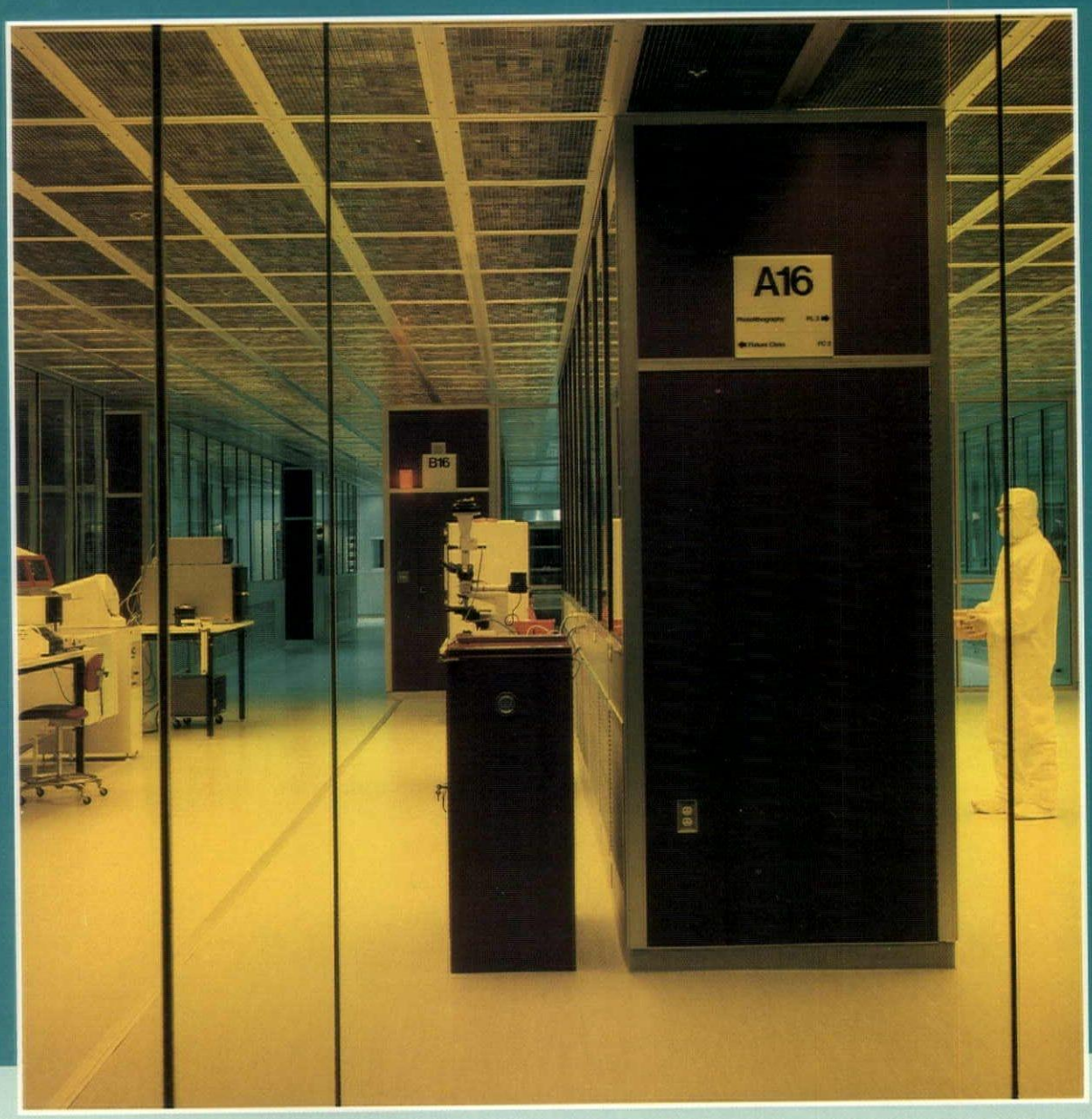
# ARCHITECTURAL LIGHTING

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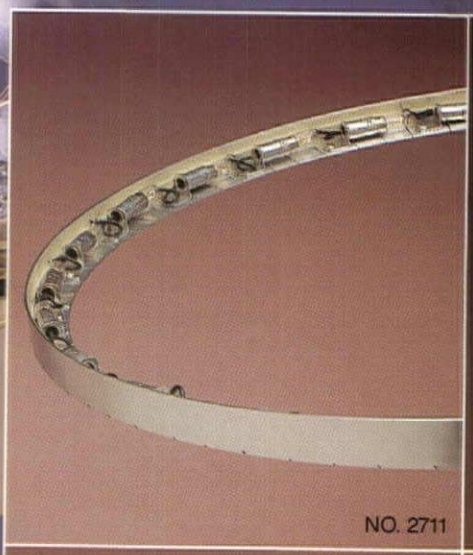
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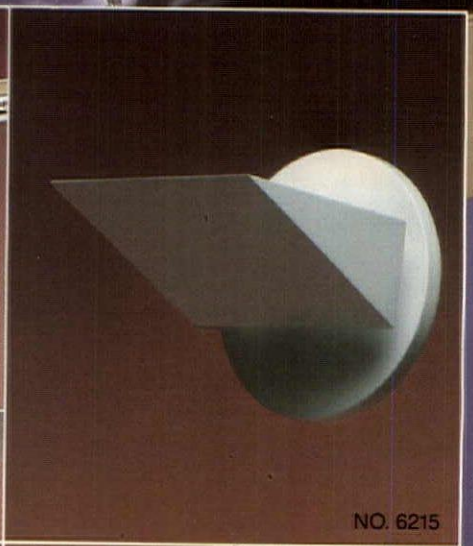
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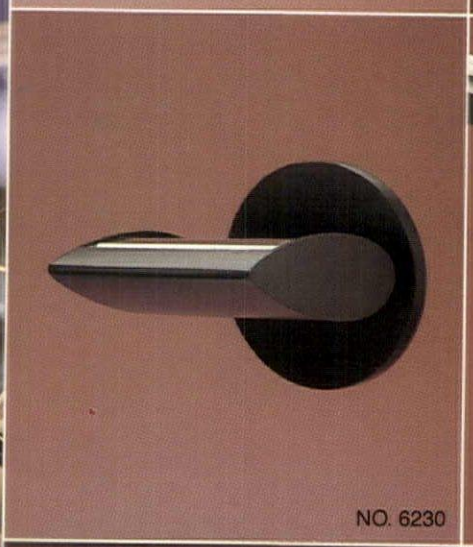
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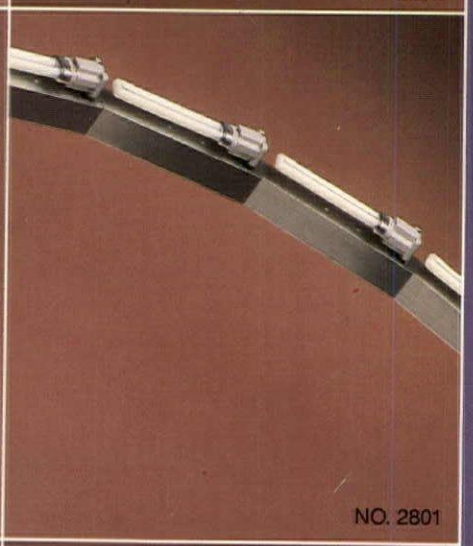
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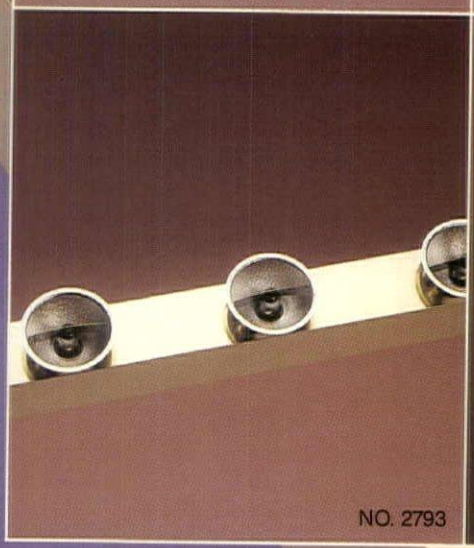
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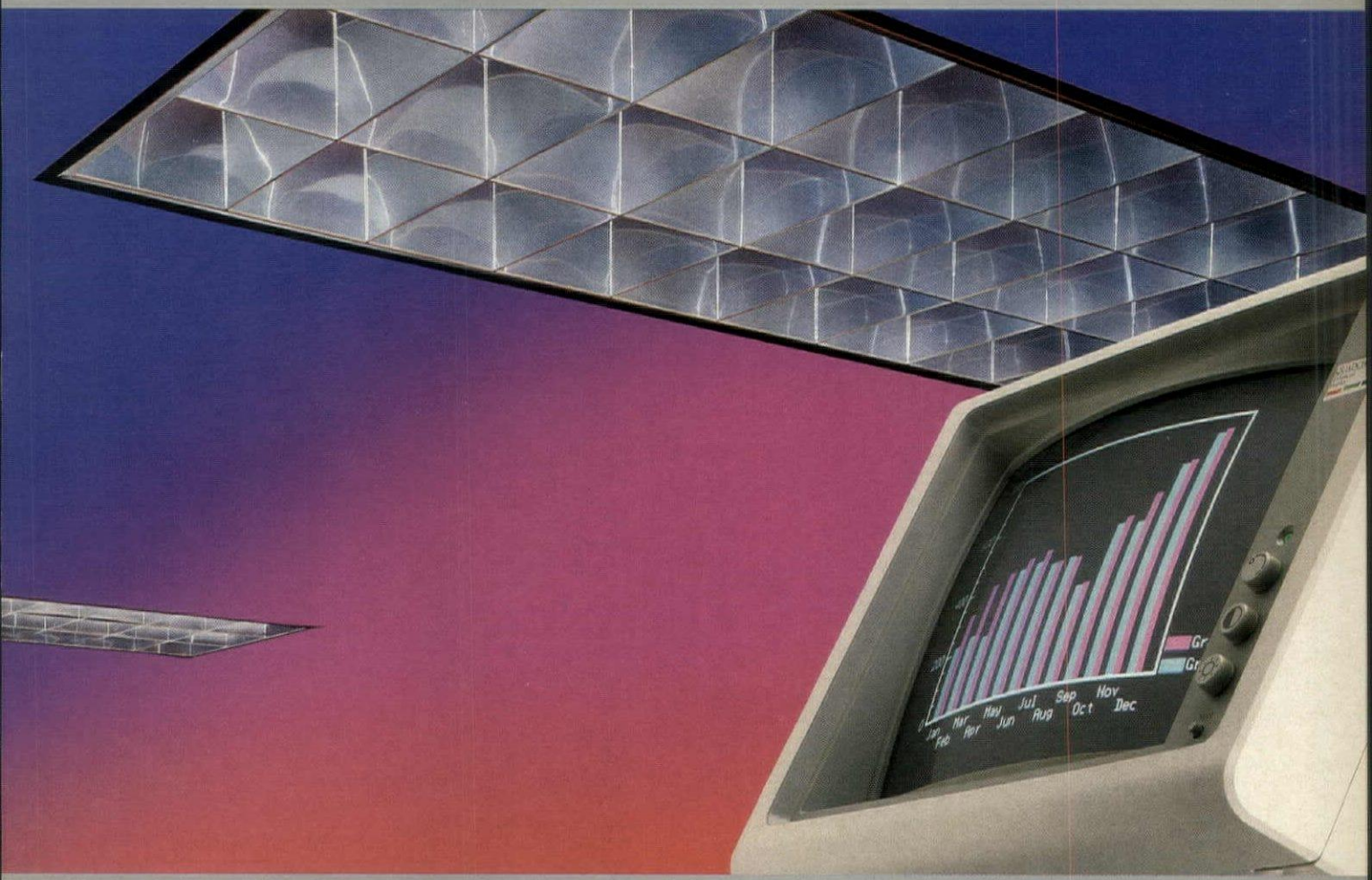


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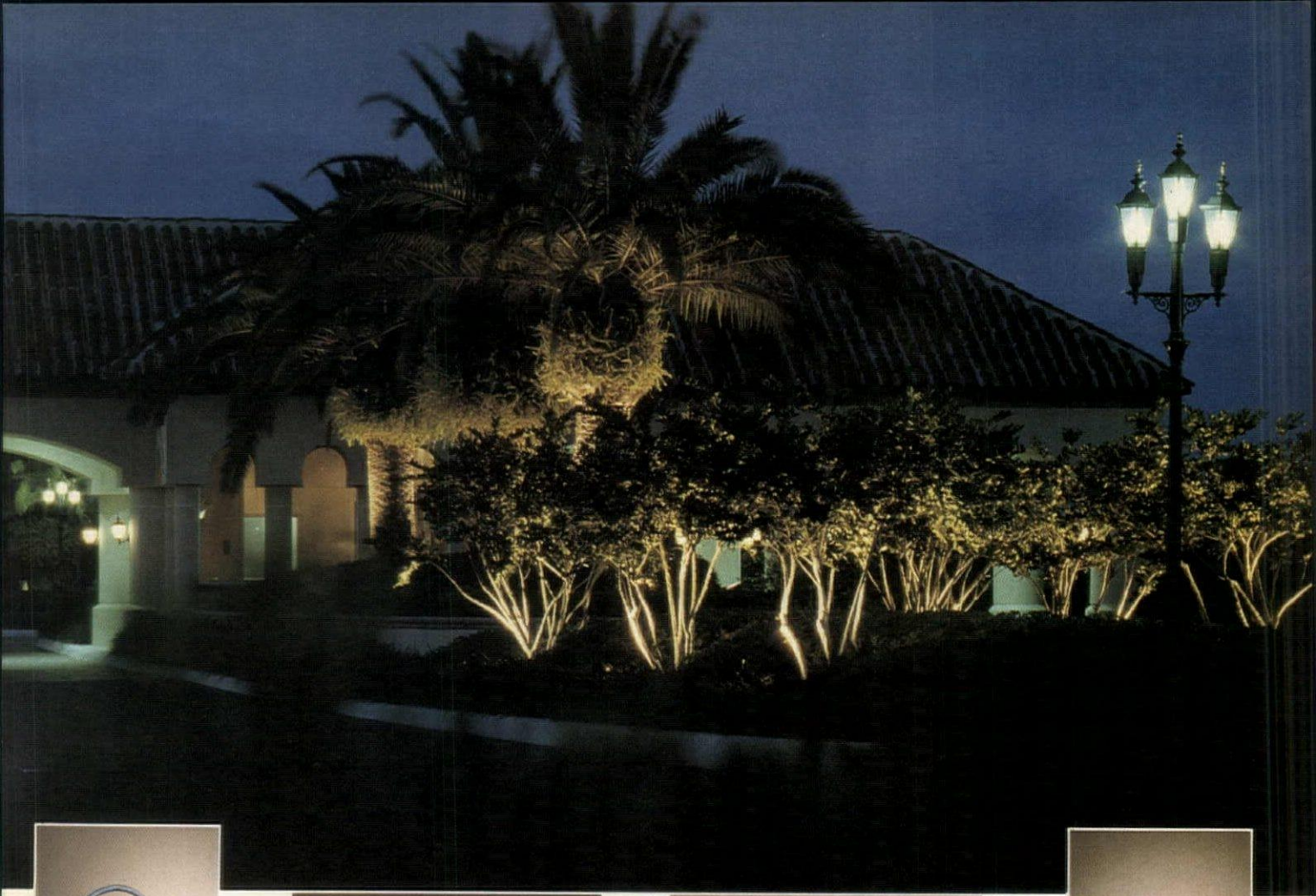

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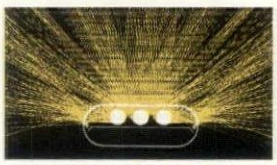

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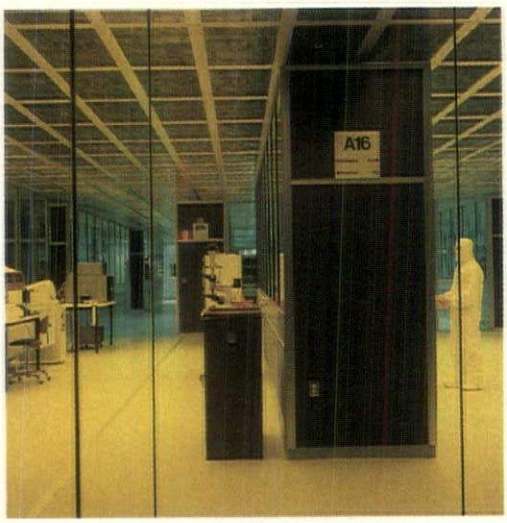
**Circle 6**

ARCHITECTURAL LIGHTING

**September 1988**
**Volume 2, Number 9**

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*The Designer's*

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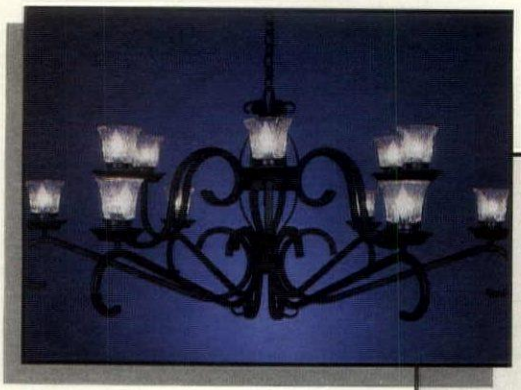

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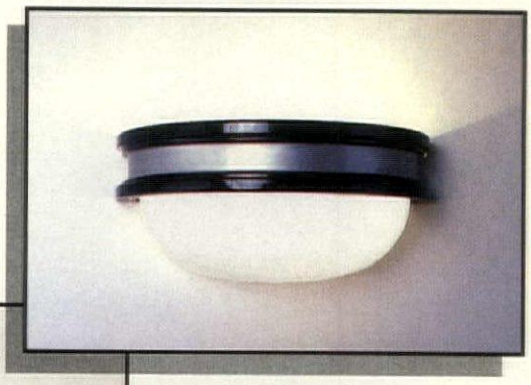

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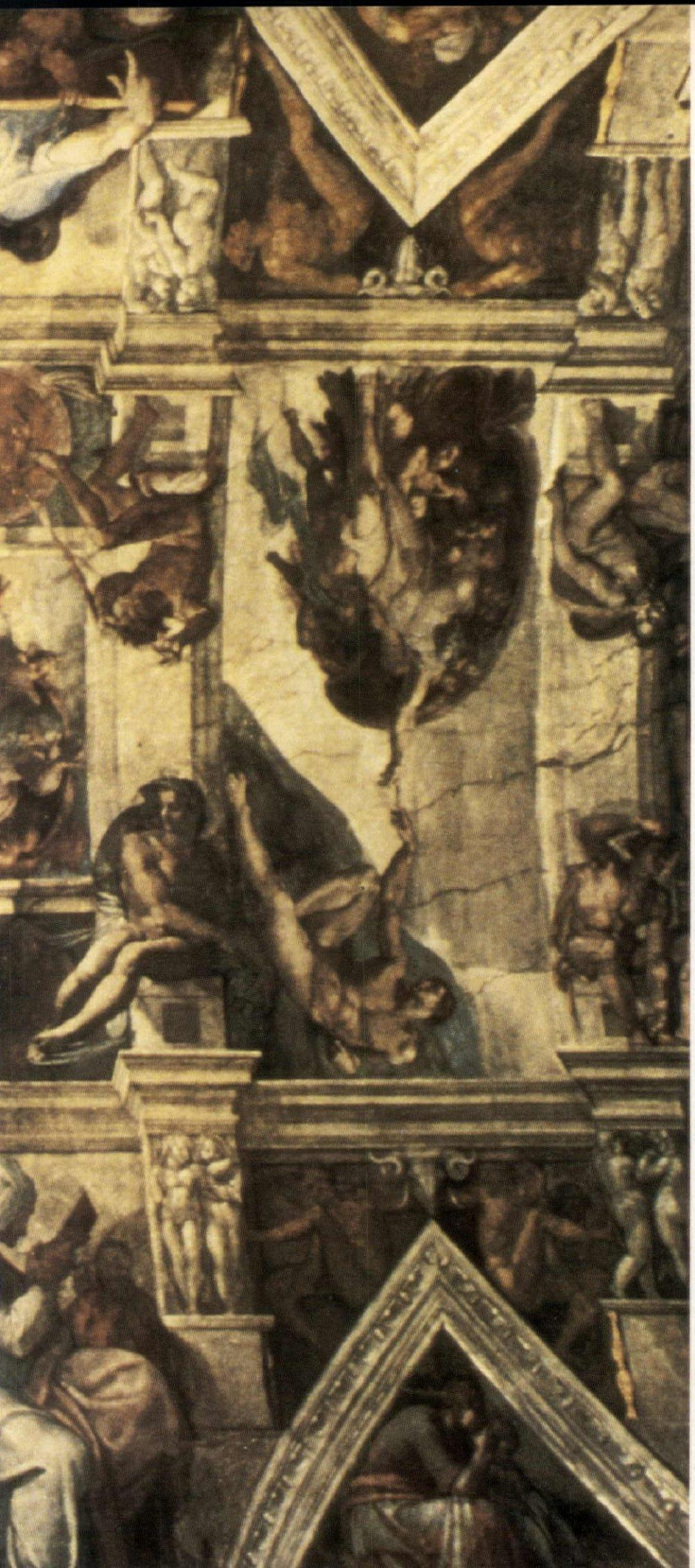

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Circle 8

# From the Editor

I hope all the furor created by our July *Showcase* issue has died down by now. No, we haven't permanently changed the magazine's size — and I want to put to rest once and for all rumors that the July issue was oversized because we put it on the wrong printing press by mistake. That's not true. We made it bigger intentionally.

We've had tons of reader response. I mean it. Tons. Some positive, some negative. And I've learned a great lesson from all of this: an editor cannot be cavalier about increasing the dimensions of a magazine, even for just one month. Editors must at all times seriously consider the consequences for the reading public. Even though those consequences may crash beyond the edges of the imaginable.

