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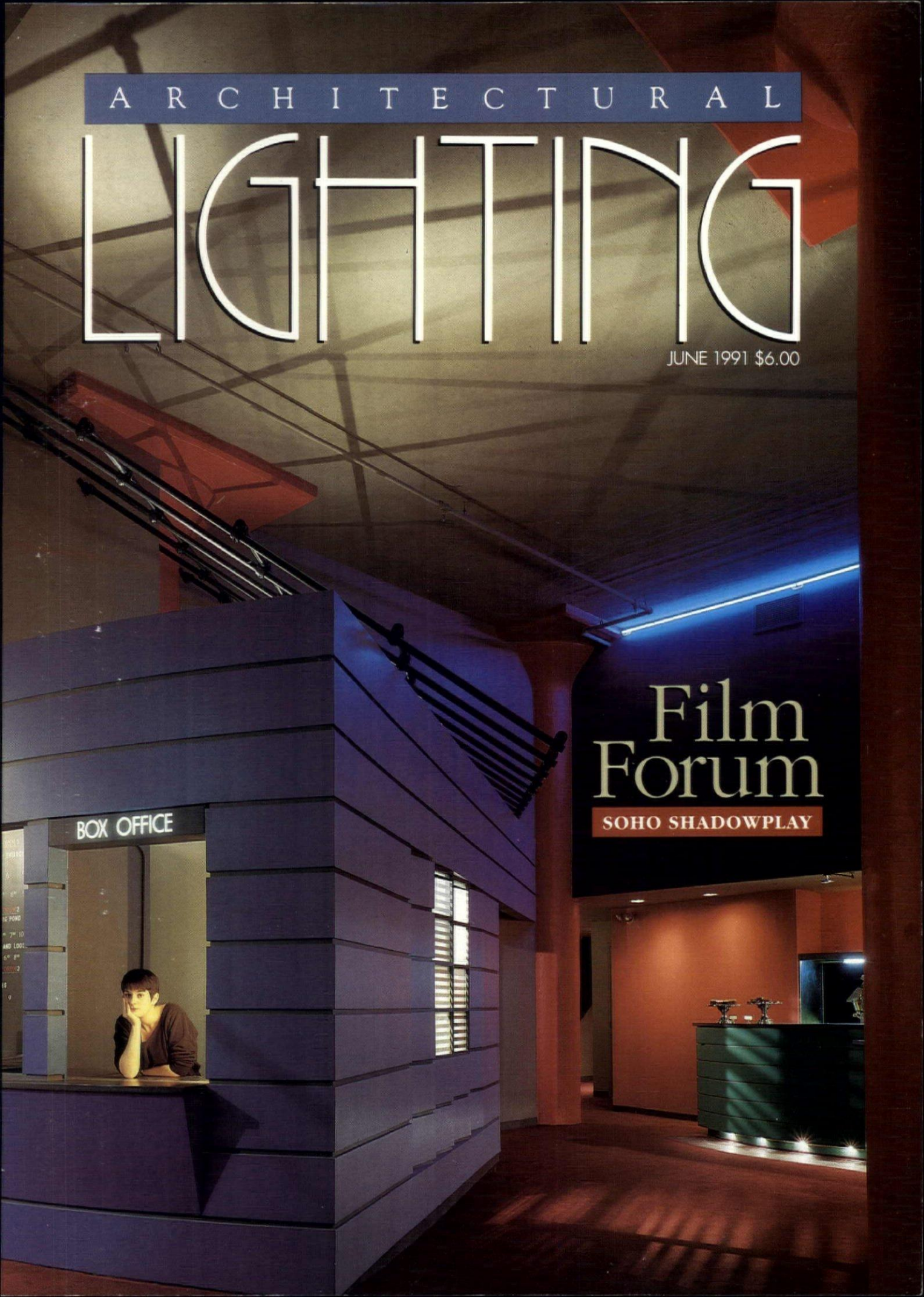


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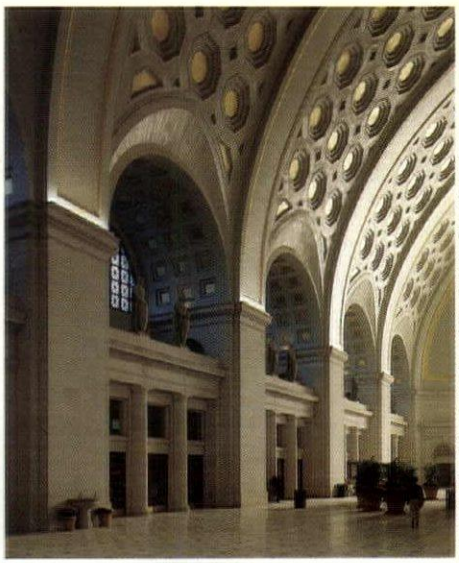

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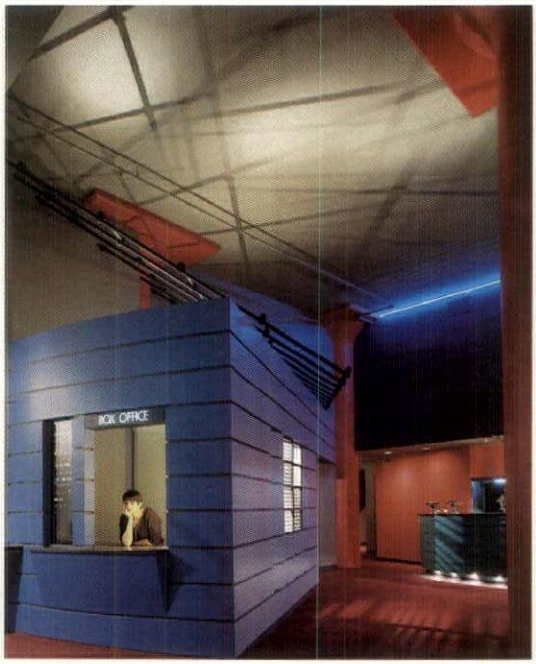
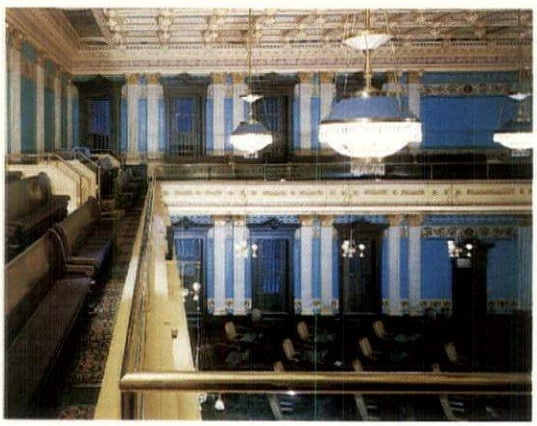



