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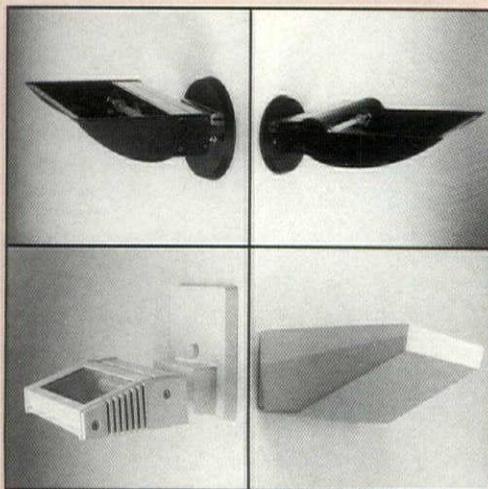
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Circle 1



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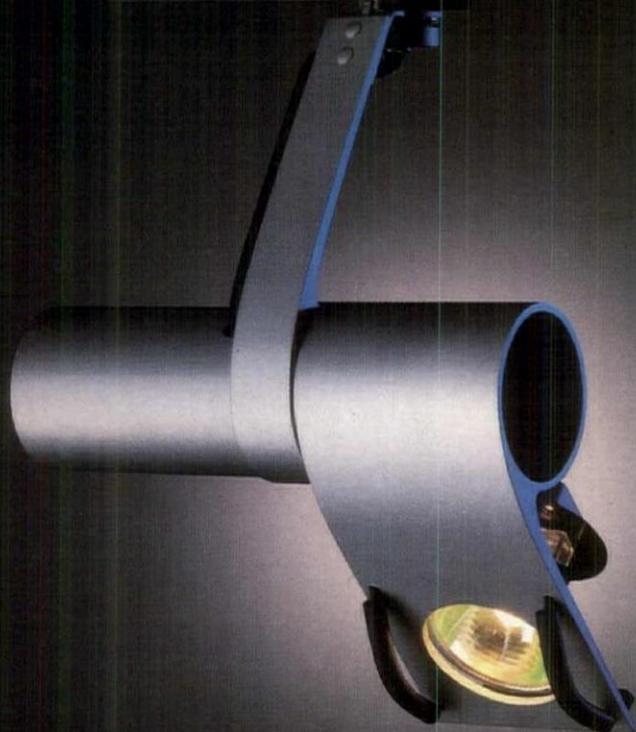


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Circle 3

ARCHITECTURAL LIGHTING

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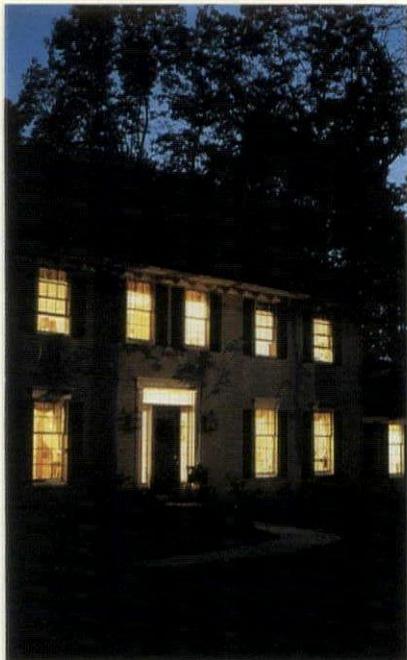
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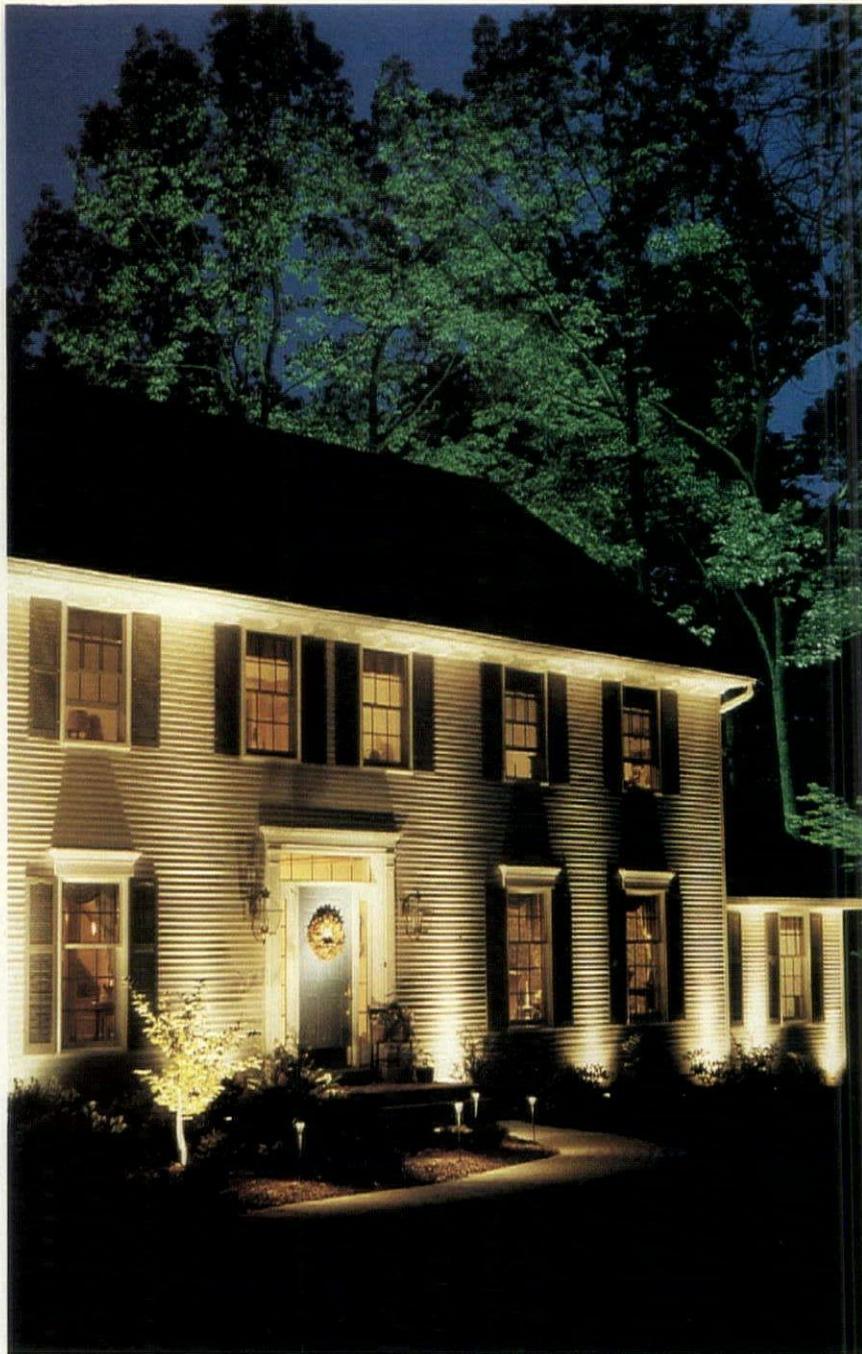


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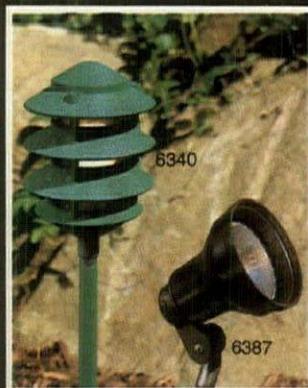
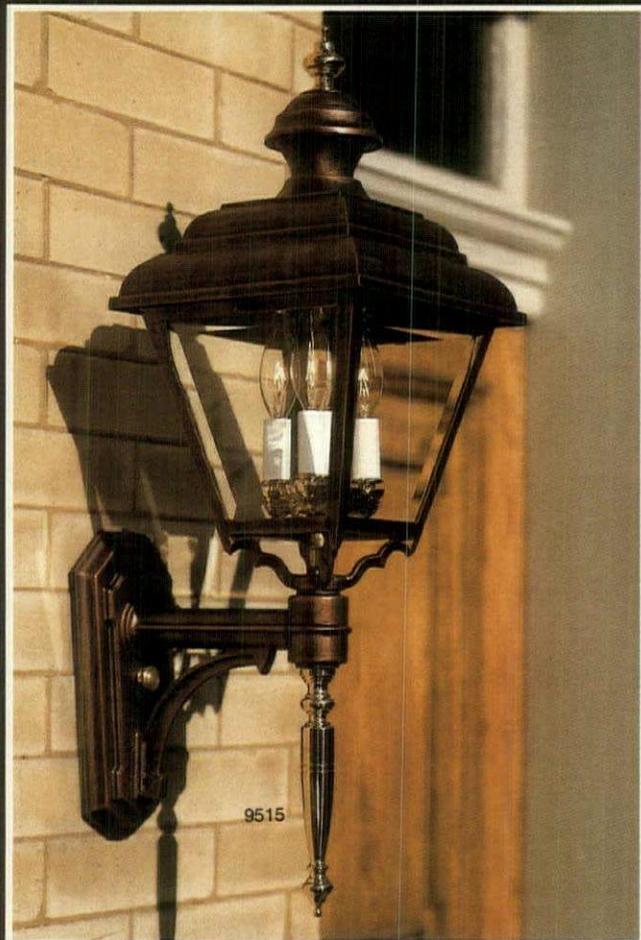
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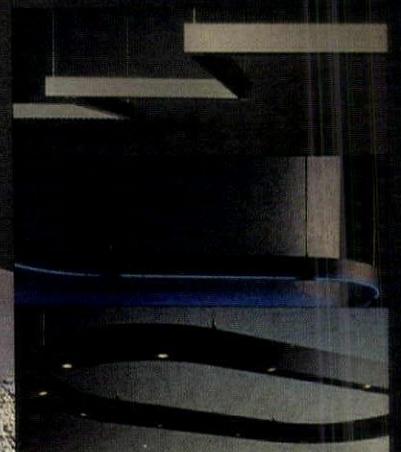
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San Francisco, California

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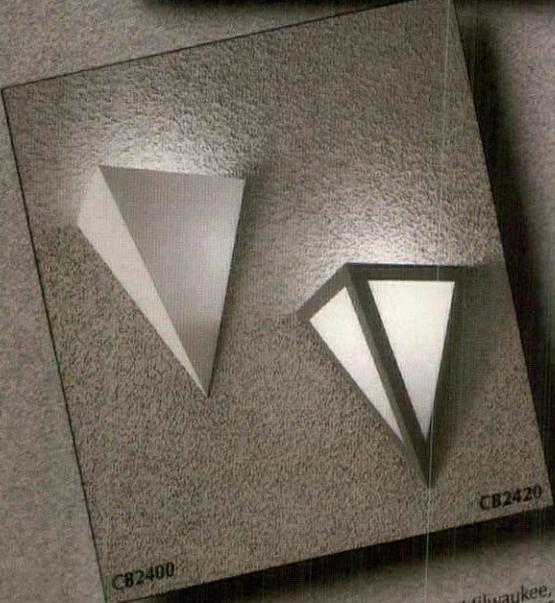
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Circle 7

From the Editor

Genlyte Corporation Chairman Fred Heller gave a wonderful keynote address at the Illuminating Engineering Society's annual conference early last month. He made several key points that deserve to be repeated here.

First, Mr. Heller says that the lighting industry in this country is an underachiever. Given all that better lighting can do for people, our industry has not done enough to educate either the general public or designers, or to help lighting technology reach its full potential. Second, he notes that the IES has much to gain by changing the lighting industry from an underachiever to an achiever, and that it is in a better position than any other organization to help make that change come about. Finally, Mr. Heller points out quite correctly that the key to making the lighting industry into an achiever is *education*.

Mr. Heller is absolutely right that the lighting industry is an underachiever. Currently, a designer's primary technical postacademic education comes from manufacturers' literature, and light bulb packaging provides the public's primary general knowledge of lighting. Nobody could argue that the current state of education on lighting is all it can be.

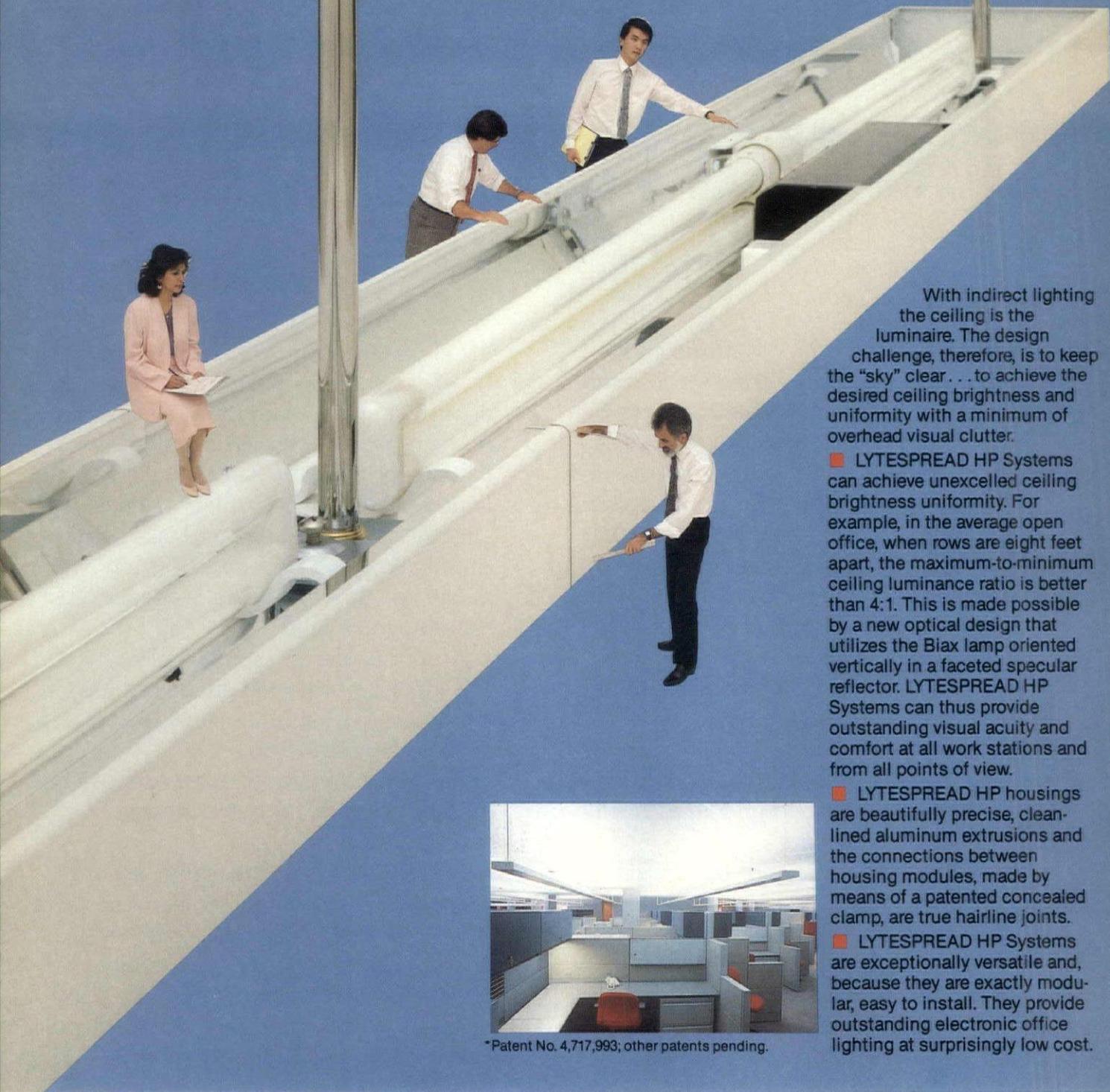
And I agree that the goals Mr. Heller set before the IES are worthy ones: to increase membership, to hire a full-time professional to bolster its educational mission, and to focus research efforts on establishing positive relationships between lighting and the issues that concern people, such as the relationship between lighting and productivity.

While the IES is perfectly capable of assuming the leadership role in improving lighting education, I think it would be counterproductive for the IES to do so without the help and involvement of other worthy organizations that share not just a vested interest in achieving this goal, and additional resources, but also the *responsibility* for achieving it. One small example of this concept in action was a lecture on daylighting given last year to a joint meeting of IES and AIA chapters in Kansas City. Organizers from both organizations were astonished at the success of a meeting of two groups with educational interests not previously thought of as compatible. And, oddly enough, an AIA member delivered the lecture.

Mr. Heller's address to the IES took a lot of courage. And I wouldn't want to sound as if I'm saying anything negative about the noble goals he has set. They're *great* goals. But the best results for both designers and the general public can be achieved if the IES uses its influence and resources to forge relationships with other organizations, and if *all* of them work together toward improving lighting education.

Charles Linn, AIA

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allow you the option of dimming them.

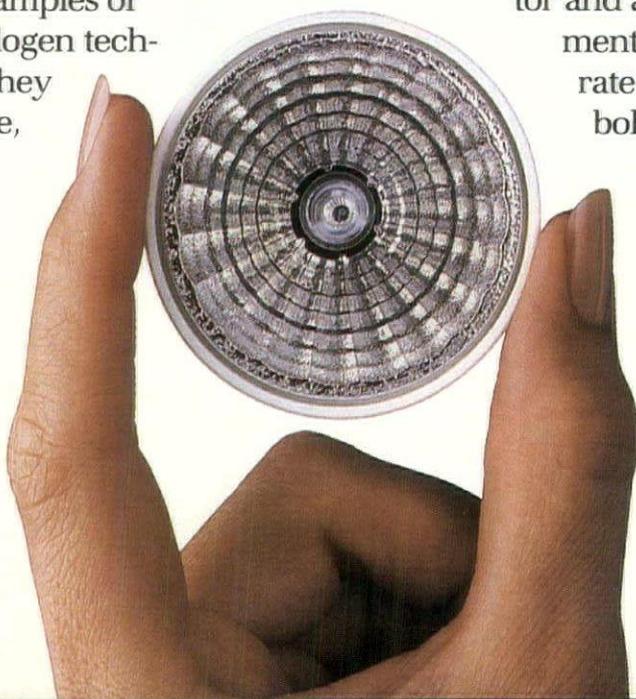
All of which opens up new choices for lighting designers and users. Retailers can now opt for shallower, less expensive fixtures—or no fixtures at all. A Designer 16 lamp is all that's needed for effective, attractive down lighting and task lighting. No transformers, no lens covers, no baffles, in fact no other hardware is needed. Just a beautiful, bare bulb.

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A lot of sophisticated engineering went into this remarkable little PAR lamp. Got a minute? Let us explain.

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gineer, being in art of a great idea.

With Sylvania Designer 16 lamps, you get performance efficiency similar to low voltage light sources but with some very big differences—no bulky transformers, no expensive add-ons, no extra costs, and no inconvenience.



Look ma! 120 volts. No transformer.

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Perhaps that's why Esprit, with its young, spirited clothing, decided on going high tech all the way with Designer 16 lamps lighting up their merchandise.

Esprit found that Designer 16 lamps offered better savings than standard MR 16 lamps. They also found out something else that's very interesting.

Esprit added just the right spirit to their stores with Designer 16 lamps.

Store managers tend to be intimidated by transformers and baffles. So these people were reluctant to replace burnt out bulbs by themselves. But Designer 16 lamps were so easy to change that maintenance was simplified.

And you thought a light bulb was just a light bulb.

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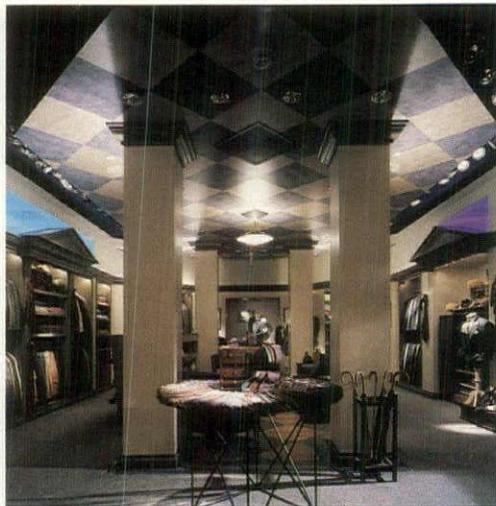
We'll help make you as obsessed with lighting as we are. Which will do wonders for the traffic in your store.