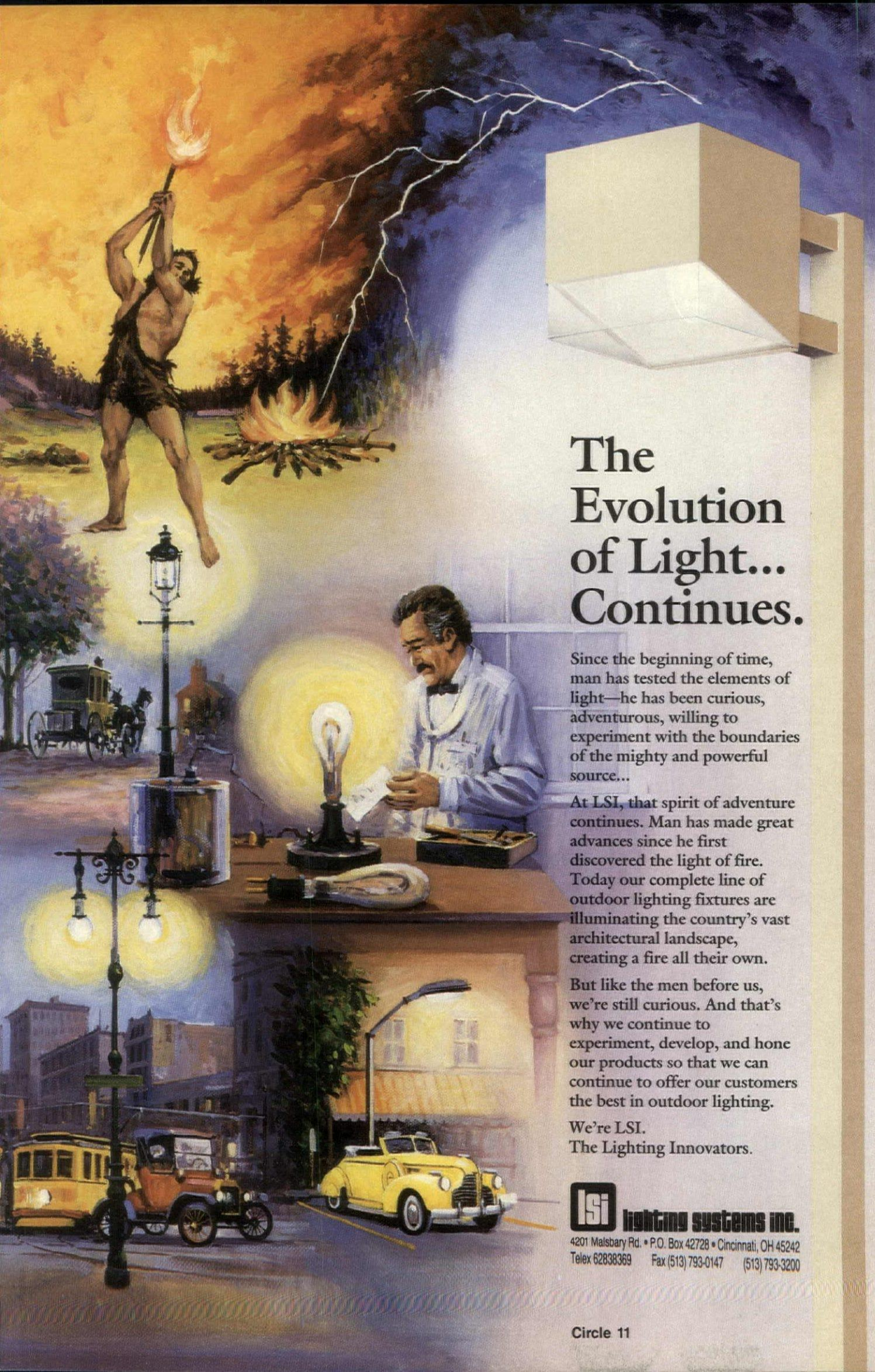
Take the case of architect Ludlow Borrscht. He phoned recently to ask, "What're you doing to us? This *Showcase* is big, kid. Really big. Too big to handle, too beautiful to toss. I called a charette to generate some creative storage ideas. Sketches were drawn, models built. Heated discussions ensued. I knew I was a marked man when suddenly, hot lead burst from a concealed mechanical pencil, striking me in the chest. By the time the graphite dust cleared, my top two designers had run out, leaving me in the lurch. And you know what? They took our only two copies of the *Showcase* with them."

That was typical. And, judging from the volume of mail we received on the subject, I've convinced myself that at least for one month, the biggest architectural lighting problem facing design firms in this country was figuring out where to put our oversized issue. And just for those of you who are still wondering, I've used my considerable connections with several top designers to come up with these solutions to the problem:

☐ Keep the *Showcase* issue in the "A" drawer of your flat file. "A" is for *Architectural Lighting*, of course.
☐ Attach the *Showcase* issue to the most important set of plans currently on file in the plan rack, for easy reference.
☐ Roll the tabloid up and keep it in a special tube with other nondisposable contract documents.
☐ Grasp the *Showcase* firmly with both hands, fold in half across the middle, place on shelf.
☐ Do not, under any circumstances, attempt to puncture the *Showcase* issue with a sharp object, as serious damage to the magazine will result.

And finally, get ready. In December's mail, you'll get another *Showcase* issue.

Charles Linn, AIA



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Circle 11

# Fiber glass poles a hole-in-one

**Project:** Gulf Golf
**Location:** Treasure Island, Florida
**Project Manager:** Ron Cromer, Shakespeare Company
**Photos:** Ron Cromer

Myron Gilcher knew he had to replace the light poles at his miniature golf course. "We're a block from the ocean, and the steel poles were rusting badly," he says. "They got so bad at the base I was afraid they'd start falling over on the customers. I put steel sleeves around them, but the sleeves started rusting quickly too."

But as he opened the job for bids, he dreaded the specter of heavy machinery and cement trucks rolling over his delicate links, planting more doomed steel, then leaving damage in their wake. Gulf Golf's success depends on the looks of its grounds. Fresh paint, trim lawns, structures and walkways with a dollhouse enchantment, and — the crowning touch — 155 rose bushes and a 12-foot-high philodendron turn a tour of the holes into a stroll through a prize garden. "Some of these plants are over 30 years old," he says. Gilcher himself has been close to the course for 25 years.

The benefits of fiber glass — light weight, low maintenance, noncorrosiveness — couldn't have better filled the bill. "It was great. The installation crew just came in, dug the hole, dropped the pole in, aligned it by eye, and filled in the dirt. It took about 30 minutes per pole. Nothing more than a foot away from the pole was disturbed, and you couldn't even tell that the next day," Gilcher says.

The nine poles chosen for the job were 30 feet long, with flared bottoms set in 5-foot hand-dug holes. The textured bronze finish blends with the landscaping, and the poles never corrode, lose their color, or need painting.

"The sun and salt air turn everything white here," he says, "so we painted the steel poles every two or three years. And it was a dangerous job. We'd tie a rope to the top of each pole and have two guys hold it taut; a third guy leaned a ladder against the rope and brushed the pole down."

Steel poles are, of course, used successfully in locations with high wind factors, particularly where corrosion is not a serious problem. The fiber glass poles, on the market only since 1968, come guaranteed to withstand winds up to 120 miles per hour with a gust factor up to 30 percent. Gilcher says his new poles weathered a storm that broke his neon sign tubes, with no noticeable swaying or bending. A simulated relamp from a ladder leaned against the pole met with similar stability.

"We couldn't be happier," Gilcher says. "They didn't tear up the course and the poles look great."

**—Mike Heffley**

*For product information, turn to page 70 and see Manufacturers.*

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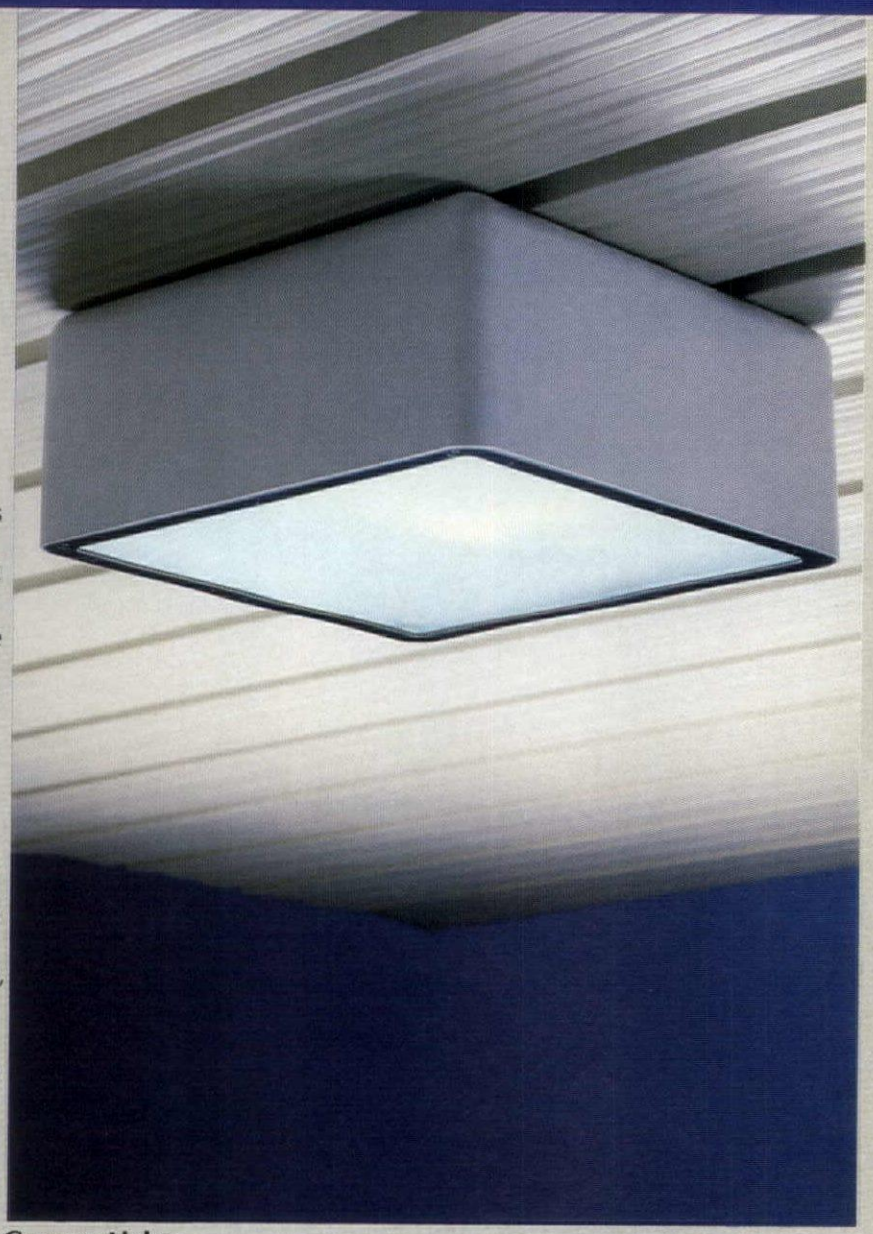

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Circle 12

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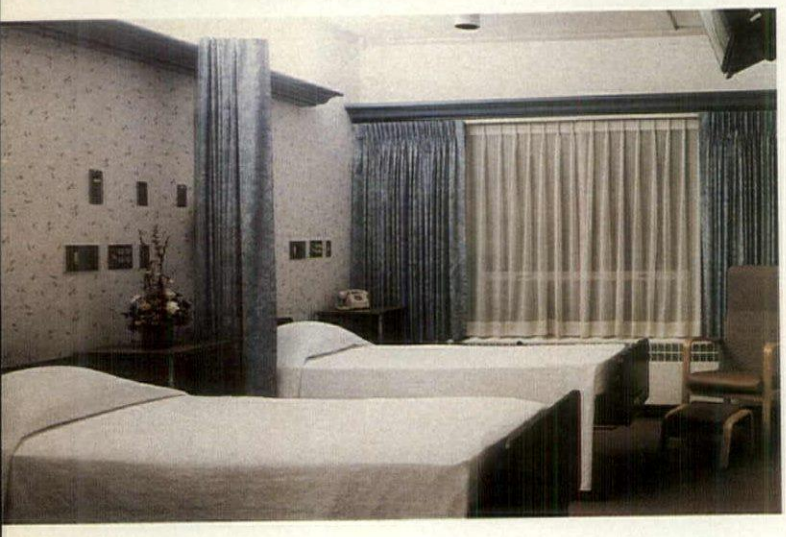
# Humanizing health care with pleasant, homey light



**Project:** Northwest Hospital
**Location:** Seattle, Washington
**Architect:** Waldron Pomeroy Smith Foote and Akira; John Jex, project manager
**Lighting Designer:** Lane Lighting Design
**Interior Designer:** Sari Graven
**Electrical Engineer:** Sparling and Associates, Inc.
**Photos:** Richard Springgate

"Hospitals are having to market so competitively these days that they can no longer afford the sort of clinical, institutional image projected by cold fluorescent glare. They're having to appeal to customers with a more human, homier image. Lighting is the key to that."

So says Sari Graven, the architectural interiors director with whom lighting designer Lori Lane worked on the lighting of Northwest Hospital's rooms for surgical patients. Graven expresses the client's top priority: humanize the place, for both patients and staff.

It was a challenge. The wing's floor was covered with 1960s linoleum; the walls were painted white, green, and orange; and the lighting was bright overhead fluorescent. In practical terms, *humanize* meant several things: indirect lighting where appropriate, optimum color rendition of patients' skin tones, a variety of switching options for patient and staff control of light levels, and incandescent task lights to supplement the general fluorescent illumination.

Lane decided the light level in the corridor should be strong at floor level, where new patterned carpeting might play tricks on people's eyes and cause them to stumble. She recessed continuous slot luminaires into dropped soffits perpendicular to patient room entrances, the most trafficked areas, taking care to keep the nurse call lights above the doors visible. She put long-life compact fluorescents in decorative wall sconces with a brass fixture housing that reflects a soft golden, incandescent-like color. Finally, she grouped three compact fluorescent wall washers together for soft illumination of poster prints on art display walls.

In the patient rooms, warm white fluorescents are installed in a wall-mounted uplight housing detail that is extended, sans lights, to conceal the drapery rods above the windows. The lamps are 4-foot tubes above each bed, each controllable by either its own bedside switch or a bank of switches by the door. Surface-mounted incandescent downlights above the beds can also be switched on and off as needed for examinations. Patients have their own incandescent reading lights, also switchable and movable. Near the sink area, there's even a residential-type incandescent lamp, which patients often turn on as their sole light source.

Because it is a hospital, care was also taken to finish the construction work as quickly as possible and to minimize future maintenance. For the lighting designers, this meant choosing long-life lamps and equipment that would be easy to install within the existing ceiling system. Total wattage of the project also met the King County energy code allowance of 1.7 watts per square foot.

Sam Deliganis, the hospital's director of support services, says, "The response has been great. The nurses and doctors say it's a more pleasant and efficient place to work, and the patients say it's a neat place to get well in."

**—M.H.**

*For product information, turn to page 70 and see Manufacturers.*

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**Circle 13**

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# Daylit atrium pleases permit pullers; cooling system real ice-breaker

**Project:** Kern County Public Services Building
**Location:** Bakersfield, California
**Architects:** David Milazzo, AIA; Milazzo & Associates Architects, in joint venture with Warren E. Pechin Architects, AIA
**Project Architect:** Bert James
**Electrical Engineers:** Cornelius Engineering
**Mechanical Engineer:** Charles Mistretta and Associates, Inc.
**Photos:** Mike Urbanek

As every designer knows, pulling permits can be a pain. But Kern County, California, provides a one-stop facility for that purpose in a pleasant, daylit atrium in its Public Services Building.

"The Public Services Building," says architect David Milazzo, "is where the police, fire, building, health, planning — all those kinds of agencies — are located. The atrium was a natural way to pull the building apart and to get more light in from the perimeter. The public is expected to use the atrium a great deal."

"In the atrium," adds project architect Bert James, "is the building, planning, and fire permit counter. Normally, when a person goes in for an office building permit, that person has to to the fire department, then to the planning department, and then go to the building department to get their approvals. All that can be taken care of in one stop at this counter."

Lighting in the atrium was designed with people's activities in mind. "We've given them really good, parabolic fluorescent lighting over the counter where the plan checking actually occurs. But where the customers are just waiting to get into line, we've given them daylight. Translucent fiber glass insulating panels allow the light through, but not the heat. And you don't have to have quite as much air conditioning," James says. "We didn't overlight it; the atrium is meant to be a place where there is enough light being transmitted into the space to let you get where you need to be and feel comfortable." The 2 3/4-inch panels specified by Milazzo and Associates have a white surface on each side, 17 percent light transmittance, and a shading coefficient of 0.14.

Elsewhere in the building, light shelves are used to bounce daylight deep into the building's interior, thereby reducing the need for electric lighting during peak demand periods. Double-glazed clear glass (2 feet, 6 inches high) over the shelves allows unobstructed daylight to bounce onto the ceiling. Below the shelves, view glazing is constructed of 4-foot-high, high-efficiency tinted reflective glass with 20 percent light transmittance and a 0.35 shading coefficient. Both sections of glazing are shaded during the summer months.

The use of light shelves is only one of several strategies the designers used to make the building energy-efficient. "We put in large ice-generation bins," says Milazzo, "that manufacture ice at night when electricity rates are substantially lower. During the daytime, pumps circulate water through the ice, and air blown over that chilled water becomes the conditioned air. By shading the glass, we eliminate a lot of the heat that could come in. By bouncing the light in, we reduce the need for electric lighting. Getting the loads down to a manageable level really makes the air conditioning system much more efficient."

**—Charles Linn, AIA**

*For product information, turn to page 70 and see Manufacturers.*

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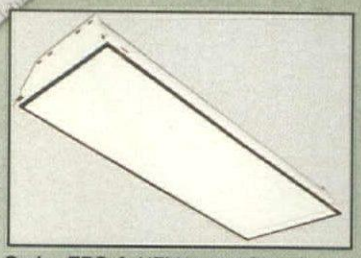
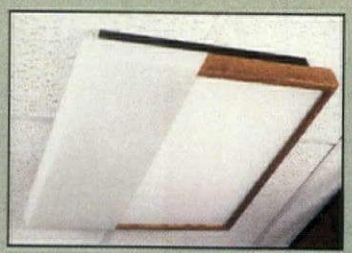
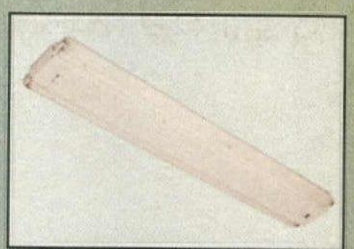


**Series EPG-A.** NEMA type "G" troffer, air-handling luminaire with floating door. 1/2" deep regress aluminum door with full reveal standard; flat door optional. Door frame hinges from either side and has fully enclosed, spring-loaded cam action latches.



**Series 25-28.** Surface or pendant mount with easily removable, cubed white acrylic diffuser. Solid oak wood diffuser frame is optional, and wireway cover removes without tools.



**Series SM76.** Surface or pendant mount with side-mounted strip lamps. Low-profile lighting available in rapid-start and slim-line models. Tombstone-type lampholders have plated contacts. Wireway cover removes without tools.

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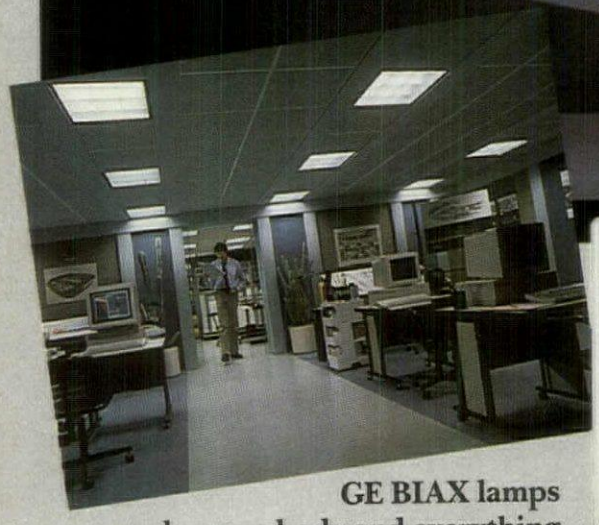

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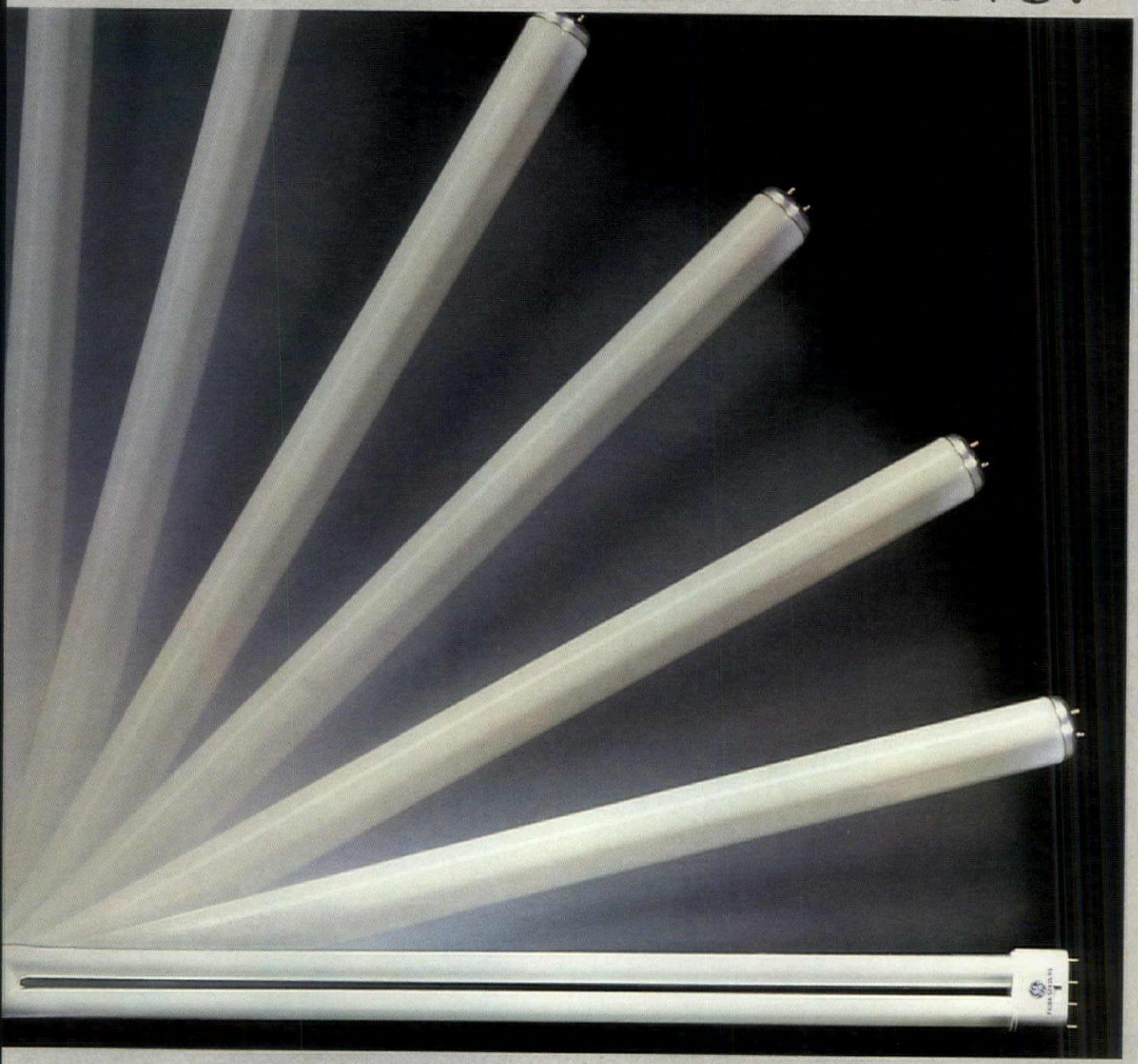

cents can, the lighting you design will make the environment and the people who work in it more attractive.