COVER PHOTO BY PETER AARON/ESTO

20 **CINEMATIC SANCTUARY**



14 **CAPITOL GAINS**

## FEATURES



## DESIGN FOCUS REPORT: RECREATIONAL LIGHTING



## DEPARTMENTS



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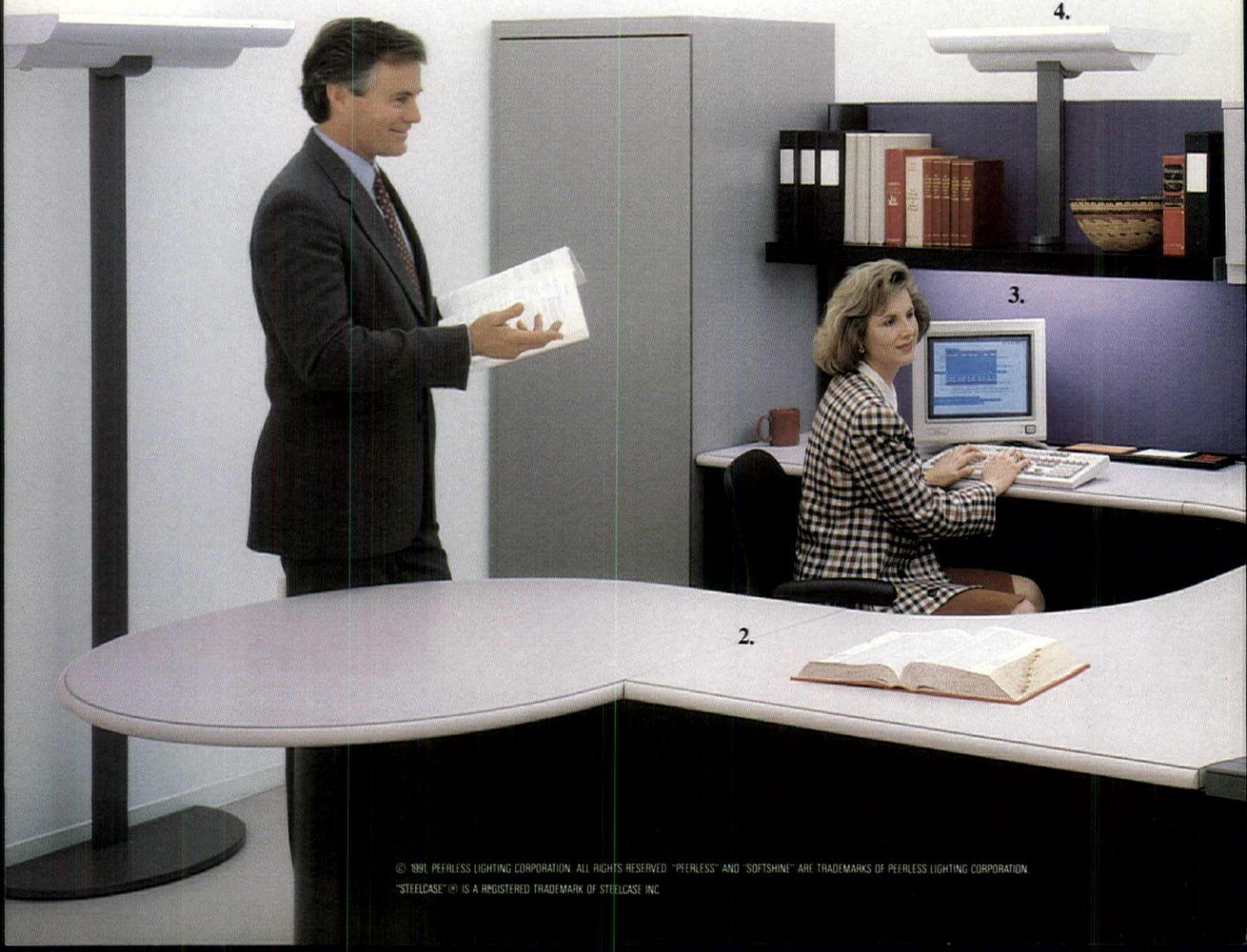

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EDITORIAL

# MOTIVATING FORCES: FROM MONEY TO MORALS

Wearing his trademark off-white suit and black bow tie, *Bonfire of the Vanities* author Tom Wolfe recently shared his insights with an audience of several hundred at New York's Pennsylvania Hotel on how attitudes and outlooks have guided behavior throughout the 20th century.

According to Wolfe, "money fever"—a drive to accumulate money and material things even to the point of excess—characterized the 1980s, the Golden Age of the Wall Street yuppie.

In the 1990s, however, we're in for a change. It's to be a decade of searching, permeated by "moral fever"—a quest for values, and answers to the moral dilemmas created by technical and scientific advances, and economic and environmental pressures.

Recently, a lighting professional involved in the renovation and retrofitting of a 25-year-old building told me that the driving force behind the renovation investment was not rebates from energy-saving retrofitting, but property enhancement—the creation of a quality environment to attract tenants. Not only did the utility company rebate not cover the cost of the renovation, but it was used instead to purchase additional system elements to produce a higher quality lighting design.

Rebate behavior for energy savings may turn out to be a lot like that for cars. A buyer may be more inclined to use the "found money" to purchase options that otherwise couldn't be afforded, than to bank the cash.

In this decade of moral fever, savings alone won't push people to adopt energy-saving techniques, but the value in protecting the environment, and adding to the quality of work or home spaces will.

And it is because of this that the specifier of lighting systems will become more and more important in the future. It is your skills that will be counted on to show clients how good design can affect the quality of life, because they do not have the expertise to know it themselves.

The move toward saving energy in the coming decade will be propelled by genuine concern for the good of the planet. And clients will be interested not only in money saved, but in greater value for money spent.

**WANDA JANKOWSKI**
EDITOR-IN-CHIEF

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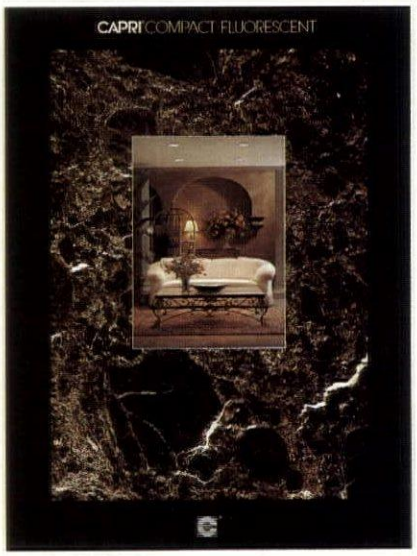


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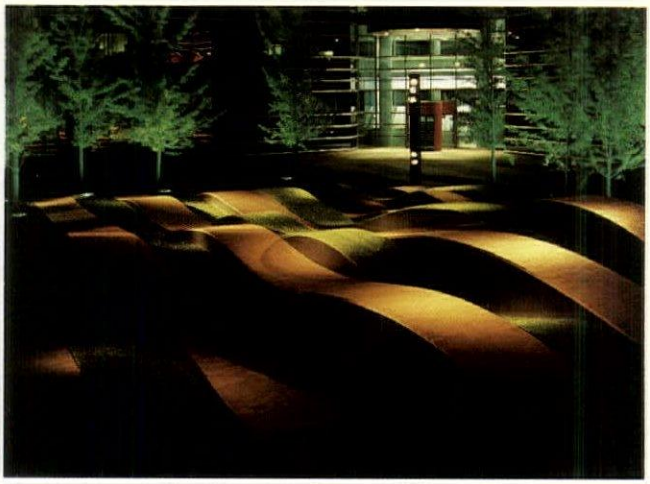
## LETTERS



# Regent Court Credit Due

**TO THE EDITOR:**

We at Illuminart were very pleased with the feature on the Regent Court landscape sculpture lighting in the April issue of *Architectural Lighting* (pages 26-27). We appreciate the opportunity to give recognition to the landscape architect, Randy Metz, John Grissim Associates, and the owner, Ford Motorland Development Corporation.

Lighting is designed to complement the character and form of architecture, and the landscape sculpture, which received the Top Honors Award for Design from the American Society of Landscape Architects, provided us with a unique sculptural form that made a creative, award-winning lighting solution possible.

Our thanks to *Architectural Lighting* for a fine article, and our compliments to Randy Metz with John Grissim Associates for excellence in their field.

**STEFAN GRAF, IALD, IES**
DESIGN DIRECTOR
*ILLUMINART*
YPSILANTI, MI

# In Appreciation

**TO THE EDITOR:**

Your April 1991 issue devoted to the IALD Awards was wonderful. With the large variety of trade publications today, it's not possible to keep them all, but this issue will certainly become a part of my library.

The IALD Awards program has never been so beautifully presented. The copy, as well as the photographs and their layout, were excellent. The IALD owes you a debt of gratitude for such a super job.

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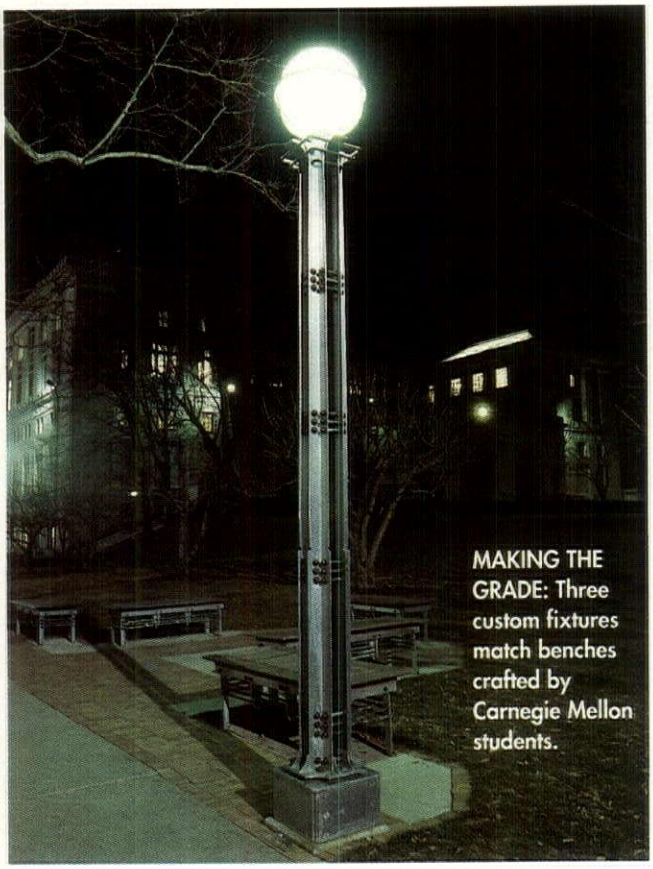
# NEW AND IMPROVED



MAKING THE GRADE: Three custom fixtures match benches crafted by Carnegie Mellon students.