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Circle 9



September 1989
Volume 3, Number 9



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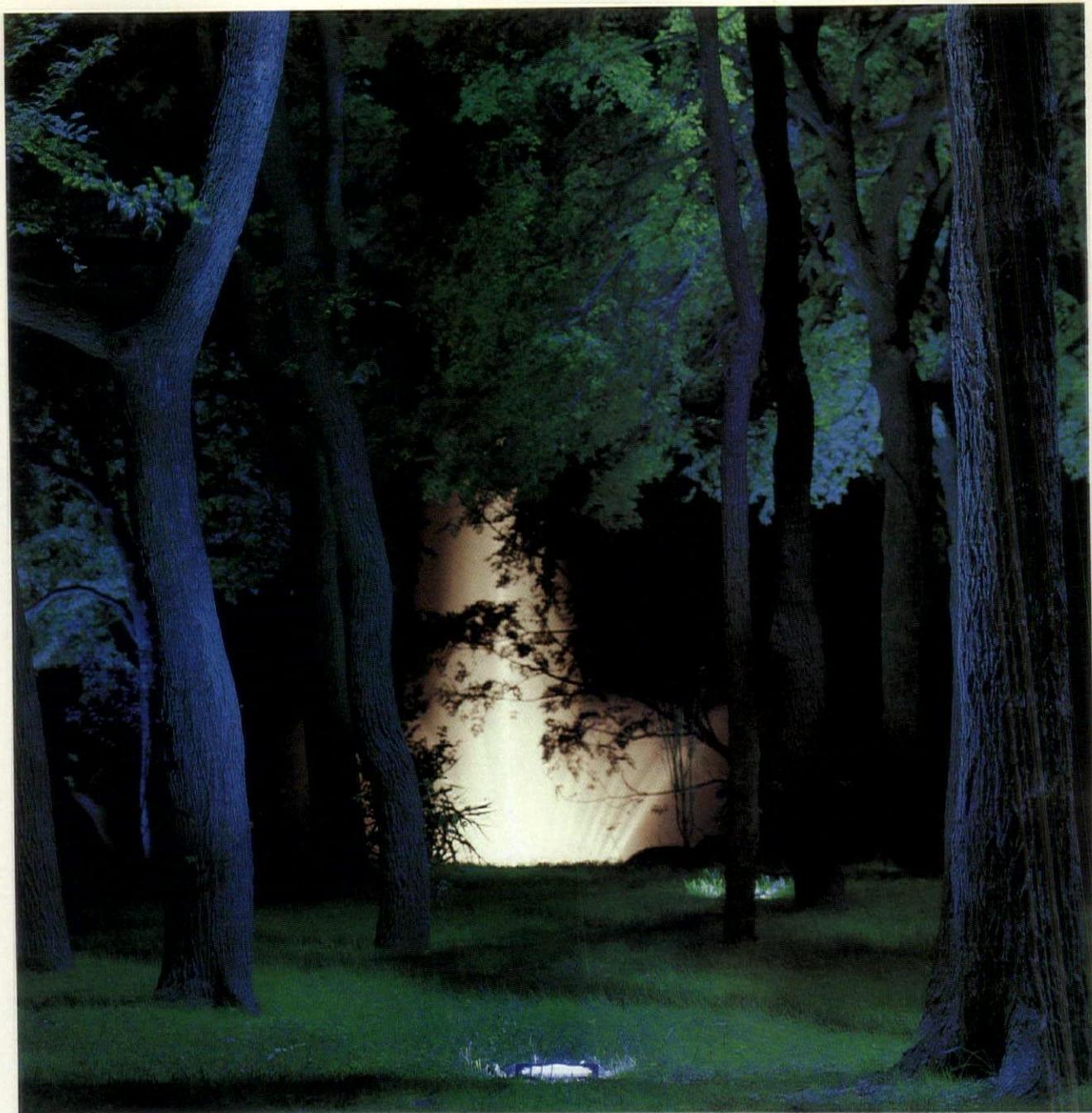
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GROUND EFFECTS

The beautiful grounds of this Southwest home are illuminated by Hydrel Series 6000 Well Lights using mercury vapor lamps to help create a "moonlight" effect. In the background, Hydrel 4000 Series Underwater Incandescent lights illuminate a Hydrel Aquahue fountain.

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Circle 11

Letters

A closer look at silver-film reflectors

I read James R. Benya's May 1989 column on office lighting with a good deal of interest. Unfortunately, although his lead into the subject was clearly based upon the high cost of energy and the changes that have occurred in lighting to help mitigate these increases, he failed to mention the potential energy savings that can occur when reflectors made with high-reflectance silver films are used as original equipment in lighting fixtures or retrofitted into existing fixtures.

Over the last six years, millions of square feet of this material have been put into office buildings and other facilities. As a result, it has been generating millions of dollars in savings.

Today, just about all major fluorescent lighting fixture manufacturers have introduced silver into their products, while dozens of retrofit companies have been installing the same material into fixtures currently in service. As a result, thousands of companies — including many of our country's largest — have been enjoying the cost savings these products clearly can provide.

Robert J. Mataya

Vice President, Marketing

Specular+

Elk Grove Village, Illinois

The columnist replies

I have not overlooked silver-deposited film laminate reflecting materials in my work. In fact, I have made several point-by-point computer analyses of new and retrofit installations, and have found that even in prime situations, the performance of silver-film reflectors is rivaled within a few percent by aluminum reflector systems.

Most silver-film reflectors have an overall reflectivity of nearly 95 percent. Other reflecting materials commonly used in luminaires are less reflective. For example, highly specular anti-iridescent aluminums appear to have a total reflectivity of 85-90 percent, depending on the product, and a well-painted surface using modern polyester powder coat paints has a reflectivity between 80 and 90 percent. Clearly, there is a potential advantage in using silver films, although the benefit from energy savings may not always be sufficient to warrant the added cost.

I agree that the specifier should be aware that reflector retrofit kits using both silver film and highly specular aluminum are available and can increase the efficiency of existing lensed troffer systems. If a lensed system design is called for in new construction, the specifier should investigate these materials because they may have appropriate applications.

In general, silver-film reflectors have been marketed primarily to owners of existing lensed troffer installations. Those who have failed to properly maintain their lighting systems can delamp, install reflectors, and achieve dramatic results, although in most cases, the cleaning and lamp replacement alone would allow a visually equivalent illumination level with 50 percent fewer lamps. Those who have cleaned their luminaires and group relamped on a very frequent basis will not realize as dramatic an improvement.

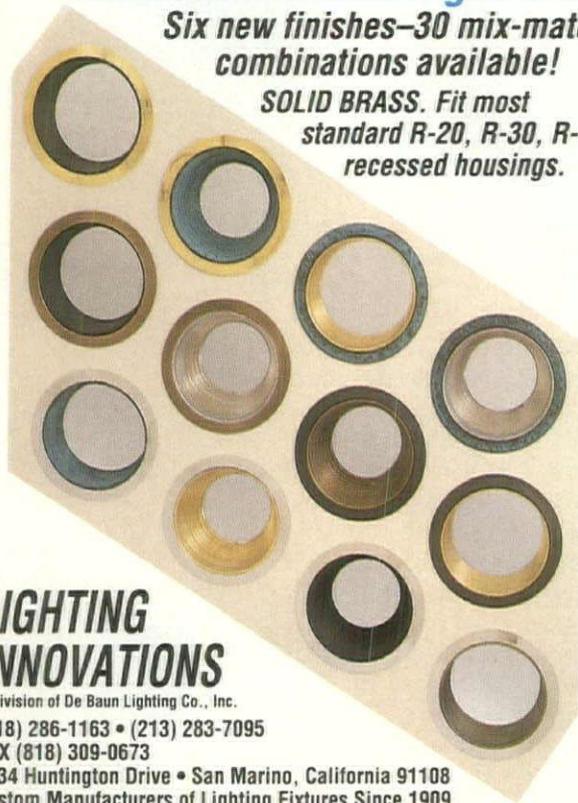
The life-cycle cost benefit of retrofitting reflectors is greatly influenced by the type of ballast. In most cases, if the existing ballast is not an energy-saving type, it is more economical to replace the entire fixture with a new parabolic one than it is to replace the ballast and install a reflector. With the

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Circle 12

LIGHT AND DESIGN

parabolic, one gains superior glare control, an improved VDT work environment, and a batwing distribution, none of which are achieved by the reflector retrofit.

I did not present silver-film reflectors as a major option for office lighting because my column was based on the premise that glare control and minimal VDT interference are modern design goals. I was unable to find superior performance capable of "generating millions of dollars in savings" through the use of silver-film material in luminaires that I believe are correct for this specific application.

In lensed troffers, reflectors increase the coefficient of utilization (CU) and fixture efficiency. I have found a 25-30 percent improvement in efficiency when comparing an optimally designed new silver-film luminaire with an everyday painted troffer. But the specular, faceted reflectors invariably cause a definite teardrop-shaped candlepower distribution, somewhat less desirable for uniformity and equivalent sphere illumination (ESI) than a batwing distribution. This also results in a decreased spacing-to-mounting height ratio. There is a small improvement in visual comfort probability (VCP), but reflector-equipped fixtures are just about as bad as any lensed fixture when it comes to causing a reflected image in a computer screen.

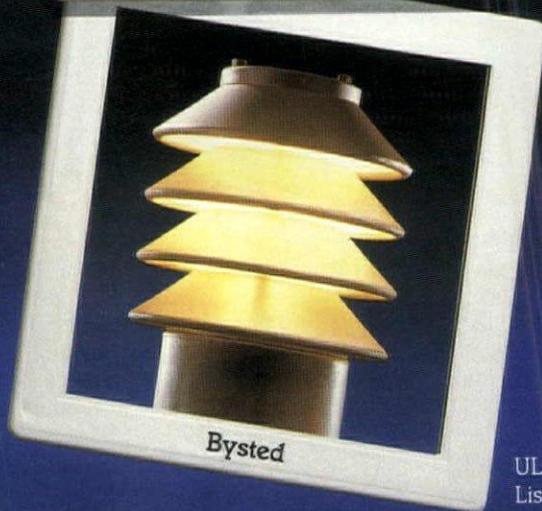
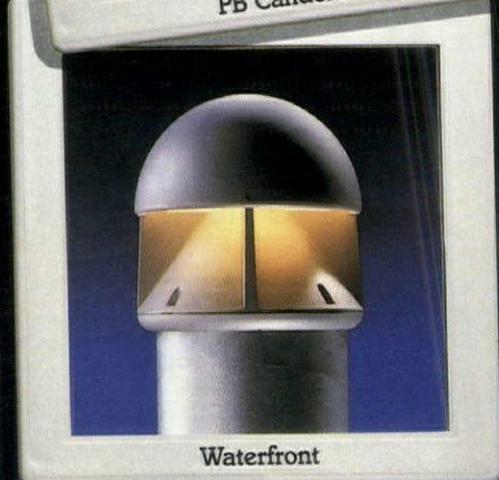
Silver film does not particularly improve a new parabolic fixture, as the material does not lend itself to use in the door-and-louver assembly. In my point-by-point analyses of a parabolic equipped with a silver-film reflector, it performed about the same as conventional parabolics with aluminum and painted reflectors. In fact, some high-performance parabolics made with standard materials outperformed the silver-film parabolic, largely due to the superior overall optical design of the high-performance fixtures.

As laminates, silver films have questionable life cycles. Early products suffered from delamination within 2 years of installation. Some concern remains about the life cycle of the polyester film on which the laminate is deposited because the surface illuminance and heat in a fixture are high enough to cause rapid degradation of any synthetic material. For extremely long life, materials including the film, substrate, and adhesive would have to be immune to photodegradation or thermal degradation effects.

Some question remains as to whether silver-film reflectors have an acceptable "reflectance life"; only time will tell. One manufacturer offers a 5-year warranty on its material, but there are no data on reflectivity after 10 years of at least 50 percent duty cycle.

James R. Benya, PE, IALD
Senior Principal
Luminae Souter Lighting Design
San Francisco, California

The editors welcome your letters, which help keep us responsive to our readers' needs and interests. Address your letters to Charles Linn, AIA, Editor, Architectural Lighting, 859 Willamette Street, P.O. Box 10460, Eugene, OR 97440. All letters are subject to editing.



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Angled beams are the secret to lighting glass cases

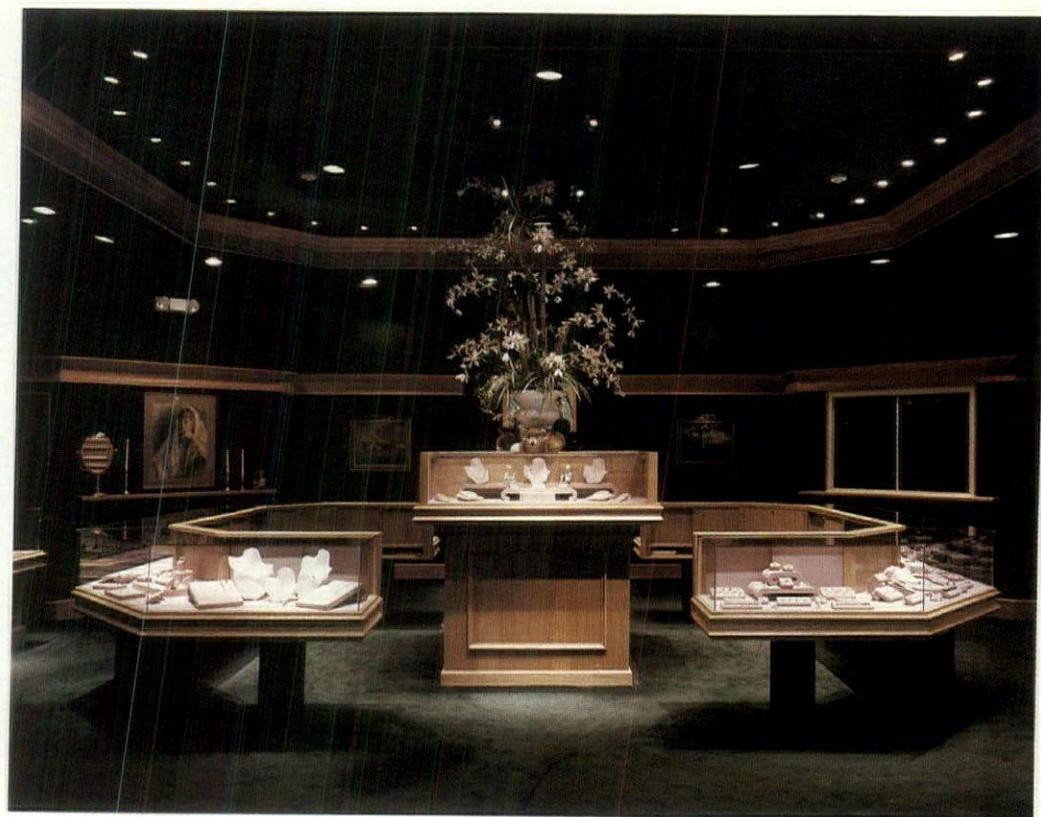
A jewelry retailer established a sophisticated new image and solved the problem of glare on glass cases. Architect Ken Parr angled and crossed the narrow beams from recessed MR16 downlights in a way that sends reflections away from the eyes of approaching customers.

In a program to shift its stores from strip shopping centers to malls, C. & H. Rauch Jewelers left behind lensed fluorescent troffers and selected instead an all-incandescent design featuring recessed MR16 lamps.

The company did not want lighting mounted inside glass display cases because that requires a blocky, solid band right at the edge where customers stand. Yet lighting from outside the case can cause distracting glare.

Architect Ken Parr experimented with fixture spacing, aiming, and beam spread. The cases appear to float against the subdued background of the walls, ceiling, and floor. The only other fixtures in the area are recessed 150-watt R-lamp cans on a dimmed circuit.

"The most difficult problem is that our personnel are not used to working with the MR16

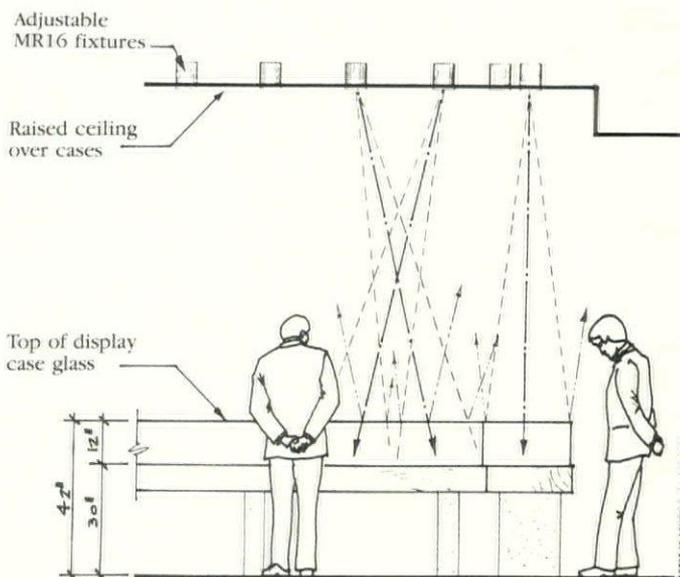


lamp," says Parr. "They complain about burnouts because they think it's a hassle to change lamps." He studied the lamp life of the MR16s in three of the new stores and found that they do live up to the manufacturer's rated hours.

Satisfied with the MR16's intense white light and excellent color rendition, Parr declined to use the blue-tinted incandescent "diamond lights" marketed to jewelers. Rauch liked the results, and plans to have built at least 20 stores based on the prototype by the end of 1990.

—Gareth Fenley

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



Project: "Thoroughbred" prototype store

Location: Turfland Mall, Lexington, Kentucky

Owner: C. & H. Rauch Jewelers

Architect: Kenneth J. Parr, AIA

Concept: Robert Cloyd

Photo: Doug Hedrick

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Circle 14



Now you see it, now you don't



Project: The Market at Portland International Airport

Location: Portland, Oregon

Client: Port of Portland

Architect: Jon Schleuning and Mark Foster, SRG Partnership

Lighting Designer: Craig Marquardt, PAE Consulting Engineers, Inc.

Electrical Engineer: Robert Sulek, PAE Consulting Engineers, Inc.

Interior Designer: Laura Hill and Claudia Gentzkow, SRG Partnership

Photos: Ed Hershberger

An airport shopping area changes its look at different times of day.

The secret to the changing balance of white and colored light is a curved, suspended screen called "the cloud." Its perforated steel panels seem transparent when strongly illuminated from above by daylight, and they seem opaque when multi-hued interior lighting from below dominates at night or on a cheerless overcast day.

Renovation at the Portland International Airport introduced monitor skylights into the retail area. A shading system was needed to protect the glass storefronts on the east side from glare, and the problem was solved in straightforward fashion with wood louvers on the west-facing monitor. But an inventive team of architects and lighting designer Craig Marquardt didn't stop there: they created the cloud and an elaborate electrical lighting system to play off its unique properties.

With CADD modeling and full-scale mock-ups, the team compared screening materials and configurations. They selected a perforated steel panel that, when painted gloss white, makes a smooth transition from transparency to opacity.

A computer-driven dimming system orchestrates changes in the electrical lighting, inspired by daily and seasonal changes in daylight. Mounted below a catwalk on the east side of the cloud panels are two rows of fluorescent fixtures, one with

4100K T8 lamps and one with 3100K T8s. A third row has track-mounted incandescent spotlights with amber gels that produce a deep sunset-orange color. The computer changes the lighting blend on a 24-hour cycle, with fade times varying from 5 to 90 minutes. Because retailers thought that changing light might distract customers, the most dramatic color changes occur after store hours.

Before dawn, the amber spotlights and 3100K fluorescents are set at full output, making the cloud look opaque. It becomes transparent after sunrise as the electric lights dim and daylight takes over. On overcast days, a photocell triggers a special preset pattern of spotlights to create a warm atmosphere.

At sunset, the electric lights come up again, beginning with the 4100K fluorescents at the lower portion of the cloud. Colors progressively change, producing a sunset effect. Late in the evening, the atmosphere is subdued, with the spotlights and 4100K fluorescents at full output and the 3100K fluorescents at 10 percent.

Adding to the blend of light sources, custom metal halide standards provide downlight and 10 percent uplight in the mall throughout the day. Merchandise is lit with 3500K cold cathode cove lights and MR16 accents. The dimming program keeps the lighting energy use for the total system at 1.1 watts per square foot, making the project not only dynamic but energy-efficient as well.

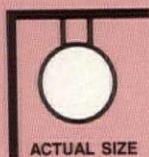
—Gareth Fenley

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

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Circle 15





Chandeliers and column-mounted uplights provide ambient lighting at Alexander Julian. Accent lighting for displays and racks near the edge of the dropped ceiling comes from recessed low-voltage track, lamped with PAR 36s in a variety of beam spreads.

gels cast a deep purple and magenta glow onto the soffit.

Inside the store, the lighting combines ambient sources with vigorous accents. Indirect incandescent lighting from chandeliers and sconces blends with display accent lighting provided by recessed adjustable downlights and concealed track lighting. "The indirect fixtures get light up onto the ceiling where it's bounced back down onto the floor," says Roeder, "so that the general light level of the

store is high enough to view things without glare. Then we've come in with our other equipment for accent lighting."

Most of the accent lighting for racks and display cases around the perimeter is tucked into a recess 12 inches higher than the dropped ceiling it borders. Track lighting was suggested by interior designer Ken Walker, who said, "After all, it's optimal for a retail store," Roeder recalls. "We had to take a deep breath," he says. "Track's

flexibility is a must, but we wanted the most finished-looking ceiling possible. We came up with a blue finish for the track, which matched the blue squares in the ceiling, and recessed it off to the sides. Eighty percent of the time when you're standing in the store, you see a finished ceiling. You may see part of a track head here and there, but the majority of the track is recessed out of sight."