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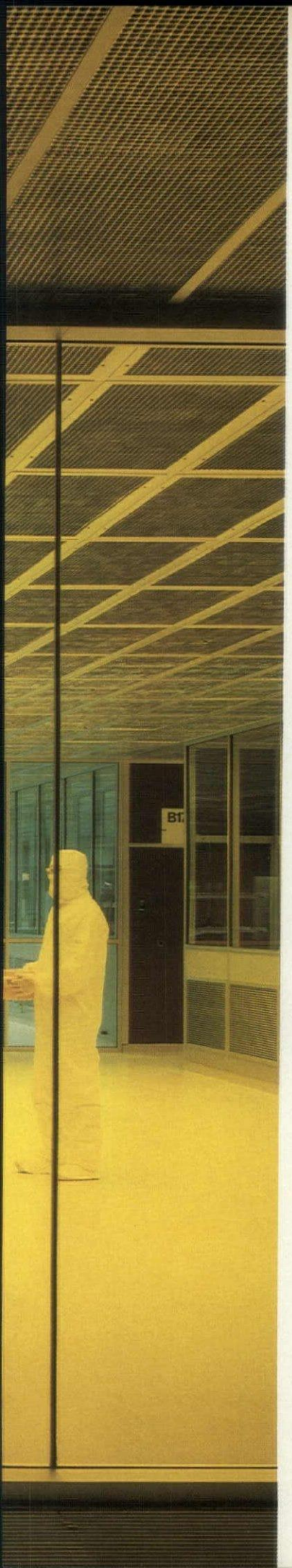


# Microelectronics clean rooms: Standard lighting for special facilities

**ARTICLE BY**
JAMES CRAVEN AND JOHN JOLLY

**PHOTOGRAPHS BY**
TIMOTHY HURSLEY, THE ARKANSAS OFFICE

Lighting design in a clean room is closely coordinated with the ventilation and filtration system. In fact, the luminaires often are actually integrated with air-handling equipment. To light these high-tech facilities, we use only two basic fixture types, both incorporating standard fluorescent lamps. There is definitely room for new technologies to expand and improve the selection of fixtures on the market.

A clean room is a rigorously controlled environment, much cleaner than a hospital operating room. This special type of facility is used in several industries, including microelectronics manufacturing and research. Silicon wafer materials are extremely sensitive to environmental factors; the cleaner the room, the higher the yield of top-quality microchips. During some operations, ambient light must be controlled to create a darkroom environment.

Typical lighting issues for microelectronics clean rooms are demonstrated in the Delco Fab III building — an advanced engineering and production facility with a 60,000-square-foot clean room enclosure. The clean area includes 35,000 feet of space designated Class 100, which means that airborne particulates 0.5 microns or larger are limited to an average count of 100 per cubic foot.

Because Delco employees spend so much of their time isolated in segregated work zones and gowned for contamination control, the architects were told to give high priority to humanizing interior spaces and providing amenities. At the same time, Delco expected the Fab III building to help shape its corporate image as a leader in advanced technology.

The first design priority for the clean room, which set the tone for the entire facility, was to provide visual release for those working inside. This sense of openness psychologically counters the physical sealing off

**Project:** Delco Fab III
**Location:** Kokomo, Indiana
**Client:** Delco Electronics
**Architects:** Anderson DeBartolo Pan, Inc. (ADP); Jack DeBartolo, Jr., FAIA, Robert Bracamonte, AIA, and Michael Stanley, AIA
**Structural Engineers:** Robin E. Parke & Associates, Inc.
**Civil Engineers:** Monical Associates, Inc.
**Electrical Engineers:** ADP; Robert Oakes, PE, and James Craven
**Lighting Designer:** ADP; John Jolly
**Interior Designer:** CHA, Inc.

*Visitors can watch operations in the sealed, glass-walled clean room (at left) from the perimeter walkways. At night, incandescent glow rings on sloped bulkheads add a touch of warmth to the perimeter break area (above).*

of the area that is essential to its functioning. Glass walls provide a visual link both to the outside and to contiguous work areas. They separate the clean room bays from one another, and they contain the whole area within large perimeter walks, from which visitors can view the interior. The glass walls also create potential reflection and glare problems for the lighting system.

Despite the unusual glass walls, our lighting solution for Fab III was similar to that for other clean rooms. We created a luminous ceiling of integrated modules that incorporate ventilation and filtration. Low-brightness louvers prevent distracting reflections on the surrounding glass. The system maintains 80 footcandles at 42 inches above the floor. The modules are carefully sealed to prevent air from the plenum from leaking through the fixtures or their mountings.

## Reliability Essential

Electronics facilities place top priority on reliable systems because a few minutes of downtime — anything that might cause a loss of product — could cost the company thousands of dollars. Any object brought into the clean room must undergo a special cleaning process. For that reason, whenever possible, equipment that needs maintenance or replacement is located in chases outside the room. At Fab III, that equipment includes remotely located fluorescent ballasts and low-voltage switching relays.

Inside most clean rooms, including Delco's, we use an integrated system that combines a high-efficiency particulate air (HEPA) filter and a lighting fixture in one modular unit. The HEPA filter–luminaire units are tested for airflow requirements. The Fab III filter units have four lamps apiece; they also include sprinklers and speakers where required. Modules are factory made to include the equipment configuration we specify, so they can be designed for best airflow.

The lighting layout covers the entire ceiling, creating a luminous plane, so the facilities manager can arrange equipment quite readily with modular panel systems and electrical systems. In this type of facility, however, remodeling is a major undertaking because the whole room has to be cleaned; the company usually doesn't make a lot of changes. No separate task lighting is necessary except specialized microscope lighting that comes with the equipment.

We seldom use surface-mounted fixtures in Class 100 or Class 10 clean rooms. The ventilation engineers want more than 90 percent ceiling coverage with HEPA filters, and they don't want the airflow disturbed. In a few facilities, we have used special surface-mounted fix-

tures that mount to the bottom of T-bars. These lensed fluorescent fixtures have a shallow teardrop-shaped profile that minimizes airflow disturbance. The lens is just barely wide and deep enough to get around one or two lamps. These fixtures take as little area out of the ceiling as possible, so they can be mounted between filtration units. The slim, shallow profile also means more glare and less efficiency than a fixture with a good lens and reflector.

## Energy Efficiency

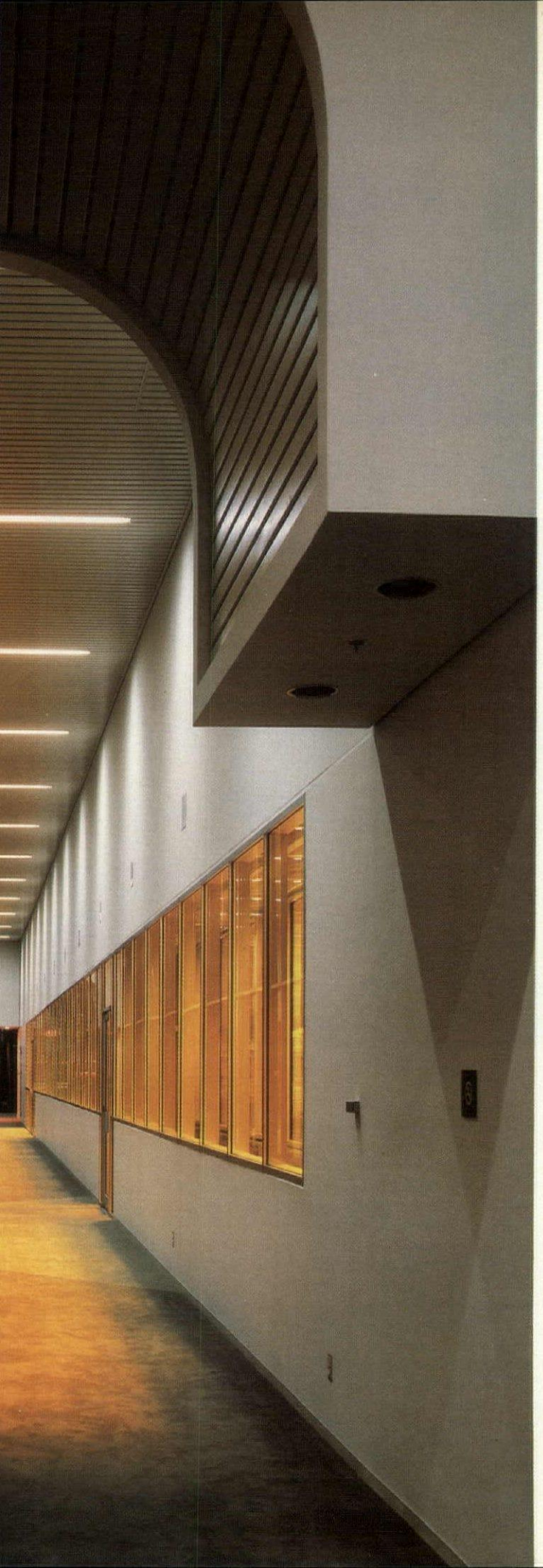
Automated control systems are usually inappropriate for clean rooms, although they work quite well in support areas. Most of the clean rooms we've designed operate 16 to 24 hours a day. The lights at Fab III are on 24 hours a day.

Manual multilevel switching is a good solution in some situations. For example, some clean room bays may not be in use throughout a complete shift. In that case, instead of shutting off the lights the staff can cut the lighting level in half. Sometimes the staff may need higher light levels for a particular step of an operation. Once they set up a process, they may be able to switch down to a lower level. We give them the ability to do that if they want to.

It's up to the staff to use the lights appropriately. Although a motion sensor system could be used, it's possible that air movement or someone in an adjacent bay could set off the sensor. A sensor system needs to be designed in close coordination with the eventual user so that the designer doesn't make erroneous assumptions about the light levels needed.

We always specify energy-saving lamp and ballast combinations. Fluorescent lamps are universally accepted in clean rooms, not only for their energy efficiency, but also for their fast starting and long life. Lamp selection, however, is limited by the choice of ceiling module. On one project, for example, our only choice was 6-foot lamps. That meant we were stuck with the slimline, which is noisier, less efficient, harder to get, and more costly than other fluorescent lamp and ballast combinations.

At Fab III, we had a standard 2-by-4 unit, and we specified 34-watt rapid start, light white lamps. We strongly recommend against using 32-watt lamps with cathode thermal cutouts. We learned this the hard way when an electrical contractor mistakenly installed them on one of our projects. When the lamps were switched off and then on within 60 seconds after an extended period of operation, they had to cool down and restrike, almost like HID lamps. Had the



lights gone down because of a power interruption and an emergency power system kicked in, that restrike time could have created danger and possible loss of product.

## Optical Control

Clean rooms require some specialized light control functions. For photolithography, a photographic process in microchip manufacture, a darkroom environment is required. Any ultraviolet or visible wavelengths below 500 nanometers degrade the sensitive materials. A special coating on the glass walls prevents white light from getting into Fab III's photolithography bays.

To filter fluorescent light from a bay's ceiling, however, we couldn't use a coated lens; that would stop the airflow through the HEPA filter. That left us with two choices: gold fluorescent lamps or colored tube guards. Gold lamps require long lead times for ordering replacements. They are expensive — the price for a 4-foot lamp can reach $20 — and we've seen uneven quality on them in the past. Sometimes a bit of the lamp end is clear, and an uneven coating might let white light escape. Some facilities prefer the lamp, but at Fab III we used the tube guard.

We've never seen a clean room lit with bare lamps. Everyone seems to use louvers, mostly for aesthetic reasons. The standard egg crate louver is white translucent plastic with a straight vertical blade. Given the high light levels at Fab III, the amount of ceiling coverage, and the incredible amount of glass in the facility, we believed a low-brightness ceiling would be much more comfortable and more aesthetically pleasing than the old egg crate. The client willingly accepted our selection of a paracube louver with a silver Alzak finish.

The silver paracube cuts glare and reflections on viewing windows between bays and on the show corridor and on instruments. It also adds to the visual appeal of the space; the crisp silver ceiling looks very high tech. The look is very important because Delco uses this facility as a showcase for visitors, who can view the inside by walking around the perimeter.

## Future Directions

The fluorescent fixtures we specify make the best of a difficult situation. HEPA filters cover 90 percent of Class 100 ceilings, which severely restricts ceiling layout and makes indirect lighting impossible. A more compact source would be nice, but then we'd have to worry about fixture placement and how well the lamp will maintain its lumens.

*The work bays for photolithography have yellow darkroom lighting, others have white light.*

We'd like to see a combination HEPA filter–luminaire that's more efficient than the ones currently available. Unfortunately, with the filtering medium above the lamps, any type of reflector would block the airflow. So efficiency for these fixtures runs between 25 and 30 percent. We hope that one of these days a manufacturer will come up with something a lot more efficient.

Although some manufacturers can work around them, narrow surface-mounted fixtures cause a problem for clean room ventilation because they extend down from the ceiling and into the airflow. A narrow metal channel is above the lamp, and there is little room for a reflector, so a lot of light comes out the side of the fixture rather than going down to the work surface. Still, the HEPA combinations aren't really controlling the light a whole lot better.

Improvements to other light sources and systems should be considered. Anything we can do to extend lamp life and make equipment more reliable is attractive to clients because it helps avoid production downtime and danger to the facility operators.

We are investigating the possibility of using low pressure sodium or filtered high pressure sodium in photolithography bays. It would be more efficient to generate yellow light with the lamp and ballast instead of generating white light and filtering out all but the yellow band. Although sodium lamp life is very good, we're concerned about restrike time and about how well the lamps would work with and without color filters. Also, sodium is more of a point source than fluorescent and wouldn't perform as efficiently above a louver. Low pressure sodium lamps for roadway lighting do come in lengths up to 4 feet, but the long ones are much too bright for indoor use.

Light pipe is another option. With it, the entire fixture can be outside the clean room, so maintenance people and equipment never have to enter the space and disrupt production. A specially designed extrusion on the lens or pipe would have to accommodate airflow. We have yet to try it.

We basically stick with standard, tried-and-true equipment types because we're not convinced the market offers anything better. Of course, if we could somehow get an efficient reflector that reduces the number of lamps required to obtain desired light levels, we could cut energy consumption and the cost of the unit. We're ready to see any reliable new system that increases airflow, uses energy more efficiently, and is marketable to clients. That could be the new standard of the future. ■

*James Craven is an electrical engineer and John Jolly is a lighting designer with Anderson DeBartolo Pan, Inc., an architecture and engineering firm headquartered in Tucson, Arizona.*

*For product information, turn to page 70 and see Manufacturers.*

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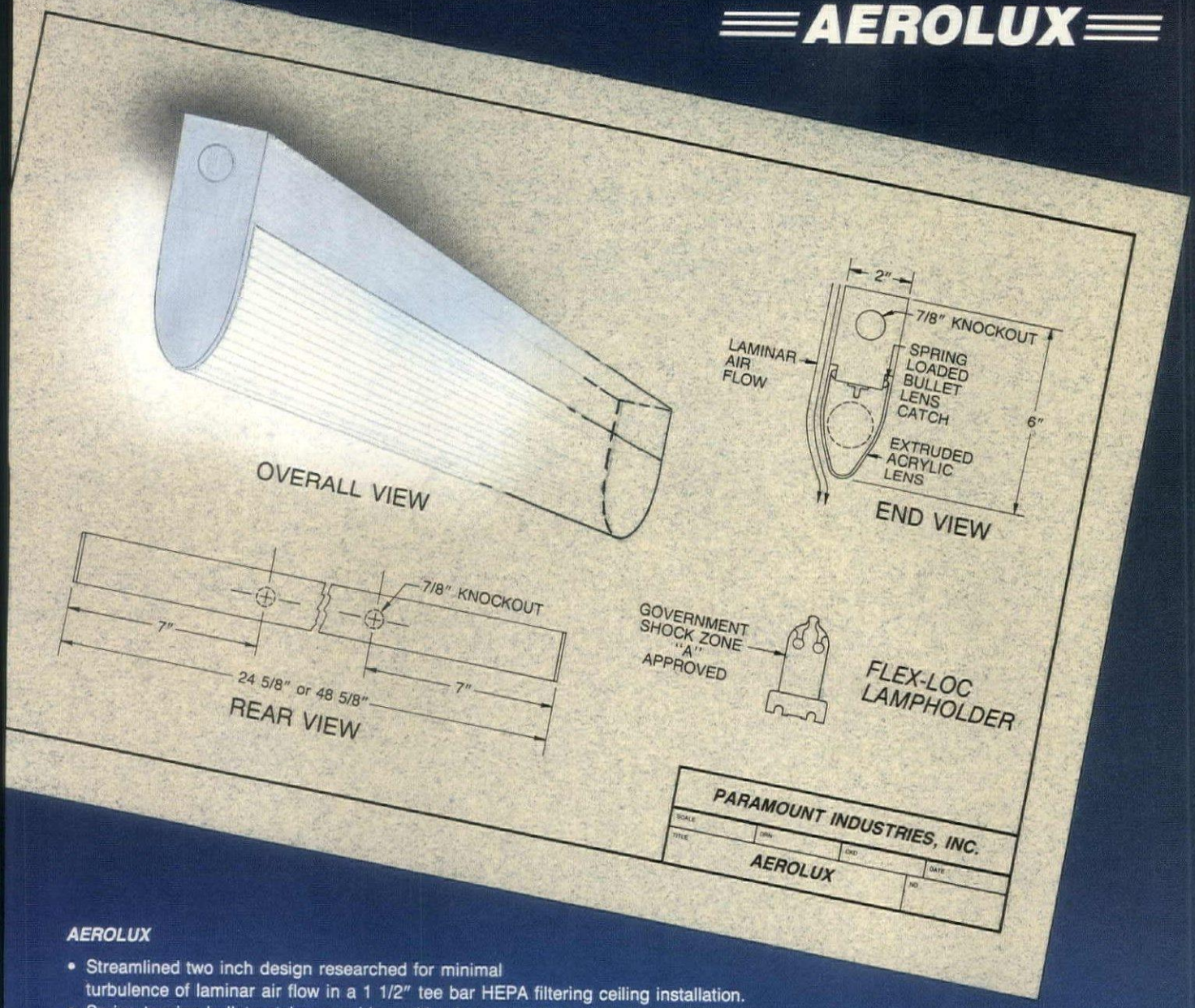


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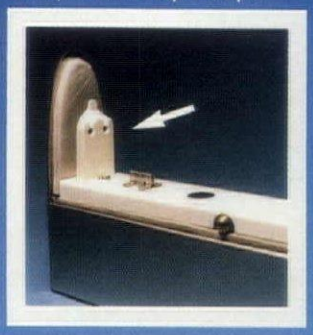

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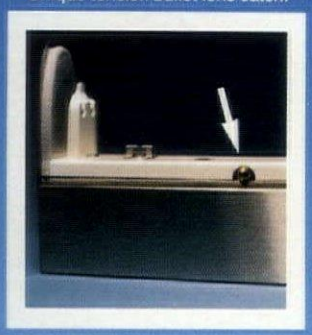

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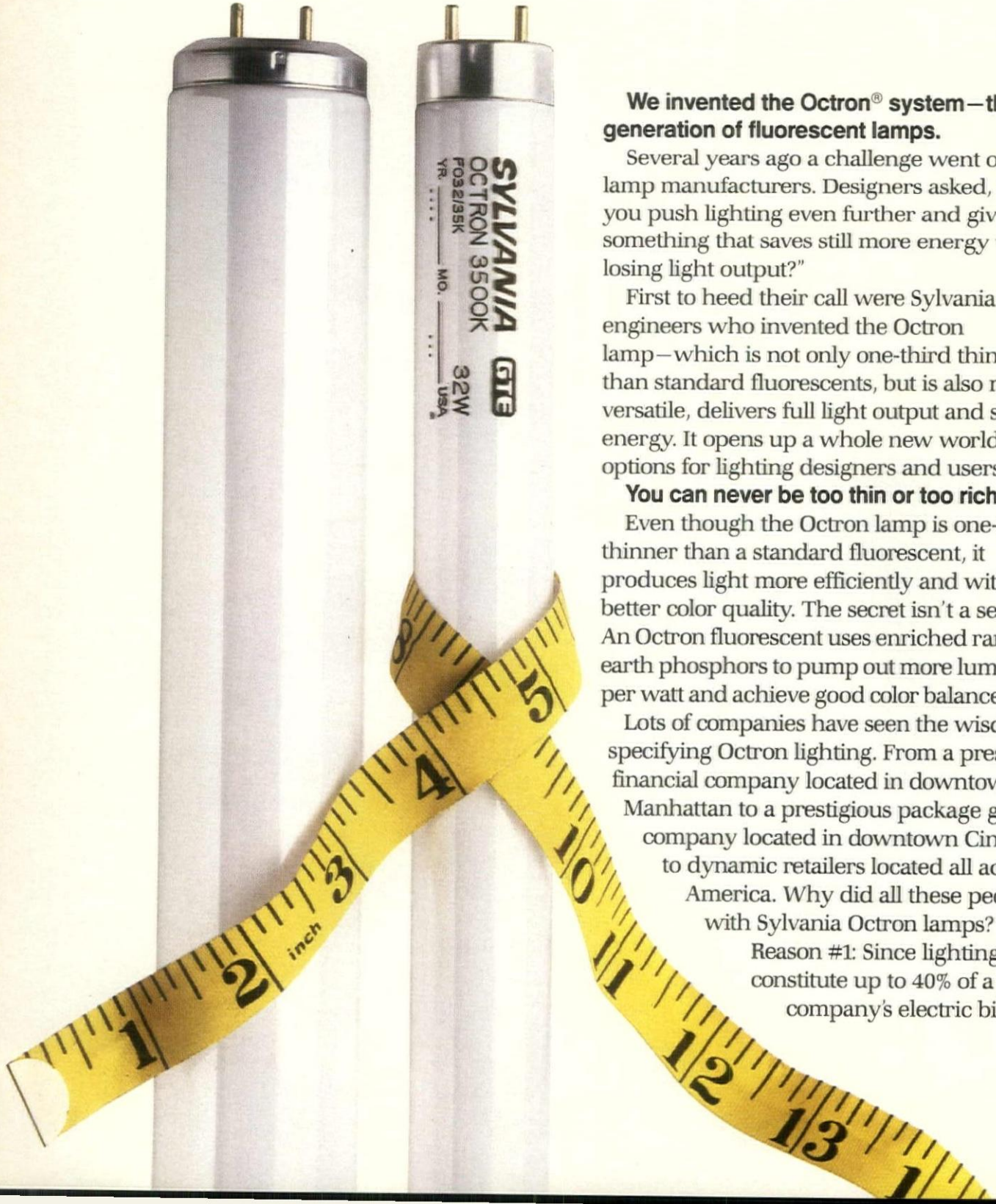


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Reason #2: People simply like the quality of Octron lighting better. A major university switched to Octron lamps and found their faculty and students used the facility more often and felt more relaxed than before. This says a lot about the comfort quality of Octron lighting and the way it accents subtle differences in colors and textures so important to successful interior designs of all kinds.