**DETAILS**
**PROJECT:** *SEATING AREAS AT CARNEGIE MELLON UNIVERSITY*
**LOCATION:** *PITTSBURGH*
**PROJECT TEAM:** *DESIGN BUILD TEAM: ARI SKLAR and CHRISTOPHER HAUPT, project managers; DAVID CELENTO; MARIA COLE; KRIST DODARO; STEPHEN GIBSON; DAVE GOFF; GLENN KORNBREK; AUDREY LIU; ROXANNA MATTICOLI; ANDREW MOSS; CARLA SEDDIO*
**INSTRUCTOR:** *KIMO GRIGGS*
**ELECTRICIAN:** *CMU PHYSICAL PLANT*
**LIGHTING MANUFACTURER:** *BEGA: globes*
**PHOTOGRAPHERS:** *ARI SKLAR AND ANDREW MOSS*

**BY CHRISTINA LAMB**
ASSOCIATE EDITOR

**CHALLENGE** Twelve fifth-year architecture students at Carnegie Mellon University, collectively known as "The Design Build Studio," designed and constructed an outdoor space on the Pittsburgh campus as part of their required architectural curriculum. They started the project in fall 1989, completing it the day before their springtime graduation.

"Some of the architecture students decided to do this as part of an effort that called for improving areas of the existing campus environment," says Ari Sklar, co-project manager. "We wanted to clean up this particular portion of the path and make it the focus of our design because it's the central and most active part of the campus." The team decided to improve and expand a seating area that had four concrete benches and two aluminum, and obsolete, light fixtures.

**DESIGN/TECHNICAL CONSIDERATIONS** There were no specific lighting requirements, except that the area be sufficiently illuminated, providing safety and security for nighttime activity. This was to be accomplished through artistic planning, using architectural elements and light as tools to enhance the quality of the outdoor space.

**METHOD** "There are now three column-like light fixtures, organized rhythmically along this well-traveled path," Sklar says. These are spaced 60 feet apart with two groups of five benches placed between them. The light fixtures are the focal point and the benches echo the design.

"Since both the city of Pittsburgh and the university have a history of using aluminum structurally as well as decoratively, our decision to use aluminum as the main design element was appropriate," Sklar says. "Also, it's durable, yet soft enough to cut with the tools that were available to us."

The base of each column is composed of four plates that rest on a concrete footing and are bolted together to house the electrical conduit which powers the unit.

"The shaft is constructed of four aluminum angles, and through the center of that we ran the conduit that holds the wires for the lamp above," says Sklar. The four angles are held together by brass-threaded rods encased by copper tubing. The copper tubing, while serving structural and protective purposes, also provides a lasting and permanent quality to the fixtures, since the students patinated them.

The fixtures, which are approximately 12 feet high, use 250-watt metal halide lamps located in globes. These, like capitals, are mounted on top of the columns. The globes were customized to the design through a number of techniques, including sandblasting, to make the material more textural, says Sklar.

**CONCLUSION** The project ties together the relationship between architecture and light, and reflects a modern design that remains sensitive to the traditional architecture.

TODD ZWIGARD, RA

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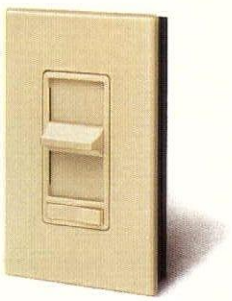

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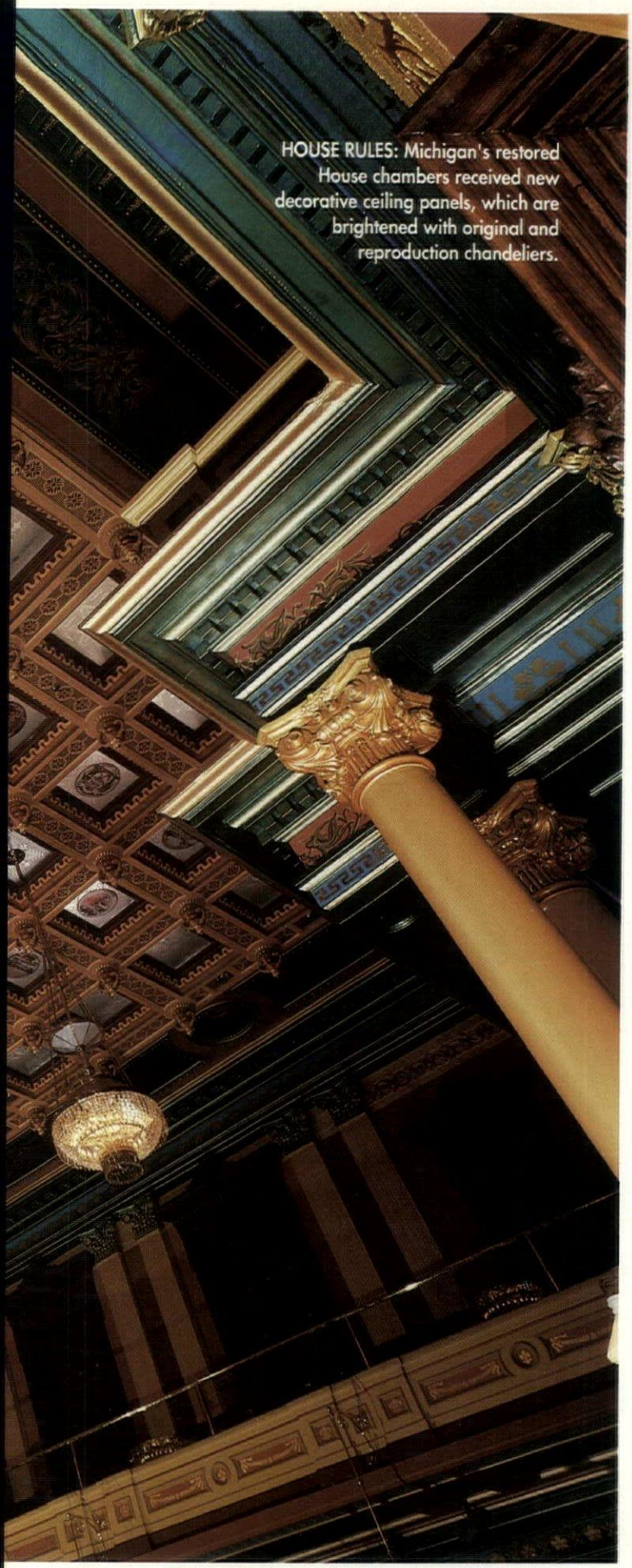


HOUSE RULES: Michigan's restored House chambers received new decorative ceiling panels, which are brightened with original and reproduction chandeliers.

# Capitol Gains

## Indirect lighting system revitalizes Michigan's historic Capitol

**BY DANA DUBBS**
CONTRIBUTING EDITOR

Electric light didn't exist when architect Elijah E. Meyers designed Michigan's Capitol in Lansing more than 110 years ago. So, to illuminate the interiors of the building's cavernous House and Senate chambers, Meyers relied on honeycomb-glass skylights, decorative glass panels in coffered ceilings, and ornate gas chandeliers.

But when SWS Engineering of Birmingham, MI, was hired in 1988 to help restore the Capitol's chambers to their original grandeur, lighting designer Judy Bentley walked into a different scene.

"As the skylights had aged, they'd begun to leak," she says. "And rather than repair them, maintenance crews had covered them with tar. The gas chandeliers were still there, but they'd been electrified and retrofitted with A lamps.

"The decorative glass panels that once allowed sunlight to pass through attic space and illuminate the chambers had been destroyed and lost," Bentley adds. "They'd been replaced by plexiglass sheets in the House chamber and by plywood in the Senate chamber. General light came from 2-foot x 4-foot fluorescent troffers atop the plexiglass, and from incandescent downlights poking through the plywood."

Of the two rooms, the Senate chamber was the darker

PHOTOS BY DIETRICH FLOETER


EXIT
EXIT

one. Its ceiling, floor, and furnishings were dark brown. Its walls were dark green. And its few large windows were hidden behind heavy gold drapes.