All the track lighting uses 75-



Stimulating retail sales with lighting that adds visual excitement

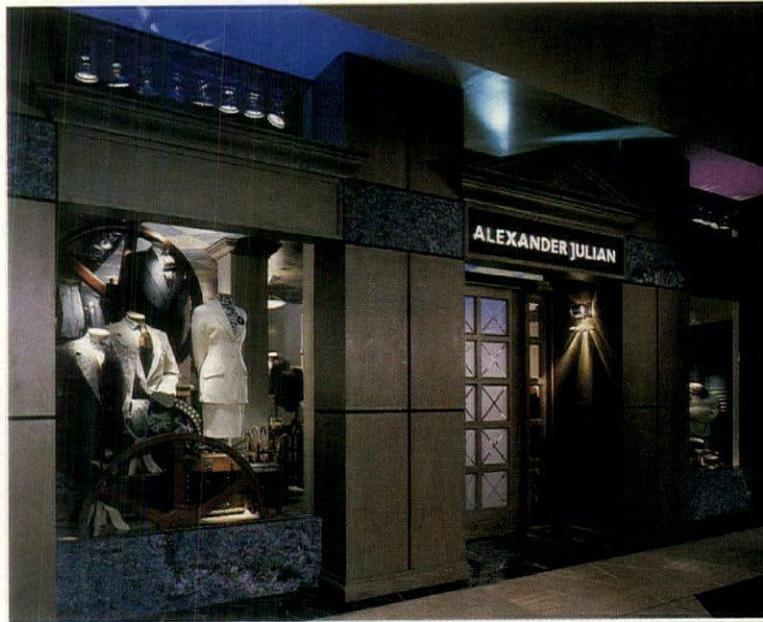
ARTICLE BY
CHARLES LINN, AIA

PHOTOS BY
PETER PAIGE

Lighting for retail must do two basic things: attract the customer's attention and, particularly in high-end garment retailing, flatter the appearance of customer and merchandise. Lighting designer Craig Roeder is hard put to say which is more important. When discussing his design of the lighting for the Alexander Julian store in Atlanta, he mentions both as his major goals.

"After a customer momentarily takes in the look of the store, the focus really becomes the clothing," says Roeder. "Of course, it's our responsibility to make the interior of the store look spectacular. But showing off the clothing is the major goal.

"Actually, our number one goal is always to make people look good. That's true even if we're doing a hotel, but especially if we're doing a retail clothing store. If a customer puts on a suit, and it makes him look marvelous, he's going to feel good. And hopefully that translates into sales. If a customer tries to buy a suit at a store where the lighting is poor, and it gives him terrible facial shadows so he seems to age as he steps before a mirror, he'll put that suit right back on the rack and leave."



Eye-Catching Displays

The Alexander Julian entryway is a delightful union of lighting and architecture. Two eye-catching decorative sconces spray beams of light across the stained wood recess that frames the door and sidelights. Overhead, crossing turquoise beams of light graze the soffit over the door's pediment. Low-voltage track lighting illuminates mannequins and clothing in display windows, and above them, concealed fluorescent strips with

Project: Alexander Julian store
Location: Atlanta

Lighting Designer: Craig A. Roeder and Associates; Craig A. Roeder, principal; Robert Mapes, project manager

Interior Designer: Walker Hughes, Inc.; Ken Walker, John Hughes, principals

General Contractor: G.P. Winter Associates, Inc.; Gill Winter



watt low-voltage PAR lamps in either 3-, 10-, or 30-degree beam spreads, depending on whether the lamp is providing an accent or flooding an entire rack. "One of the things Mr. Julian said to me early on is, 'I've never been to a store where the bottom rack of suits was lit,' so we've done that," Roeder says. "We use a 30-degree lamp to wash the entire rack bay, and then take two 10-degree lamps and slash their beams diagonally across the bottom rack. That

really does a nice job of letting you see the clothing at the bottom of the rack as well as at the top." Recessed fixtures evenly illuminate pant drawers, which have a concealed switch to close the lighting circuit when the drawers are opened.

Freestanding displays in the center of the store are illuminated by recessed adjustable low-voltage downlights with PAR 36 lamps. These are slightly more difficult than track to adjust when displays change,

but allow the center section of the ceiling to remain perfectly flat.

General illumination for shelves and display cases comes from concealed low-voltage halogen lamps mounted on extruded aluminum strips or miniature low-voltage downlights. "Those provide the general illumination," Roeder explains. "But from out in front of the cases we've used some of the concealed track fixtures to shoot two or three pin spots

into the cases for accent light. It's not as if the lighting in the case is all one light level — it has light and *highlight*. The display case is more exciting if the background is one level and then there are two or three possibly more expensive items popped out with their own little lights. I really believe this creates visual excitement, which then translates into sales."

Roeder has also given special attention to the dressing rooms,



where customers see how the new clothes they have selected will look on them for the first time. "The mirror is modeled on the idea of a vitrine, one of those small mirrored boxes where your grandmother might have displayed her collection of china dolls. The light in a vitrine bounces around, and the effect is just wonderful. Here, the customer becomes part of the vitrine.

"This is the only place in the store where we've used A-lamp downlights. If you put PAR lamps over people, they make horrible facial shadows. Instead, we've taken a fixture with a nice, wide distribution and put that softer light over the mirrors where people put on clothes. Then, using a glass gel, we've thrown in a little pink light on the face for the complexion, and a pin spot. This throws a skinny blaze of light across the suit or shirt or whatever the customer has on and makes it sparkle. The whole garment is lit, but the extra stripe of light slashing across it makes it pop and look exciting."

Colored Coves

Color is a key to Alexander Julian's fashion style. "It may be only a thread of color in the fabric," Roeder says, "but it's that thread that the lighting picks up and plays with. As nice as the lighting coves are in the photo-

graphs, the color of the light that comes out of them in life is much more intense than that. The individual colors themselves are really a statement about Julian, because the purple and turquoise are very big colors for their lines of clothing."

The light box for the cove is painted off-white, with the color produced entirely by wrapping sheets of theatrical gel material over fluorescent lamps. On high-wattage incandescents, theatrical gels normally have a very limited life due to lamp heat. Over fluorescents, though, Roeder predicts they should last a couple of years. This gives an added bonus: flexibility. "All colors have a limited life. They come and go. The other colors in the store are pretty neutral; the colored gels in the light boxes can be changed later, to give the store an entirely different feeling."

Elsewhere on the project, fluorescent fixtures are conspicuously absent, except for 1-foot by 4-foot louvered recessed fixtures in the stock room and tailor shop at the rear. But the need for appropriate color rendering in these supporting areas has not been neglected. "We used 3000K lamps back there, and tried to match the color rendering from the store through the tailor shop and stock room. It is especially important that a customer not feel that the color

of the clothing changed when he took it in to the tailor shop to be fitted. In the stock room, too, color rendering is vital. The salesperson runs into the back to pick up a shirt or tie; if they pick up the wrong color under a cool white lamp, they could potentially lose a sale."

Controls and Maintenance

All the lighting in the store is controlled on a simple four-scene preset system. "The daytime setting, which has the highest lighting level, still dims the lamps about ten percent to increase lamp life," Roeder says. "I realize, of course, that control systems are more expensive than lamps, but the greatest advantage is the convenience of not having to relamp nearly as often.

"There are two evening scenes, one that is used when the store is open in the evenings, where everything is dimmed about 70 percent, and another fun little cocktail setting which brings down the ambient light level a bit more and bumps up the accent lights a bit. This can be used for special occasions. When the lights are dimmed for the evening settings, the light level of the fluorescent coves doesn't dim at all, but becomes a brilliant kaleidoscope of color." The final scene is used when the store is closed. Several lights on dis-

"Display cases are more exciting if the background lighting is one level and more expensive items are popped out with their own little lights," says Roeder. In this display case, recessed miniature low-voltage downlights illuminate top shelves, and recessed adjustable downlights accent artwork and lower shelves.

plays throughout the store remain on, dimmed to a low level, as do the lights on displays in the front window.

The lack of ongoing relamping, focusing, and maintenance have been the downfall of many a good retail lighting design, so Roeder employs a comprehensive education program for his clients once a project is completed. "We always teach our clients how to adjust the track and downlights, as well as the basics of relamping as part of our services. Our retail clients are very good about taking care of the lighting. They hire people who know how to play with the lighting because they've learned how much lighting can do for them. Lighting creates visual stimulation, and that once again, ladies and gentlemen, turns into sales." ■

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

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Lighting Graphics

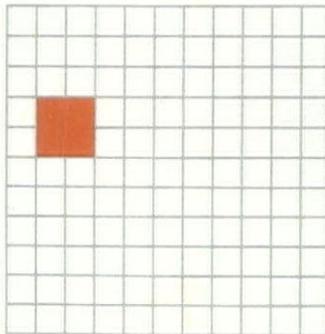
Simple wood or concrete posts are often used as a demarcation between pedestrian and vehicular areas, or between paved surfaces and landscaped grounds. If lights are added to improve nighttime visibility, the posts are magically transformed into lighted bollards. They furnish general illumination in the surrounding area for pedestrian and vehicular circulation, improved security, and luminous enhancement of the after-dark environment.

Lighting fixture manufacturers offer a wide selection of lighted bollards with a variety of interesting shapes, colors, finishes, and light sources. Occasionally, architectural lighting installations allow the luxury of using custom-designed and hand-crafted lighting equipment; under conditions of favorable labor and material costs, this can be a desirable option that will not significantly affect the overall project cost.

The accompanying drawings show a bollard made from inexpensive and readily available materials. It uses pressure-treated wood for the housing — rather than redwood or cedar — because of its greater strength and durability. The wood can be stained or left to weather naturally. Tight joints, galvanized fasteners, and weatherproof glue are also recommended.

Traffic signal lamps are used to obtain a warm incandescent color and unusually long lamp life (8000 hours). They are available in 69-watt and 116-watt sizes. Compact fluorescent lamps could also be used in the 9-watt and 13-watt sizes, which offer approximately the same respective light output and lamp life. In cold weather, however, these lamps will have some problems starting and furnishing full light output.

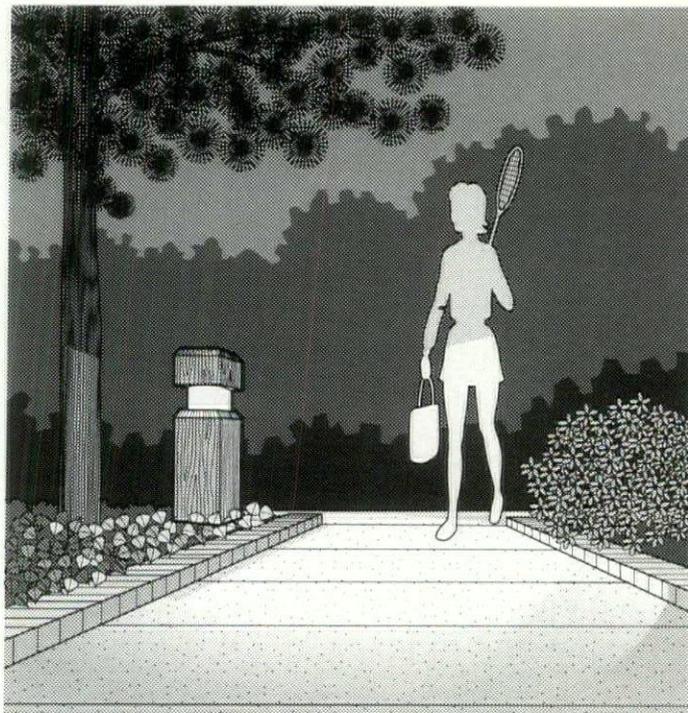
To add a final custom touch, a company logo, identifying symbol, or special design can be routed into one or more sides of the wood housing. ■



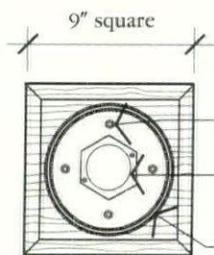
Custom-designed lighted bollard

Sam Mills, AIA, IES

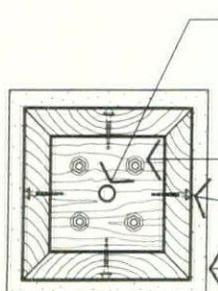
Sam Mills is an architect and lighting consultant with his own firm in Oklahoma City.



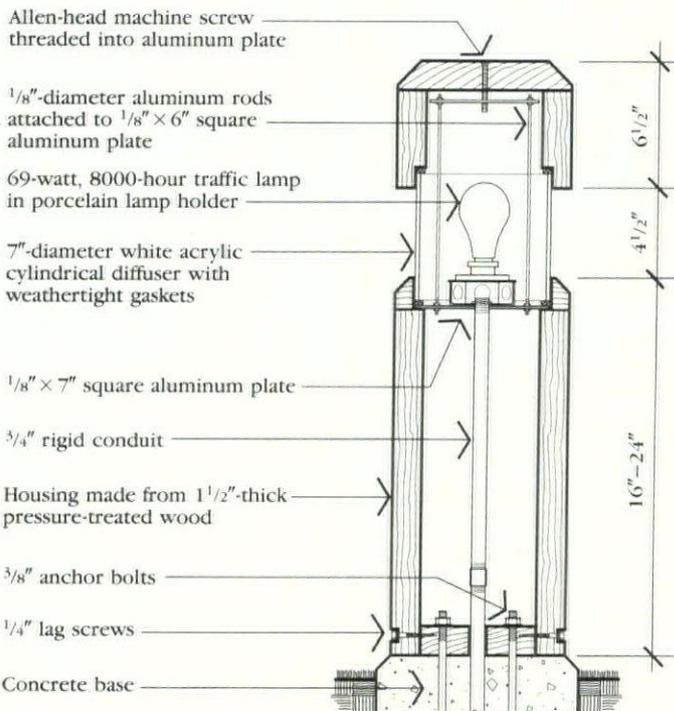
Lighted bollards furnish illumination for pedestrian and vehicular circulation, improved after-dark security, and enhancement of the nighttime exterior environment.



Cross section



Cross section



Section

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It utilizes the softening effects of multi-point illumination with

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Plus, better light control means fewer fixtures are needed, for a cost advantage that extends from installation into routine upkeep. Compared to fluorescent, there are 1/4 as many fixtures to install, and 1/12 the lamps to burn out.

There simply isn't a better lighting source for the retail environment than the Holophane PrismGlo. It defines form, emphasizes texture, and reveals color like no other fixture ever has. It saves money from the very outset, and makes you and your merchandise shine in the process.

For more information on how to let your retail merchandise do a better job of selling itself with the PrismGlo, see your Holophane representative or write Dave Meredith, Holophane, 214 Oakwood Avenue, Newark, Ohio 43055. (614) 349-4118.



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Daylighting Techniques

As architects, engineers, and other designers reduce the energy required to heat and cool large commercial buildings, electric lighting becomes the largest energy consumer in these buildings. Daylighting promises to reduce these lighting loads. The major drawback for designers is the lack of fast and accurate analytic and design tools.

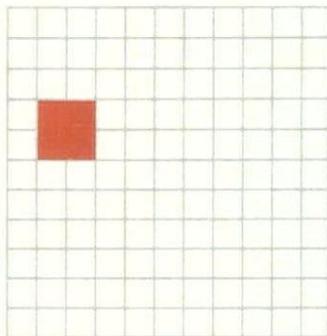
Many methods are available for predicting daylight illumination inside buildings, including scale model photometry and numerical calculation techniques. This month I will discuss the application of computer calculation methods and describe some of their strengths and weaknesses. For additional information, see "Software Reviews," March and August, 1988.

Calculation Methods

The two principal types of numerical daylighting calculation methods differ in their theoretical approach. The *daylight factor method* was developed for uniform sky conditions, in which the sky has the same luminance in all orientations, and can be either overcast or clear.

The *lumen method* was adapted from an electric lighting calculation method, the flux averaging method. That method assumes that the indoor light level is proportional to the light flux coming through openings from outside light sources. Because it was developed for electric light sources, the spatial distribution of luminance that it yields is not applicable to daylight. To compensate for this, the lumen method's developers made a series of full-scale indoor illuminance measurements with varying daylighting design parameters. The results, converted to a tabular format, enable designers to estimate illuminance levels for limited design conditions.

The current practice recommended by IES for daylighting is based on the lumen method.



Software for daylighting prediction and design

Mojtaba Navvab

Mojtaba Navvab is a research scientist in the College of Architecture and Urban Planning at the University of Michigan, Ann Arbor.

A typical daylighting calculation includes these design variables.

To use it, designers must accept certain assumptions. If the assumptions are inconsistent with their design, the results may not be accurate. The method falls short, for example, with complex office and fenestration designs. Modern floor plans are divided by partitions, and windows have combined glazing and shading systems. A simplified model with empty open spaces and bare, rectilinear windows does not provide enough information to lighting designers.

More sophisticated modeling is possible with the computational power of computers. Many daylighting programs have been published for computers ranging from microcomputers to mainframes. Research scientist Robert Clear of Lawrence Berkeley Laboratory wrote the original daylighting program for a TI-59 programmable calculator. That program, Quicklite 1, remains the base line among computer programs for daylighting calculation in terms of capability and limitations.

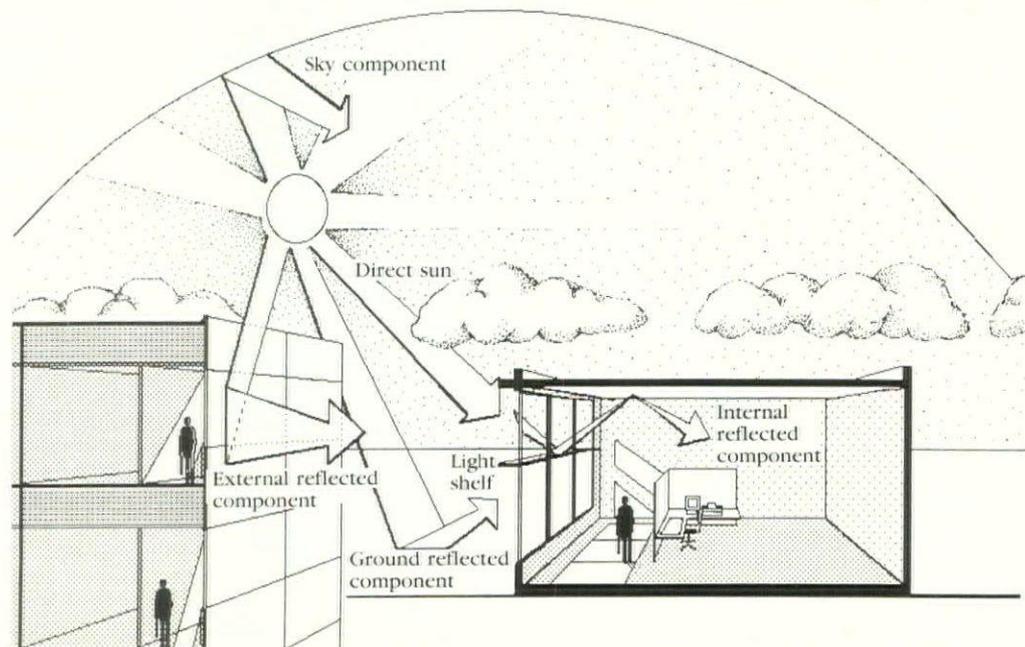
Quicklite 1 was designed to provide a fast estimate of daylighting levels inside buildings. The program computes the sky

component of daylight under uniform overcast and clear sky conditions. It does not, however, compute the direct sun component and does not indicate its presence in the space. It does not handle internal or external obstructions, sloping ground, light shelves, non-vertical glazing, or irregularly shaped rooms. The internal reflected component for the entire space is computed as an average value; therefore, the program's accuracy may be poor for situations where the sky component is low.