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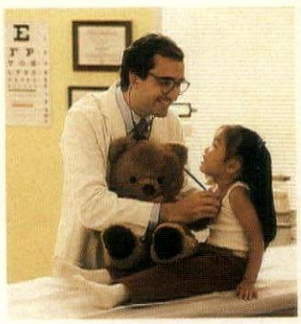

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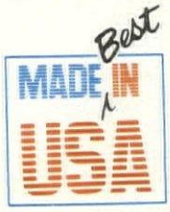


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Circle 17

# Collaboration brings space to life with color and contrast

A hotel ought to be a lively, interesting, diverting place for guests. But the Hotel Intercontinental Miami before its renovation — with nearly all the surfaces in its lobby of beige marble — reminded lighting designer Craig Roeder of a mausoleum. Roeder and interior designer Rita St. Clair collaborated to bring the space to life with vivid colors, including bold colored lighting.

"We walked into — the closest thing I can think of is a Moscow subway station," St. Clair recalls. "The floor was travertine, the walls were travertine, the ceiling was painted white and a travertine color. Sitting in a tiny pool of water in the middle of this enormous space was a Henry Moore sculpture. And guess what it was made of: Travertine."

**Gareth Fenley**

*Gareth Fenley is senior assistant editor of* Architectural Lighting.

St. Clair transformed the monochromatic lobby into a colorful, popular hospitality space where hotel guests can enjoy cocktails. To provide a better setting for the sculpture, she introduced landscaping, a larger fountain, and new lighting. Adjacent to the lobby she designed a new restaurant. "Bright Miami colors" are splashed on furnishings and custom carpet throughout the spaces.

By day, an enormous triangular skylight illuminates the lobby — projecting intriguing shadow patterns through the palm leaves to introduce contrast and visual interest. Huge white canvas umbrellas shield guests from the fierce Florida sunlight. At night, the umbrellas glow with turquoise and magenta light. "They become like flowers in a fantasy space," St. Clair says.

Roeder was originally called in to light the Moore sculpture. "I called Craig because he knows how to manipulate light and color to create form," says St. Clair.

St. Clair wanted to differentiate the sculpture from the other pieces of travertine. "We wanted it to look different from every other marble surface in the

*The lighting designer used gels that pick up colors from new furniture and custom carpet.*

**Project:** Hotel Intercontinental Miami at Miami Center
**Client:** Miami Center Holding Partnership
**Location:** Miami, Florida
**Architect:** The Russell Partnership Inc.
**Landscape Architect:** Albert Perez & Associates
**Interior Designer:** Rita St. Clair Associates, Inc.
**Lighting Designer:** Craig A. Roeder Associates, Inc.
**Electrical Engineer:** McDowell-Johnson-Helmick Associates
**Photos:** Dan Forer

lobby," Roeder says. "We used white lights with just a little amber gel to pop it forward a bit." Lending additional sparkle are reflections from underwater lights dancing on the surface of the pool.

St. Clair was initially apprehensive about the vivid colored lighting Roeder proposed for the umbrellas. "I use a lot of color — I'm basically a colorist — but I seldom use colored lighting," she says. "Usually I don't need it to enhance the spaces I design. But in this case, I did not color the surround. When Craig wanted to use colored light, I was afraid of his color range, not knowing what these gels would do. I felt at first that they would compete with the color of the carpets and the furniture."

Roeder chose shades from St. Clair's own color scheme for the umbrella highlights. "Rita was a little nervous about it," he remembers. "A lot of people are scared of colored light. On this project, I just made sure that the equipment could hold color filters, and when I put the color in she said, 'Yes, that's it.' "

Torcheres in the lobby relate to the umbrella forms. St. Clair picked them out, along with other luminaires such as the task light on the concierge desk. "We let the interior designer select all decorative fixtures," Roeder says.

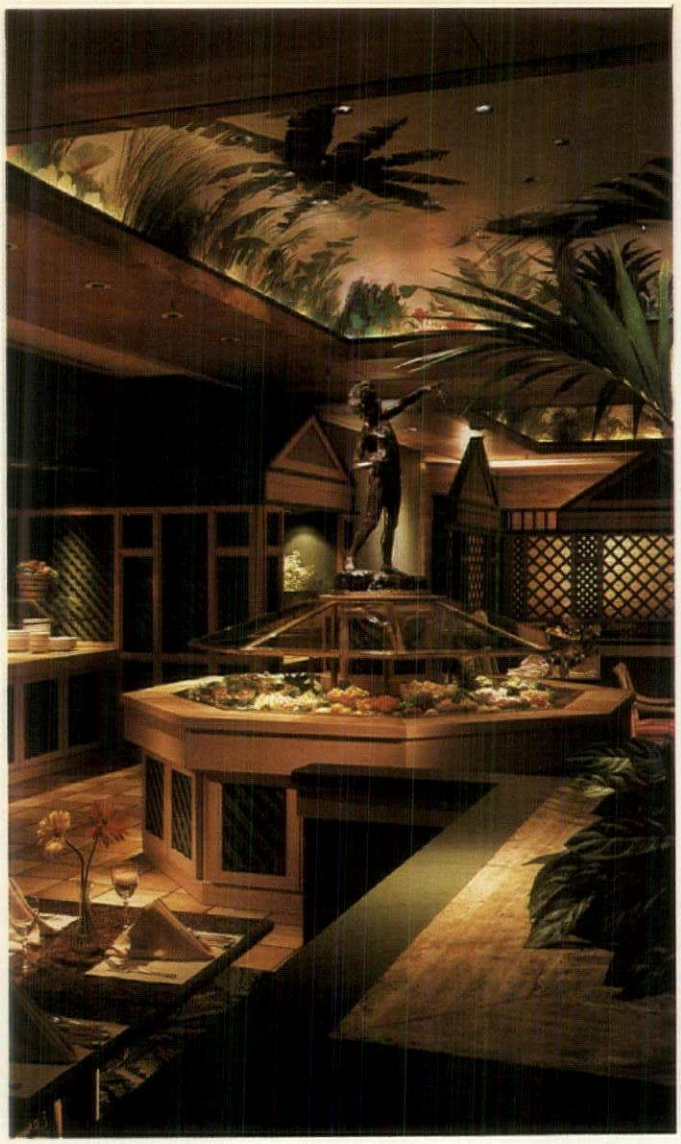
## How It's Done

Mounting positions in the existing ceiling for the ambient lighting fixtures, including the color spots, were restricted to plaster bands that represent only about 15 percent of the ceiling area. Most of the lobby lighting is mounted in a four-circuit track installed in a strip around the skylight aperture. In other lobby areas, and in the newly constructed restaurant, Roeder used recessed MR16 fixtures.

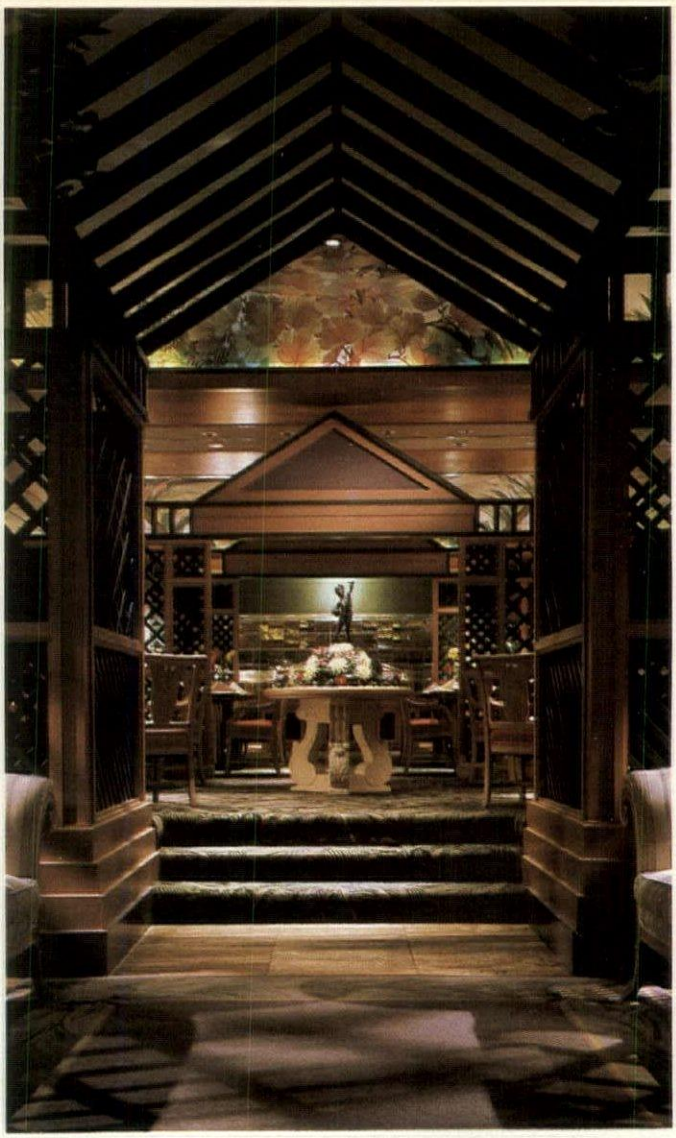
Cove lighting in the restaurant changes from white to blue after dark. St. Clair explains, "I wanted to light the coves brightly in the daytime, then have them go very dim at night. Craig suggested using blue light on the ceiling. I don't usually like blue ceilings, but he calibrated the color so that it looks like you're looking at a dusk sky."

For cost-effective, smoothly dimmable cove lighting, Roeder used simple incandescent lamps. "Most of the designers we work with just want a nice

*Palms, umbrellas, and colored lighting bring life to a lobby that once looked like a marble mausoleum.*



*To set a nighttime mood, cove lighting in the new restaurant fades from white to blue.*



*Lattices and recessed low-voltage fixtures create intriguing shadows in the restaurant.*

incandescent cove," says Roeder. "This one is done with little 25-watt A lamps on 6-inch centers. They're set in a two-circuit track, and every other lamp is blue. In the evening, we just do a long time-fade from the white to the blue lamps. There aren't any hot spots, and the whole thing has a beautiful soft glow and sparkle to it.

"The advantage of incandescent cove lighting is in the dimming," Roeder says. "You just can't cost-effectively dim fluorescent lights to a low level for the evening hours. Most owners would rather pay for a little more air conditioning than spend up to $100 apiece on good dimming ballasts."

A preset dimming system adjusts lighting levels in the lobby and restaurant to settings for day, foggy day, night, and late night. All lighting is low voltage, and maximum power never exceeds 80 percent (except for the cleaning and maintenance setting). The total lighting system load is only 0.9 watts per square foot, accomplished on a budget of $7 per square foot, "which is exceedingly low for this type of installation," Roeder notes.

## Collaboration

"I'm a great devotee of good lighting designers," says St. Clair, "because I think good lighting can either make or break a space. At one time, we did a lot of lighting ourselves, more than most interior design firms. But now technology has far surpassed anything that we might be able to accomplish in house, unless it's a very simple job."

She says, "It's simple to figure out how many lumens you need to read a book." When it comes to creating moods, she thinks a designer or architect is foolish to get someone who has only the engineering ability, recommending instead "someone who's got the flair and the gift of visualizing and understanding what a designer wants."

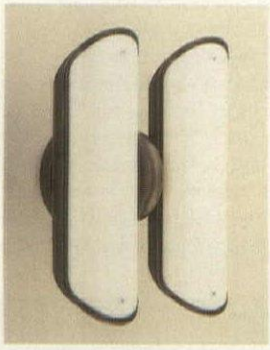
When working with another designer, she says, "the one thing that creates more problems than anything else is personal ego." She likes to work with lighting designers like Roeder, who don't try to design the space — people who offer her ideas but who don't launch a tiresome campaign if she decides not to use them.

St. Clair says, "I conceptualize work; I can express it in drawings, and I know where to find a team. The thing that I can do best for the client is to pull a team together, and make sure that team's going to see everything in the same way, and is capable of producing. I think it's high time that professionals realize that, if we're going to utilize all that's available of today's technological marvels — the arts and the crafts available to us — the days of the universal designer are gone. The *team* then becomes the designer." ■

*For product information, turn to page 70 and see Manufacturers.*

# Progress Ovalla® Lighting
# Designed to be designed

**The Innovative Ovalla Lighting System.** It builds with components to afford a designer versatility for indoor and outdoor applications. Contemporary and functional, Ovalla lighting is designed to be designed.



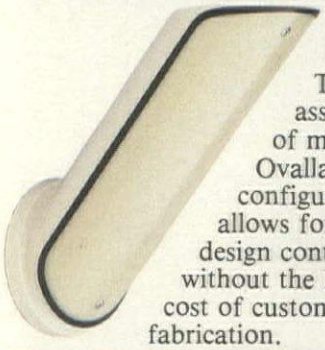
**The Ovalla Look.** Each durable, clean-lined cast aluminum light pod is sleek, smooth and substantial. The diffuser is shatter-resistant, UV stabilized polycarbonate.

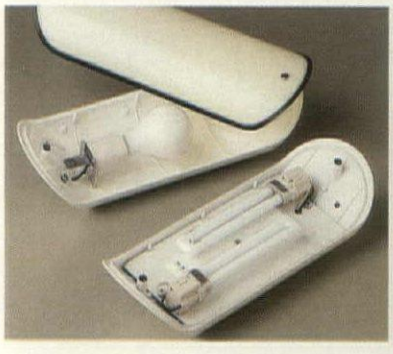
**Pedestal, Bollard or Post Mountings.** Three slim-profile, extruded aluminum uprights enable use both indoors and outdoors at pedestal, bollard or post heights...in a variety of one and two-light configurations.

**Choice of Three Finishes.** White, black or bronze. Ovalla components are electrostatically powder-painted and oven-baked for a durable, chip-resistant finish which resists even the corrosive effects of seaside salt air.

**On Walls and Ceilings.** Modular light pods mount in many one and two-light combinations on walls and ceilings, indoors and outdoors.

**Design Continuity.** The wide assortment of modular Ovalla configurations allows for unique design continuity without the high cost of custom fabrication.



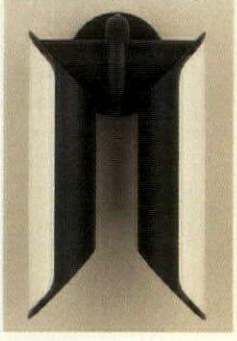


**Incandescent or Fluorescent.** Each of the Ovalla light pods is available as a 75W incandescent or as a 2-lamp 13W compact fluorescent (PL13).

**Horizontal, Vertical or Angled Mountings.** Three modular light pods offer a variety of different mounting options for a wide range of horizontal, vertical and 45° angle configurations.




**UL Listed for Wet Locations.** Extend Ovalla's design continuity from exterior walkways, driveways, landscapes, steps and parking areas to corridors and public spaces inside hotels, stores, apartments, restaurants, office buildings, and malls.



**For More Information:** Complete specifications for Progress Ovalla lighting are available from local distributors or Progress Lighting, Box 12701, Phila. PA 19134.

PROGRESS®
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LIGHTING SYSTEM

# Stadium lighting pays off for city, sports fans

**Gareth Fenley**

*Gareth Fenley is senior assistant editor of* Architectural Lighting.

Energy conservation pays off fast in San Diego, where the electric rate is the second highest in the United States — 12.5 cents per kilowatt-hour. The energy-efficient new system at multipurpose Jack Murphy Stadium, installed in time for the 1988 Super Bowl, saves the city enough electrical energy dollars to pay back the initial cost in less than four years. The luminaires perform as expected with no surprises, as verified by special advance testing.

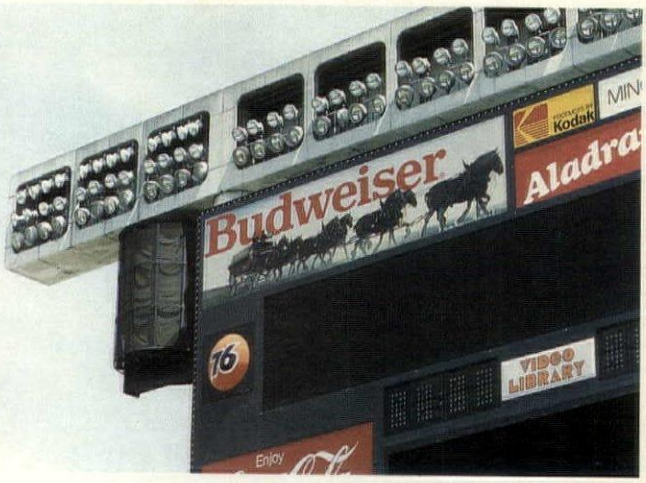
Ray Broady, president and chief designer at Creative Lighting, developed the new system. It had to be installed during a six-week period between sports seasons. If the project ran past deadline, or if the equipment functioned improperly after installation, the city would face a scheduling nightmare. One local official joked that if the lighting wasn't working on time, he'd have to leave town.

"We had to satisfy the needs of everyone from Padres baseball and Chargers football to the local high schools and colleges that also use the stadium," Broady recalls. "We also had to consider TV networks, photographers, spectators, special event promoters, and the maintenance people who work there."

The stadium's 20-year-old original lighting system was past its prime. It operated with 365 5000-watt incandescent lamps and 800 1000-watt metal halide lamps. The short-lived incandescents frequently burned out, so the city had to maintain a large — and expensive — lamp inventory. Even with ongoing maintenance, the deteriorated system provided poor illumination levels.

Broady's design team used in-house computer capability to develop a better fixture layout and new performance specifications. "We evaluated a number of light sources for the project," says Broady. "We picked metal halide because it offered high-quality color rendition and good com-

**Project:** Jack Murphy Stadium
**Client:** City of San Diego, California
**Lighting Designer:** Ray Broady, Creative Lighting
**Photometric Testing:** Lighting Sciences Inc.
**Electrical Contractor:** McCain Electric Construction
**Photos:** David Monley


patibility with TV specifications. That was especially important for the Super Bowl. Then, for the luminaires, we needed a NEMA Type II symmetrical distribution that could handle a 146-foot mounting height and throws of up to 480 feet."

The system was publicly bid, and no substitute equipment was allowed once the contractor was selected. Key requirements for manufacturers included previous stadium lighting experience, documented equipment performance, readily available initial and replacement lamps and luminaires, and competitive pricing.

To ensure that all manufacturers were given a fair chance for competitive bidding on the contract, Broady recommended independent photometric testing. "The city wanted to make absolutely sure that the project would be bid on the basis of objective performance data," he says. "To ensure no bias in luminaire selection, we used an independent laboratory to evaluate the 12 major manufacturers on our preliminary list. The results in some cases differed significantly from the manufacturers' published photometric data. One manufacturer even revised its literature after learning, from the tests, that its published photometrics had been wrong for years. Based on the test conclusions, we cut the list to four manufacturers who competed for the contract."

The new system incorporates 676 1500-watt metal halide floodlights set in a ring atop the stadium and the scoreboard. An activated charcoal filter in each fixture helps keep bugs and dirt out of the optical assembly, reducing cleaning and other maintenance. The three-phase, dual 208/277-480 volt system is controlled by a preprogrammed master controller. For emergency lighting, the system retains 100 of the old incandescent fixtures.

Broady customized an aiming device for the fixtures, based on a similar gadget he'd seen years before. He mounted a nine-power variable rifle scope on a removable bracket that slips into fittings on top of each luminaire. The scope allows extraordinarily precise aiming. "With the throws we faced, a 1-inch error in aiming meant a 40-foot error on the ground," he notes. "That's why precision is so important."

In addition, so that the system would always be properly aimed, Broady produced a tab for each luminaire that shows its identification number, zone location in the system, panel and circuit numbers, and X and Y values for aiming.

"With the new lighting, the city cut electrical energy use 66 percent and got a payback of 3.8 years from reduced energy expenses alone," Broady concludes. And with the independent testing, the city got peace of mind. ■

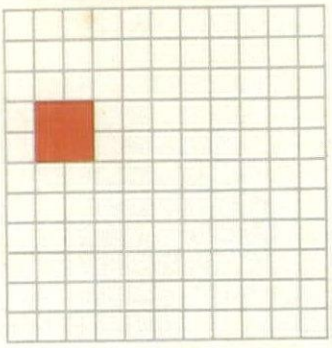
*For product information, turn to page 70 and see Manufacturers.*

**Jack Murphy Stadium lighting**

| Use | Horizontal lighting: Footcandles at camera | Horizontal lighting: Uniformity ratios | Vertical lighting: Footcandles at camera | Vertical lighting: Uniformity ratios | Number of fixtures |
|---|---|---|---|---|---|
| **Professional baseball** | | | | | 630 |
| Infield | 300 | 1.07:1 | 350 | 2.2:1 | * |
| Intermediate outfield | 250 | 1.35:1 | 300 | 3.0:1 | * |
| Outer outfield | 175 | 1.4:1 | 250 | 4.0:1 | * |
| **Professional football**** | 275 | 1.1:1 | 325 | 2.2:1 | 498 |
| **College football**** | 150 | 1.1:1 | 175 | 2.2:1 | 280 |

**630 total fixtures for baseball lighting.*
***Playing field and 10 feet at all sidelines.*
*Data are for both original specifications and completed system.*

# Lighting Graphics



## Fluorescent wall bracket and lighted shelf

**Sam Mills, AIA, IES**

*Sam Mills is an architect and lighting consultant with his own firm in Oklahoma City.*

The old standby 3-foot and 4-foot rapid start fluorescent lamps continue to serve a special purpose in architectural lighting in spite of the fact that many new, more efficient compact light sources are available to lighting designers. Their ability to be installed in tandem to furnish lengths in any 1-foot multiple (except 5 feet) makes them ideal for built-in linear architectural lighting elements, and one of the new, more efficient lamps is available in a 5-foot length. It is one of a new group of rapid start lamps that uses a T8 tube (1 inch in diameter) instead of the conventional T12 tube ($1\frac{1}{2}$ inches in diameter).