"Light levels were about 18 to 25 footcandles, but the room felt even darker than it was," Bentley says. "Senators would walk out of their bright, fluorescent-lit offices and into the dark surroundings of the chamber and feel like they were entering a cave. Their eyes would need time to adjust to the change."

The chamber's incandescent downlights caused additional discomfort. Recessed within the ceiling, they created hot spots and glare on desks and reduced visual contrast on tasks.

Conversely, the House chamber, lit by cool-white fluorescent tubes, was overly bright.

"The room's cream-colored walls and plexiglass ceiling created so much reflectance that walking into the room was like walking into a snowstorm," says Bentley.

## Respecting The Past

As part of each chamber's restoration, SWS was directed to accommodate computer use and other modern-day work requirements with an improved lighting system and better illumination levels. But, because the Capitol is listed in the National Register of Historic Places, the firm had to do so without altering either room's original appearance.

The lighting design team began warming up the House's chamber and brightening the Senate's by removing all plexiglass and plywood from the coffered ceilings and replacing them with reproductions of the original, decorative glass panels. The 44-inch etched square represents each of our nation's 50 states plus the major industries of Michigan.

Skylights were also reintroduced, but since Lansing averages less than 100 full days of sunshine annually, they don't offer much more than a nod to history.

"The skylights are ineffective as sources of general illumination for most of the year," says Bentley. To compensate, she designed an indirect lighting system that simulates natural light for the chambers and hid it in the attic spaces between skylights and coffered ceilings.

"We chose 400-watt metal halide floodlights for the bulk of the lighting system and sprinkled in some 400-watt high-pressure sodium lamps to simulate the golden color of sunlight," Bentley says.

The SWS team mounted the fixtures for a crisscross effect on planks between glass ceiling panels in the coffered ceilings. When the system's turned on, light bounces off the attic's ceiling, walls, catwalk, and ductwork from every direction. It passes, diffused, through the etched glass panels into the chambers below. Everything in the attic was painted white for maximum reflectance.

"We achieved nearly 100 percent equivalent sphere illumination," Bentley says. "And in doing so, we provided optimal visual comfort for the legislators and maximized contrast on their tasks. The lighting in the chambers is so uniform that hot spots and veiling reflections on desks no longer exist."

The potential for reflections on computer screens, which pop up at an angle from legislators' desks, was also eliminated by this uniform, indirect lighting scheme.

## Chandeliers Shine

Original and reproduction chandeliers provide additional light in the House and Senate chambers, bringing illumination levels in both rooms into the 35 to 40 footcandle range. The original, two-tiered "Sunlight" chandeliers, made by Mitchell, Vance & Company in the 1800s, are suspended over the main floor in each chamber. Three-branch reproduction chandeliers hang from balconies to the sides.

"The Sunlight chandeliers originally burned gas," says Bentley. "But over the years, the fixtures were equipped for electricity and the gas jets on both tiers were replaced with sockets for large, clear sparkling A lamps."

Restoring the chandeliers to their former brilliance involved replacing all mirrored surfaces inside the fixtures' shades, retrofitting the upper tier for 50-watt R lamps, and retrofitting the lower tier for energy-saving, 32-watt candelabra lamps. Flickering amber lamps were avoided because of their potential to reflect on the computer screens below. Legislators' desks are also arranged in a horseshoe shape, each one turned slightly from the angle of the chandeliers' light, which further minimizes the potential for reflections.

**SENATE MAJORITY: The restored chandeliers in the Senate (left and above) and House chambers sport new mirrored surfaces inside the shades, 50-watt R lamps for the upper tier, and energy-saving 32-watt candelabra lamps for the lower tier.**

"What I like about this project is that the light is so diffuse. You walk into the chambers, and you don't know where it's coming from."

—Judith Bentley


Solid brass side chandeliers provide uplight and downlight in the chambers. And because the fixtures are reproductions of gas-burning chandeliers, three medium-base incandescent sockets have been incorporated for the uplights. Four medium-base incandescent sockets have been incorporated for the downlights.

Each of the different fixture types is controlled separately through a dimming system and is wired to a programming panel at a technician's desk in the back of each room.

"Since there's still no efficient way to dim HID, we put the lamps in the attic on a multi-level switching system," Bentley adds. "They can be switched for one-third use, 75 percent use, and full use. We tried to keep the switching as even as possible to maintain a uniform lighting effect at every level. Where two HID lamps are side by side, each is on a different switch."

Rostrums in both chambers are lit by pole-mounted fixtures, which were reproduced from photographs and architectural renderings. The fixtures are connected to the dimming system, as is a surface-mounted spot luminaire highlighting the state seal in both chambers.

Emergency lighting is provided by the lower tier of candelabra lamps in the Sunlight chandeliers.

"We didn't want to use typical emergency lighting, so we put the chandeliers on the emergency system," Bentley says. "If the main circuit is broken, power is transferred to racks of batteries in four chandeliers in the Senate chamber and six in the House. The lamps will burn for 90 minutes."

The job of lighting the rostrum and other designated points for live and closed-circuit broadcasts went to the New York office of Imero Fiorentino. The consultant installed 1,000-watt television-style lights to the sides of the attics and aimed them at different points in the chambers through holes cut in the coffered ceilings. Similar 500-watt lamps were mounted under balconies on each side of the chambers. The television lights operate on a separate switch from all other lights in the rooms and provide a criss-cross pattern of beams that prevent shadows.

"What I really like about this project is that the light is so diffuse," Bentley adds. "You walk into the chambers, and you don't know where it's coming from."

Legislators in both chambers have similar thoughts. They passed unanimous resolutions commending the work of the design and construction teams. ■

**Both the Senate and House chambers are part of the National Register of Historic Places, thus mandating that the renovations could not change the rooms' original appearance.**

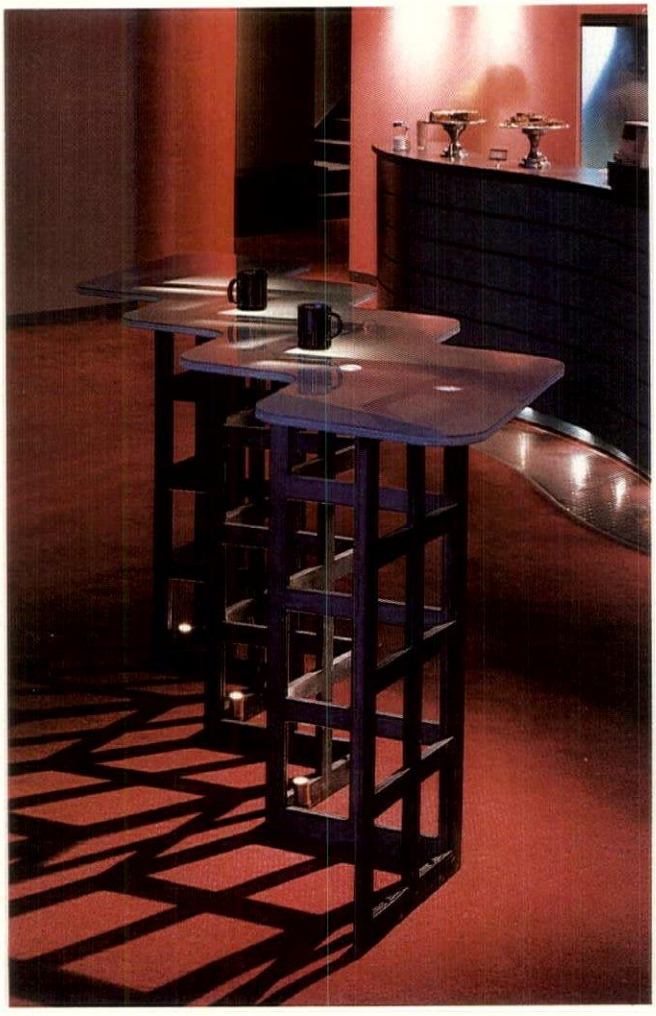
## Details

**PROJECT:** *MICHIGAN STATE CAPITOL, HOUSE AND SENATE CHAMBERS*
**LOCATION:** *LANSING, MI*
**CLIENT:** *STATE OF MICHIGAN*
**RESTORATION ARCHITECT:** *RICHARD C. FRANK, AIA*
**LIGHTING DESIGNER:** *JUDITH BENTLEY, SWS ENGINEERING, INC.*
**ELECTRICAL ENGINEER:** *SWS ENGINEERING*
**ELECTRICAL CONTRACTORS:** *QUALITY ELECTRIC and HAYES ELECTRIC*
**HISTORICAL FIXTURE DESIGN CONSULTANT:** *WILLIAM SEALE*
**TELEVISION SYSTEM CONSULTANT:** *IMERO FIORENTINO ASSOCIATES*
**PHOTOGRAPHER:** *DIETRICH FLOETER*
**LIGHTING MANUFACTURERS:** *SPAULDING: Lisbon series 400-watt metal halide luminaires, Lisbon series 400-watt HPS luminaires; SYLVANIA: MS400/C/HOR phosphor-coated lamps, LU400/D coated lamps, Supersaver lamps in 32-, 48-, and 52-watts; JEFFERSON ART LIGHTING: Sunlight chandeliers; VICTORIAN LIGHTING: side chandeliers; CIRECAST: pole-mounted luminaires with single and multiple heads; ELLIPTIPAR: surface-mounted spot luminaires with 150-watt tungsten halogen lamps; LEE COLORTRAN ENVIRONMENTAL LIGHTING: lighting control system*


# Cinematic Sanctuary

**BY EDWARD EFFRON**

*The author is president of Edward Effron Associates, New York.*



The original Film Forum, designed by Stephen Tilly, AIA, and the late Alan Buschbaum with lighting by Edward Effron Associates, had been more than a movie theater. It was a social center and downtown Manhattan meeting place for cinephiles, students, artists, and Soho visitors. When the Watts Street building that housed it was demolished in September 1989, the marquee was spared, dismantled and sent to a warehouse to be stored until a second home could be found for the Film Forum.