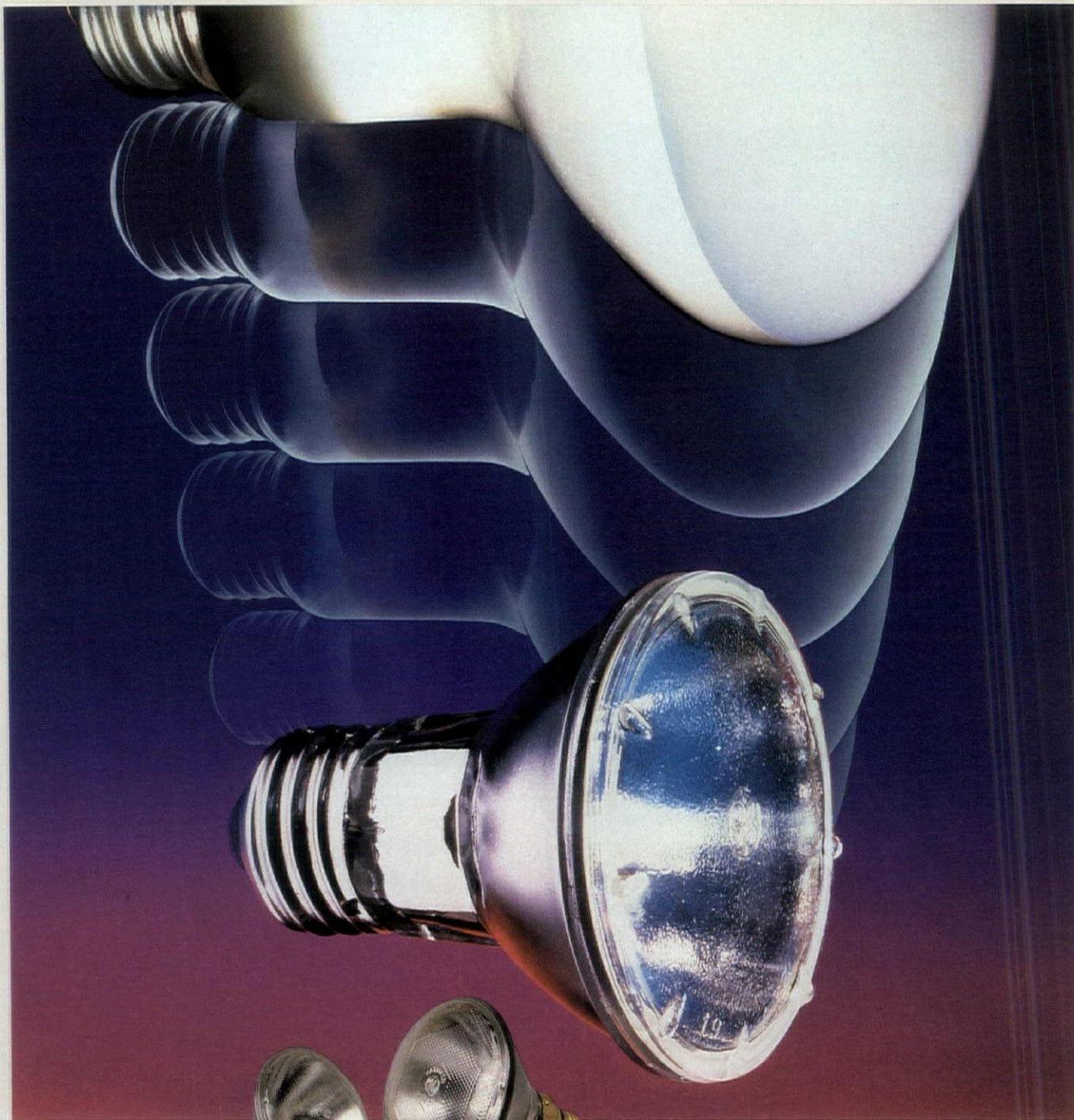
Newer programs such as Microlite, CADLight, and Superlite have enabled design professionals to simulate several design alternatives quickly. More importantly, they are being used by students as educational tools. These computer tools, when combined with traditional design methods, can generate new design ideas for students and professionals.

Computer Modeling Advances

Computers can now calculate the daylighting contribution from the sky for complex room geometries and various sky conditions. This sky component



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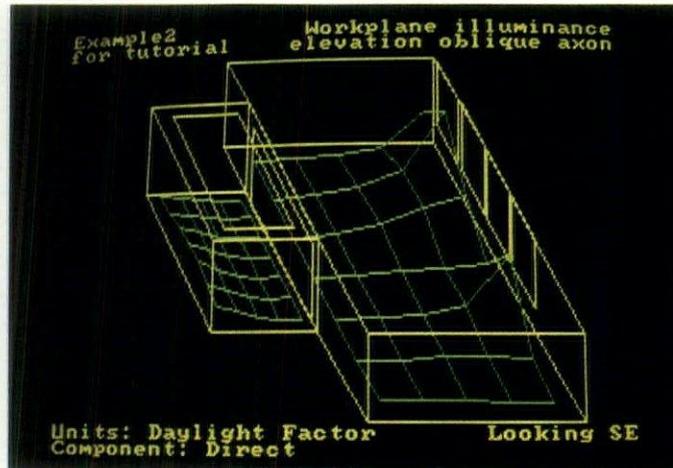
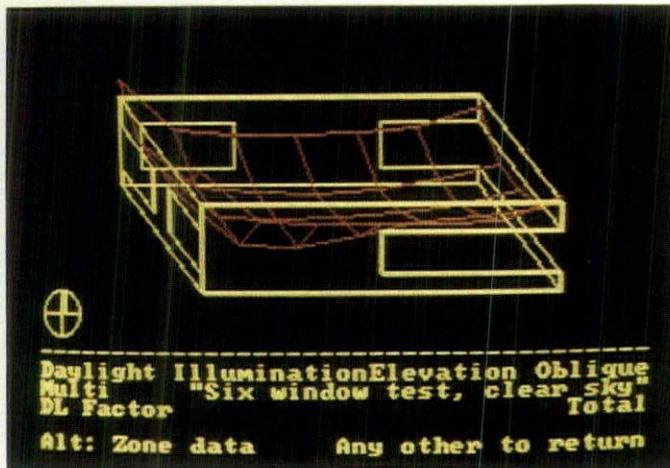
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Sample output screens from Microlite (left) and CADLight (right) show the distribution of daylight throughout a room.

calculation takes into account simple internal and external obstructions such as interior partitions and neighboring buildings. A new algorithm can determine the luminance distribution for nonrectangular windows under any kind of sky luminance distribution that the user can describe mathematically. With hand calculation or tabulated data, only simple windows and uniform sky conditions could be analyzed.

New simulation models compute the transmittance of light through glazing as a function of the angle of incidence of the direct sunlight. Some computer programs provide an integrated approach to energy and lighting design by combining daylighting with energy analysis.

Another major advance in computer models has been the calculation of the reflected component. The *split flux method* gives accurate results for conditions where the reflected light is uniformly distributed over the entire work plane. It has been widely accepted for application in daylighting calculations. Even so, it has certain limitations. For example, it as-

Daylighting calculation software

Program	Source	Computer ¹	Capabilities ²
Building Energy Estimation Module (BEEM)	Ross & Baruzzini, Inc. 7912 Bonhomme St. Louis, MO 63105 Maurice Garoutte, (314) 725-2242	MI	D+
CADLight I	EnergyWorks, Inc. Wiley Professional Software John Wiley & Sons 605 Third Avenue New York, NY 10158 (201) 469-4400	MI	D
Controlite 1.0	Lighting Systems Research Building 90-3111 Lawrence Berkeley Laboratory Berkeley, CA 94720 Francis Rubinstein, (415) 486-4096	MI	D+
Dalite	National Institute of Standards and Technology Building 226, Room A-313 Gaithersburg, MD 20899 Gary Gillette, (301) 975-6448	MI	D
Daylit	Graduate School of Architecture and Urban Planning 405 Hilgard Avenue University of California Los Angeles, CA 90024 Murray Milne, (213) 825-7370	MI	D+
DOE 2.1D	Simulation Research Group Building 90-3147 Lawrence Berkeley Laboratory Berkeley, CA 94720 Fred Winkelmann, (415) 486-5711	MF	D+

continued on page 32

1. MI = microcomputers, MF = mainframes.

2. D = daylighting only, D+ = daylighting plus other capabilities.



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sumes diffusive surfaces in the space. When direct sunlight is computed, the accuracy of the internal reflected component decreases.

Some new methods have not yet been validated for daylighting design. These include *ray tracing*, for calculating the effect of specular light reflection from shiny surfaces; *radiosity*, for calculating the diffuse reflection from matte-finished colored surfaces; and *glass transmittance*, for calculating the loss of light as it penetrates the glazing system. Ray-tracing software can generate design renderings, complete with interior and exterior finishes and lighting effects.

Even the newest daylighting design tools suffer from serious limitations. These tools cannot simulate interior illuminance levels for a broad range of design alternatives. Current energy simulation models include the effect of direct solar radiation on indoor thermal environments, but the most recent lighting design tools do not calculate the influence of direct solar illuminance on luminous environments. Daylight availability and sky luminance distribution models are available for only a limited selection of climatic regions.

Some limitations lie in the theoretical modeling of the optical properties of building components. For example, light-reflecting surfaces are modeled as perfectly diffusive, when in most real situations they are not. Simulation programs — including glass transmittance simulations — also assume that transmitted and reflected light is uniform over the visible spectrum, thereby modeling all surfaces as gray.

Another type of limitation is a function of software efficiency and hardware capability. Daylighting programs may be more or less satisfactory in their simulation of a clear sky with direct sunlight, their allowance for

sloped surfaces and glazing, and their ability to model complex shading devices such as light shelves and overhangs. They vary in how well they handle input and output in a familiar graphic format. They may allow a limited number of interior surfaces, windows, and skylights in the spatial description. They may or may not be integrated with thermal and electric lighting analysis programs for an overall building performance

evaluation. Finally, two computer programs with identical calculation procedures can differ greatly in their "user friendliness."

Some of these limitations restrict the number of design alternatives that designers have to choose from. Nevertheless, building design professionals are increasing their use of computers at every stage of design, especially for lighting — including both daylighting and electrical

lighting. Their objective is to light not only more efficiently, but more beautifully as well. Accurate prediction of lighting quantities provides a good base for a qualitative evaluation of the lighting design. ■

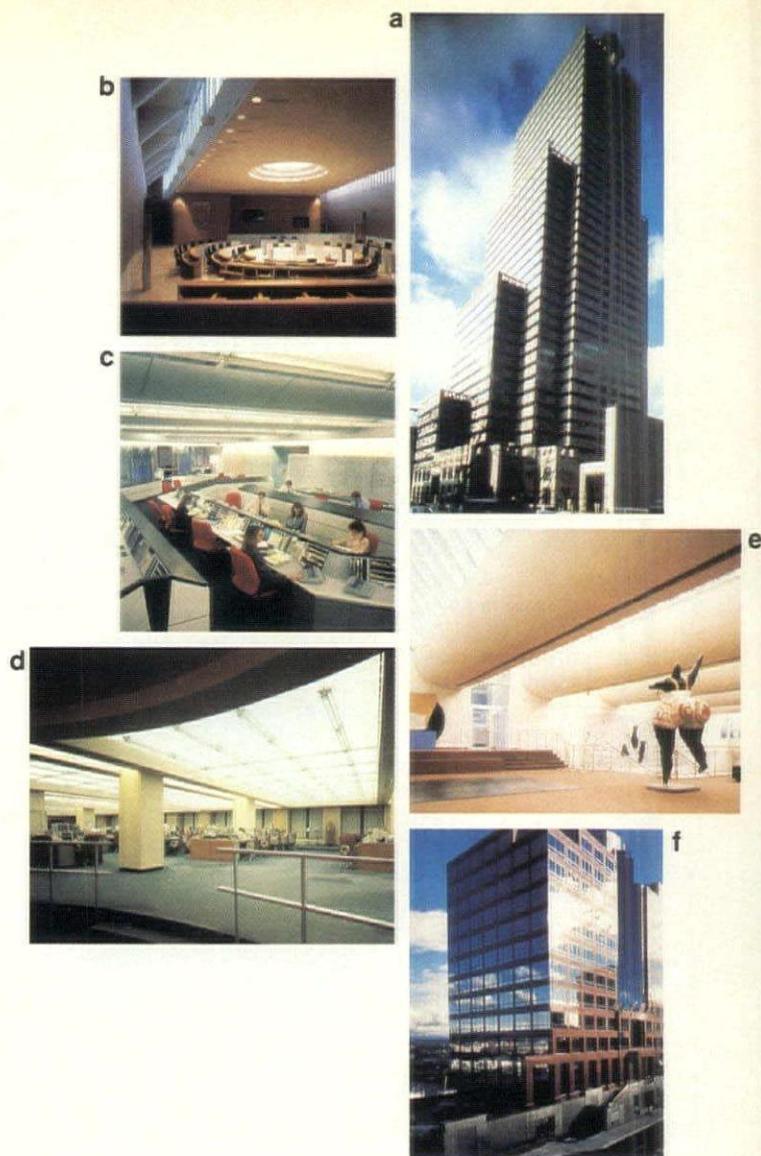
The daylighting columnist would like to hear from readers about unique daylighting applications. Write to Mojtaba Navvab, MIES, College of Architecture, University of Michigan, Ann Arbor, MI 48109.

Daylighting calculation software (continued)

Program	Source	Computer ¹	Capabilities ²
Dynalite	Center for Environmental Design Research 373 Wurster Hall University of California Berkeley, CA 94720 Mark Smith, (415) 642-2896	MI	D
Lumen II and Lumen III	Lighting Technologies 3060 Walnut Street, Suite 209 Boulder, CO 80301 David DiLaura, (303) 449-5791	MF, MI	D+
Microlite 1.0	Department of Architecture Graduate School of Design Harvard University 48 Quincy Street Cambridge, MA 02138 Harvey Bryan, (617) 495-9741	MI	D
Quicklite 1	Windows and Daylighting Group Building 90-3111 Lawrence Berkeley Laboratory Berkeley, CA 94720 (415) 486-5605	MI	D
Skysize	Sun Pine Software 2275 Cox Road Cocoa, FL 32926 Ross McCluney, (305) 631-6225	MI	D
Superlite	College of Architecture and Environmental Design Arizona State University Tempe, AZ 85287 Jong-Jin Kim, (602) 965-6210	MF, MI	D
UWLight	Department of Architecture Gould Hall JO-20 University of Washington Seattle, WA 98105 Marietta Millet, (206) 543-4180	MF	D

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Hillside home's lighting emphasizes architecture, artwork, and vistas

Residential projects offer many opportunities for special lighting that enhances architectural space, artwork, furnishings, and beautiful vistas. But taking advantage of these opportunities requires teamwork among design professionals. "It is most important to us," says lighting designer Chip Israel, "to get the strongest lighting possible, but not to jam a lighting concept down anyone's throat. By the time we're done, the project is sort of a hybrid of efforts." That coordinated effort is evident in the lighting design for the Lee Bronson house in the Hollywood Hills.

Susan Degen

Susan Degen is associate editor of Architectural Lighting.



Gates of a sheltered entryway open to reveal floor-to-ceiling glass doors. Through the front doors visitors can see a long hallway cutting across the middle of the house and, through a second pair of glass doors at the far end, a view of city lights. Niche-lined walls of the dramatic hallway display spotlit African masks. Landscape fixtures on overhanging roof beams accent an outdoor metal sculpture framed by the doorway at the far end of the hall. It lures visitors through to a back patio, where they can take in a panoramic view of Los Angeles from high in the Hollywood Hills. Although wired to a separate circuit, the fixtures are controlled from inside, as are other lights in the hall gallery.



Project: Bronson house
Location: Los Angeles
Client: Lee Bronson
Architect: Ed Fields and Dave Richards, Fields & Silverman
Lighting Design: Raymond Grenald and Chip Israel, Grenald Associates Ltd.
Photos: Chip Israel

Entry and Mask Gallery
Lighting emphasizes the rhythm of the house's front facade. Here, each column is washed by burial-type, blue-green mercury uplights, blending with fluorescent lights built into the back of each column that wash the walls. In contrast to the

cool color temperature on the facade, the entry itself is marked by a warm and inviting pool of quartz incandescent light.

Inside, visitors find themselves at the house's focal point, a dramatically lit hallway that serves as a gallery, where

niches line two walls. Each niche showcases a mask from the owner's prized collection of African art. "The hallway has a very strong architectural rhythm that we wanted to emphasize," says Israel. "We also wanted to provide correct, acceptable lighting for the art-



Three niches displaying statues on one wall of the living room continue the architectural rhythm of the mask gallery. As in the gallery, lighting designer Chip Israel used recessed accent fixtures to light the statues. Adjustable MR16 accent lights highlight the two square columns separating the living room from the niches. Wall washers illuminate large canvases on both adjacent walls, and they spread light on the surfaces of built-in cabinets on the opposite wall. Among the cabinets, a small recessed bar with glass shelves and a mirrored back glistens in the light of its own built-in downlights. Accent downlights aimed at the long couch facing the cabinets illuminate the sitting area. Just outside is an outdoor dining area lit by MR16 accent lights recessed into the 12-foot-deep overhang that shelters it.

work."

Custom recessed sconces along one of the two niched walls provide indirect ambient light, while recessed adjustable MR16 pinhole spots with sources of varying intensities accent individual masks. "The main emphasis was to make the

one wall more intense as one looks down the hallway and to provide strong fill and focus lighting on the masks," says Israel.

A lighting control system allows the owner to vary levels of ambient and accent light in the gallery. "Everything is dim-

mable," says Israel. "There might be multiple fixtures aiming at each mask, but they are all on different circuits. One fixture provides the soft lighting for the wall, and two others provide the more intense light for the mask. There are also 8 presets, so the owner can dial in dif-

ferent moods, then come in and touch one button to modulate all the lights."

Living Room

With its 12-foot-high wall of sliding glass panels, the living room is designed to take full advantage of abundant daylight and

a panoramic view of the Los Angeles basin and the Pacific Ocean beyond. "Those floor-to-ceiling glass doors slide just like a storefront in a mall," says Israel. "You can open up the whole house and walk right out to the edge of the world." A 12-foot-deep overhang on this southwest-facing side of the house prevents direct daylight from endangering the valuable artworks or causing heat gain.

In the middle of the glazed living room wall is a built-in fireplace. Over it hangs a large painting lit by three recessed wall washers. Israel minimized shadows here by using four downlights to crosslight two sofas in front of the fireplace. An accent light aimed down at a low angle highlights a table between the sofas. "Any time that we do this sort of lighting," says Israel, "we have to know exactly where the furniture will be placed, because we don't light just the space, we light the function — what will be taking place throughout the area.

"We knew exactly where the two seating groups and the piano would be. This gave us the ability to silhouette the piano against the wall, task light the music, and even provide an accent for the vase displayed on top of the piano. For successful lighting you have to have a good team that can nail down all of the locations. The fixtures can't move that much, unless you use track, which is usually unacceptable in a residence."

Kitchen and Formal Dining Room

The kitchen and dining room both have glazed walls that open onto a tree-filled courtyard. The trees help protect the interior from the glare and heat of direct sunlight. "The island kitchen format is pretty typical," says Israel. "We have fluorescent task lights built underneath the cabinetry. The cabinets are cantilevered from the wall, so we used the space



Mounted under the ventilation hood in the kitchen, three greaseproof incandescent fixtures light a grill on the cooking island. Fluorescent fixtures concealed atop the hood add indirect ambient light to the room. More fluorescents are mounted under and above cabinets.

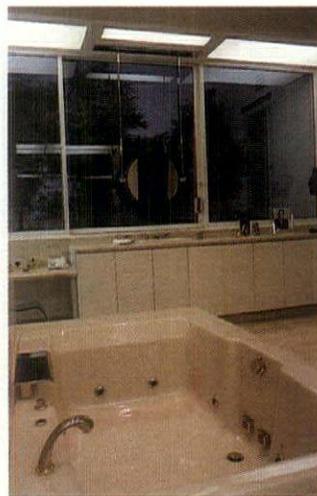
above them to conceal an indirect fluorescent light to wash across the ceiling.

"All the lamps are high color rendering fluorescent lamps," he adds. "Normally we would use warm light sources in a residence, but because everything was white and gray and marble, we went a little bit cooler, using 3500K fluorescent lamps."

Visible across the courtyard is a formal dining room that has a cluster of PAR downlights in the high ceiling over the table. "The downlights pound a lot of light downward," he says. "You also get an indirect light reflecting off the surface, especially with a white tablecloth. There are enough lamps so that you get crosslighting of the people's faces and a higher light level down on the table itself." Wall washers set in a soffit illuminate another large canvas that hangs above a low recessed sideboard.

Master Bath and Bedroom

One of the two sink areas in the master bath has a window that looks out onto a little landscaped courtyard. "To light up the vegetation, we mounted low-voltage track lights out on the back side of the wall above the window," says Israel. "When it's dark outside and you're inside where it's brighter, the glass acts like a mirror. But when you light the outside area too, the glass becomes more transparent. That was the concept in a couple of the rooms, everything from the landscape lighting to the little atrium courtyards — you try to pump a lot of light outside so that the spaces are expanded beyond the glass wall."



Over sink areas in the bathrooms are custom-built direct/indirect fixtures that house simple industrial strips with high color rendering fluorescent lamps. Israel added side lighting for one sink by recessing a vertical run of plastic-lensed fluorescent lamps in walls to either side of the counter. Ceiling-mounted low-voltage MR16 accent lights graze the stone wall behind the whirlpool tub and provide reading light for those using the whirlpool.

Lighting over sink areas in the bathrooms comes from high color rendering fluorescent lamps on simple industrial strips concealed inside custom-built direct/indirect fixtures. To light a walk-through shower behind the tub area in the master bath, Israel used a louvered fluorescent slot recessed in the ceiling above the wall with the shower head. Low-voltage downlights illuminate the tub. Israel also added an infrared motion detector that conveniently controls lights in a walk-in dressing room between the master bath and the master bedroom.

