic options include a Type-V glass refractor and a 180-degree house-side shield. Various finishes are available. **Circle No. 102**





The Eurotique Series from **Antique Street Lamps** consists of outdoor decorative lighting in three styles: Munich, Copenhagen and Hanover (shown). Each is available in two sizes and with a range of arm styles as well as poles. The series accommodates HID lamps in a variety of wattages and features cast aluminum construction. Munich and Hanover offer anodized and segmented reflectors and globes in clear glass or clear acrylic. Copenhagen is equipped with anodized reflectors and clear acrylic or polycarbonate globes. A variety of finishes is available. **Circle No. 103**



From **Sterner Lighting Systems**, the Infranor Polaris S Series, which features the PS6 and PS12, incorporates full-cutoff, horizontal-lamp optical systems and offers a choice of two architectural arms and Type-II, III, IV and V symmetrical distribution patterns. PS12 is available with segmented and hydroform reflector sets and uses standard HID lamps and pulse-start metal halide sources. PS6 accepts Philips' T6 MasterColor lamps and electronic ballasts (70W max.). Reflectors are field-rotatable in 90-degree increments without tools. Other features include one-piece die-cast aluminum housing and door frame, integrated heat sink fins, clear tempered glass lens and dual-point compression sealed gasket system. Various finishes available. **Circle No. 104**

Beacon Products' Village Collection Globes may be specified in clear or white acrylic, clear textured or white polycarbonate and are available with unmatched pole, fitter, dome and finial options. Construction features ASTM 356.2 virgin ingot aluminum, cast in permanent molds. Cast aluminum parts and mounting poles have a thermoset polyester powdercoat finish applied over a sandblasted surface. Options include a 90- or 180-degree light shield, Type-V Optilouver or curved heat reflectors and borosilicate glass refractor lenses. **Circle No. 105**

Quality Lighting's Design-FLV-42 floodlight is equipped with a multi-surface, segmented aluminum reflector that accepts single or double-ended HPS and metal halide lamps in various wattages and beam spreads. Options include glare shields, straight louvers and color filters. The lamphead moves through a range of lockable angles for precise aiming. An above-ground adjustable Y-yoke mounting bracket is standard; wall bracket mounting or a slip fitter for pole mounting may also be specified. Construction is die-cast aluminum alloy with a baked polyester powder-coat finish. C/UL-listed for wet location use. **Circle No. 106**

Offering long and narrow distribution for area lighting, **Holophane's** HMSP luminaires feature the Prismetal open glass optical system with a metalized glass reflector and a variety of factory-set lamp positions for different fixture spacing ratios. A unitized ballast assembly with quick disconnect facilitates fixture installation and removal. Housing is die-cast aluminum with a seven-stage pre-treatment and polyester powder paint finish. Producing no uplight, HMSP units are International Dark Sky-friendly and meet all IESNA requirements for full cutoff as well as UL 1572 rain test requirements. Narrow asymmetric, wide asymmetric and square contours are also available. UL-listed for 40-degree ambient. **Circle No. 107**

For outdoor area and roadway lighting, **Metrolux'** TownMaster Series employs a one-piece reflector assembly with a chemically brightened, clear anodized surface to maximize light output. The reflector delivers an effective projected area (EPA) of 3.4 sq. ft. and is rotatable through 360 degrees to facilitate aiming. Computer-enhanced reflector facets diffuse emitted light and redirect light away from the lamp's arc tube for safety and long operational life. A choice of flat or convex lens and round and square symmetrical or forward-throw light distribution patterns is offered. Shielding and louver options are available. TownMaster uses metal halide and HPS lamps. **Circle No. 108**

Available exclusively through **Se'lux**, Citylighter from Sill is a plane projector that demonstrates precision reflector engineering and features a range of light distributions in asymmetric narrow- or wide-beam optics for direct or indirect illumination. Batwing distribution is also available for city area use. Adjustable brackets are offered for ceiling, wall or column mounting. **Circle No. 109**

Progress Lighting's Georgian Collection offers fixtures characterized by a cast construction, water-seeded glass panes and choice of Burnished Chestnut or Classic Black finish. The Georgian post lantern measures 12 in. wide and 31 5/8 in. tall and fits a 3-in. diameter post. Illumination is provided by four 60W candelabra-base lamps. **Circle No. 110**

Bega's Model 8535 bollards are equipped with optical systems that conceal the light sources and provide dowlighting as well as asymmetrical floodlighting of walls. The fixture features a trapezoidal housing, rugged construction and uses ceramic metal halide G12 T6 lamps. **Circle No. 111**

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endpoint

Is There a Lighting Man in the House?