Most built-in architectural lighting elements are characterized by their indirect distribution of light. They rely on the reflection of light off other architectural surfaces, with the final distribution having a non-directional and diffuse quality. The custom-built feature of this type of lighting also offers the opportunity for special detailing and integration with the architecture and interior design.

*Successful fluorescent bracket lighting is dependent upon proper lamp selection.*

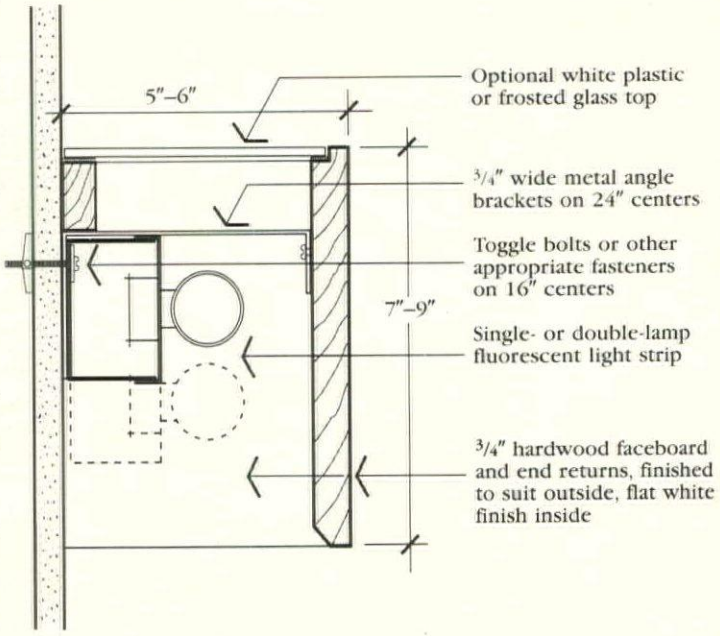
The February 1988 Lighting Graphics column featured a custom designed fluorescent wall bracket that furnishes indirect general lighting and direct task illumination. The accompanying drawings show a similar design mounted lower on the wall for improved task lighting with a decorative glass shelf top.

The success of both of these lighting installations depends heavily on proper lamp selection — a job that has become increasingly more difficult with the current proliferation of fluorescent lamp types, sizes, and colors. For most architectural applications, it is important to coordinate the color qualities of the light with other fluorescent lamps used in the same space. If different colors of white light are used where they can be viewed at the same time, both colors may appear unnatural and undesirable. It's also important to use lamps with good color rendering characteristics to make skin tones look normal and colors reflect their true spectrum.

A color rendering index (CRI) is used to rate this characteristic of different lamps. It is based on a scale of 100; values between 70 and 100 are considered good to excellent. This rating, however, is only relative and is applicable only when applied to lamps in the same range of color temperatures. For a more complete explanation, see November 1987 Lighting Graphics.

Six fluorescent lamps with good color rendering charac-

*Lighted low wall brackets provide light with a soft diffused quality and both indirect general lighting and direct task illumination.*




**Wall bracket cross section**

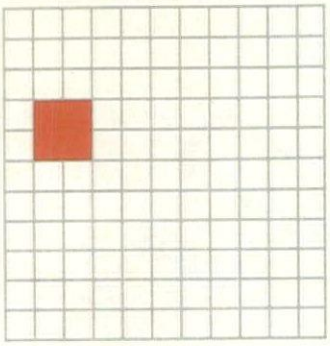
teristics should be considered for this application: in the warm range, incandescent-fluorescent (IF), warm white deluxe (WWX), and 3000K or 3100K; in the cool range, cool white deluxe (CWX) and 4100K; 3500K is sometimes identified as the neutral range. The accompanying table lists characteristics of these lamps for comparison.

*If different colors of white light can be viewed at the same time, both colors may appear unnatural and undesirable.*

Notice that similar lamp colors have approximately the same light output per foot of length for 3-foot, 4-foot, and 5-foot lamps. This is desirable for a uniform lighted appearance. Two-foot lamps are also available, but are not recommended in the T12 types because their output per foot is noticeably less than the others and they are not the rapid start type. If the lamps are to be dimmed, it is desirable to use lamps all of the same length for the most satisfactory dimming performance.

Future columns will show other architecturally integrated lighting elements such as lighted cornices, soffits, coffered ceilings, coves, and other special items along with complete details and a discussion of their important features and characteristics. ■

# The Lighting Design Professional



## The art of control, Part II: Architectural energy management

**James R. Benya, PE, IALD**

*James R. Benya is senior principal and CEO of Luminae Souter, San Francisco. He is on the faculty of California College of Arts and Crafts, is active in IES and Designers Lighting Forum of Northern California, and teaches lighting design classes for the ASID, IBD, and AHLI.*

Although good lighting design manages energy use wisely with all components, controls are the real design challenge of the 1990s. Conservative estimates suggest that a comprehensive program of control devices can save 30 percent of the energy a building consumes, no matter how efficient its lighting system.

Rising energy costs throughout the 1970s and 1980s have brought lighting under close scrutiny as owners seek ways to trim building operating costs. Although energy prices have stabilized, lighting still accounts for 5–10 percent of the total cost of owning and operating an office building in the United States. Annual energy costs for lighting a typical high-rise range from 50 cents to $2 per square foot, and pose attractive opportunities for conservation and savings.

Energy conservation is now mandated by some state and local codes, but financial benefit remains the strongest motivation. Building managers and engineers usually measure the effectiveness of an energy-saving scheme in terms of its *simple payback,* or the number of years it takes after the investment for savings to repay the initial expense. In mathematical terms, simple payback (in years) equals the cost of the scheme divided by annual energy savings (in dollars).

*Control systems can save 30 percent or more of the energy a building consumes.*

Although there are many more sophisticated techniques for financial analysis of investments, most corporate decision makers want engineers to use simple payback because income taxes, interest rates, and other factors complicate the calculations. Prudent real estate managers establish simple payback periods that offer low risk and high performance. A developer, for example, usually requires extremely fast payback because badly needed cash is hard to get at the beginning of a project; the government can afford a longer period.

### Two Parts of Cost

The rate paid for electric service is composed of two parts. *Demand* represents the maximum instantaneous power draw on the utility, and *energy* represents the actual energy consumed. A utility must design its grid and power plants for the total demand of its customers. Very few electric customers use power evenly throughout the day and night; typically, demand peaks from 11 a.m. to 7 p.m. on a hot summer day.

*To cut lighting energy costs most, focus on indoor lighting that runs during expensive peak hours.*

Progressive public utilities commissions are allowing utility companies to charge heavily for demand, thus discouraging increased demand and keeping the need for new plants to a minimum. Energy charges, which account for the actual pro rata cost of fuel and related operating costs, stay relatively low in this situation.

Lighting, interestingly, appears to be mostly an off-peak use of energy. Outdoor lighting, for example, normally operates after 7 p.m. and before 11 a.m. Many utility companies now offer low energy charges and no demand charges for night lighting, for they have spare power at night and not much to do with it. It makes very little sense to cut outdoor lighting operations to reduce energy costs. Instead, it is best to focus on costly demand charges and on-peak energy usage indoors.

### Control Strategies

Four basic strategies use controls to reduce building energy consumption and, sometimes, demand.

*Scheduling.* Turn lights on only when needed; turn them off immediately when not needed.

*Daylighting.* Dim or turn off electric lights when windows or skylights provide enough light in an area.

*Tuning.* Dim lights to the lowest level that does not impair task performance. This strategy works because most lighting systems are designed to provide more light than needed.

*Lumen maintenance.* Switch or dim newly installed lights to reduce unnecessarily bright light levels. As lamps age, fixtures get dirty, and lumen output therefore depreciates; increase power over maintenance periods until reaching full power at relamping and cleaning time.

### Energy credits

Although each strategy's energy savings potential varies from application to application, California's Title 24 (the state building code) includes specific energy credits for the use of controls. Credits are based on a survey of actual savings made by using specific control strategies instead of conventional, user-accessible switching. The credits allow for the following equivalent percentage reductions in wattage.

*Daylighting:* from 20 percent for stepped switching to 30 percent for continuous dimming.

*Scheduling:* from 15 percent for automatic programmable timer-based switching to 30 percent for occupant sensing devices.

*Tuning:* no credit (too hard to ensure responsible use).

*Lumen maintenance:* 10 percent.

The maximum controls credit is 44 percent for a room under 250 square feet with occupant sensing and continuous daylighting controls. With tuning, one imagines saving 50 percent of the usual energy consumption of a conventionally switched environment. □

# FROM THE HOUSE THAT RUTH BUILT TO THE HOUSE THAT JACK BUILT

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### A controls checklist

In developing its second-generation building efficiency standards, the California Energy Commission updated and reinforced the role of controls in determining compliance. The new standards still use the multiple switching requirements developed in the 1970s, and these requirements for all new buildings still make a good controls checklist, no matter where the project is.

☐ Provide multilevel switching or dimming to encourage users to set their own lighting to the lowest workable level.

☐ Switch daylit zones separately from interior zones, encouraging manual reduction when adequate daylight is present.

☐ Switch every independent room, or the smallest practical zones.

☐ Make switches accessible to users; avoid panelboard switching.

Our experience in California is that these comparatively inexpensive items have such a rapid payback that no matter how low the electric rate, it's worth the small cost to provide this sensible switching.

Updated standards allow other technologies, such as occupant sensing, to replace these basics. For instance, a ceiling occupancy sensor may be less costly than tandem ballasted fixtures and two toggle switches in the wall, including conduit, wire, and so on. But note that for compliance calculations, occupant sensing can only be used as a credit if a user can select from multiple lighting levels in the room. ☐

## Design and Dollars

Scheduling is by far the most common lighting energy management strategy. Virtually any form of time clock, computerized building automation system, occupant sensor, or even a wall switch is a scheduling device. The relatively low cost and high reliability of these types of devices and systems make them fast-payback technologies for almost any kind of building.

The most powerful strategies employ daylighting and other smart technologies that, combined with efficient electric lighting systems and effective architecture, can save the greatest amounts of money. The drawback to these systems, however, has always been high first cost. Often, payback depends on the building's architecture and use; many building types cannot realize a reasonable payback with these approaches.

Some popular approaches and their major payback considerations are discussed below. In each case, the higher the kilowatt-hour rate, the more rapid the payback. The size and configuration of control zones (often, but not always, equal to rooms) is also a key factor.

*The most powerful control strategies use daylighting and other smart technologies.*

*Occupant sensing.* Passive infrared and active ultrasound devices can sense human presence by detecting motion. Most systems turn the lights on upon first motion and off after some delay following last motion. Some systems require a manual switch "on" and allow for a manual "off" override.

These systems offer especially quick payback in private offices, college classrooms, airport holding rooms and baggage claim areas, and other spaces that tend to have lights left on when they are unoccupied. In general, the smaller the zone, the greater the energy savings and the higher the initial cost of the system.

*Sweep or sentry systems.* These systems turn off lights throughout whole buildings at predetermined times, and require manual override to turn lights back on. They are especially useful for large office buildings with late workers and cleaning crews. The less expensive systems of this type use electronically latching switches that reset (turn off) when power is briefly interrupted; such systems operate crudely but are effective. More advanced versions use computers and time clocks, and by dialing a code, a late worker can prevent his or her lights from being interrupted.

Sweep systems are very effective for large, mixed-use office buildings that combine open plan areas, private offices, and support spaces, and are easily applied to multitenant buildings. The largest possible zone is often recommended for fastest payback: sweep systems are an exception to the rule that small zones save significantly more energy.

*Occupant sensing with time override.* Lamp cycling is a common problem of occupancy sensing. In intermittently used spaces, such as restrooms, constant cycling on and off shortens lamp life. A system that combines occupant sensing with a time clock can keep the lights on all day Monday through Friday, then activate occupant sensing after hours. The real savings of these combined systems are in maintenance costs.

*Daylighting.* Various types of systems are available to control electric lighting in areas with daylight. Large-zone continuous dimming daylighting systems use beefy and expensive light level controllers — a type of dimmer designed to dim fluorescent lamps (with standard nondimming ballasts) over a modest range from full output down to 25 percent. A photocell in the room monitors ambient illumination and attempts to maintain a predetermined minimum. To be cost-effective, these systems should control about 2000 square feet of uniformly daylit space with multiple occupants requiring all lighting either on or off (no subzone switching). Most modern office buildings have difficulty meeting these criteria.

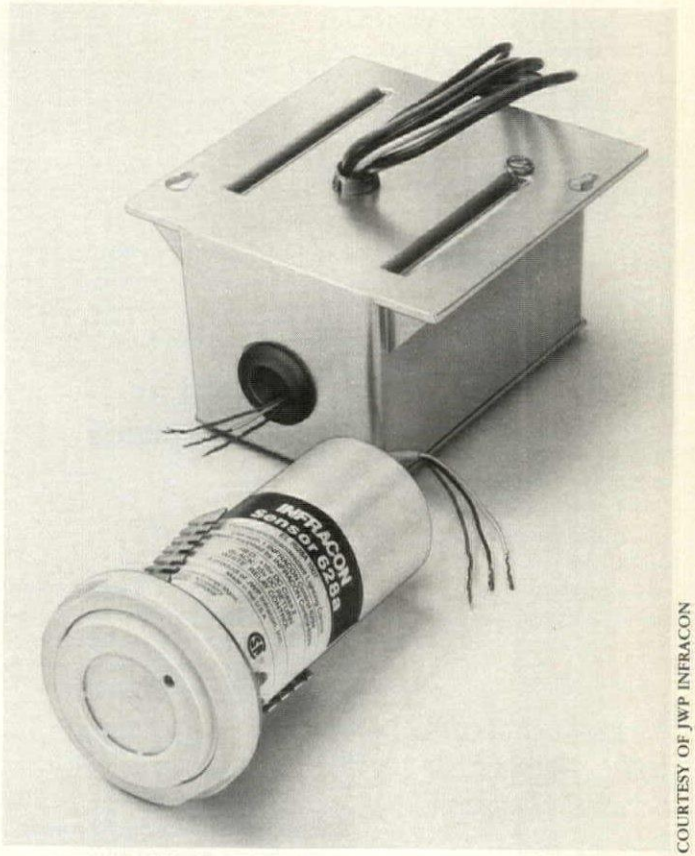
Small-zone continuous dimming daylighting systems use one of two effective technologies. Either a single, smaller light level controller is used for each room, or electronic ballasts are connected together from a common low-voltage photocell-driven control system. These systems are more likely to be cost-effective because the zone size is much smaller, and the system can be used with ordinary fenestration daylighting.

Stepped daylighting may be the most cost-effective of all. A simple application is to manually switch lights near the window separately from lights near the inner wall of a room. More sophisticated solutions might include the use of tapped (multilevel) ballasts or the switching of groups of lights near windows. Distracting flashing of lights is a potential problem with stepped daylighting. But because its techniques are inexpensive, it may be a wise choice.

*Lumen maintenance.* Lumen maintenance systems use the same types of equipment as continuous daylighting systems. Consequently, they are seldom cost-effective: the saving potential of daylighting is up to 100 percent, depending upon climate and building use; lumen maintenance can save only about 15 percent for any prudently

COURTESY OF SENSOR SWITCH

*This passive infrared occupant sensor replaces a standard wall switch.*




COURTESY OF JWP INFRACON

*A ceiling-mounted passive infrared occupant sensor and its control unit.*

designed and maintained lighting system. The best candidates for lumen maintenance are large areas, such as assembly or shop areas, that have highly depreciating lighting systems with a light loss factor less than 0.70.

*Tuning.* Tuning is similar to dimming. Both techniques allow someone to set a preferred lighting level between off and 100 percent in a zone. The difference is who determines the level: in tuning, the building manager or engineer sets the maximum level; in dimming, the user makes a manual adjustment.

Tuning has tremendous potential. Most office lighting, particularly troffer lighting, is overkill, and the fixtures are located for uniformity. Many private offices are lighted to over 75 footcandles without daylight, and tuning them to 50 or less can bring big savings on demand and energy costs.

Real tuning is best done with adjustable output ballasts or hard-to-access light level controllers. In large rooms, tuning might be done to track the time and work intensity of the day using a time clock. In smaller zones, fixed tuning to compensate for overdesign or reduced real need can save tremendous amounts. Note that tuning, in order to be effective, must be part of a well-maintained program or the equipment will be wasted.

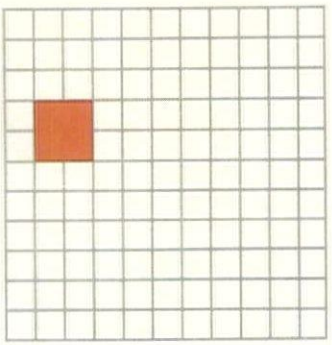
## Building Blocks

To put the pieces together in designing a control system, one useful approach is the "building block" technique. Low-voltage relays can be the principal connecting element. These systems can be connected to occupancy sensors, manual switches, time clocks, computers, and a host of other devices. Smaller zones mean more relays but more flexibility. In addition to the relay itself, wiring to the relay isolates the individual lighting circuit for future technologies without rewiring. Central cabinet relay systems have been used for many years; localized transformer-relay systems have recently been introduced.

Another possible building block is the power line carrier (PLC) system. By using the building power wiring for digital communications, vast systems can be designed without rewiring. Relays, dimmers, and other devices can simply be plugged in. Control activations can come from computers, photocells, manual switches, and other devices. Only the practical problems of clean signal communications have prevented PLC systems from replacing everything else.

The alternative to the building block approach is simply to not connect the elements, letting each stand on its own. This is a form of distributed intelligence, with each function complete and independent. Occupant sensors need no other connection, and daylighting systems can be connected to manual on-off switches. By eliminating interconnection, there is no master element to fail or break. ■

# Daylighting Techniques



## Daylight in atrium spaces

**Mojtaba Navvab**

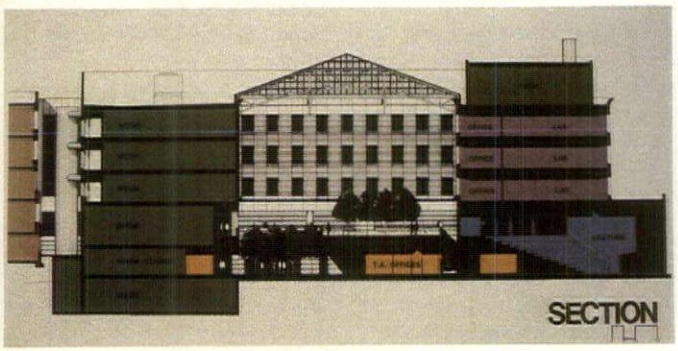
*Mojtaba Navvab is an assistant professor of architecture in the College of Architecture and Urban Planning at the University of Michigan, Ann Arbor.*

Now more than ever, atrium spaces serve a variety of purposes in many different kinds of buildings. Increased office construction and rising land values, along with changing schedules for retail operations — they're no longer just 9-to-5 — have all contributed to an increase in the use of atrium spaces.

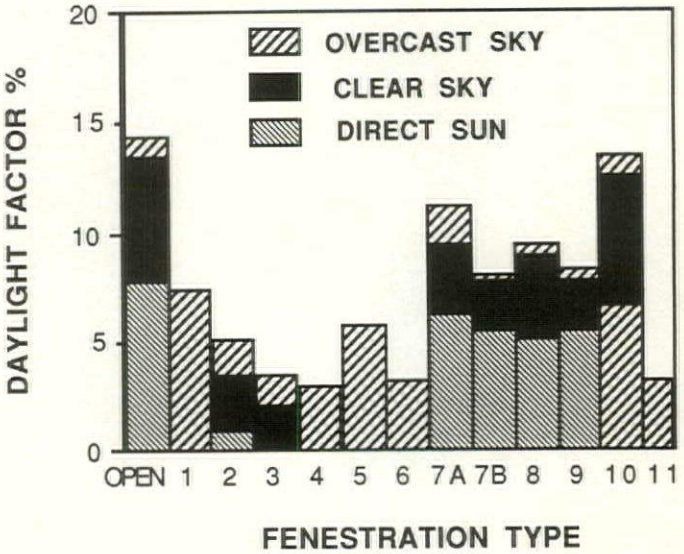
Atria fill aesthetic, social, and economic needs. At the same time, a main design objective for an atrium in many new buildings is to create a thermal buffer zone in order to make the "outdoor" space more comfortable and usable for more of the year. Other factors considered in atrium design are zoning regulations, fire safety guidelines, and cost savings for heating and air conditioning.

*As atria distribute light, they affect the overall thermal energy balance of a building.*

This column focuses on those atrium characteristics that influence the admittance and distribution of solar gain and daylight. Claims that atrium designs can reduce space conditioning loads are even more controversial than claims that they can save lighting energy. The multiple functions of atria increase their appeal to building owners but make the design analysis more complex. Conventional daylighting calculation techniques are inadequate in any but the simplest atrium designs. The results presented in this column are part of an extensive scale model photometry and computer simulation based on real case studies.




*Building section drawing of the University of Michigan chemistry building.*




*Horizontal illuminance (daylight factor) at center of the first floor of an atrium in a 10-story building under overcast, clear, and direct sun at 50 degrees altitude.*

Although control of glare and high-quality lighting are expected in all atria design, especially in public buildings, the lighting criteria tend to be more specific to the task than to the building type. Atria that serve as circulation spaces, for example, normally have the same lighting criteria whether they are in hotels, office buildings, or hospitals. In other cases, the lighting design may be dictated more by the illuminance requirements of plants than by the lighting needs of people passing through. Atria also are designed as light-admitting elements that transfer light flux to adjacent office spaces. Although this objective may be easy to achieve in low-rise buildings, it can be difficult in a deep atrium and in other designs that block direct sunlight.

In addition to distributing light, atria affect the overall thermal energy balance of a building by virtue of their heat loss characteristics and their natural and forced convection links to HVAC systems. Proper selection of glazing types, shading devices (fixed and adjustable), fenestration orientation and geometry, and overall atrium size and shape will determine the energy costs and benefits for a specific building in a given climate zone.