Floor-to-ceiling windows fill one wall of the master bedroom. A row of recessed wall washers illuminates the other three walls, highlighting large canvases over the bed and on an adjacent wall and the built-in closets and fireplace in the wall opposite the bed. Little reading lamps on the nightstands add visual interest to the setting. However, Israel notes, most of the reading light comes from recessed adjustable accents aimed toward the bed.

Whether it be the city lights below, a tree in an inner courtyard, or an African mask in the gallery, the Bronson house is designed to enhance a viewer's enjoyment of the object viewed. Lighting becomes a crucial element in such a design, not only because it helps emphasize the architectural design but also because it focuses attention on objects and details rather than on the lighting itself. "If the architect and interior designer make accommodations for the lighting, then it definitely increases the number of things you can do," says Israel. "It also comes down to money — having a client who realizes how important the lighting can be." ■

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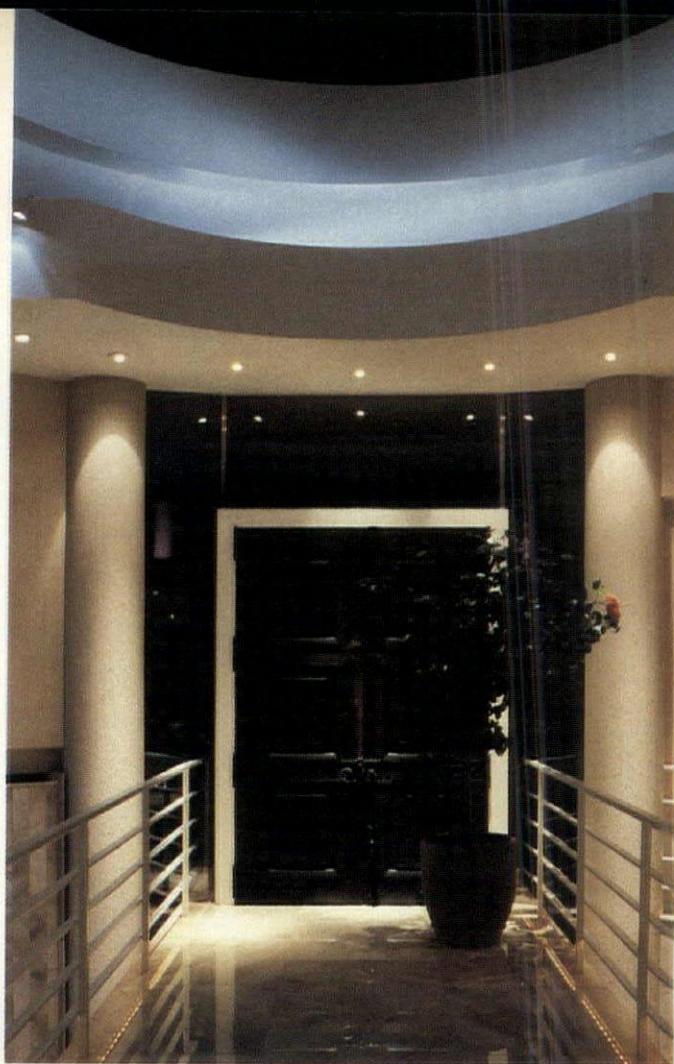
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Theatrical light shows make Michigan residence an adventure

What do you get when you combine a lighting designer schooled in the theater with a client more interested in creativity than in economy? Add an architect eager to provide the spatial opportunities for imaginative lighting, and you get a house that defies the dark Michigan winters with a spectacular array of lighting techniques.

Lighting designer Stefan Graf worked together with architect Jack Brown to design and illuminate the house. "Brown was sensitive to lighting issues," says Graf. "He designed a lot of tall spaces and provided shelves and soffits that we could do indirect lighting from. He'd thought about that in advance, which was really helpful."

Barbara-Jo Novitski is contributing editor of Architectural Lighting.



Daylight, dimmers, and colored filters produce a variety of effects in the living room.

Project: Residence
Location: Michigan
Architect: Brown and Deyo; Jack Brown
Lighting Designer: Illuminant; Stefan Graf
Interior Designer: Richard Talbert
Landscape Architect: John Crampton
Photos: Thomas Weschler

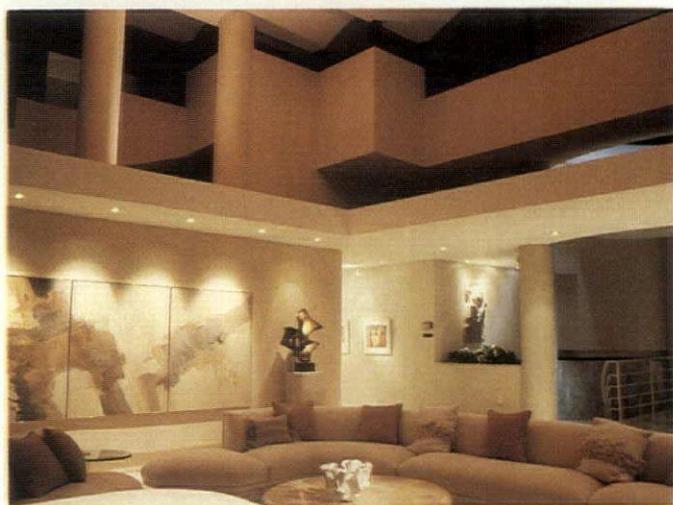
The owner's contribution to the design process was a willingness to experiment. Retired and planning to spend more of his days at home, he wanted his new house to demonstrate state-of-the-art lighting technology. Because the owner entertains frequently, he wanted a flexible control over the luminous environment so he could orchestrate changes to suit the occasion. The result is a house that is an adventure to live in with a lighting system that is exciting to operate.



Adventures in Colorful Living
The living room hosts a theatrical light show. The owner can manipulate a multipurpose lighting system to suit his whims. Around the perimeter, about halfway between floor and ceiling, is a shelflike platform that varies in width from about 4 to 8 feet. Concealed behind a 10-inch baffle are lights on four dimmed circuits that create a variety of effects on the walls and vaulted ceilings.

Two circuits operate color-filtered uplights to modify the

A large hemispherical skylight near the main entrance is punctuated with stepped coves and illuminated with a light blue wash (top photo). This effect was created with concealed, directional MR16 spot lamps. The designers were able to illuminate the entire dome perimeter from one location on top of the entrance canopy. Linear spread lenses changed the beam pattern from 12 degrees to about 12-by-55 degrees.



A bridge just inside the front door crosses over a three-story, 15-foot-diameter circular stairwell (above left). In the fountain below, a statue is backlit with a red color wash and front-lit by an MR16 spot with a gold color filter. On the travertine marble walls, a blue light washes down one side to illuminate a waterfall spilling over the edge of a small pool. Small lights tucked under the stair rail highlight the stair treads.

ambient light color and complement the room's furnishings. The selected colors are a warm peach and a cool lavender. Graf explains that these colors were chosen in preference to saturated primaries like red or blue. "It's a theatrical approach," he says. "The colors are subtle, but they still create a warm and a cool feeling. The owner has a lot of flexibility to determine what type of atmosphere he wants to create for a given evening or a given event." A third circuit controls a



series of template projectors. The owner can insert a stainless steel cutout into the projector and project that shape onto the ceiling. Templates of clouds, stars, and a variety of holiday symbols can be applied in combination with the color washes. According to Graf, the owner enjoys having the ceiling dark as his guests arrive and surprising them later on with the light show. With the fourth circuit, Graf created another interesting "color" effect with white light.

A ceramic art sculpture behind the whirlpool (above right) is lit by two systems, providing two very different options for showing off its depth and character. Downlighting from a horizontal cove across the sculpture's top creates shadows and shows off its three-dimensionality. Side lighting from vertical coves on each side of the piece is more uniform. The owner can turn on either circuit or both together to give the artwork a different look.

The breakfast nook (above) is a semicircular space surrounded by a glass wall and skylight. To create a sparkle without continuous lines of light, low-voltage lamps were installed in the cross points of the mullions, with the low-voltage wiring running inside the hollow mullions. A wet bar of stainless steel and glass (below) has a cool, specular, metallic quality. The designers chose a color-correction filter to increase the color temperature to about 3600K, thus distinguishing the bar from the rest of the room. "Fluorescents are appropriate in residential spaces," says lighting designer Stefan Graf, "because of the exceptionally good color qualities and color selection that are available today. If they're used appropriately, especially if they are indirect, they work really well."



To dramatize the stepped ceiling, he used incandescent and quartz lighting with small variations in color temperature. The light is 2800K in the center of the ceiling, 3400K on the first step, and 3800K around the perimeter. "It's a subtle shift from very warm to cooler," Graf says. "It complements the steps in the architecture. When we talk about changes in colors, we don't always mean theatrical colors. We can make the changes very subtle by only using color-correction filters."

As another alternative, the owner can turn all four circuits off to make the ceiling recede. "When the lights are off," says Graf, "you get a sense of the night sky coming through all that glass."

Art Illumination

During the design process, the owner had not yet selected artwork to go on display, so the designers had to provide flex-

ible lighting systems that could accommodate a variety of unknowns. To complicate his criteria, the owner wanted to minimize the number of apertures in the ceiling and to keep them as small as possible. He also wanted a flexible dimming and control system that would not create a profusion of switch boxes on the walls.

For these reasons, and to control beam angle and tilt, Graf illuminated art locations with 4-inch-aperture recessed, adjustable low-voltage downlights. These provided flexible aiming angles and beam distribution. With linear spread lenses, Graf altered the beam characteristics still more. "We did that a lot in this job," he says. "For example, we used linear spread lenses to take a 14-degree beam spread

and create a 14-by-55-degree pattern. This was not only for lighting areas of visual interest like the artwork, but also for creating paths of light through the house."

The Control System

For the owner to operate this flexible system requires extensive, sophisticated controls. But the designers were unwilling to sacrifice the appearance of the walls to the demands of large control panels. Instead, the system is controlled from small switch plates throughout the house. Each 2-inch by 4-inch plate contains up to nine buttons, and each small button serves as both power switch and dimmer. The double function reduces the number of switch plates on the walls.

Circuits are carefully designed to produce the most useful effects with the most convenience. One button at the main entrance, for example, can turn every light in the house on or off. Another circuit lights a specific pathway from the garage to the living room at the other end of the house.

Graf modestly sums up the lighting effects in this house in a way that, like the control system, does not call attention to the lighting. "The house has a museumlike quality; it's warm and intimate. The light directs your attention to areas of visual interest, and it complements the architectural character of the space." ■

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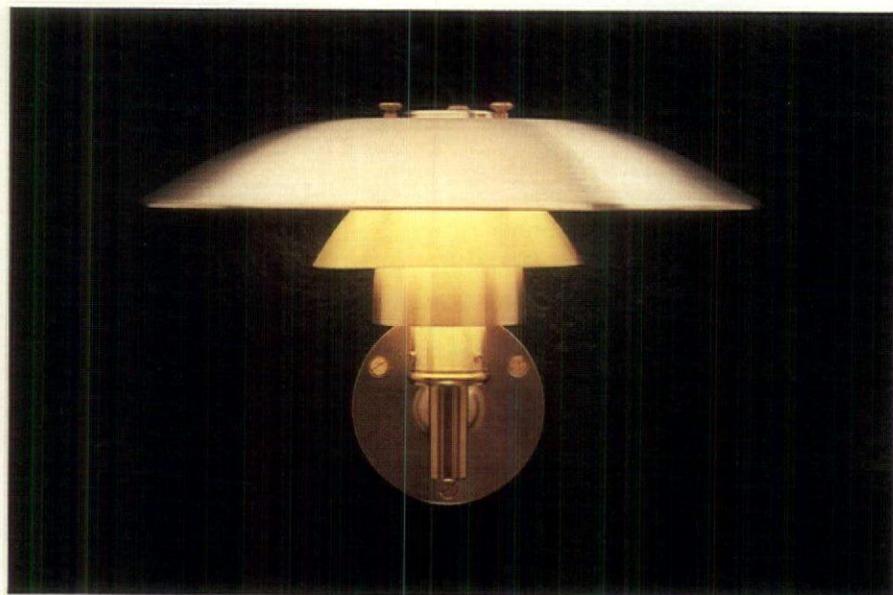


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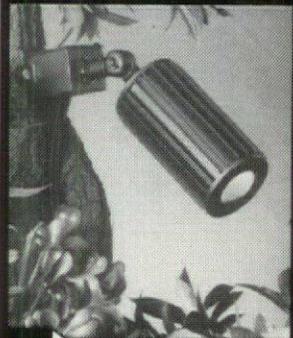


■ Wall bracket

Poul Henningsen designed Poulsen Lighting's PH Extended Wall, a wall-mounted version of the PH pendant. The lamp is concealed by overlapping reflector shades of untreated copper that develop a verdigris patina in outdoor applications. The copper-plated support arm, wall plate, and lamp holder assembly are made from heavy-gauge solid brass; inner reflecting surfaces have a weather-resistant matte white enamel finish. The unit accepts an incandescent lamp up to 100 watts and is UL listed for wet locations. Poulsen Lighting Inc., Miami, FL.

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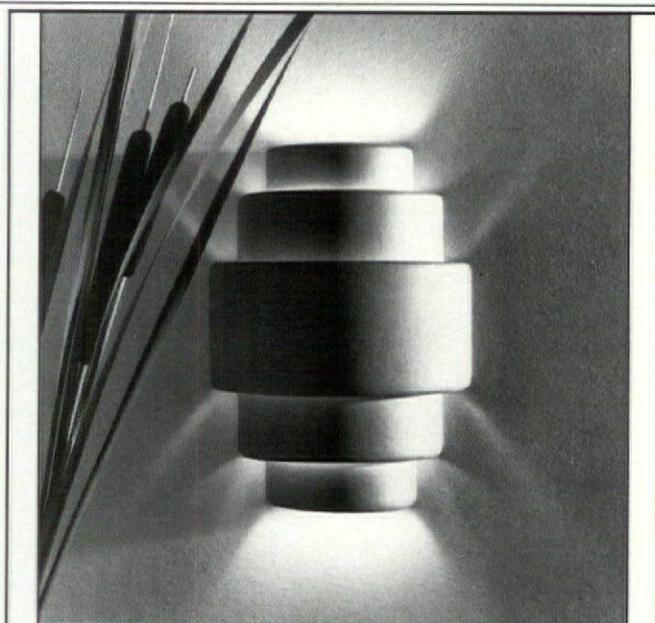
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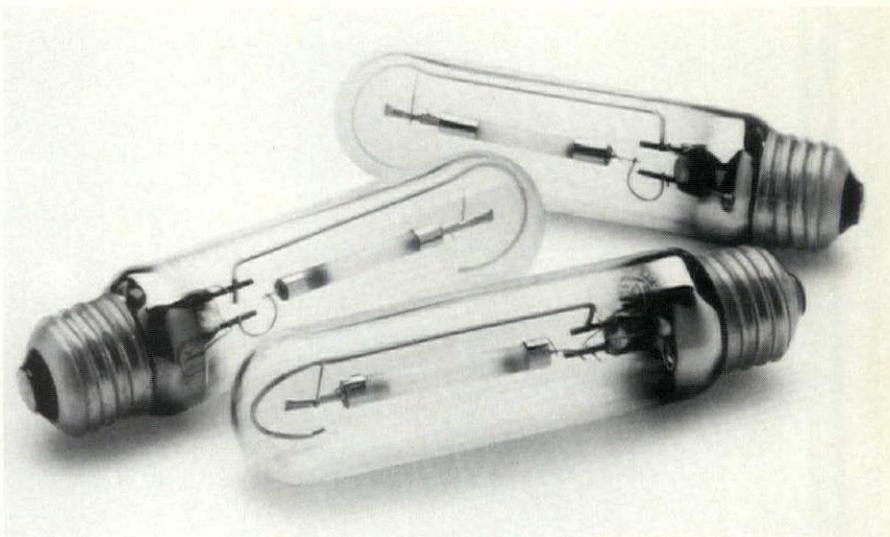
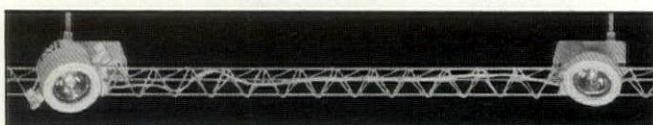
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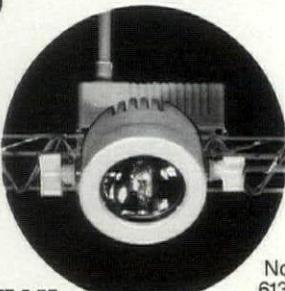



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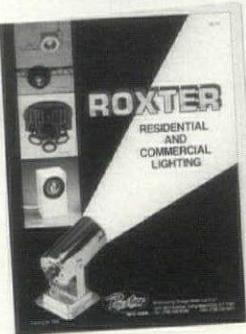
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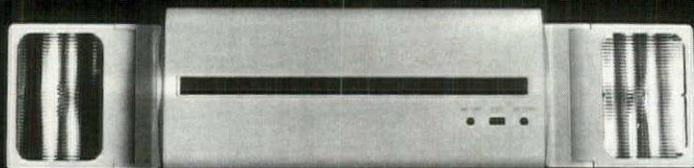
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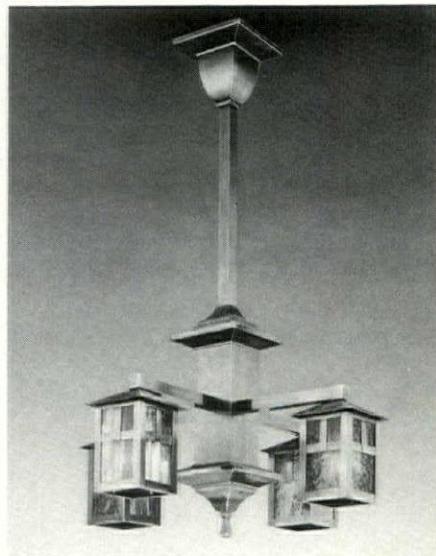
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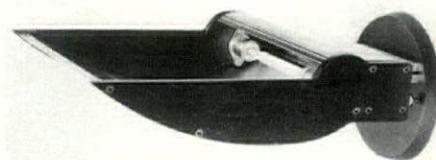
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■ Brass chandelier

Rejuvenation Lamp & Fixture offers the Mission-style Alameda four-arm solid brass chandelier. It comes in seven finishes; art glass lantern shades are available in four colors. The 22-inch-diameter, 36-inch-long chandelier accepts 60-watt incandescent lamps. Rejuvenation Lamp & Fixture Company, Portland, OR.

Circle 63



■ Indirect lighting

The Pan-A-Lux 88 indirect reflector from Rambusch Lighting was developed by product designer Douglas Green. The cast aluminum unit has extruded anodized aluminum reflectors that project a precisely controlled, even wash of light over a large ceiling surface. It accommodates a double-ended tungsten or Osram HQI lamp. Rambusch Lighting, New York, NY.

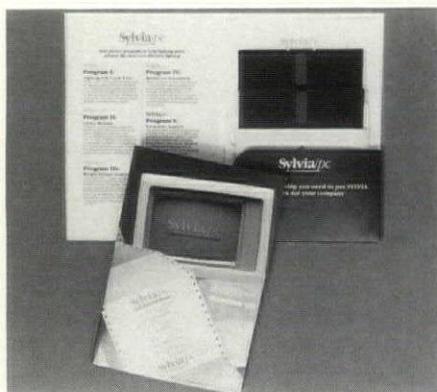
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■ Decorative area luminaire

Architectural Area Lighting's post-mounted three-ring reflector luminaire is made of aluminum. Its three acrylic rings have luminous edges and come in a variety of accent colors. The luminaire can accommodate a variety of HID lamps and is suitable for interior and exterior applications. Architectural Area Lighting, La Mirada, CA.

Circle 62



■ Lighting analysis program

GTE offers the Sylvania Information Analysis (Sylvia) software for IBM and IBM-compatible microcomputers. It compares different lighting systems and procedures and determines which is most economical. Functions include analysis of various lighting situations, selection of the most efficient lighting system, identification of the most economical relamping procedure, and calculation of payback periods. A description of program capabilities and easy-to-follow, system-prompted instructions are included. GTE/Sylvania, Danvers, MA.