Most movie theater design teams have to be content with an educated guess as to who the theater's clientele will be. But, during the initial fundraising and programming phase of the second Film Forum, the design team was fortunate enough to come in contact with the loyal, diverse core of people for whom the movie theater is a cardinal point in their lives.

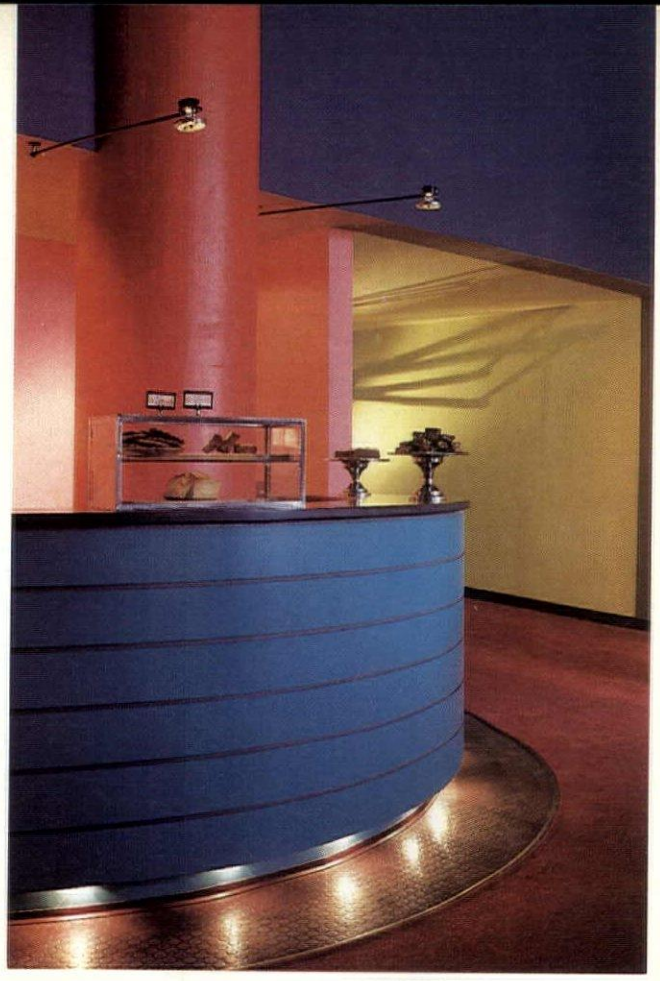
With them in mind, Stephen Tilly and I set out to house in a 13,000-square foot space on the ground floor of a 12-story building three theaters, and a comfortable, ample foyer that would provide patrons with a living room for the social part of moviegoing.

"The tradition of the atmospheric theater came into play (Drew Eberson, one of the originators of that tradition, had been a consultant on the previous Film Forum), not in a literal or nostalgic sense, but in a way that would help transport people out of their daily lives and into the world of the flickering image," Tilly says.

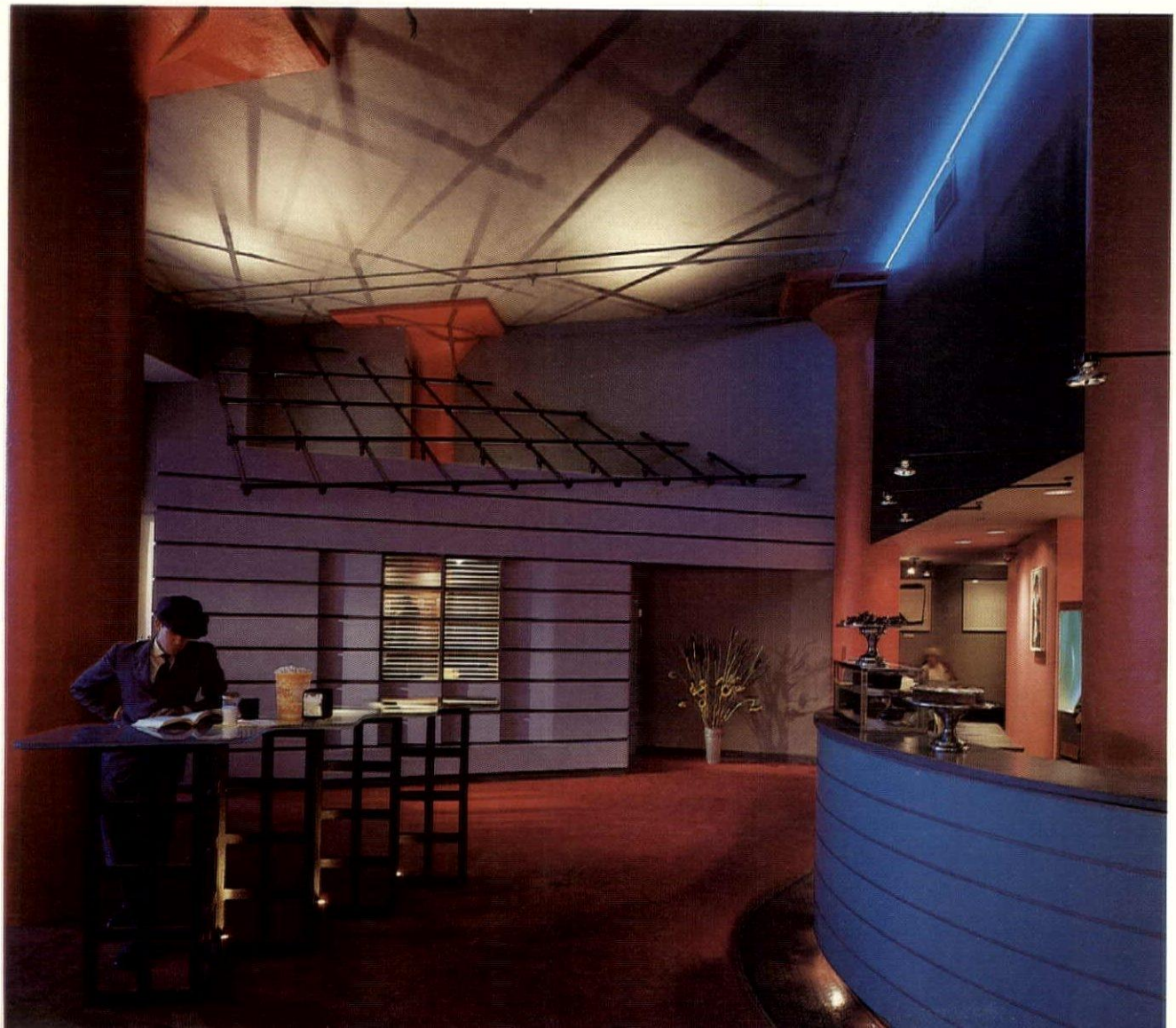
The dominant feature of the existing space was the 30-inch