### Daylighting Systems

Several major design features influence the daylight that reaches the bottom floor atrium space. Each can be controlled by the designer to some degree.

*Fenestration systems.* The fenestration system controls the intensity and spatial distribution of light entering the atrium. The net transmittance of this system depends on the glazing system; geometry, glazing orientation, and type of shading; and daylight availability conditions, such as diffusion by sky or direction of sun. The accompanying bar graph illustrates variations in illuminance at the first-floor level in a 10-story atrium that has high-reflectance (86 percent) interior walls. The graph

## THE BRIGHT IDEA IS AN IDEA THAT WORKS

*It is officially called the Specular Silver Optical Reflector (SSOR). By installing the high performance retrofit reflectors in your buildings fluorescent light fixtures, the fixtures can be de-lamped by 50% without significant reduction in light levels. As a result,* **The Bright Idea** *provides important* **benefits** *for your buildings needs.*

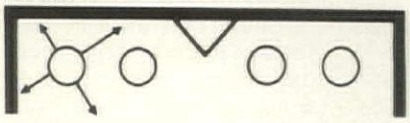
- *40 to 50 percent reduction in lighting energy bills*
- *Lighting maintenance cost reduction (50 percent fewer lamps and ballast to replace)*
- *No significant reduction of light levels*
- *Fixture illumination uniformity*
- *Glare control and reduction*
- *Improve color rendition*
- *Building cooling system load reduction*
- *Longer light fixture component life (lower fixture operating temperatures)*
- *Assured reflector reliability and longevity*

## THE BRIGHT IDEA IS SIMPLE

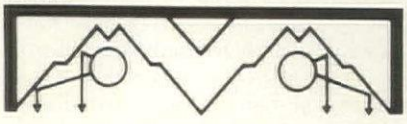
*Maximum Technology has engineered the highest performance reflector. The specular silver optical reflector consists of a space age silver film that is bonded to .025" aluminum material creating a highly reflective mirror. Unlike polished metals; the silver film demonstrates superiority in reflectivity because it reflects 96% of incident light.*

*When The Bright Idea is installed in a fluorescent light fixture, the light is precisely reflected back into the work area rather than being scattered by the aluminum or white metal surfaces found inside most fixtures.*

**BEFORE**



**AFTER**



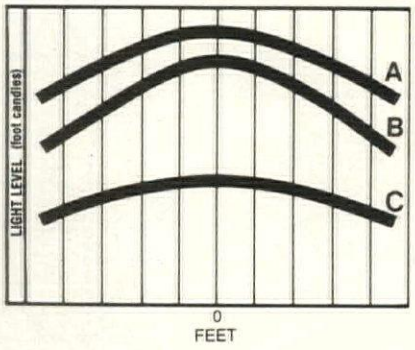
## THE BRIGHT IDEA IMPROVES LIGHTING EFFICIENCY

*Maximum Technology manufactures* **The Bright Idea** *for almost all types of fluorescent luminaires, new fixtures as well as existing fixtures. Over 3,000 custom designs have been produced for a wide range of customer applications. However, the most common fixture is the standard 2×4 foot luminaire. Let's examine how* **The Bright Idea** *improves efficiency, through wattage reduction.*

| 2×4 Fixture Components | Before Retrofit | After Retrofit |
|---|---|---|
| #lamps/watts | (4) F40W/160W | (2) F40W/80W |
| #ballast/watts | (2) Ballast/30W | (1) Ballast/15W |
| Total watts | 190W | 95W |
| Total watts saved | 95W | |

*By installing* **The Bright Idea** *50% of the lamps and ballasts are removed from the 2×4 luminaire, thus improving efficiency of the fixture. Available photometric testing demonstrates the improved efficiency as well as the impressive light level performance.*

**FIXTURE**




**A** *Standard 2×4 foot fixture with 4 lamps*

**B** *Standard 2×4 foot fixture with 2 lamps removed and* **The Bright Idea**

**C** *Standard 2×4 foot fixture with 2 lamps removed*

## THE DESIGN IDEA IS A QUALITY DESIGN

*Maximum Technology utilizes computer aided design (CAD) techniques to engineer the highest performance reflective design for your fixtures. Once the design is determined, the reflectors are manufactured in Maximum Technology's 25,000 square foot modern production facility.*

*Sophisticated computer controlled fabrication equipment insures the accuracy and quality of the reflectors. The quality control department demands ±½° angular accuracy and ±.005" dimensional accuracy, because the slightest variations in angle or dimensions can change reflector performance.*

*Maximum Technology maintains a large inventory of raw materials as well as 15 computer controlled machines to produce up to 100,000 reflectors a week.*

## THE BRIGHT IDEA IS GUARANTEED

*Your building, like your business, is different from any other. To accommodate these differences, a comprehensive* **Lighting Application Analysis** *is recommended to determine the value you will receive from installing* **The Bright Idea.**

*A no-charge walk-through evaluation of your facility is the first step. You will receive a written quotation, financial proposal and energy audit. Upon your acceptance, an evaluation test area within your building is designated. This will allow your personnel to experience the benefits of the system to be expected throughout your facility.*

*A design team determines the exact specifications required for each fixture to produce the best results. Once installed, either by Maximum Technology or by your crew, the system requires no special maintenance or cleaning. Maximum Technology* **unconditionally guarantees** *the product and installation* **in writing.**

*Most installations are completed during off-hours, so there is no intrusion during normal business hours.*

## THE BRIGHT IDEA PAYS FOR ITSELF

*The installation of* **The Bright Idea** *provides dramatic energy savings such that the investment ususally pays for itself in less than 2 years. In addition, energy credits, tax incentives, local utility rebate programs and other incentives may provide additional savings.*

*Maximum Technology offers an exciting financing program. Based on documented energy savings,* **The Bright Idea** *can be installed in your building* **without a down payment or cash outlay.** *The fixed monthly payments can be funded comfortably from energy savings.*

## THE BRIGHT IDEA HAS BEEN APPROVED

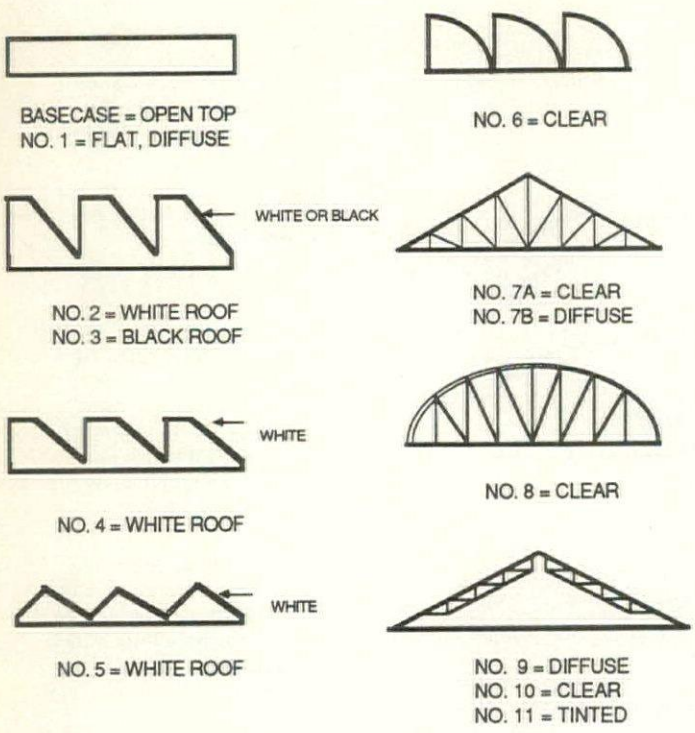
*This is a patented system that is* **U.L. Listed** *(for safety).*

*Over 100 major facilities have been successfully retrofitted with* **The Bright Idea.** *Customers include: manufacturing facilities, offices, banks, institutions, stores, assembly plants—in large, medium and small buildings. Complete case histories and documented test results are available for your review. Call today and get* **The Bright Idea!**

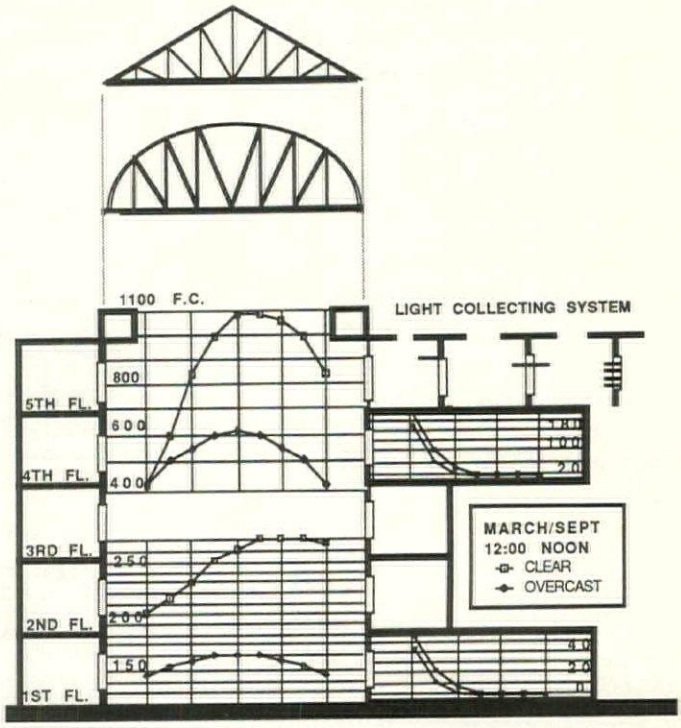
MAXIMUM TECHNOLOGY

*60 Industrial Way*
*Brisbane, CA 94005*
*(415) 468-2560*

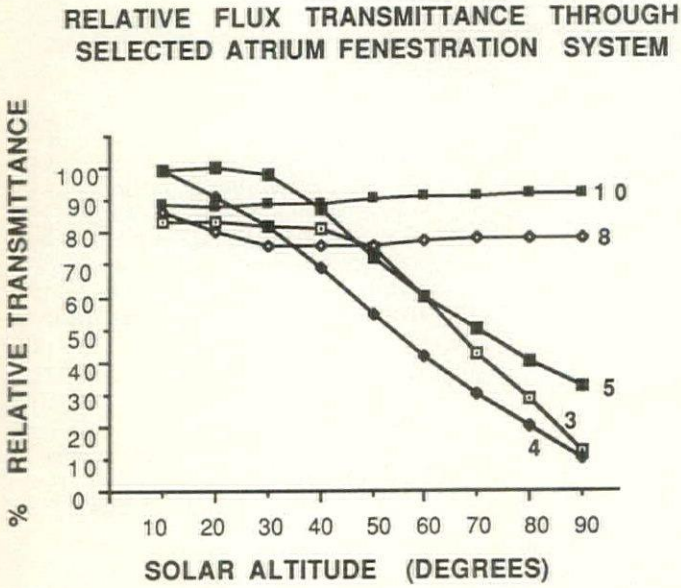
*U.S. Patent 4562517 Other patent pending products.*




*Eight fenestration systems with glazing variations: base case (1), four roof monitor systems (2–6), pyramid (7A, 7B), vault (8), and A-frame (9–11).*




*Variations in illuminance at the first-floor level of a five-story atrium. Illuminance at the atrium floor can be used to estimate adequacy of lighting for plants.*



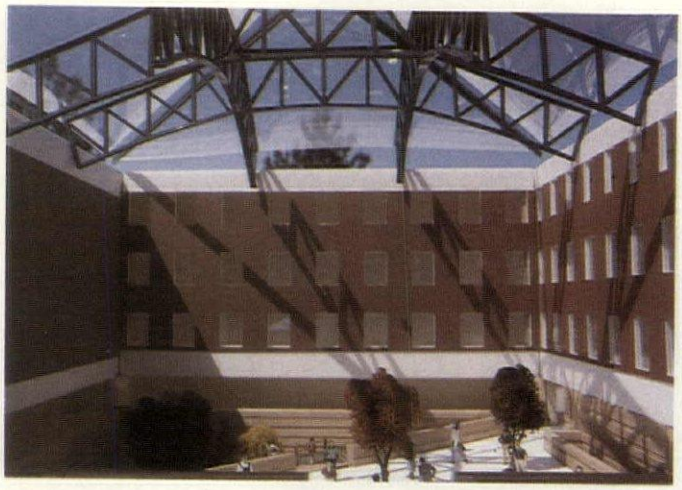

*This relative flux transmittance graph shows hemispherical transmittance for five of the fenestration systems above. It indicates reduced transmittance for the roof monitor systems (3, 4, and 5) at high solar altitudes and indicates much less angular selectivity for the vault (8) and A-frame (10) systems.*

represents illuminance under uniform sky conditions; several systems were also tested under clear sky and direct sun conditions. The clear sky and sun conditions are for a single intermediate case, in which the solar altitude is 50 degrees and the solar azimuth is 0 degrees. Note that the ratio of clear-sky daylight to direct-sun daylight varies considerably, depending on the directional properties of the fenestration system.

These directional properties are illustrated more clearly in the relative flux transmittance graph, which shows hemispherical transmittance for five fenestration systems as a function of solar altitude (relative to an open atrium). The graph indicates reduced transmittance for the roof monitor systems (3, 4, and 5) at high solar altitudes. The pyramid, vault, and A-frame systems have much less angular selectivity. The transmittance versus incident angle for azimuths of 90 degrees and 180 degrees differs, of course, from that at 0 degrees azimuth. The effect of the exterior reflectivity of the monitors on net transmittance is modest. Note that the transmittance shown is for an open atrium; absolute transmittance is lower, particularly at low solar altitudes.

*Light guiding systems.* The atrium wall surfaces act as a light well to bring the light deep into the atrium space. This effect is dependent upon surface reflectance and its property and location with respect to the sun's position.

*Light collection systems.* A light collection system serves two design objectives: to block or shade the direct beam and to reflect light deep into adjacent spaces. The amount of light on vertical walls is normally less



*Some studies of the design were performed using this scale model, others using computer programs.*

*The new University of Michigan chemistry building under construction at Ann Arbor.*

than 20 percent of the exterior horizontal values. This means that during winter the amount of interior light ranges from 5 to 50 footcandles (50–500 lux) and is inadequate without supplementary light. The illuminance at the atrium floor can be used to estimate the adequacy of the lighting design for plants. Four basic factors must be considered in plant lighting: intensity, duration, spectrum, and direction. Many plants need from 100 to 200 footcandles (1000 to 2000 lux) for at least 12 hours per day. The atrium cross-section shows light levels at the first and third floors under clear and overcast noon sky conditions.

Conventional skylight systems are applied in one- to two-story atrium buildings and in industrial factories and warehouses. The shapes are dome or pyramid with single or double layers, but customized skylights can stretch these designs with their structural glazing systems.

## Modeling and Simulation

Physical modeling and computer simulation were used for the new chemistry building designed by Harley Ellington Pierce Yee Associates for the University of Michigan in Ann Arbor. It has five levels: four above and one below grade.

The atrium space was designed to serve as the major circulation area for the new building. In the daytime, the atrium cavity provides useful light to adjacent offices and first-floor offices and also keeps plants at the lower levels healthy. In addition to distributing light for people and plants, the atrium's fenestration also provides for natural or forced convection to control heat loss and gain. That is valuable because the public uses the space for a variety of purposes at various hours day and night, placing heavy demands on the air conditioning system. A 500-seat lecture hall opens onto this space.

The model study had a major impact on the size of the windows facing the atrium space. Behind those windows are laboratories and faculty offices; the design and size of the windows provide for flexibility in interior layouts. Light from the outside goes through the fenestration system, with its glazing and frames, then reflects off or on the walls, and finally reaches office tasks. Although the amount of this light may be insufficient for demanding reading tasks, it does provide a time-of-day reference for people occupying the spaces. The systematic approach and the use of various design tools made it possible to design the space for both humans and plants.

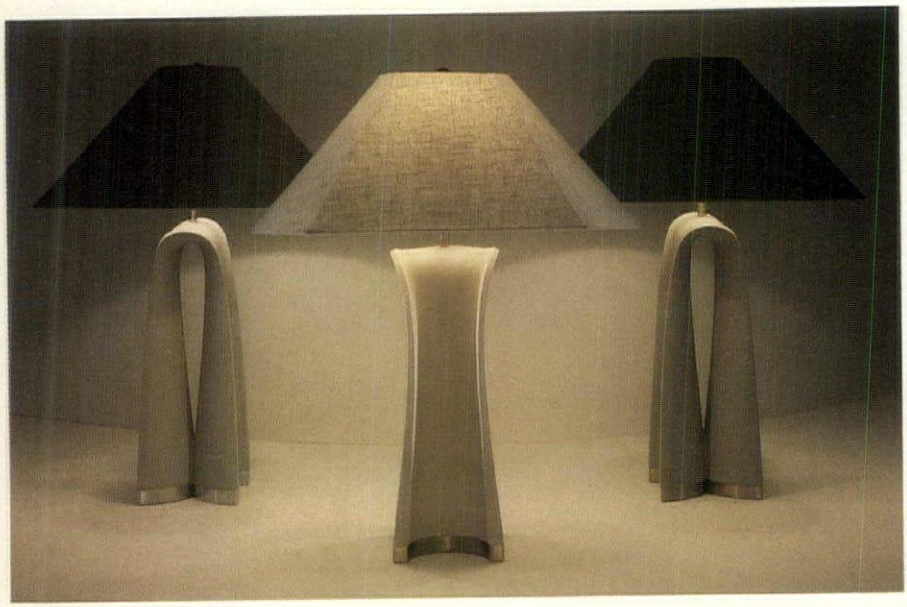
The results of the model study were used at various stages of the design. Some choices were obvious, because of the client's requirements; other choices were made only after qualitative and quantitative study of design options — through video simulations, for example. Each design condition had to be studied separately. Because of the computer programs used, some analyses were made in different steps with various parametric studies.

In general, the study shows that southern exposure of the fenestration system was beneficial from the daylighting point of view but increased heat gain. Some side openings in the fenestration system are designed to vent heated air during the peak load. The use of clear glazing and light-colored interior walls in offices adjacent to the atrium made it possible to reduce the brightness ratio with respect to atrium light levels.

The structural support systems and glazing frames were used to create shade and shadow and to reduce the high luminance level "hot spots" on the south-facing wall of the atrium. That structural system and its sloped surface had to be integrated to withstand a snow load and to provide for water drainage. Because the material presented in this column is specific to certain projects, use caution in generalizing about the daylighting effects in your own designs. Do remember, however, that specific cases present examples of the keys to an attractive, marketable atrium space in today's urban environment. The keys include selection of glazing material and structural system; the meeting of fire safety, building code, and energy requirements; and — whenever it is possible — total system integration. ■

*The daylighting columnist would like to hear from readers about unique daylighting applications. Write to Mojtaba Navvab, MIES, College of Architecture, University of Michigan, Ann Arbor, MI 48109.*

# Product Showcase



## ■ Table lamp

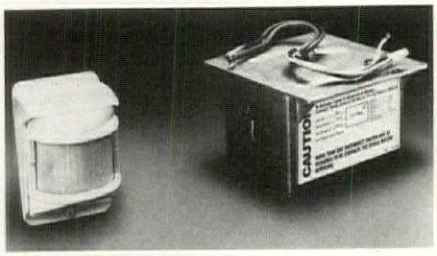
Kevin von Kluck designed Boyd Lighting's Gemini table lamp, which has a faux stone base in a ribbon-loop shape with a bottom trim of satin-finished brass or chrome. Belgian linen and paper shades are available in several colors, the base in three colors. The lamp has a dimmer and accommodates an incandescent lamp. Boyd Lighting Company, San Francisco, CA.

**Circle 60**

## ■ Low-voltage accent light

Wendelighting offers low-voltage fixtures for lighting plants and sculptures, including those in wet locations. The compact, glare-free units have a two-piece copper housing and a Pyrex lens; they accept an MR16 lamp. Shown is the downlighting version of the 20-watt model 1380 with a swivel base and an optional glare shield. Models for stake or beam mounting are available. Wendelighting, Burbank, CA.

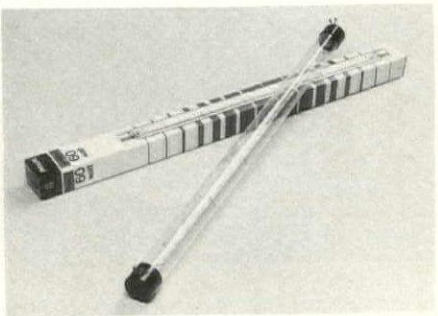
**Circle 61**




## ■ Wide-view occupancy sensor

JWP Infracon's model 800 wide-view passive infrared occupancy sensor operates with the company's model 629a control unit to turn lights on when people enter a space and off at an adjustable, preset interval after they leave. The low-profile, surface-mounted sensor covers a 180-degree view of large, open rooms up to 1800 square feet, such as gymnasiums and open-plan offices. An adjustable daylighting control device can keep some or all lights off when sufficient daylight levels exist. JWP Infracon, Inc., Fairfield, NJ.

**Circle 62**



## ■ Linear incandescent lamp

The 60-watt Lumiline II linear incandescent lamp from Philips Lighting is a tubular light source shaped like a fluorescent lamp that produces warm, incandescent light. Built-in end fittings connect the lamp to fixture sockets. Philips Lighting Company, Somerset, NJ.

**Circle 63**

## ■ Crystal chandelier

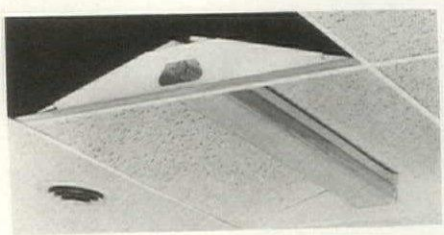
The Light Concerto chandelier from Architectural Crystal is made of Swarovski lead crystal, solid brass, and 24-karat gold plate. It is available in two diameters and accepts a standard incandescent or halogen lamp. Architectural Crystal Ltd., New York, NY.

**Circle 64**

## ■ Architectural floodlight

The integral yoke of Emco's Articulight lets users adjust it 45 degrees forward and backward for precise beam placement. The compact floodlight is designed for easy relamping and can be realigned on site. It has a tamper-proof, die-cast aluminum housing, a one-piece impact- and vandal-resistant tempered glass lens, and silicone rubber gaskets. Emco Environmental Lighting, Milan, IL.