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■ Fluorescent floodlight

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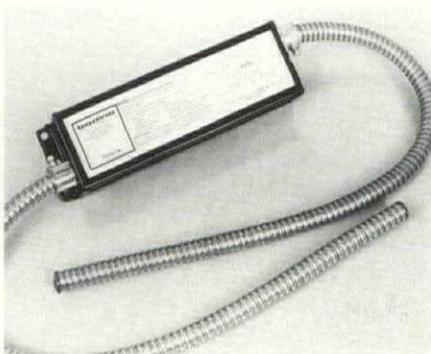
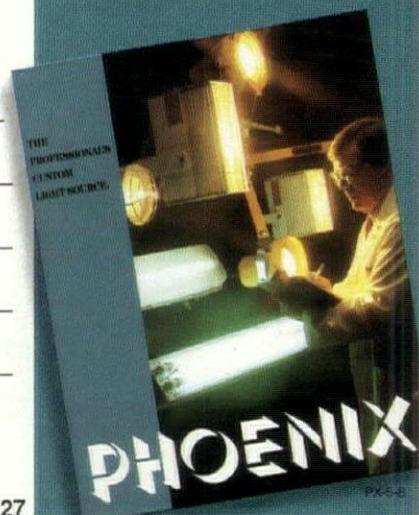
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■ Emergency ballast for quad lamps

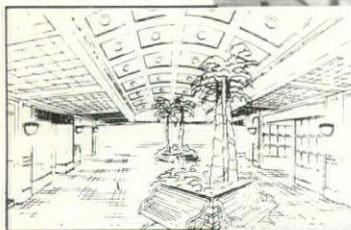
The B426 emergency ballast from Bodine is designed for 10- to 26-watt quad-tube compact fluorescent lamps in new and existing fixtures. It automatically starts and operates a lamp at full power during the first few seconds after AC power fails, then reduces lumen output to conserve battery power. The ballast can power a lamp for a minimum of 90 minutes and automatically returns to charging mode when power is restored. The Bodine Company, Collierville, TN.

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To

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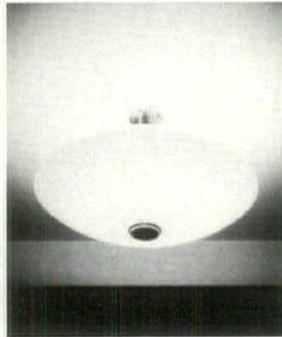
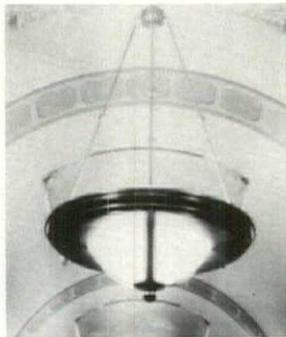


Louis Harvey

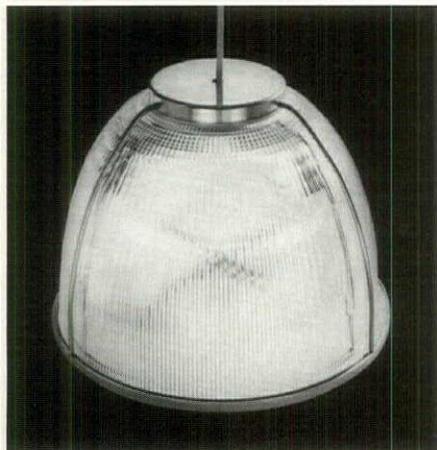
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Circle 28



■ Prismatic acrylic luminaire

Brilliant luminaires from Aura Lighting have a domed acrylic prismatic reflector that produces diffused light without hot spots or glare, according to the manufacturer. The lightweight, shatter-resistant reflector is easy to clean and is virtually free of distortions, bubbles, and blemishes. The luminaires come in a wide range of styles and colors. Aura Lighting, division of Spero Electric Corp., Cleveland, OH.

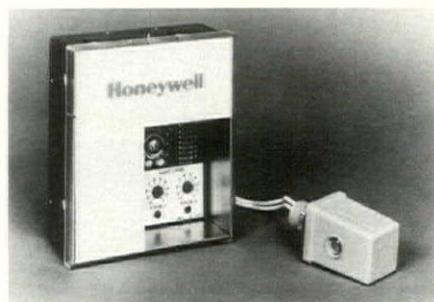
Circle 68



■ Marble luminaire

Forluce offers Cierra's two-lamp Pietra pendant luminaire, whose halogen lamps provide both up- and downlighting. The horizontal plate of solid marble is available in black, white, and rose; trim rings are available with 24-karat gold plating and in chrome. Adjustable stems supporting the luminaire can extend from 23 to 37 inches. Versions for one and three lamps are available. U.S. distributor: Forluce, New Orleans, LA.

Circle 69



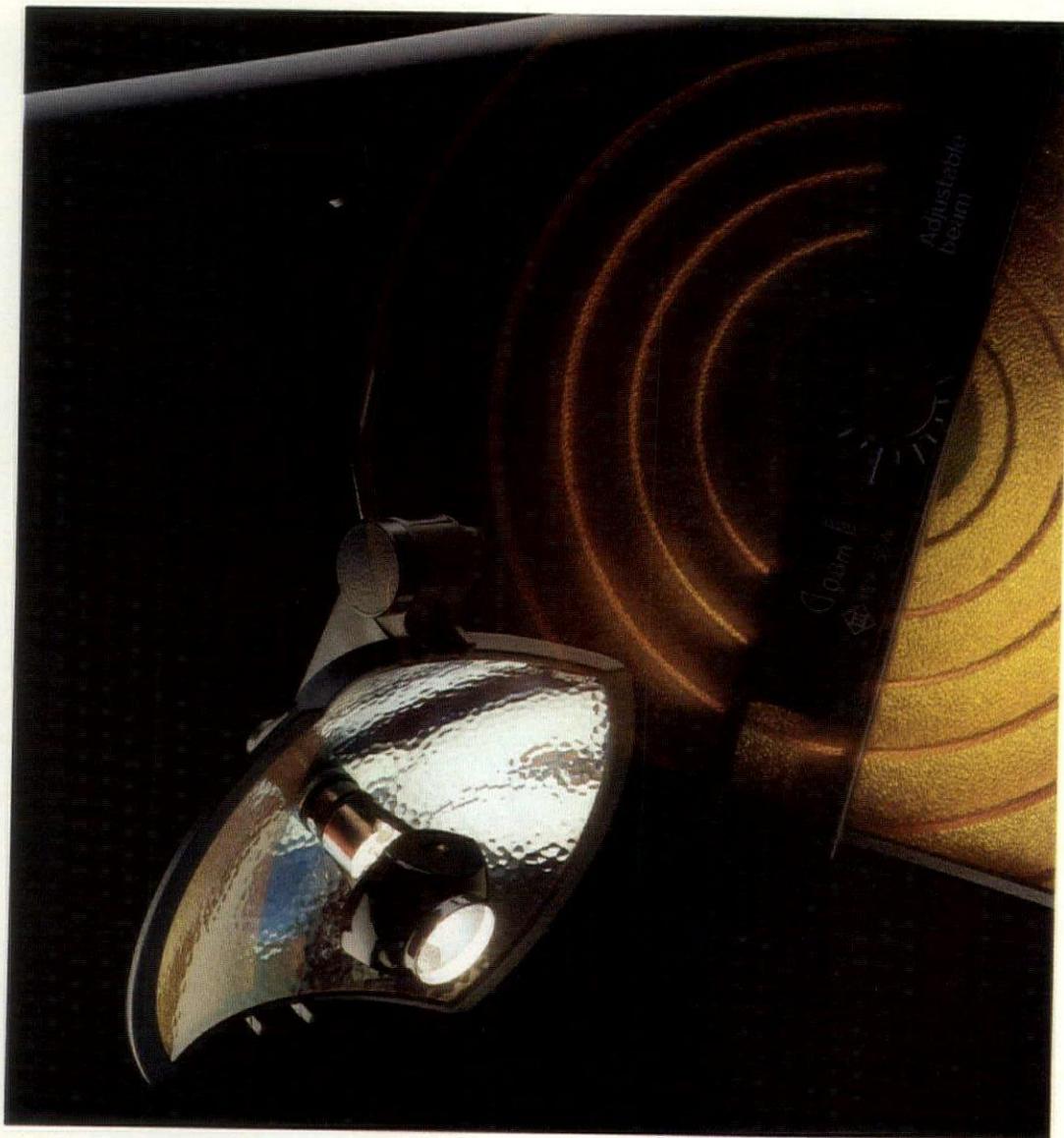
■ Two-stage outdoor controller

Honeywell's CR7075 two-stage outdoor lighting control system provides independent on/off control of two separate lighting circuits in response to signals from a remote photocell. The controller automatically signals lights to turn on or off when user-determined ambient light intensity levels are reached. The system is designed to allow sensor recalibration at the controller and can be operated in conjunction with a timer or building management system. Honeywell Inc., Minneapolis, MN.

Circle 70

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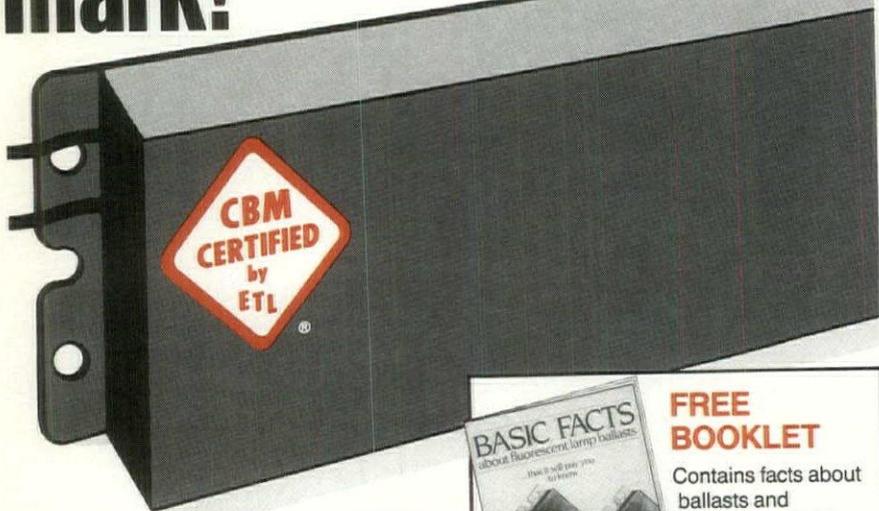
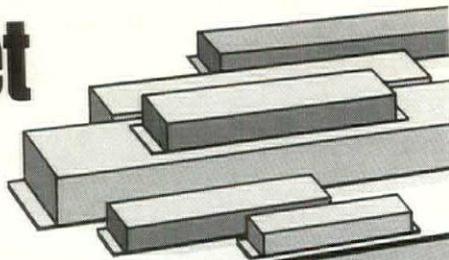
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Circle 29

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Circle 30

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Outdoor HID floodlight

Day-Brite's Micro Flood outdoor HID floodlight has a compact, durable one-piece housing of die-cast aluminum and a tempered glass lens that resists thermal shock and impact. A slide track in the hinged housing door simplifies lens replacement. The floodlight comes with a one-piece reflector of hydroformed, anodized aluminum and a 1/2-inch die-cast swivel mount. It accommodates HID lamps up to 175 watts and meets UL standards for wet locations. Day-Brite Lighting Co., Tupelo, MS.

Circle 71



Halogen minibollard

Lumière's 2 1/4-inch-wide Tahoe minibollards come in five styles for various landscape lighting applications. The model 503 pictured is suitable for uplighting foliage or lighting an area near a pathway. The minibollards have UV-stabilized tops of solid acrylic, accommodate a bipin halogen lamp, and come in heights of 6, 12, and 24 inches. Lumière Design and Manufacturing, Inc., Westlake Village, CA.

Circle 72



Photocell control

Area Lighting Research offers an outdoor lighting control that uses a custom chip and a photocrystal diode to control switching even when system voltage fluctuates. The SST series is designed with an integrated circuit-based photocontrol in 120-, 240-, and multivolt models. Each unit lasts longer than conventional controls and extends the life of related lighting components, according to the manufacturer. Area Lighting Research, Inc., Hackettstown, NJ.

Circle 73



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Circle 31



■ Neon table lamp

The handcrafted Tubes² neon table lamp from Neonetics consists of four tubes of different heights and colors. It stands 30 inches high, has a 12-inch-diameter base, and comes in a choice of four finishes. Custom neon colors are available. Neonetics Inc., Baltimore, MD.

Circle 74



■ Decorative pendant

The Dopler decorative incandescent pendant from Winona Lighting's Perf Light series comes in two sizes, three standard finishes, and two perforated metal patterns. The version shown has a metal bowl with 1/4-inch-diameter perforations, an acrylic disk above the bowl, and detailing in brass and black Nextel. Matching sconces are available. Winona Lighting, Winona, MN.

Circle 75



■ Landscape lampholders

Stonco's 900 Series die-cast aluminum architectural lamp holders come in two sizes: the 920 series for PAR 20 and R20 lamps and the 940 series for PAR 38 and R40 lamps. Optional integral transformers for the 920 series and ballasts for the 940 series permit use of the lamp holders for other lamps, including some HID lamps. Both units can be aimed above horizontal when using PAR lamps and can be enclosed for use with R lamps. Lamp-shielding accessories are available. Stonco, Union, NJ.

Circle 76



Underground Atlanta

Architect: Cooper Carry & Assoc. Inc.
Lighting Consultants: Fisher Marantz, Inc.

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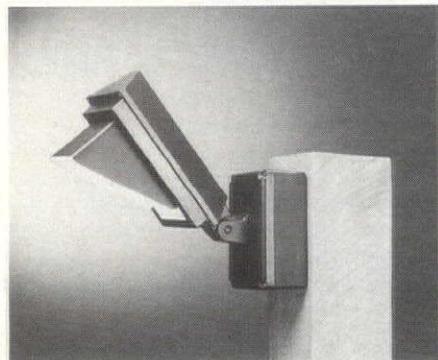


■ **Vandal-resistant luminaire**

The ceiling-mounted VR series luminaire from Lumax Industries is designed for applications subject to vandalism and adverse environmental conditions. The prismatic polycarbonate lens surrounding the fixture assembly is held in place with tamper-proof hardware. Models are available for a

variety of fluorescent lamps, including rapid start and high-output types. The unit is UL listed for damp and wet locations. Lumax Industries, Altoona, PA.

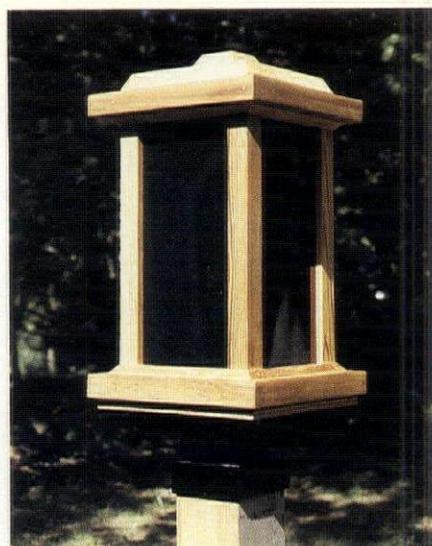
Circle 77



■ **Floodlight**

The model 3515 die-cast, specification-grade floodlight from Gim Metal Products offers excellent thermal performance and photometric efficiency, according to the manufacturer. It can be mounted on posts, walls, ceilings, or floors and can accommodate a variety of HID lamps, including the Osram HQI. The unit is UL listed for wet locations and is sold unassembled for OEM use with all necessary hardware. Gim Metal Products, Carle Place, NY.

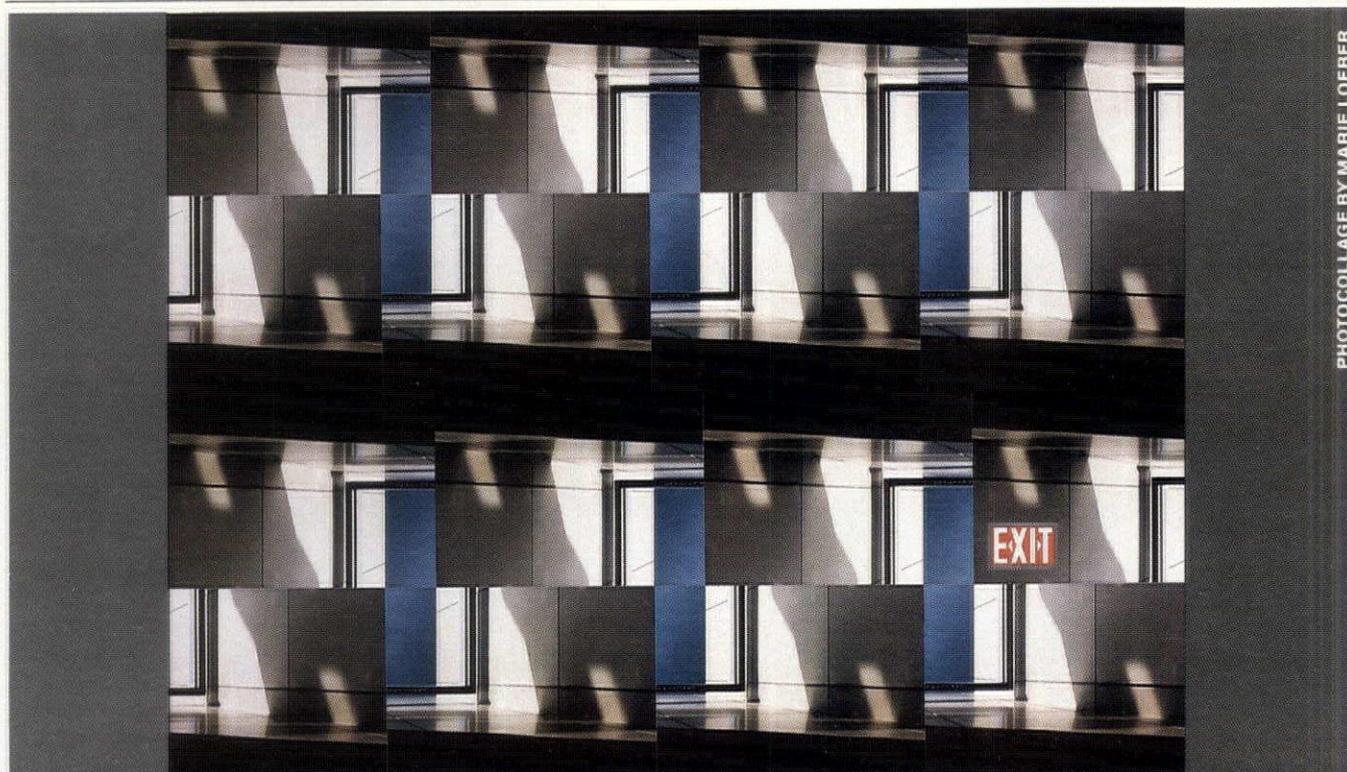
Circle 78



■ **Cedar luminaire**

Ryther-Purdy's Old Saybrook luminaire is handcrafted of clear western red cedar. The version shown measures 10 inches square and 20 inches high. Plexiglas or Lexan acrylic panels come in three standard colors as well as custom colors and textures. Versions for incandescent, fluorescent, and HID sources are available. They can be pole-, wall-, or pendant-mounted. Ryther-Purdy Lumber Company, Old Saybrook, CT.

Circle 79



PHOTOCOLLAGE BY MARIE LOEBER

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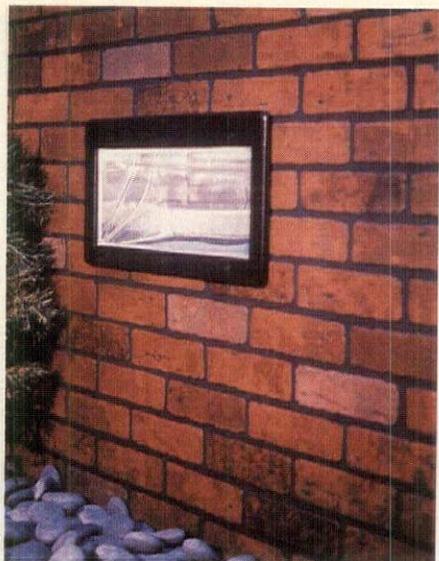
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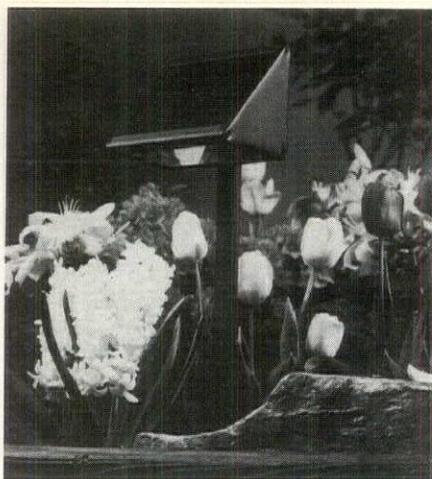
Circle 33



■ Low-level floodlight

Engineered Lighting Products offers a low-level floodlight that produces glare-free illumination from a concealed light source. The 4-inch-deep unit can be recessed in standard 4-inch stud walls or in concrete construction; only the face plate projects beyond the wall surface. Various models accommodate one or two 13-watt compact fluorescent or biaxial fluorescent lamps. Engineered Lighting Products, El Monte, CA.