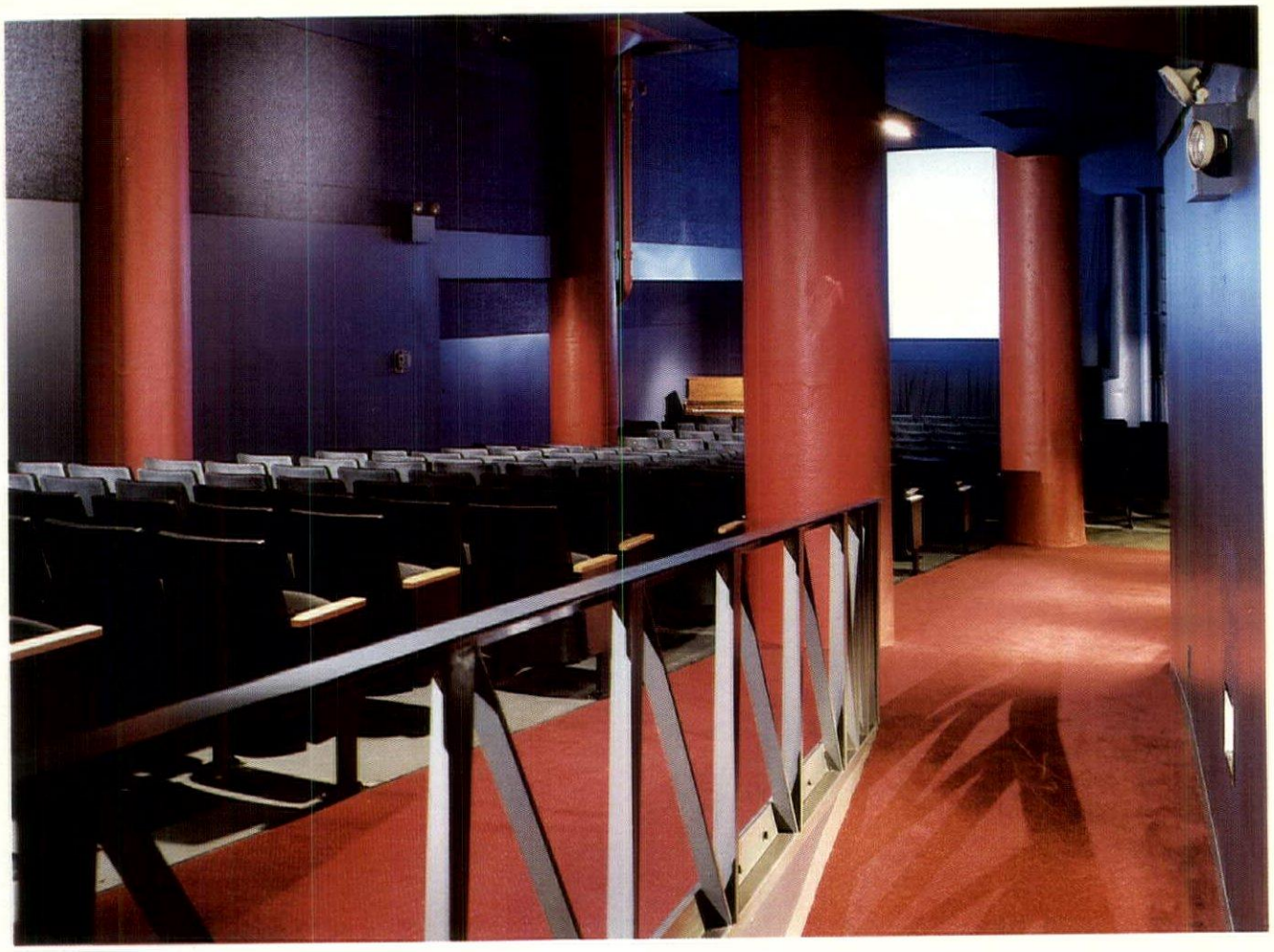
PHOTOS BY PETER AARON/ESTO

THE ORIGINAL MARQUEE (opposite page, top) is part of the second Film Forum's glass and metal facade. The freestanding glass sandwich and metal frame table (opposite page, below) is uplighted with MR-11 fixtures designed originally for outdoor use. The lobby's lighting (right and below) is soft and not overly bright, so patrons eyes' can adjust easily when they enter the darkened theaters.



**Playful architectural elements with lighting designed to emphasize their bold, clean lines create a second home for cinephiles at Soho's Film Forum**





**THEATER LIGHTING is controlled by the film projectors which trigger a dimming system.**

diameter columns formerly required to support heavy printing machinery. In the new design by Tilly and colleague Jay Hibbs, the columns, painted deep red, define the aisles of three theatres containing 137, 148, and 173 seats.

The lobby is approximately a square—34 feet on a side, a multiple of the 17-foot ceiling height. Within the lobby, Tilly created a series of architectural events.

"In order not to disfigure this volume, we housed the necessary functions in objects that populate the space: a pie wedge box office, which seems to pivot from one corner; a serpentine concession counter which skirts a column; and an underlit sandblasted glass freestanding table nosing by a column in the middle," says Tilly. "These objects are consistent with Film Forum director Karen Cooper's wish for some playful geometric shapes—what she called the 'Pee-Wee's Playhouse' look."

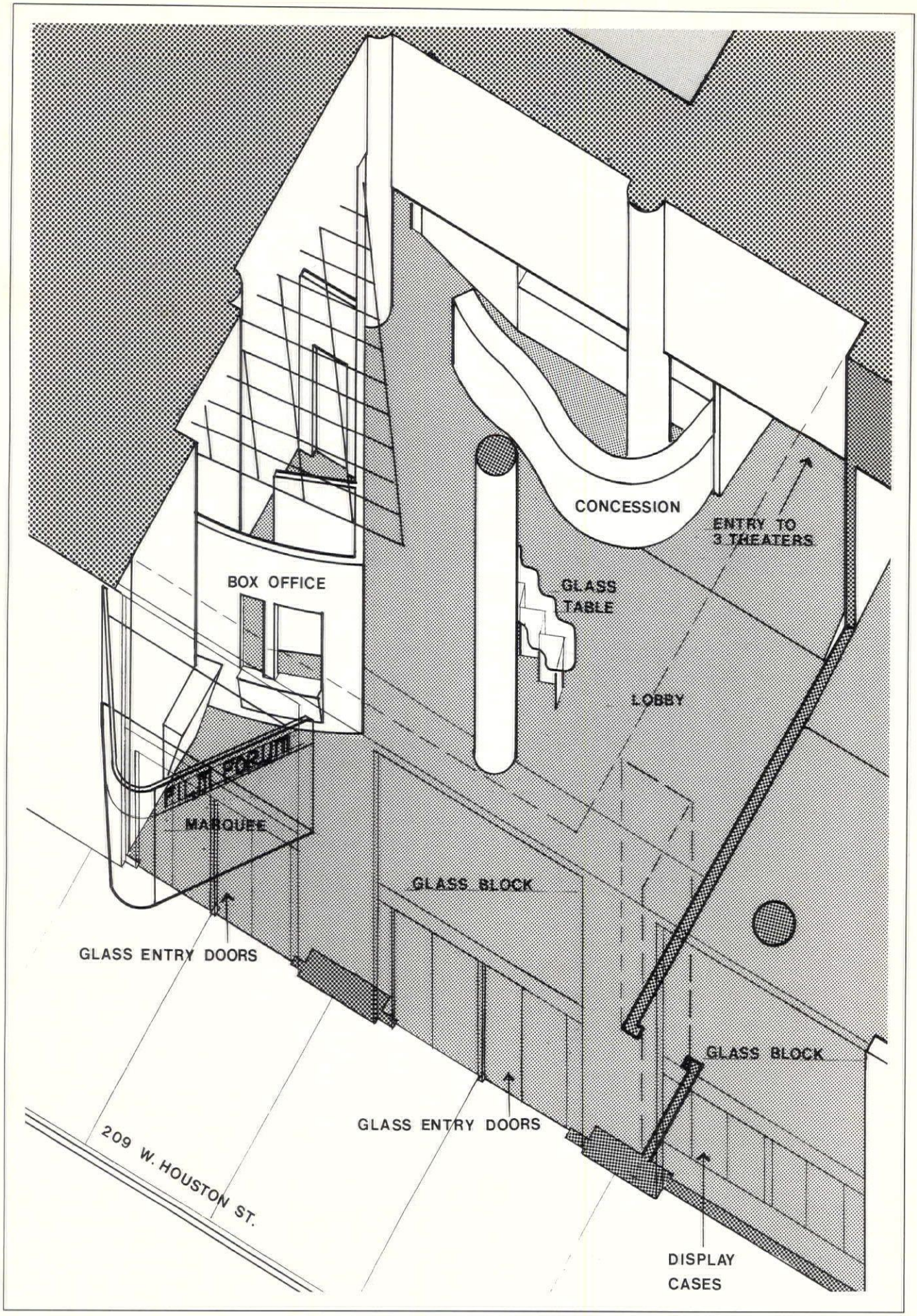
To spare patrons' eyes the discomfort of adjusting from brightness to a darkened theater, the lobby lighting purposely illuminates only the architectural details, and does not introduce ambient lighting. Also, the refreshingly high ceilings and the columns were pure concrete and off limits to wiring and lighting. Thus, the lighting of the interior elements became more internalized.