BY BILL KLAGES

I recently attended a session of the Society of Motion Picture and Television Engineers Society Convention at the Pasadena Conference Center during which a panel of well-known cinematographers discussed digital mastering for feature films. A projection screen was adjacent to the panel that was to show applicable examples, yet there were no means available to separately light the panel members and still see the projected images. The moderator of the panel, George Dibie, president of the International Cinematographer's Guild, exclaimed in frustration, "Is there a lighting man in the house?" Ironically, he was surrounded by a panel of lighting experts and a room full of lighting professionals.

The problem with this particular situation is not isolated to one room in Pasadena, nor one convention venue; it exists everywhere. There is no lecture or seminar room in any convention facility that provides any means of properly lighting the typical presentation. Incidentally, the same can be said of head tables in ballroom events.

Is it so difficult to apply rudimentary theater to presentation areas? A little more lighting facility, a lot more common sense might do the job.

Who is at fault? All of these facilities had an "architectural lighting consultant" and boasted "state-of-the-art lighting," which, in case you are wondering, consists of two circuits for each space, overhead general fluorescent lights and a group of wide-beam angle downlights. Oh, I forgot, there is a wall box with buttons ("state-of-the-art control system") programmed to provide different lighting levels. They are usually set for "low," "medium" and "high." Translate these settings to "might as well be off," "not enough for note-taking but too much spill on projection screen" and "noon day in the market for a visibly challenged cleaning crew." Of course the plot thickens when, a half-hour before your presentation and after having just finished a very heated confrontation with the building's surly group of A/V technicians, you ask for the lighting person. "We're really (not) sorry, but the person who knows how to program the system is off today." You reply, in your most modest manner, "Never mind, I'll do it myself." I have big news for you. You won't. Give up at this point. What devious, disturbed mind devised the "easy" programming of architectural control systems? Forget any thoughts about enhancing your beautifully programmed talk with a proper visual environment. Is it so difficult to apply rudimentary theater to presentation areas? I suggest a little more lighting facility and a lot more common sense might do the job. So:

1) We need lighting instruments to separately light the presenters or panel members. If a projection screen is involved, these units have to be capable of lighting a precise area. This requirement dictates ellipsoidal theater instruments with framing shutters. Plan on at least two (three is better) fixtures located in positions that will provide visibility of the presenter to the guys who are sitting at the ends of the audience. Light should come from left, center and right positions. The units should be at an elevation angle from the presenter's eye level horizontal plane of 30 to 45 degrees. They should be placed in accessible positions that they can (and, hopefully, will) be focused for each session. Remember to de-focus the ellipsoidals slightly so that the edges of the lighted area are softer and do not distract the audience. Make sure that the presenter's background is not a white wall, otherwise, he will be in silhouette. In fact, the interior designer should be tactfully instructed that 90-percent reflectance white is NOT the color of choice.

2) The audience lighting can be standard architectural downlights but with a narrow cutoff angle to minimize glare for the audience. However, they should be circuited so that units that spill light on the presentation area or screen can be turned off. The lighting must be able to be isolated on the audience only. Remember that, in addition to the audience's ability to see to take notes, the presenter may also need to see the audience to connect with them or take questions.

3) The presenter may need some local worklight of low intensity on his script or equipment controls. Carefully place these lights in positions that don't blind the audience or throw a huge shadow of the presenter all over the back wall!

4) It would be nice to control any downlights located at entrances so that a slightly higher lighting level can be set for latecomers' safety. Separate control of the aisles is also desirable. In addition, it may be advantageous from a visual standpoint to have control of lighting enhancing architectural details as soffits, valences, sconces, etc. And don't forget a separate downlight on the refreshment table.

It is important that all instruments and lighting units be individually dimmer-controlled with the ability to be easily grouped. In addition, the programming should be intuitive so that the presenter can not only set it up, but also have control of different lighting settings during his presentation. If there is no programming time available and he must ad lib, he should have the ability to manually adjust the different lighting circuits. Resist the temptation to have everything on three buttons, each 1/8 in. in diameter, 1/8 in. apart. And please take the mystery out of the circuiting by giving instruments names that clearly describe their function, "Audience Reading Light" instead of "Group 7, Room 101."

Enough sermonizing. I hope that I am correct in anticipating that lighting professionals in the architectural field will take this as a challenge to provide sensible lighting facilities to the large group of presenters at every convention and seminar to improve the delivery of their message. ■

Bill Klages, PE is a well-known television lighting designer and has received seven Emmy awards for lighting network productions. In addition, he is actively consulting on television facilities as well conducting lighting seminars.