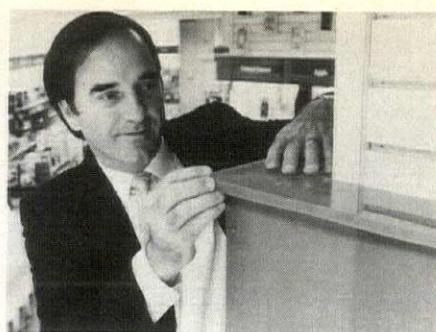
Circle 80



■ Solar-powered garden light

Sunergy's WalkLite garden light has a solar panel that recharges the built-in battery even on overcast days. The light turns on automatically at dusk and operates up to seven hours each night, depending upon its panel size and lumen output; it turns off automatically when its collected energy is depleted. The unit is made of high-impact, weather-resistant materials and comes with a mounting post and a wall bracket. Sunergy, Princeton, NJ.

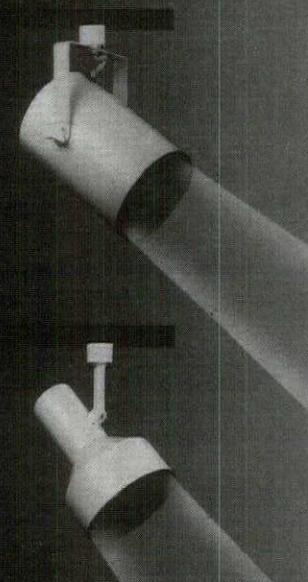
Circle 81



■ Luminescent plastic

LISA light-intensifying plastic can be installed by a general contractor and used in place of neon. The cornice shown here is made of the plastic; it glows when backlit by fluorescent lamps. Specifying LISA instead of neon cut initial costs of the decorative perimeter lighting system by 90 percent, according to the client, Waldenbooks, Inc. The plastic contains a stable polymeric dye that will not fade like those in conventional "fluorescent" plastics, according to the manufacturer, Mobay Corporation. The material comes in seven colors and is available in polycarbonate sheets and films and in acrylic sheets and rods. U.S. distributor: Acrilex, Inc., Jersey City, NJ.

Circle 82



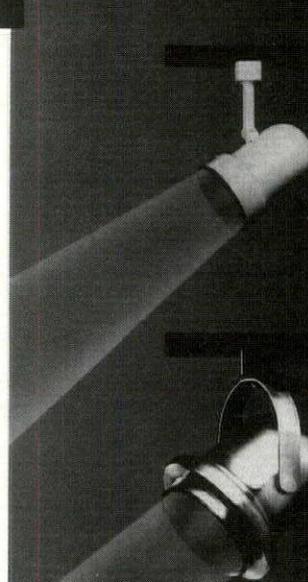
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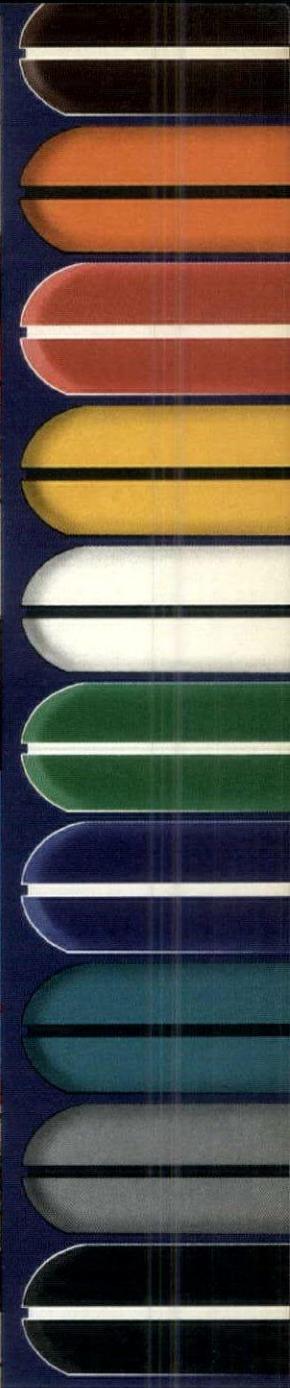




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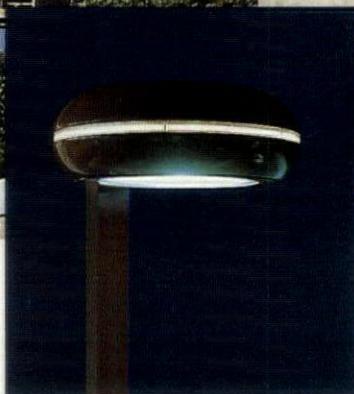
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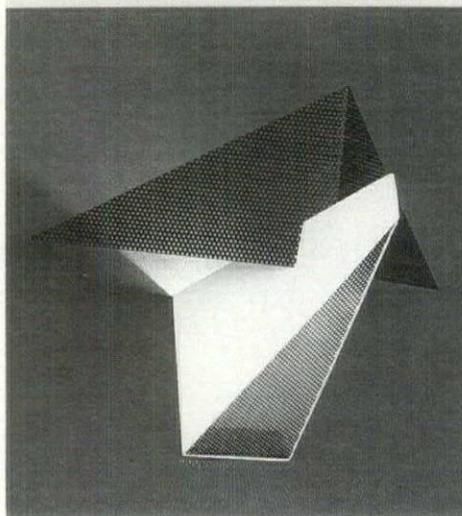
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Circle 36



Decorative landscape fixture

Hinkley Lighting's model 1570 low-voltage landscape fixture has a 4-inch-diameter ball that casts a tight circle of downlight. Perforations in the ball project tiny rays of light outward. The solid brass ball has a black outer finish and a white inner finish for maximum light reflection. The 22-inch-high unit comes with a solid brass 1/2-inch stem finished in black and a 12.3-watt 1156 lamp. A ground spike is optional. Hinkley Lighting, Cleveland, OH.

Circle 83

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Circle 37



Alabaster chandelier

The Granada chandelier from Lightolier features a hand-polished solid brass band and decorative scrolls that support bowls of carved, polished alabaster. The band encircles the large central bowl, which accommodates two 60-watt A19 lamps; three solid brass scrolls each hold a smaller carved bowl, which conceals a 40-watt G16 1/4 candelabra lamp. A matching wall bracket is available. Lightolier, Secaucus, NJ.

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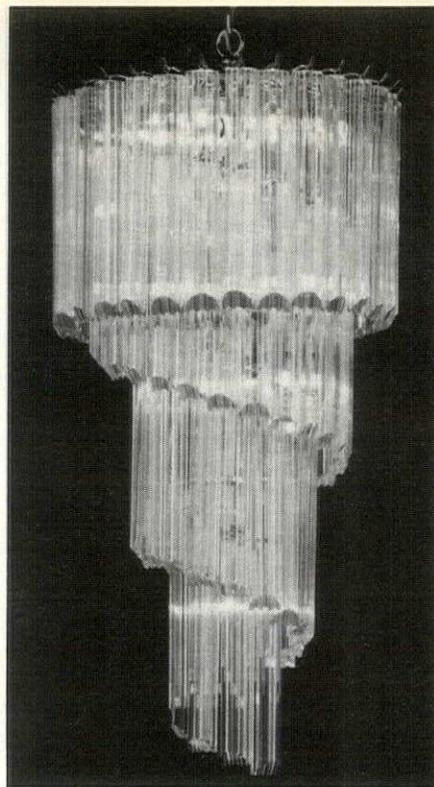


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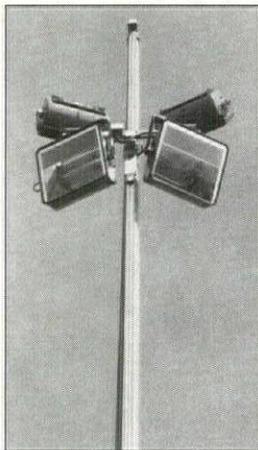
■ **Acrylic chandelier**

Triarch offers a variety of standard and custom chandeliers with components of virgin triacrylic. The 30-inch-high model 385 pictured has four spiraling tiers of half-round acrylic rods and accommodates 12 candelabra-base incandescent lamps. Models come in heights from 28 to 72 inches. Triarch Industries, North Miami Beach, FL.

Circle 85

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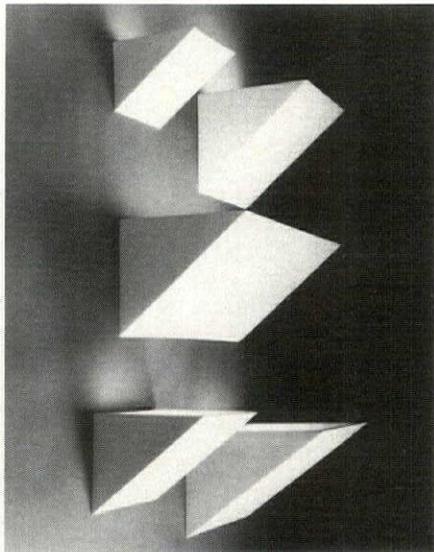
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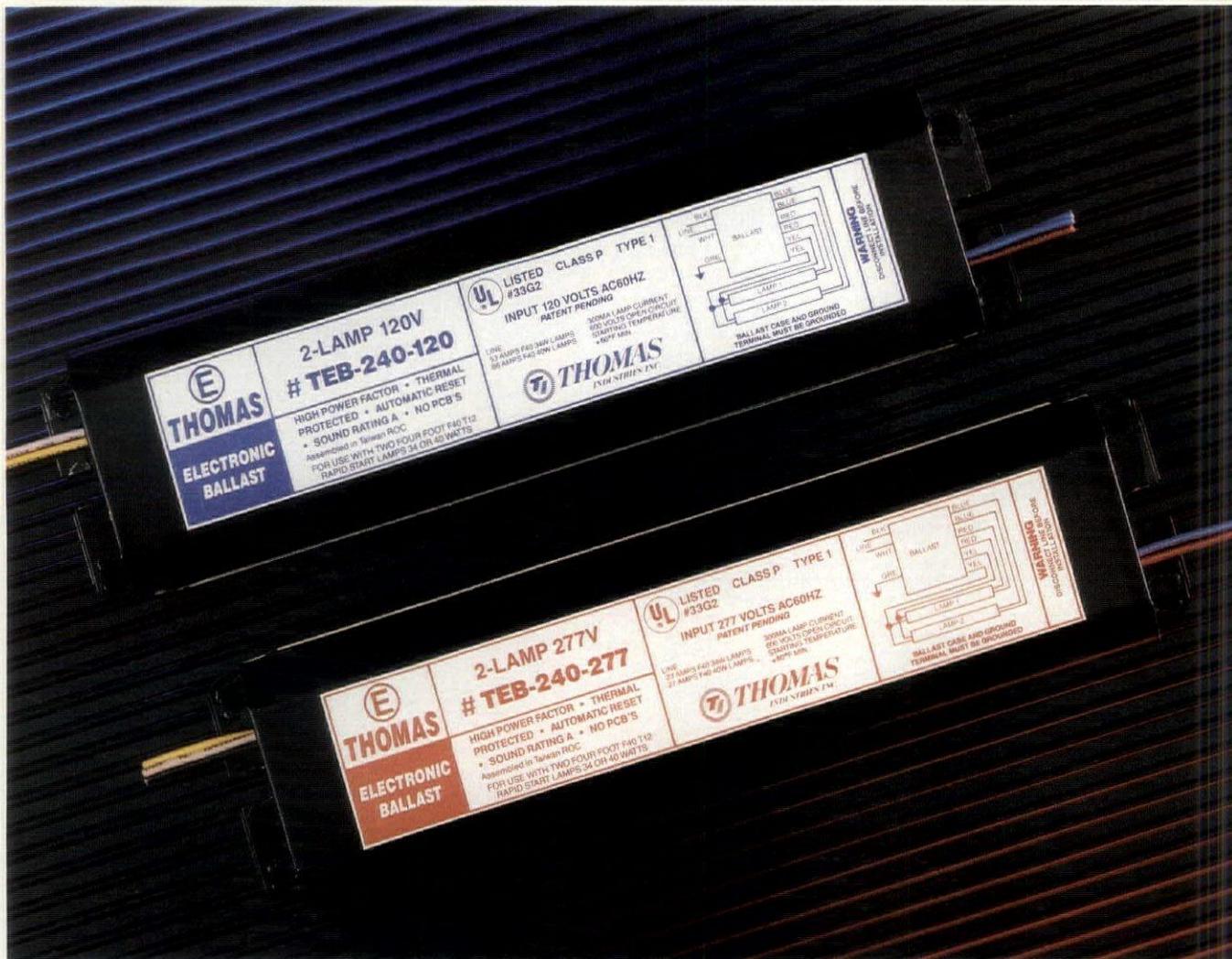
■ **Wall fixtures**

Sirmos offers Skyline wall fixtures, which are hand cast of a reinforced resin fiber. They come in a variety of sizes and finishes; some versions can be used as brackets to display art objects. Sirmos Inc., Long Island City, NY.

Circle 86

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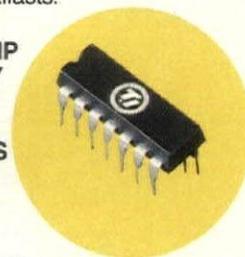


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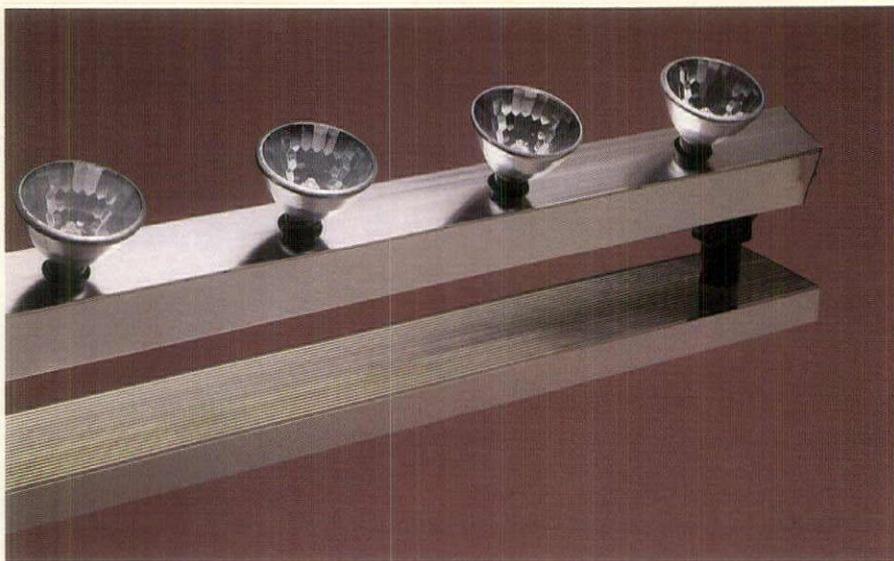


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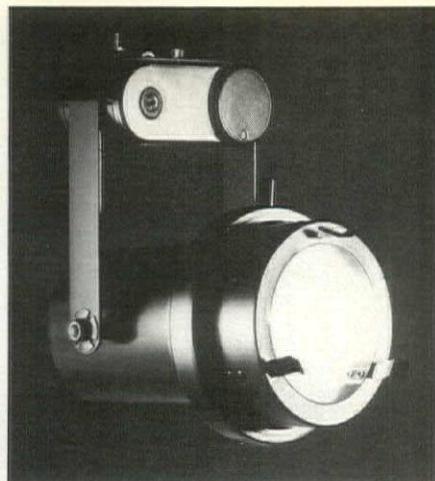


■ Halogen light strip

Norbert Belfer Lighting's model 2794 light strip is designed specifically to accommodate low-voltage halogen metal reflector lamps from Philips and Osram. Lamps can be spaced 6 or 12 inches on center along the 1½-inch-square extruded aluminum raceway. The strip can be installed as a sta-

tionary unit, or it can be mounted on the 2300 series adjustable raceway shown, which allows lamps to swivel 90 degrees in either direction. Norbert Belfer Lighting, Ocean, NJ.

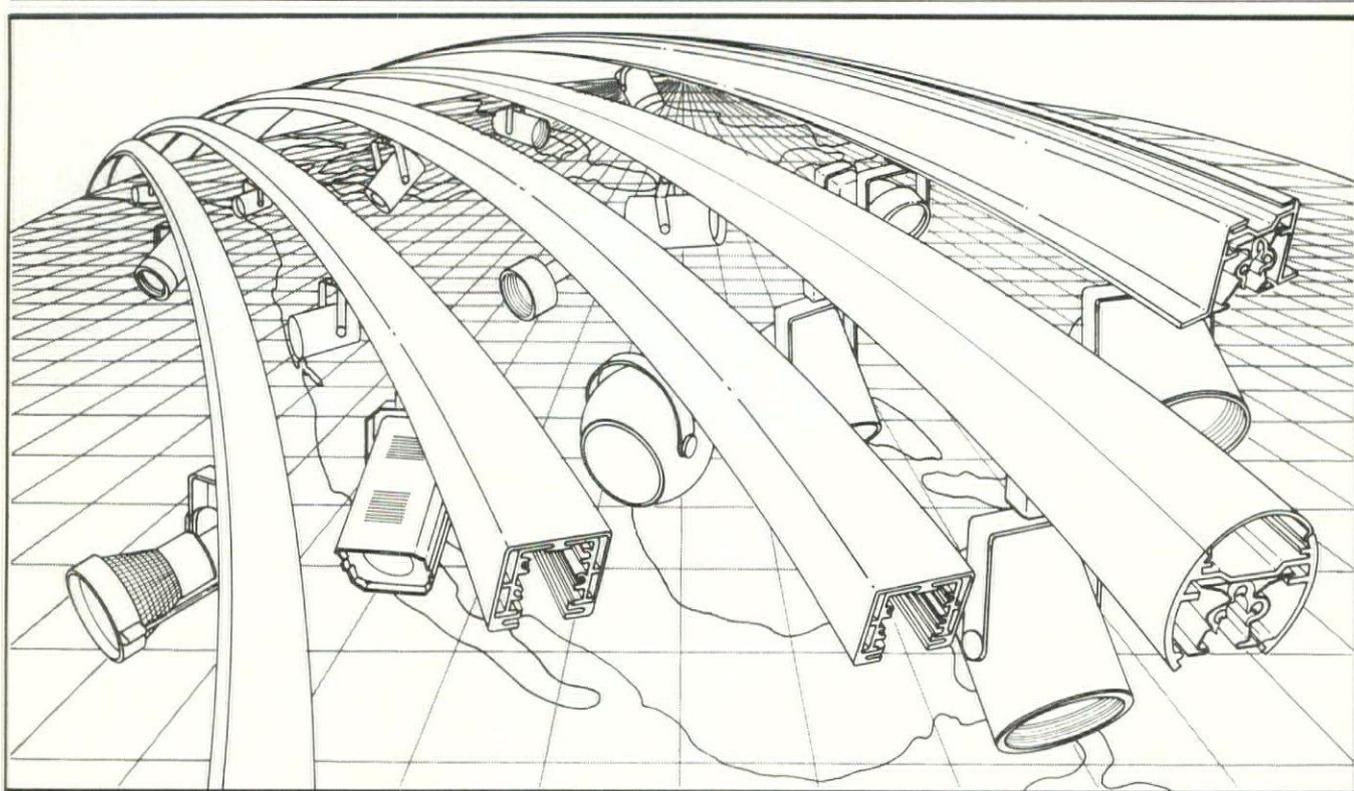
Circle 87



■ Low-voltage track fixture

The 36 Series low-voltage track fixture from Lighting Services has an integral transformer and can accept a full-range integral dimmer pod that allows on-site dimming of individual fixtures in a track system. A built-in handle allows the fixture to be rotated for precise beam placement. The fixture comes in three colors and accommodates a PAR 36 lamp, which is available in three wattages and four beam configurations. Color filters and other track accessories are available. Lighting Services Inc., Stony Point, NY. ■