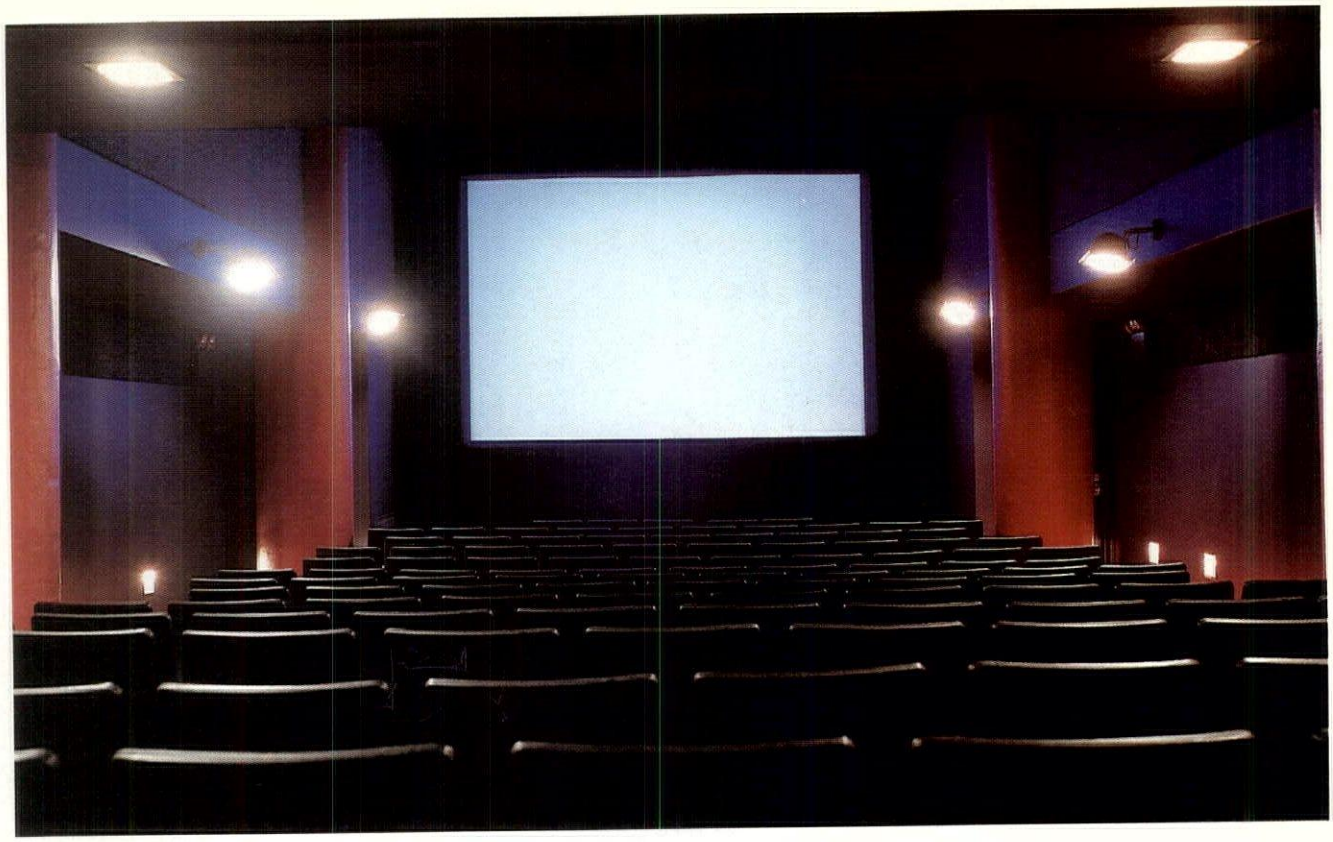
All the light is designed to come out of objects and reflect off the walls, ceiling, grid, carpet, or glass; or from two linear, colored strips that reinforce intersections or lines. A variety of sources project light through grids—the glass block grid, the steel table base and wire glass-top grids, and especially the skewed box office "roof" grid—to cast emphatic shadows. (Film people call these shadow devices "cookies," supposedly invented by a director who had someone hold a ladder in front of the lights to cast eerie shadows onto the set of a silent era thriller.)

The ticket booth/manager's office, with its open, pipe grid ceiling structure became the aperture of a light fixture. A simple track was used, with fixtures pointing up through the ceiling structure and down through the window with its strips of etched glass to create strong shadows on the ceiling and floor. The ticket booth is framed in linear incandescent to light up the booth's interior as well as the ticket vendor.

The free-standing table's top, made of a sandwich of three different types of glass, is lit from below by MR-11 fixtures incorporated into the table's design.

The concession stand is delineated with uneven patches of light recessed in the kick space. Further attention is called to the concession by high profile, low-voltage stem fixtures. The wall with the menu is lit with recessed


CONCESSION
ENTRY TO
3 THEATERS
BOX OFFICE
GLASS
TABLE
LOBBY
FILM FORUM
MARQUEE
GLASS BLOCK
GLASS ENTRY DOORS
GLASS BLOCK
GLASS ENTRY DOORS
209 W. HOUSTON ST.
DISPLAY
CASES



**AISLE LIGHTS are recessed parabolic fixtures specially adapted to use T10 lamps.**

adjustable PAR 30 fixtures. Above all this at the ceiling line is a linear strip of cold cathode, which is reflected by (parallel) linear fiber optics along the glass block at the entrance. The color wheel circuit is isolated so that the color can be stopped or allowed to turn freely.

Tota-lite fixtures from my design for the old Film Forum were reused to illuminate the wall of posters. They also serve as a line of light to lead the audience toward the theater entrance. To light this entrance hall, I again used a simple theme from the former theater: exposed fluorescent tubes, recessed in vertical niches and fitted with neutral density sleeves to lower the light levels.

The long hallway leading to the services and exit is lit with randomly placed fixtures. Their adjustability allows for simple downlighting or illumination of wall-hung exhibits.

A passageway leading from the lobby gives controlled access to the three theatres and dampens interior light and sound levels.

The lighting in the theaters is controlled automatically, triggered by the film projectors which activate a dimming system. The aisle lights are recessed parabolic fixtures specially adapted to use T 10 lamps. General light is from 10-inch theatrical scoops employing diffusing media to soften the light.

A control system was programmed to maintain automatic settings for all lobby and marquee lighting. The top end trims of the dimmers have been slightly cut back to increase lamp life without sacrificing noticeable lighting effects.

In September 1990, the original marquee was illuminated at the theater's new location on West Houston Street, part of the open and inviting facade of the new Film Forum.

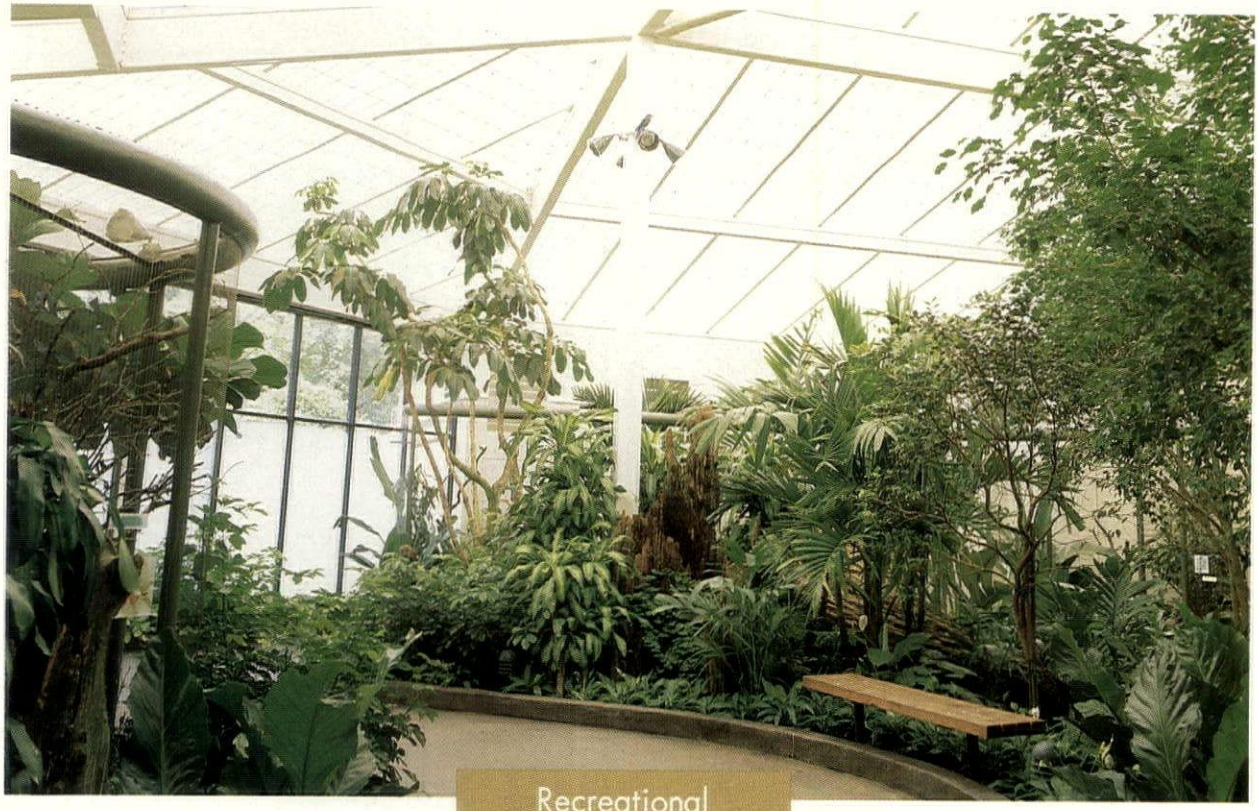
"Out on the street we wanted a calm, civilized presence," Tilly says. "The steel and glass facade is intentionally austere in contrast to the colorful interior glowing behind it. The standoff Futura lettering is from the modern tradition which has a history on the street in New York, and we tried to use it throughout to calm the graphic clutter that an operating theater generates." ■