**Circle 65**

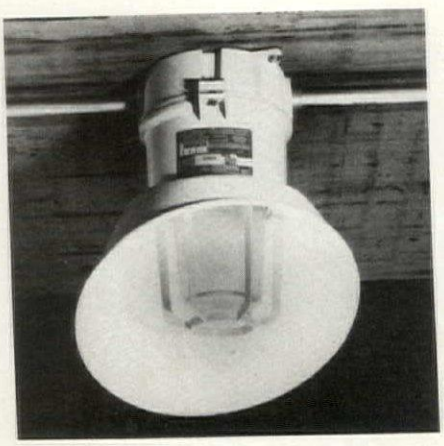


## ■ Vaulted ceiling fluorescent

The H.E. Williams series VS4 vaulted fluorescent ceiling unit allows designers to create a coffered ceiling effect with NEMA type G ceiling systems. End supports of cold-rolled steel hold the luminaire and ceiling tiles in place. The unit has a clear acrylic prismatic lens and accommodates one to four fluorescent lamps. It meets specifications for schools in several southern states. An HVAC air-return option is available. H.E. Williams, Inc., Carthage, MO.

**Circle 66**





## ■ Industrial lighting

American Electric's Hazlite M1 high-performance industrial fixture for hazardous environments has an airtight polymeric housing that protects internal parts from moisture, corrosive chemicals, and dust. Computer-designed refractors provide optimal light distribution, according to the manufacturer. Models are available for HID and fluorescent sources in a variety of configurations. American Electric, Memphis, TN.

**Circle 67**

## ■ Decorative outdoor lighting

The Coronado series of outdoor fixtures from Old World Lighting can be mounted on brackets, sconces, and posts. The fixtures accommodate incandescent and HID light sources. Buyers can choose from three sizes, five finishes, and several types and colors of lens materials. Old World Lighting, division of RWL Corporation, Solvang, CA.

**Circle 68**

## ■ HID pendant luminaire

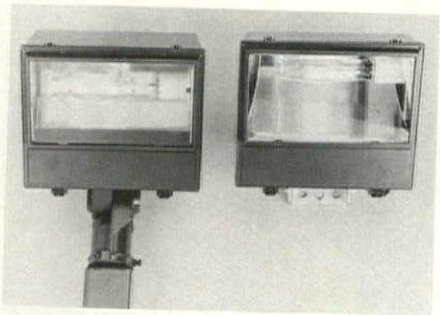
The Renaissance line of HID pendant luminaires from SPI Lighting includes the SMR series of painted and plated domes in single- and double-stem versions. The luminaires have specular aluminum reflector segments and a spring-action hook system for quick dome removal. SPI Lighting Inc., Mequon, WI.

**Circle 69**

## ■ Adapter ring

The AR-36 adapter ring allows most of Lighting Services' low-voltage PAR 36 fixtures to accommodate Osram PAR 36 lamps up to 50 watts. The ring is available for most fixtures. Lighting Services Inc., Stony Point, NY.

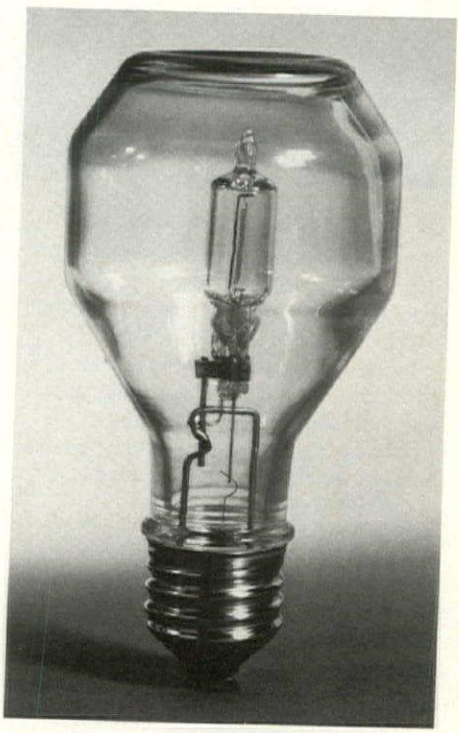
**Circle 70**



## ■ Floodlights

McGraw-Edison offers 250- and 400-watt metal halide Warrior floodlights, which the manufacturer says can be installed, lamped, and serviced with only basic tools. Components include a watertight, die-cast aluminum housing, a heat- and impact-resistant tempered glass lens, a heat-resistant silicone gasket, and a one-piece specular reflector of anodized aluminum. Built-in angle index markings allow field adjustment. The floodlights come with trunnion or tenon mounting assemblies. McGraw-Edison, Vicksburg, MS.

**Circle 71**



## ■ General service halogen lamp

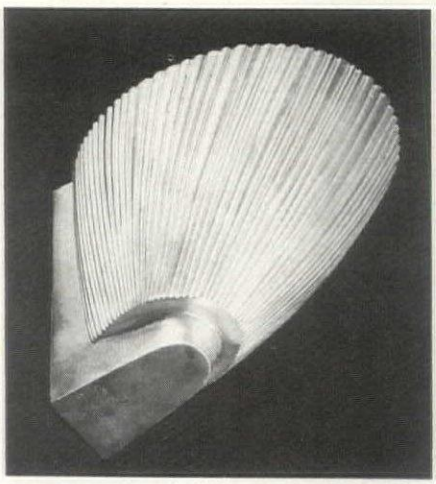
GE offers the 90-watt Performance Plus general service halogen lamp with a bottle-shaped heavy-glass outer bulb. It provides the same light output as a conventional 100-watt incandescent lamp but produces a whiter light and is more energy efficient, according to the manufacturer. The lamp is rated at 1750 initial lumens and 2000 hours and has a color temperature of 2950K. GE Lighting, Cleveland, OH.

**Circle 72**

## ■ Specular aluminum

Alcoa's Everbrite dipped and anodized aluminum specular reflector material for retrofitting fluorescent light fixtures has a static-free surface and resists corrosion, chemicals, and fire. Its image clarity is as much as 93 percent, and it has high reflectivity and excellent forming characteristics. Alcoa, Davenport, IA.

**Circle 73**

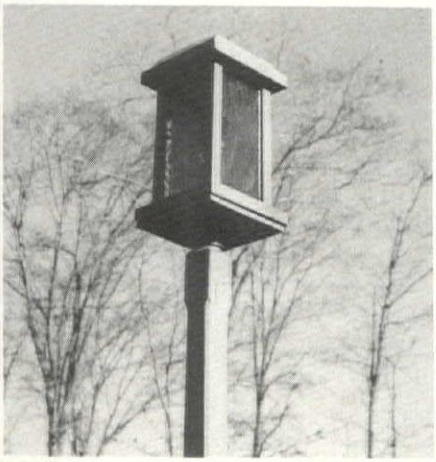


## ■ Wall sconce

The cast aluminum U-500 wall sconce from Rambusch Lighting was originally designed 50 years ago and has been in continuous use in some buildings. The sconce's fluted scallop-shell design helps eliminate a strong backsplash of light on the wall immediately above the fixture. The sconce accommodates various compact fluorescent and incandescent lamps. Rambusch Company, New York, NY.

**Circle 74**

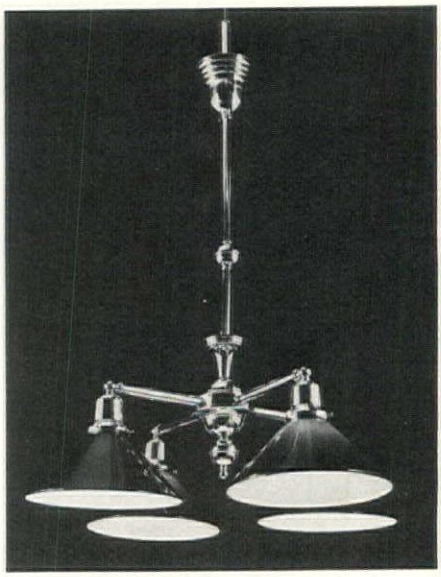




## ■ Western red cedar fixture, pole

Ryther-Purdy's Old Saybrook fixture and Type W pole are handcrafted of western red cedar. The fixture's mitered joints are pegged and glued with waterproof adhesive, and its top can be removed for relamping. It accommodates incandescent and HID sources and has acrylic and polycarbonate panels in a choice of patterns and colors. The matching 4-inch-square pole comes in several surface textures. Ryther-Purdy Lumber Co., Inc., Old Saybrook, CT.

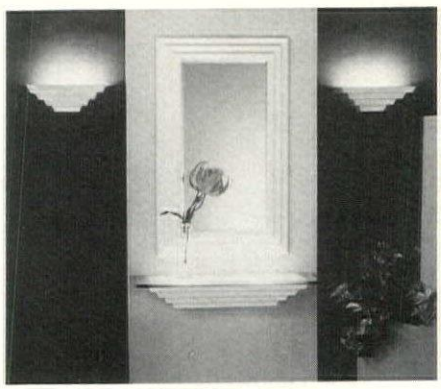
**Circle 75**



## ■ Pool table light

Rejuvenation Lamp & Fixture offers the Irvington solid brass pool table light with a lacquered finish. It comes in lengths from 19 to 40 inches and in models with two, three, or four arms. Several shade styles are available. Rejuvenation Lamp & Fixture Company, Portland, OR.

**Circle 77**



## ■ Wall sconce, lighted shelf

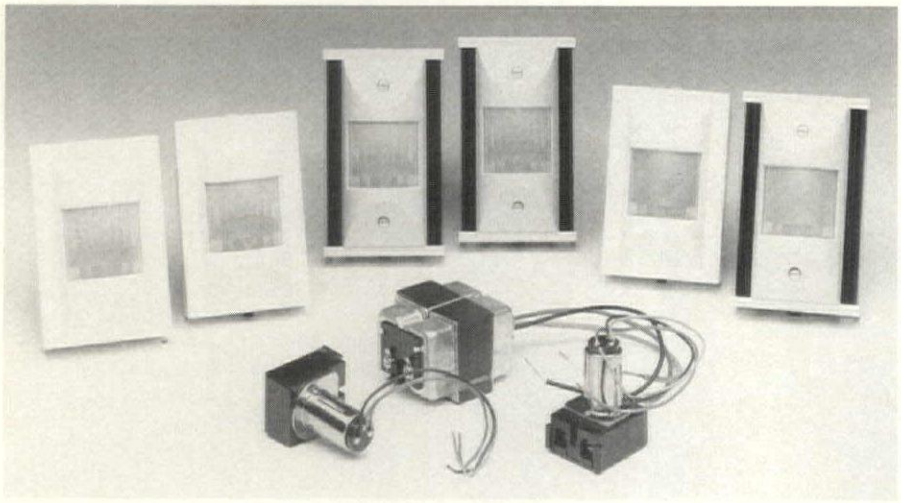
Fredrick Ramond's Pyramid line includes the wall sconce and lighted shelf shown. They have precision-welded steel bodies finished in textured acrylic gesso and accommodate halogen lamps. Fredrick Ramond Inc., Cerritos, CA.

**Circle 78**


## ■ Data processor

The compact, battery-powered DP-100 data processor from Minolta displays and prints out hard copy of data from the company's tristimulus color analyzer. It can store up to 300 individual measurements and has a built-in memory backup. It also automatically takes measurements at 6-second to 99-minute intervals. Four calibration channels can be programmed for four basic colors to measure a specific color's absolute value. Minolta Corporation, Industrial Meter Division, Ramsey, NJ.

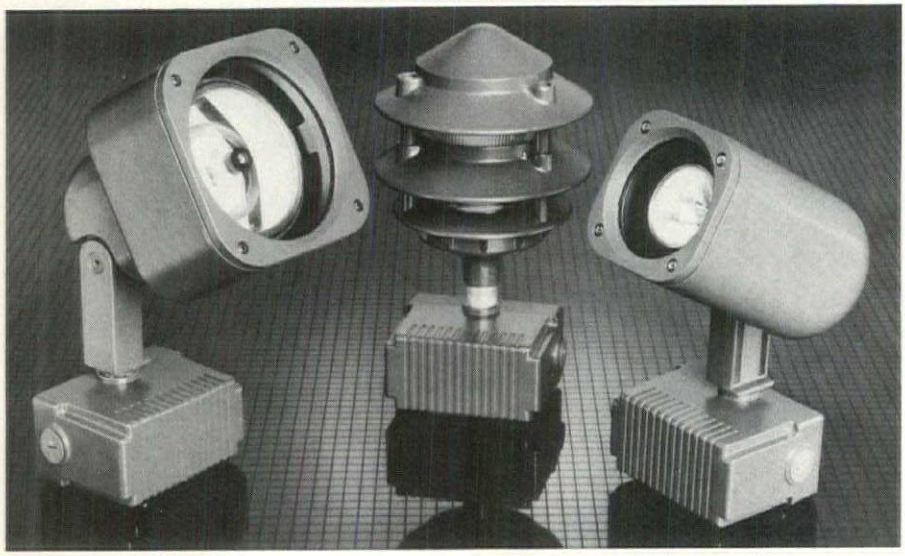
**Circle 76**



## ■ Occupancy, daylight sensors

Sensor Switch passive infrared occupancy sensors come in wall switch, wide-view, and hallway models with adjustable time delays. Low-voltage models have built-in, adjustable daylight controls that can turn on lights when available daylight drops below preset levels. Sensor Switch, Inc., Branford, CT.

**Circle 79**



## ■ Landscape lighting series

Imperial Bronzelite's LW series landscape fixture heads are designed for miniature halogen and incandescent sources. They are made of die-cast aluminum and have heat-resistant lenses, transformers for low-voltage versions, and full gasketing for durable, weatherproof operation. System power distribution configurations are available for 12 volts only, 120 volts only, and 120 to 12 volts. Accessories include photocells, glare shields, and mounting brackets. Imperial Bronzelite, San Marcos, TX.

**Circle 80**

## ■ Glare-guard metal halides

Venture Lighting International offers glare-guard metal halide lamps, which have a highly reflective opaque aluminum coating atop their outer jacket. The coating reduces glare, particularly in fixtures with clear glass enclosures, and helps reduce spill light by up to 70 percent, according to the manufacturer. Venture Lighting International, Cleveland, OH.

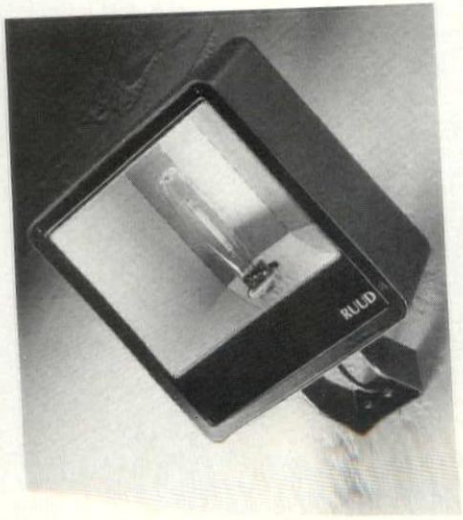
**Circle 81**

## ■ Highway sign luminaire

Holophane's Sign-Vue luminaire illuminates signs of 14 by 48 and 20 by 60 feet. It has a weathertight die-cast aluminum housing, a built-in ballast, and a prismatic pressed borosilicate glass refractor that distributes light evenly on the sign face and reduces glare, hot spots, and low spots. Starting temperatures are reliable down to minus 20 degrees Fahrenheit. The luminaire accommodates HID lamps up to 400 watts and can be mounted on conduits or catwalks. Holophane, Newark, OH.

**Circle 82**

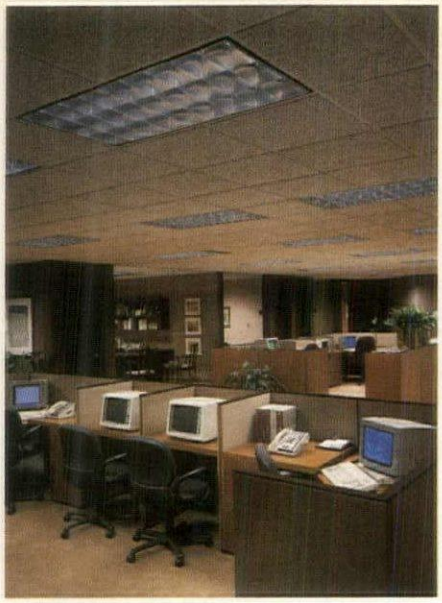





## ■ HID floodlight

The compact size and soft corner design of Ruud Lighting's yoke-mounted HID floodlight reduces wind loading, according to the manufacturer. The floodlight, which can be tilted and locked at angles from 0 to 90 degrees, comes with a clear tempered glass lens, die-cast aluminum housing and yoke bracket, and preinstalled ballast, capacitor, and igniter. Various computer-designed optical systems are available. Ruud Lighting, Inc., Racine, WI.

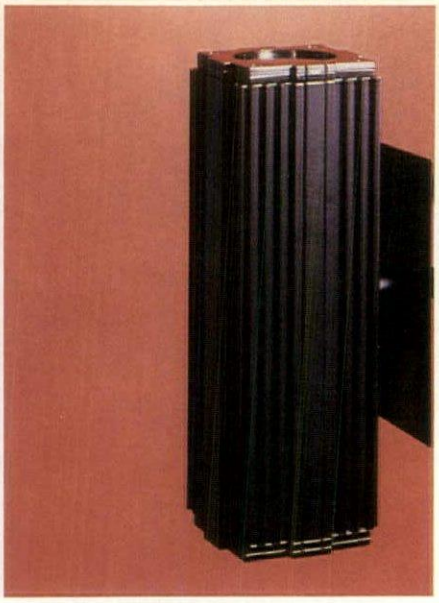
**Circle 83**



### ■ Recessed parabolic luminaires

Optimax recessed fluorescent luminaires from Lithonia Lighting can produce 70 footcandles of uniform illumination at 1.5 watts per square foot, according to the manufacturer, and have specular aluminum louvers designed to direct light away from glare-producing angles. They come in two sizes for standard ceiling grids. Lithonia Lighting, Fluorescent Division, Conyers, GA.

**Circle 84**



### ■ MR16 outdoor area luminaire

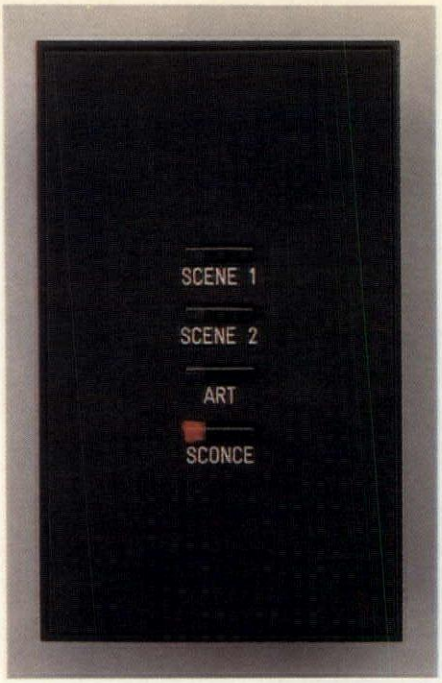
Nightscaping's Pro-Liter series of low-voltage outdoor luminaires includes the Chaparone, which uses two MR16 lamps for combined up- and downlighting. Features include an extruded aluminum housing, a weathertight Pyrex lens, exterior fins for heat dissipation, and optional honeycomb louvers and colored lenses. Nightscaping, division of Loran, Inc., Redlands, CA.

**Circle 85**

### ■ Lighting software

Lumen-Micro from Lighting Technologies generated the image shown here. Within minutes, personal computer users can produce accurate, realistic perspective images that illustrate the effect of specified lighting equipment in a space. With input from a video camera, images can be used to show fully furnished spaces and can be stored on a VHS videotape for later presentation. A color option is available. Lighting Technologies, Boulder, CO.

**Circle 86**

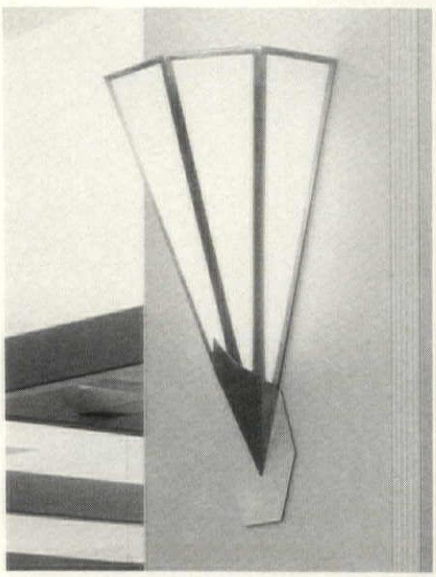



## ■ Lighting control station

Vantage Controls offers the low-profile Vista lighting control station, which accommodates one to eight switches in a single-gang space and has an LED indicator that communicates function and load status. Functions include momentary and latched switching, dimming, adjustment of light levels, group mastering, and multiple-scene preset and recall. Vantage Controls, Inc., Salt Lake City, UT.

**Circle 87**

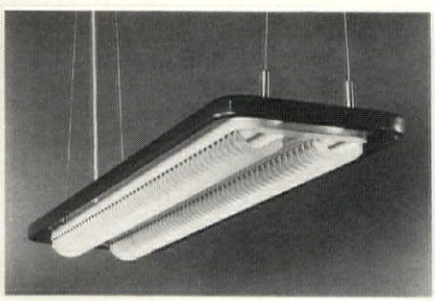




## ■ Custom wall sconce

Appleton Lamplighter manufactured this wall sconce, which was custom-designed for the Merchandise National Bank in Chicago's Merchandise Mart. The sconce has a solid brass frame and opal glass lenses and accepts two fluorescent lamps. Appleton Lamplighter, Appleton, WI.

**Circle 88**



## ■ Suspended fluorescent

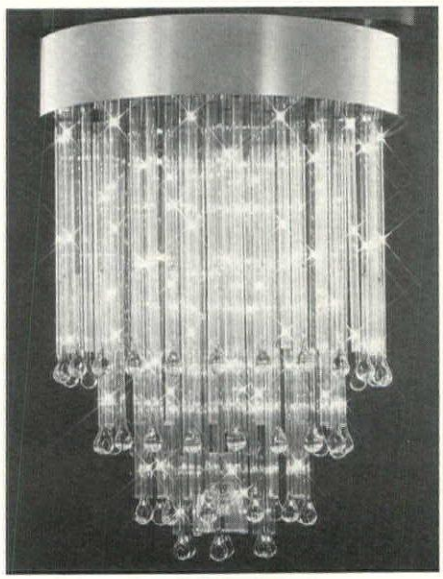
The Saturn fluorescent luminaire from Amerlux produces direct and indirect accent lighting. It hangs from four aircraft cables and has white louvers to control glare. The ring surrounding the lamps comes in standard white; special finishes can be requested. Joiner brackets are available for aligning fixtures. Amerlux, Inc., Fairfield, NJ.