Circle 88



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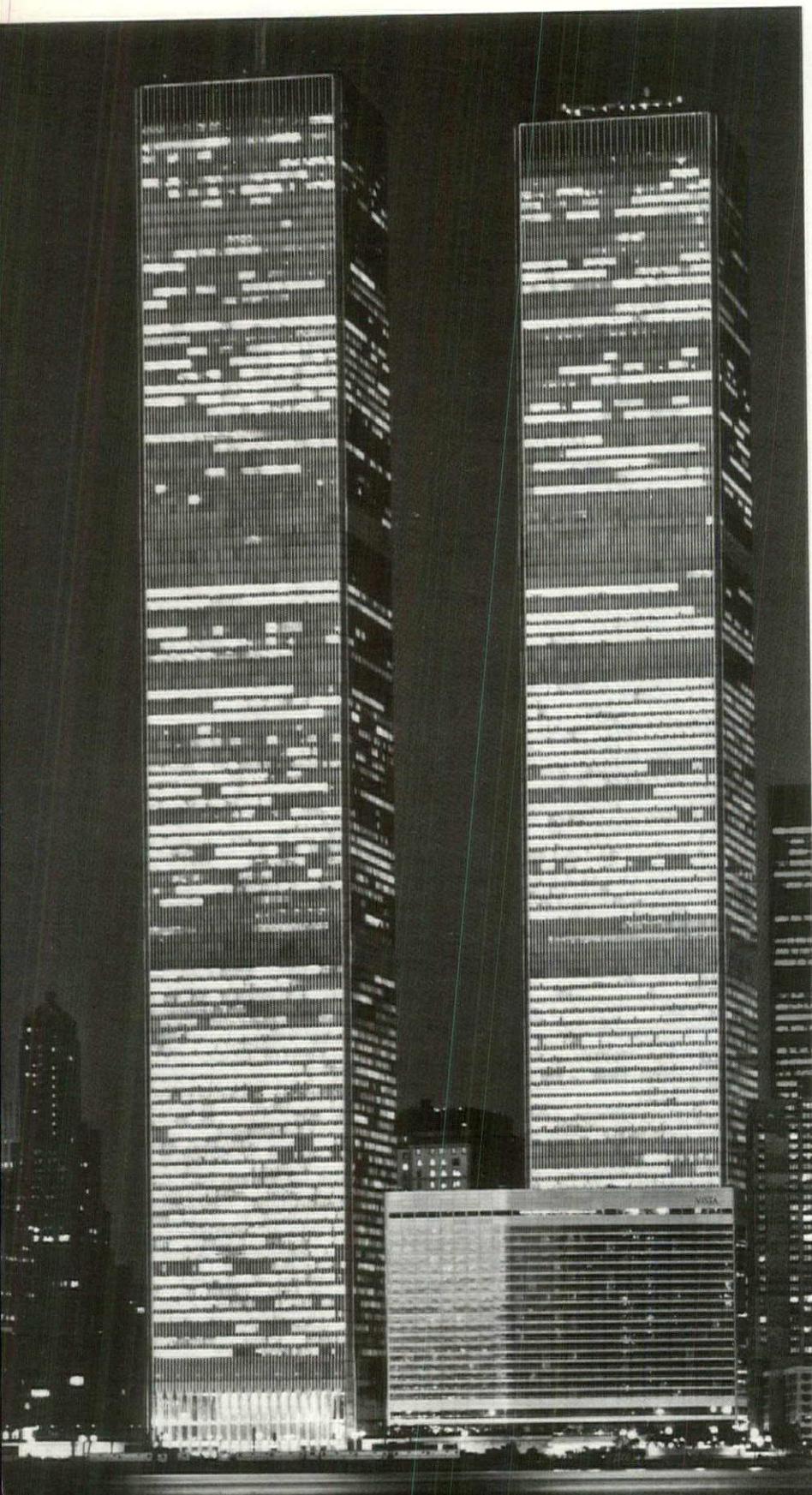
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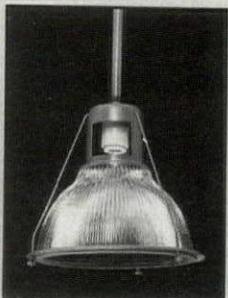
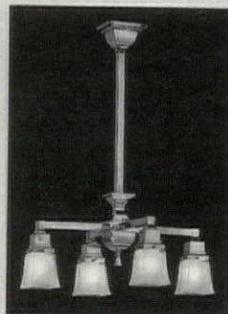
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Circle 45

Product Literature



■ Dimming system

A brochure from Lithonia Lighting describes the MaxStar series fully digital dimming system for locations that require large-scale dimming. The system permits up to 20 preset scenes and 32 channels in any control station. Lithonia Lighting, Conyers, GA.

Circle 120



■ Electronic ballast

Thomas Industries offers electronic fluorescent ballasts that deliver a constant amount of light regardless of fluctuations in the power supply. A brochure lists features, charts lamp compatibilities, and discusses benefits. Thomas Industries Inc., Cookeville, TN.

Circle 121



■ Tree lighting

TL series specification-grade tree lights come in versions for mercury and halogen lamps. A brochure includes specifications, lamp data, and an application guide for moonlighting techniques. Imperial Bronze-lite, San Marcos, TX.

Circle 122



■ Retrofit metal halide lamps

White-Lux 400-watt metal halide lamps can replace HPS lamps in standard fixtures without requiring a change of ballast or igniter. A brochure provides information on clear, coated, and small-bulb versions. Venture Lighting International, Cleveland, OH.

Circle 123



■ Emergency pack

The one-piece, self-contained Fluor-O-Pac emergency lighting pack automatically provides 90 minutes of emergency power for fluorescent fixtures when AC power fails. A brochure describes features. MagneTek Universal Manufacturing, Paramus, NJ.

Circle 124

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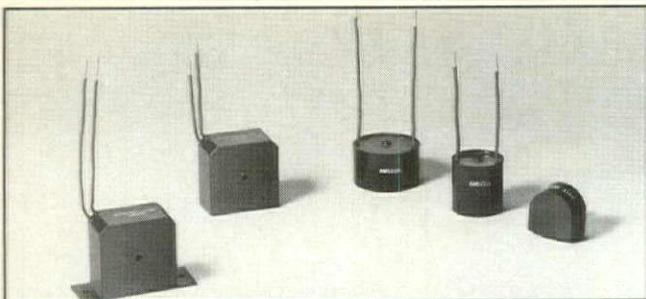
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New Packaged Debuzzing Chokes Offer No Noise In No Time . . .

Extremely quick and easy to install for both new and retrofit applications, Amecon's new line of architectural chokes essentially eliminate noise in dimmers, lamps, and fixtures. The chokes are professionally packaged to dramatically reduce installation time

as they mount to standard recessed fixtures, remote areas and wall boxes. They're built with high temperature, high impact, fire-retardant UL recognized materials. Attractively priced, they're rated at 50 and 75 watts at 12 volts, and 400 to 750 watts at 120 volts.

CONFIG.	DIA.	HEIGHT	WIDTH	DEPTH	MTG.
CIRCULAR	2"			1-3/16"	Centerhole
	1-5/8"			1-1/2"	Centerhole
	1-1/2"			1-1/4"	Centerhole
SQUARE		2-3/32"	2-3/32"	1-3/32"	Vert/Horiz
"ARCH"		1-3/8"	1-3/8"	3/4"	PCB/Vert

Applications are recommended for all types of architectural light dimmers: accent, decorative, display, and nearly anywhere a noise-rejection system is required. Call or write for new Technical Bulletin/Selection & Design Guide ALC-0689.



AMECON Quality Magnetics & Electronics
 Amecon, Inc., 1900 Chris Lane, Anaheim, CA 92805
 TEL: (714) 634-2220, FAX: (714) 634-0905

Circle 47



■ Tape lights

An illustrated brochure profiles Tokistar TLW and TS series flexible tape lights for display lighting. It lists lamp spacings, lamp types, and options, including lighting controllers, color caps, and chase and flash effects. Toki America Technologies, Inc., Irvine, CA.

Circle 125



■ Incandescent strips

Phantom 12- and 24-volt incandescent strips provide glare-free lighting for a variety of applications. An illustrated brochure contains ordering information and sketches of suggested applications for horizontal, vertical, and silhouette versions. Wendelighting, Burbank, CA.

Circle 126

THE ORIGINAL CAST.
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GEMINI



Art Directions

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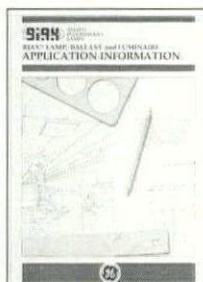
St. Louis, Mo. 63112 314-863-1895 Fax: 314-863-FAST (3278)



■ Crystal chandeliers

A 70-page color catalog details Schonbek's line of crystal chandeliers, which come in a wide variety of styles. It contains photos of each style, plus matching wall brackets and flush-mounted versions. Schonbek Worldwide Lighting Inc., Plattsburgh, NY.

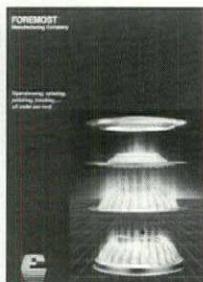
Circle 127



■ BiAxial fluorescents

An application guide for GE's BiAx fluorescent lamps includes data on lamp performance, color, and lamp life as well as information on ballasts, lamp holders, and fixtures that can be used with the lamps. GE Lighting, Cleveland, OH.

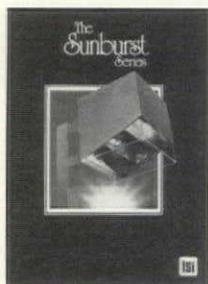
Circle 128



■ Custom forming service

Foremost Manufacturing Company produces custom formed and finished metal reflectors and housings. A brochure describes the company's hydroforming, spinning, polishing, and finishing services. Foremost Manufacturing Company, Union, NJ.

Circle 129



■ Outdoor luminaire

LSI's Sunburst outdoor luminaire has a sharp backside cutoff that produces a directional lighting pattern and eliminates wasted spill light. A brochure describes features and provides ordering information. Lighting Systems Inc., Cincinnati, OH.

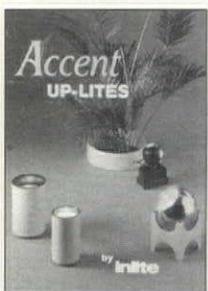
Circle 130



■ HID luminaires

Multilume II modular luminaires have a truncated pyramidal reflector and an internal refractor of molded prismatic glass that are designed for proper control of light from HID lamps. A brochure includes mounting details and an ordering guide. Holophane Company, Inc., Newark, OH.

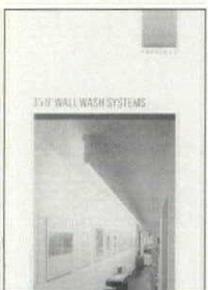
Circle 131



■ Portable uplights

Inlite offers four models of Accent Up-Lites, including two cylinders, a low-voltage eyeball, and a sphere seated in a four-legged support. A data sheet lists finishes and lamp options. Inlite Corporation, Berkeley, CA.

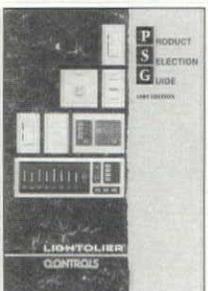
Circle 132



■ Fluorescent wall washer

A brochure details the 3-inch by 9-inch Softshine linear fluorescent wall washing system, available as wall brackets and in surface- and pendant-mounted versions. Fixtures come in a variety of colors and finishes and in lengths up to 24 feet. Peerless Lighting Corporation, Berkeley, CA.

Circle 133

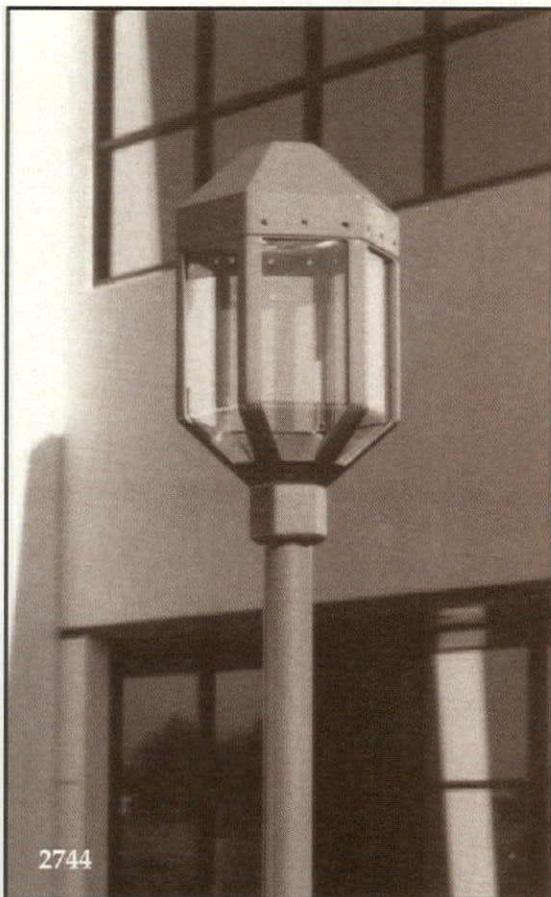


■ Lighting controls

A 30-page catalog from Lightolier lists the Lytemode custom dimming system and a variety of switches, dimmers, ballasts, and fan controls. Application and installation notes are included. Lightolier Controls, Secaucus, NJ.

Circle 134

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Circle 50



■ Electronic transformers

A data sheet lists features of Louis Harvey's line of electronic transformers, which includes two versions for track lighting systems and a trackless version that can be mounted directly on a ceiling. Louis Harvey Mfg., College Point, NY.

Circle 135



■ Lamp specification

A 96-page color catalog describes a wide range of fluorescent, incandescent, HID, miniature, specialty, film production, and sealed beam lamps. Technical and ordering information is included. Philips Lighting, Somerset, NJ. ■

Circle 136

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FAX
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Circle 51

Classified Directory

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- AMERLUX, 23 Daniel Rd., Fairfield, NJ 07006 201/882-5010
 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.
 FIBERSTARS, 47456 Fremont Blvd., Fremont, CA 94538 800/327-7877
 MARCO LIGHTING, 6100 S. Wilmington Ave., Los Angeles, CA 90001 213/583-6551
 Recessed Architectural Lighting: Compact Fluorescents-Low Voltage Capsyrite-HID-Incandescents
 NATIONAL SPECIALTY LIGHTING (see ad this section)
 NL CORP., 14901 Broadway, Cleveland, OH 44137 FAX 216/662-9069 or 216/662-2080
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 E.G. SCHLESSELMAN, INC., 2778 Banning Rd., Cincinnati, OH 45239 FAX 513/923-1654 513/923-1144
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- LEXALITE INT. CORP., P.O. Box 498, Charlevoix, MI 49720 FAX 616/547-5833 or 616/547-6584
 Custom and Proprietary Injection Molded Lighting Products. (For information call Cheryl Barron.)
 MAXIMUM TECHNOLOGY, 60 Industrial Way, Brisbane, CA 94005 415/468-2560

AMBIENT LIGHTING SYSTEMS (INTERIOR)

- DAY-BRITE/McPHILBEN/OMEGA—Complete fixture needs. Fax 601/841-5501 or Call 601/842-7212
 H.E. WILLIAMS INC., P.O. Box 837, Carthage, MO 64836 417/358-4034
 LITHONIA LIGHTING. We cover the lighting spectrum 404/922-9000
 NORBERT BELFER LIGHTING MFG., Cove & Linear Lighting Products 201/493-2666
 PEERLESS LIGHTING CORP., P.O. Box 2556, Berkeley, CA 94702 415/845-2760

AREA LIGHTING (EXTERIOR)

- ADJUSTA-POST MFG. CO., P.O. Box 71, Norton, Ohio 44203 FAX 216/745-9746 800/321-2132
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 BIEBER LIGHTING CORPORATION (see ad this section)

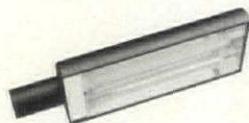


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- EMCO ENVIRONMENTAL LIGHTING, 7300 50th St., P.O. Box 1640, Milan, IL 61264 309/799-3111
 HOLOPHANE, 214 Oakwood Ave., Newark, OH 43055 614/345-9631
 RUUD LIGHTING, 9201 Washington Ave., Racine, WI 53406 800/558-7883
 RWL CORP., 240 Sargent Dr., New Haven, CT 06511 203/789-1710
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BUYING SERVICES

- MICHAEL MARTZ (For Architects and Designers) 201/944-4098

CONTROLS

- LUTRON ELECTRONICS, 205 Sutter Rd., Coopersburg, PA 18036 215/282-3800
 STRAND ELECTRO CONTROLS, 2975 S. 300 W. Salt Lake City, UT 84115 801/487-6111
 Manufacturing full line of lighting controls and dimmers for Restaurants, Hotels, Board Rooms, etc.
 VARA-LIGHT/DIMATRONICS/HUB ELECTRIC, Crystal Lake, IL FAX 815/455-1499 or 815/455-4400

DAYLIGHTING PRODUCTS

- CONSTRUCTION SPECIALTIES INC., 55 Winans Ave., Cranford, NJ (Sight & Sunscreens) 201/272-5200
 MULTIPPOINT CONTROL SYSTEMS, 3101 111th St. SW #A, Everett, WA 98204 206/347-3499
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DECORATIVE LUMINAIRES (INTERIOR)

- BRASS REPRODUCTIONS, 9711 Canoga Ave., Chatsworth, CA 91311. Decorative Fixtures. 800/828-5858

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- ELECTRO POWERPACS CORP. (see ad this section) 617/876-9220



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LAMPS

- G E LIGHTING, Ad Response Dept., Nela Park #4151, Cleveland, OH 44112 216/266-3544
 GTE/SYLVANIA LIGHTING, Sylvania Lighting Center, Danvers, MA 01923 617/777-1900
 OSRAM CORP., 110 Bracken Rd., Montgomery, NY 12549 914/457-4040
 PHILIPS LIGHTING CO., 200 Franklin Square Dr., Somerset, NJ 08875 800/631-1259 800/752-2852
 USHIO AMERICA, 20101 S. Vermont Ave., Torrance, CA 90502 FAX 213/329-3641 or 213/329-1960
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- DINICO PRODUCTS, INC., 123 So. Newman St., Hackensack, NJ 07601 201/488-5700
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 HADCO, P.O. Box 128, 100 Craftway, Littlestown, PA 17340 717/359-7131
 NIGHTSCAPING, 1705 E. Colton Ave., Redlands, CA 92373 714/794-2121

LIGHTING DESIGNERS AND CONSULTANTS

- DESIGN LIGHTING CONSULTANTS, INC., 7166 S.W. 47TH ST., MIAMI, FL 33155 305/665-6100

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OTHER LIGHTING SYSTEMS AND LUMINAIRES

- KOR-LITE Fluorescent Emergency Lighting Systems Phone: 408/727-0314 FAX 408/492-1403

REFLECTOR MATERIALS

- ALCOA, Sheet & Plate Division, P.O. Box 8025, Bettendorf, IA 52722 319/344-3007
 ALUMINUM COIL ANODIZING CORP., 501 E. Lake St., Streamwood, IL 60107 800/289-2645
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The Classified Directory is a monthly feature of *Architectural Lighting*, offering readers easy access to lighting products and services for commercial, industrial, and institutional applications. Listings in this reference section are sold on an annual basis at the rates outlined below. For full information and closing dates, contact Gordon Exe, (800) 822-6678 or (503) 343-1200.

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Manufacturers

Page 16. *Angled beams are the secret to lighting glass cases* (C. & H. Rauch Jewelers prototype store, Lexington, Kentucky).

GTE/Sylvania: Lamps.

Progress Lighting: Fixtures.

Page 18. *Now you see it, now you don't* (The Market at Portland International Airport, Portland, Oregon).

Architectural Cathode Lighting: Cove-mounted warm white cold cathode.

Capri: MR16 spots.

Elliptipar: T8 fluorescent fixtures.

Litelab: Track-mounted incandescent spotlights.

Lutron: Control system.

Roscolux: Bastard-amber glass color filters.

Visa: Indirect pedestal luminaire with custom perforated shield on custom pole.

Page 20. *Stimulating retail sales with lighting that adds visual excitement* (Alexander Julian store, Atlanta).

Artemide: Chandeliers.

Danalite: Shelf light strips.

GE: Fluorescent, halogen, and A lamps.

H.E. Williams: Fluorescent strips.

Hubbell: Recessed fluorescent troffers.

Litelab: Track.

Nessen Lamps: Lensed chrome and glass sconces.

Norbert Belfer: Wedge sconces.

Omega: A-lamp downlights.

Osram: Low-voltage and halogen lamps.

Roscolux: Fluorescent sleeves.

Strand Electro Controls: Lighting control system.

Sylvan Designs: Low-voltage downlights.

Page 34. *Hillside home's lighting emphasizes architecture, artwork, and vistas* (Bronson house, Los Angeles).

Hubbell: Exterior bullets.

Hydrel: Recessed well lights.

Lightolier: Downlights.

Luma: Exterior low-voltage track.

Nightscaping: Exterior low-voltage accents.

Prudential: Fluorescent strips.

Page 40. *Theatrical light shows make Michigan residence an adventure.*

Capri: Recessed, adjustable, low-voltage downlights and track lighting.

Devon: Color filters.

GE: Lamps.

Gray Glass Co.: Spread lenses.

Kurt Versen: Recessed downlights.

Lee: Color filters.

Litelab: Ceiling accent lights.

LiteTouch: Dimming system.

Lithonia: Fluorescent fixtures.

Osram: Lamps.

Special FX: Color filters.

Tivoli: Low-voltage tube lights.

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

Photographers

Doug Hedrich, 41 Richmond Avenue, Lexington, KY 40502, (606) 266-4238

Peter Paige, 269 Parkside Road, Harrington Park, NJ 07640, (201) 767-3150

Thomas Weschler, Photo/Graphics, P.O. Box 834, Birmingham, MI 48012, (313) 645-5868

Ed Hershberger, 3415 SW Spring Garden Street, Portland, OR 97219, (503) 245-4158

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