**Circle 89**

### ■ Butt-glazed sunroom

Because the Kleertek butt-glazed sunroom system from Sunbilt Solar Products has no horizontal exterior caps, it eliminates water and dirt accumulation overhead. The Kleertek System includes 1-inch insulating tempered glass and tubular cross muntins for lateral rigidity. Tinted and low-emissivity glass and motorized and manual insulating shade systems are available. Sunbilt Solar Products, Jamaica, NY.

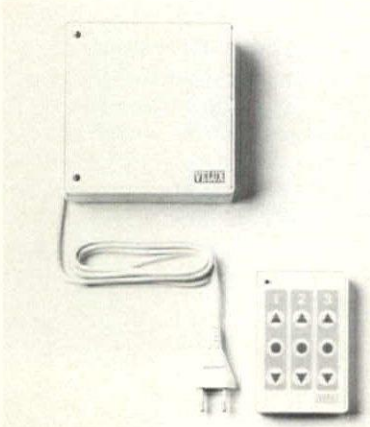
**Circle 91**



### ■ Tube light chandelier

The Illumalights low-voltage chandelier series from New Horizons includes round tiered and nontiered versions with a separately switched central R-lamp downlight. The model shown has 30 lit tubes, 30 blank reflector tubes, 60 suspended teardrop crystals, and a downlight. Options include chrome canopies, clear and fluted tubing, and chain and stem mounting. New Horizons Lighting, Inc., Palm City, FL.

**Circle 92**



### ■ Remote-controlled skylights

The Velux ES Remote Control system can open and close the company's roof windows, skylights, and sun-screening accessories with the touch of a control button. The system also has a sensor that automatically closes a window when rain contacts it. Velux-America Inc., Greenwood, SC.

**Circle 90**

## ■ Electronic compact fluorescent lamp

Osram's Dulux EL electronic compact fluorescent lamp has a medium screw base so it can be used in place of standard incandescent A lamps. Its average life is 10,000 hours, and it consumes as little as 25 percent of the energy used by conventional incandescent lamps, according to the manufacturer. Features include flicker-free instant start, excellent color rendition, and a 2700K color temperature. The lamp comes in wattages of 7, 11, 15, and 20. Osram Corporation, Newburgh, NJ.

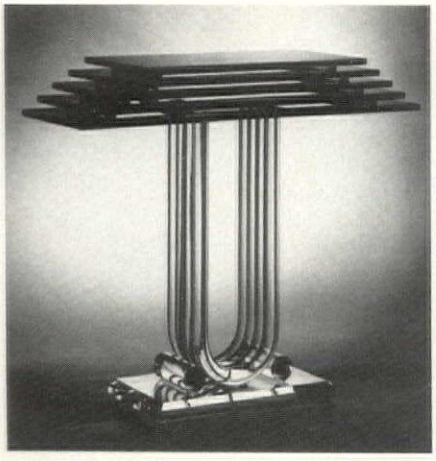
**Circle 93**

## ■ Decorative outdoor fixture

ELA's Gardens decorative outdoor fixture has cast aluminum arms that come in two sizes; its blown glass globes come in four sizes. It accommodates a cluster of three incandescent candelabra lamps and can be converted for an HID lamp. It can be wall mounted or secured to a tenon for post mounting. Environmental Lighting for Architecture, City of Industry, CA.

**Circle 94**



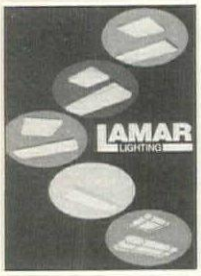


## ■ Cast acrylic decorative lamp

Nu-Century Lamp offers a collection of Contemporary–Art Deco cast-acrylic table and desk lamps designed by Herbert Fruchtnicht. Shown is the 22-inch-high Cascade with a shade measuring 8 by 23 inches. It accommodates a 13-watt compact fluorescent lamp. Nu-Century Lamp Company, Port Richey, FL. ■

**Circle 95**

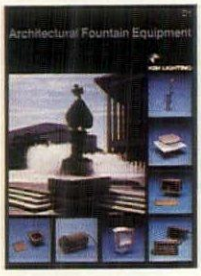
# Product Literature




### Fluorescent luminaires

A 24-page color brochure includes photos, descriptions, and dimensions of 24 decorative fluorescent luminaires for residential and office applications. LaMar Lighting Co., Inc., Freeport, NY.

**Circle 120**




### Fountain equipment

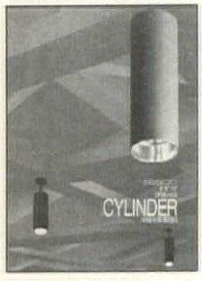
A color catalog from Kim Lighting profiles architectural fountain equipment, including jets, nozzles, and water effects. Mechanical and electrical components are detailed. Kim Lighting, City of Industry, CA.

**Circle 121**


### Ceramic luminaires

A color brochure illustrates a collection of 11 ceramic wall sconces and two pendant luminaires from Justice Design Group. It includes dimensions, lamp options, and colors. Justice Design Group, Inc., Los Angeles, CA.

**Circle 122**




### HID cylinders

Esco's 6000/6100 series open HID cylinder downlights come in diameters of 6, 8, and 10 inches. A brochure illustrates wall-mounted and pendant models with and without baffles. Esco International, Inc., Chicago, IL.

**Circle 123**


### Post-top luminaire

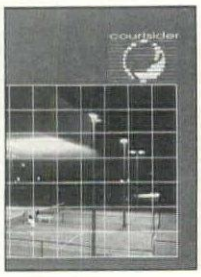
The SPLS series post-top luminaire has turn-of-the century styling. A data sheet details features, specifications, and footcandle values. Sentry Electric Corporation, Freeport, NY.

**Circle 124**

### Outdoor luminaires

Post-top lanterns and poles in traditional, contemporary, and custom styles are featured in a color brochure that includes descriptions of each model and photos of applications. Lumec, Ste-Therese, Quebec, Canada.

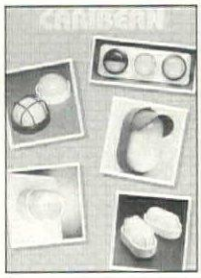
**Circle 125**




### Court lighting

The Courtsider by Lighting Systems is a sharp cutoff luminaire designed for lighting tennis courts. A brochure describes features and shows standard layouts. Lighting Systems Inc., Cincinnati, OH.

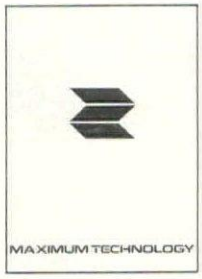
**Circle 126**




### Area lighting

A folder from Caribean Worldwide contains dimensional sketches of round, oval, and rectangular surface-mounted fixtures and accessories for incandescent and fluorescent sources. Caribean Worldwide Wholesale, Inc., Miami, FL.

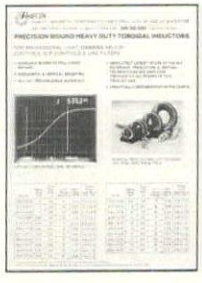
**Circle 127**




### Fluorescent reflectors

A folder contains information on optical reflectors for new and retrofit fluorescent luminaires. Maximum Technology, Inc., Brisbane, CA.

**Circle 128**



### Toroidal inductors

A brochure from Amecon lists a wide variety of precision-wound heavy-duty toroidal inductors for light dimmers, motor controls, SCR controls, and line filters. Amecon, Anaheim, CA.

**Circle 129**


### ■ Commercial outdoor lighting

A 6-page color brochure includes photometric data, specifications, and photos of commercial posts, fixtures, and accessories in the Sitescape collection. Hanover Lantern, Hanover, PA.

**Circle 130**


### ■ Display lighting

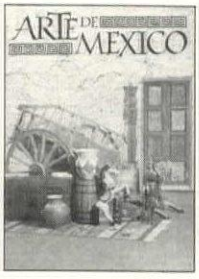
A brochure features Trucool and Retro-Rail low-voltage, air-cooled showcase reflectors with replaceable halogen lamps and low-voltage tracks, spotlights, and accessories. Display Lighting Systems, Miami, FL.

**Circle 131**


### ■ Shading software

A data sheet describes capabilities and system requirements for Shadow, a program that calculates shaded glass areas and solar loads for windows and shading devices, including irregular objects such as trees and adjacent buildings. Elite Software, Bryan, TX.

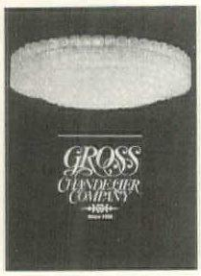
**Circle 132**




### ■ Mexican-style collection

A 22-page color catalog includes a selection of Mexican-style lighting fixtures and other products. A variety of chandeliers, lanterns, and sconces of hand-forged iron, brass, copper, and tin are shown. Arte De Mexico, North Hollywood, CA.

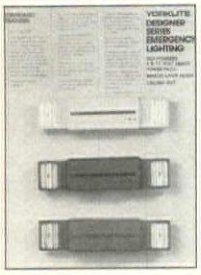
**Circle 133**




## Custom chandeliers

A bulletin from Gross Chandelier illustrates custom-designed chandeliers from the company's collection. Gross Chandelier Company, St. Louis, MO.

**Circle 134**



## Emergency lighting

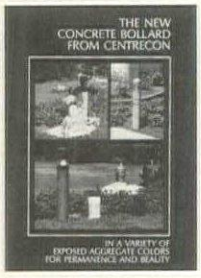
The Designer series emergency lighting unit has a fully automatic solid-state battery charger and top- or side-mounted lamp heads. A brochure details features for all models, including remote lamp heads. York-Lite Electronics, Inc., Austin, TX.

**Circle 135**


## Decorative outdoor lighting

A 58-page color catalog features decorative outdoor sconces, wall brackets, post-top lanterns, and ceiling-mounted and pendant luminaires in a variety of styles and finishes. Dinico Products Inc., Hackensack, NJ.

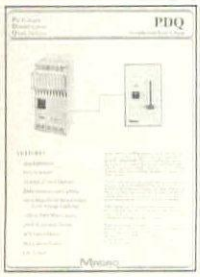
**Circle 136**




## Concrete bollards

Centrecon's concrete bollards come in several exposed aggregate colors and have complete lighting assemblies. A brochure shows cutaway sketches of several models. Centrecon, Inc., Everett, WA.

**Circle 137**




## Dimmer system

The PDQ prepackaged dimmer system controls standard and low-voltage incandescent lighting. A brochure describes features of dimmer modules, cabinets, and control panels. Macro Electronics, Austin, TX.

**Circle 138**

## Garage luminaires

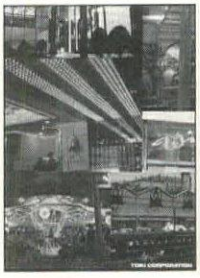
Six sharp cutoff optical assemblies are available for the Form Ten SCA garage luminaire. A brochure discusses general garage lighting needs and product features and specifications. Gardco Lighting, San Leandro, CA.

**Circle 139**

## Vandal-resistant luminaire

A data sheet provides photometrics and specifications for Perfeclite's recessed and surface-mounted miniprismatic luminaires for areas with high levels of vandalism. Models for incandescent and fluorescent lamps are available. Perfeclite Co., Cleveland, OH.

**Circle 140**



## Tape lights

A brochure from Capitol Lighting illustrates and describes components and accessories in the Toki low-voltage tape light system. Capitol Lighting Products Corp., Yonkers, NY.

**Circle 141**

## Traditional area lighting

Hadco's Old Boston outdoor luminaire is reminiscent of turn-of-the-century gaslights. A data sheet contains specifications, photometrics, cutaway drawings, and color photos of available models. Hadco, Littlestown, PA.

**Circle 142**

## Flexible light strip

Ribbonlite low-voltage flexible miniature light strips can be used for lighting ceiling coves, shelves, display cases, and other architectural details. A pamphlet contains specifications and cutaway drawings. Willem Wirtz Associates Inc., Palm Beach, FL. ■

**Circle 143**

# Calendar

| | |
|---|---|
| **September 26, 1988** | **Calendar deadline** for November *Architectural Lighting*. Contact: Susan Degen, Assistant Editor, *Architectural Lighting*, P.O. Box 10460, Eugene, OR 97440, (503) 343-1200. |
| **October 17–19, 1988** | **Architectural Lighting: Basics for Design and Application,** Penn State University, University Park, PA. Instructors: Craig Bernecker and Richard Mistrick. Contact: Donna Ricketts, 409 Keller Conference Center, Pennsylvania State University, University Park, PA 16802, (814) 863-1743. |
| **October 23–26, 1988** | **IFMA '88,** national conference and exhibition, Atlanta Market Center and Westin Peachtree Plaza, Atlanta. Contact: International Facility Management Association, 11 Greenway Plaza, Houston, TX 77046, (713) 623-IFMA. |
| **October 24–25, 1988** | **Conexion 88/Southern Lights,** Atlanta Market Center. Product exposition and educational program running concurrently with IFMA '88. Speakers: Howard Brandston, Imero Fiorentino, Frank Florentine, Randy Burkett, Mitchell Kohn, and others. Contact: Kate Nerone, Atlanta Market Center, 240 Peachtree Street, NW, Suite 2200, Atlanta, GA 30043, (404) 658-5674, (404) 581-1440, or (404) 688-8994. |
| **October 24–27, 1988** | **Indoor lighting institute,** Boulder, CO. Course on design considerations and analysis techniques for indoor lighting. Contact: Independent Testing Laboratories, 3386 Longhorn Road, Boulder, CO 80302, (303) 442-1255. |
| **November 3–4, 1988** | **Lighting Management,** Boston. Course on basics of energy-efficient design and retrofit. Repeats December 8–9 in Orlando, FL. Contact: Association of Energy Engineers, 4025 Pleasantdale Road, Suite 420, Atlanta, GA 30340, (404) 447-5083. |
| **November 3–5, 1988** | **IIDEX,** Metro Toronto Conference Center, Toronto, Canada. Contact: Association of Registered Interior Designers of Ontario, 168 Bedford Road, Toronto M5R 2K9, Canada, (416) 921-2127. |
| **November 5–9, 1988** | **ASLA annual meeting and educational exhibit,** Seattle, WA. Contact: American Society of Landscape Architects, 1733 Connecticut Avenue, NW, Washington, DC, 20009, (202) 466-7730. |

| | |
|---|---|
| **November 7–9, 1988** | **China–North America Daylighting Conference,** Scientific Hall, Beijing, People's Republic of China. Cosponsors: IESNA, China IES, and Architectural Physics Academic Committee of the Architectural Society of China. Contact: IESNA, 345 East 47th Street, New York, NY 10017, (212) 705-7915. |
| **November 13–16, 1988** | **International Hotel/Motel and Restaurant Show,** Javits Convention Center, New York City. Contact: George Little Management, 2 Park Avenue, New York, NY 10016, (212) 686-6070. |
| **November 14–15, 1988** | **Light Sources — Characteristics and Applications,** seminar, Royal Sonesta Hotel, Cambridge, MA. Course for engineers, designers, and technicians. Instructors: John Waymouth, Thomas Lemons, and Robert Levin. Contact: TLA–Lighting Consultants, Inc., 72 Loring Avenue, Salem, MA 01970, (508) 745-6870. |
| **November 14–16, 1988** | **Light and Color for Human Performance,** seminar, Georgia Tech, Atlanta. Course on recent research and performing calculations. Instructor: Alexander F. Styne, IDSA/FIES. Cosponsors: ASID, IES Georgia Section, AIA Atlanta Chapter, IBD, IDSA Atlanta Chapter, College of Engineering, Georgia Tech. Contact: Education Extension, Georgia Institute of Technology, Atlanta, GA 30332-0385, (404) 894-2547. |
| **November 15–16, 1988** | **Philadelphia Lights,** exposition and conference, Adam's Mark Hotel, Philadelphia. Cosponsors: IES Philadelphia Section, Electrical Association of Philadelphia, and Philadelphia chapters of AIA, ASID, IDC, and Preservation Techniques. Contact: Dennis Neff, The Electrical Association of Philadelphia, 9 Presidential Boulevard, Bala-Cynwyd, PA 19004, (215) 668-1700. |
| **November 16–17, 1988** | **Build Boston '88,** World Trade Center, Boston. BSA-sponsored convention and exposition for the design and construction industry. Contact: Paula DiFoggio, The Boston Society of Architects, 305 Newbury Street, Boston, MA 02115, (616) 267-5175. ■ |

# Classified Directory

## ACCENT AND DISPLAY LIGHTING (INTERIOR)

***BEND-A-LITE (see ad this section)***

***DANALITE, 16392 Gothard St. #A, Huntington Beach, CA 92647*** ..... ***FAX 714/848-1669 714/841-4325***
Low voltage / slim profile linear lighting system / high intensity halogen lamps / extensive apps.

***MIROFLECTOR CO., 40 Bayview Ave., Inwood, Long Island, NY 11696*** ..... ***516/371-1111***
Full line of recessed accent lights, down lights & wall washers. Architectural cylinders for HQI, incandescent compact quad fluorescents and HID lamp sources.

***NL CORP., 14901 Broadway, Cleveland, OH 44137*** ..... ***FAX 216/662-9069 or 216/662-2080***
Recessed HID and incandescent; decorative; custom; church; 20, 30, & 60 amp track; fluorescent lighting systems. Call for more information.



## ACCESSORIES AND COMPONENTS

***AMERICAN LOUVER CO., Skokie, IL, Louvers and Lenses*** ..... ***800/323-4250 or 312/470-3300***

## AMBIENT LIGHTING SYSTEMS (INTERIOR)

## AREA LIGHTING (EXTERIOR)

***ADJUSTA-POST MFG. CO., P.O. Box 71, Norton, Ohio 44203*** ..... ***FAX 216/745-9746 800/321-2132***
Residential & commercial outdoor fixtures. Stds. & Acces., HID, fluorescent, low volt. & incandescent.

***AMERICAN ELECTRIC, 1555 Lynnfield Rd., Memphis, TN 38119*** ..... ***901/682-7766***
HID luminaires for area, facade, roadway, sports, and industrial lighting applications.

***C.P.I. CONCRETE PRODUCTS, P.O. Box 13324, Memphis, TN 38113*** ..... ***FAX 901/775-9883 or 901/775-9880***
Concrete light poles & bollards. Fourteen decorative colors & exposed aggregate finishes such as dark bronze, black, & granite to match any setting. Square tapered design up to 65 ft.

***ELA CO., 17891 Arenth Ave., City of Industry, CA 91748*** ..... ***818/965-0821 FAX 818/965-9494***
Mfgs. of decorative outdoor fixtures, poles and arms for the commercial and residential mkts. Custom designing and mfg. of decorative interior/exterior fixtures.

***J.H. BAXTER & COMPANY, P.O. Box 10797, Eugene, Oregon 97440*** ..... ***503/689-3020***
Manufacturer of Timberwood Lighting Standards. A superior pressure-treated Douglas fir laminate for decorative outdoor lighting support. Contact Richard Baxter.

***PEMCO CORP., Philadelphia, PA, Exterior HID & Custom Lighting & Poles*** ..... ***215/236-9020***

***STONCO, 2345 Vauxhall Rd., Union, NJ 07083. Contact Phil Henry at*** ..... ***201/964-7000***
Outdoor lighting; fixtures and accessories for industrial, commercial and residential markets.

***UNION METAL CORP., 1022 9th St. SW, Canton, OH 44707*** ..... ***216/456-7653***
Steel, aluminum and concrete poles for area, roadway and sports lighting. Hi-mast raise-lower systems. Ornamental nostalgia lighting poles and luminaires.

***W.F. HARRIS LIGHTING, 4015 Airport Ext. Rd., Monroe, NC 28110*** ..... ***704/283-7477***
Indoor/outdoor decorative & vandal-resistant rustproof lighting for wall, ceiling, post & landscape applications. U.L. listed H.I.D., FL, INC & emergency fixtures.

## CONTROLS

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**GE Lighting Systems:** Floodlights.
**Shakespeare Company:** Fiber glass light poles.

**Page 16.** *Humanizing health care with pleasant, homey light* (Northwest Hospital, Seattle, Washington).
**Architectural Lighting Systems, Inc.:** Fluorescent uplight.
**Charles Loomis:** Wall sconce.
**Lightolier:** Recessed wall washer.
**Luxo:** Incandescent reading light.
**Prescolite:** Surface-mounted incandescent downlight.

**Page 18.** *Daylit atrium pleases permit pullers; cooling system real ice-breaker* (Kern County Public Services Building, Bakersfield, California).
**Capri:** Recessed HID downlights and cans.
**Hubbell:** Exterior HID floodlights.
**Kalwall:** Translucent fiber glass panels.
**Kawneer:** Light-shelf glazing system.
**Paralume:** Parabolic fluorescent troffers.
**PPG:** Tinted reflective and clear glass.

**Page 22.** *Microelectronics clean rooms: Standard lighting for specialized facilities* (Delco Fab III, Kokomo, Indiana).
**A.L.P.:** Silver acrylic paracube louvers.
**Comp-Aire:** Combination HEPA filter–light fixture.
**GE:** Low-voltage switching.
**Hi-Tec:** Pier-mounted metal halide indirect floods.
**Lightolier:** Incandescent glow ring.
**Lithonia:** Fluorescent exterior floodlights.
**Naturalite:** Skylights.
**Neo-Ray:** Fluorescent fixtures with parawedge lenses.
**Peerless:** 6-inch-diameter tube lights.
**Reloc:** Modular wiring.
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**Edison Price:** Multipurpose PAR 36 fixtures.
**Halo:** MR16 narrow spot fixtures.
**Hydrel:** Underwater lighting.
**Lite Lab:** 6- and 12-volt PAR spot fixtures.
**Norbert Belfer:** Miniature and candelabra-base light strips.
**Strand:** Dimming system.

**Page 36.** *Stadium lighting pays off for city, sports fans* (Jack Murphy Stadium, San Diego, California).
**GE:** 1500-watt metal halide lamps.
**GE Lighting Systems:** Floodlights.

*Manufacturer credits reflect the products specified for the projects; it is possible that other products were installed during construction or maintenance.*

## Photographers

**Dan Forer,** Forer Inc., 1970 North 149th Street, North Miami, FL 33181, (305) 949-3131

**Timothy Hursley,** The Arkansas Office, 1911 West Markham, Little Rock, AR 72205, (501) 372-0640

**David Monley,** 940 McKendrie Street, San Jose, CA 95110, (408) 247-7220

**Richard Springgate,** Springgate Architectural Photography, 2442 NW Market Street #345, Seattle, WA 98107, (206) 764-1962

**Mike Urbanek,** 1211 Maricopa Highway, Suite 201, Ojai, CA 93023, (805) 646-3371

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