## DETAILS

**PROJECT:** *FILM FORUM*
**LOCATION:** *NEW YORK*
**CLIENT:** *FILM FORUM*
**ARCHITECT:** *STEPHEN TILLY, AIA, AND JAY HIBBS, STEPHEN TILLY ARCHITECT*
**LIGHTING DESIGNER:** *EDWARD EFFRON, EDWARD EFFRON ASSOCIATES*
**STRUCTURAL ENGINEER:** *ROBERT SILMAN ASSOCIATES*
**HVAC ENGINEER:** *SEYMOUR BERKOWITZ & ASSOCIATES*
**ACOUSTICAL ENGINEER:** *KLEPPER MARSHALL KING*
**RMS SERVICES:** *RMS SERVICES*
**CONSTRUCTION MANAGER:** *RAMPART CONSTRUCTION*
**PHOTOGRAPHER:** *PETER AARON, ESTO PHOTOGRAPHICS*
**LIGHTING MANUFACTURERS:** *Halo: track fixtures in ticket booth; Norbert Belfer: Spectralinea in ticket booth window, and strips in concession stand; B-K Lighting: uplights in free-standing table; Osram: lamps in concession stand; Modular Lighting: stem fixtures at concession stand; Staff Lighting: PAR 30 fixtures near menu; National Cold Cathode Corp.: cold cathode at ceiling line; Fiberstars: fiber optics along entry glass block; Lowel: Tota-lites illuminate wall posters; Swivelier: Orbiter fixtures in hallway; Lehigh: dimming system; Engineered Lighting Products: aisle lights; Colortran: Viewpoint control system*

ARCHITECTURAL
LIGHTING

# DESIGN FOCUS REPORT



Recreational Lighting

# TAKING RECREATION SERIOUSLY

**IT'S IRONIC THAT THE PLACES WE CREATE for play—places where the body is refreshed and the spirit restored—can be accident and injury traps if poorly designed. Detailed here are glare-free, efficient lighting systems that allow athletes to work out safely and comfortably in the McClain Athletic Training Facility, and the U.S. Coast Guard Academy's pool. The lighting in the Tropical Bird House at the Audubon Zoo insures the health and well-being of our feathered friends there. And "The Need For Accurate Photometrics" explores the necessity for specific fixture information in order to produce safe designs. — *WJ***

DESIGN
FOCUS REPORT

## McCLAIN ATHLETIC TRAINING FACILITY

# TRAINING GROUND

Remember doing exercises on the floor of your high school gym? Remember being forced to stare into the blinding light of those giant metal halide lamps as you struggled to do the umpteenth leg lift for your overweight phys. ed. instructor?

Well, that beaming glare is exactly what the University of Wisconsin-Madison wanted to avoid when it decided to construct its McClain Athletic Training Facility.

The space is used as an indoor practice field for all of the intercollegiate athletic programs, especially the football team. The big challenge faced by the lighting group from Howard Needles Tammen & Bergendoff was creating a scheme that would be bright enough for the players but without the glare of a direct lighting system.

"Downlighting was taken out of the plans right away because they didn't want the quarterbacks, receivers, or any of the other athletes looking up and seeing the lights," says project manager John Burgan.

Another reason downlighting was nixed was because the architectural team from Bowen Williamson Zimmerman chose a Teflon-coated fiberglass fabric for the roofing. The translucent material, which covers 75 percent of the 220-foot x 330-foot field, acts as a skylight, allowing ample illumination in to assimilate daylight conditions, even on a cloudy day. The roof has six major arches, the highest point being 65 feet arching down to the side walls, which are 15 feet high.

These various factors forced the HNTB team to mount the fixtures 14 feet up on the side walls of the field.

"One of the most difficult parts of the job was getting uniform light on the field while working with the shape of the roof," Burgan says. "Basically, we ended up mounting the fixtures on the side and then tried to eliminate as many of the shadows as we could."

The team specified 180 metal halide fixtures. Ninety 1,000-watt lamps are mounted at a 63-degree angle on each side of the field. The fixtures are circuited and switched into thirds so that various light levels can be provided, depending upon the amount of sunlight available and the event going on inside.

"This is a light fixture that is made for sporting facilities," Burgan says. "The client requested metal halide because they really didn't want the yellow color you get with sodium lamps. Also, this lamp's design offers good photometric performance and light control."

The fixtures are fitted with metal shields to protect the athletes' vision and reflect the

**TOUGH STUFF: Strong roofing fabric made of Teflon-coated material arches high above the University of Wisconsin-Madison's indoor practice field. The fabric reflects the light of 180 1,000-watt metal halide fixtures.**

### FURTHERMORE

•The project received the 1990 Edwin F. Guth Memorial Award of Excellence from the International Illumination Design Awards committee of the Illuminating Engineering Society.

•The fabric ceiling is designed to be as capable of handling heavy weather conditions—including snow and winds—as any other roofing material.

light up to the fabric roof. At night with all the fixtures on, the average footcandle level is 64. The roof itself was determined to be 66 percent reflective.

Despite the lack of flexibility in the fixture placement, Burgan says the lighting team is very satisfied with the outcome.

"It was a different type of project to work on because there just aren't many of them built," Burgan says. "But the technique could be used in other applications. Since the lights are so far away from the roof, you get a nice, even illumination. For your average high school or college, it wouldn't be used a lot because it's not the cheapest solution. But for somebody that wants to upgrade a facility, it's very applicable."

The McClain facility, complete with a weight room, lap pool, meeting rooms, and lockers, cost about $9.5 million in total.

"I think the outcome speaks pretty highly of the vision that the athletic department and the university had," Burgan says.

*—Catherine Schetting Salfino*

### DETAILS

**PROJECT:** *MCCLAIN ATHLETIC TRAINING FACILITY*
**LOCATION:** *MADISON, WI*
**CLIENT:** *UNIVERSITY OF WISCONSIN-MADISON*
**LIGHTING DESIGNER:** *HOWARD NEEDLES TAMMEN & BERGENDOFF: HARVEY K. HAMMOND, partner-in-charge; ROBERT A. LEICK, associate in charge; JOHN BURGAN, project manager; JIM STANISLAWSKI, lighting designer; DOUG SAUER, electrical engineer;*
**ARCHITECT:** *BOWEN WILLIAMSON ZIMMERMAN*
**ASSOCIATE ARCHITECT:** *HNTB SPORTS ARCHITECTURE GROUP*
**PHOTOGRAPHER:** *MIKE SINCLAIR*
**LIGHTING MANUFACTURER:** *HI-TEK SPORTS: lighting fixtures; BIRD AIR: roof fabric*

DESIGN
FOCUS REPORT

## U.S. COAST GUARD POOL HOUSE

# MILITARY PRECISION

**MAKING A SPLASH: The new metal halide system, with incandescent emergency lighting, rejuvenated this dimly-lit Connecticut pool house (below), fulfilling the request for a higher level of illumination.**

Making a decision to modify one portion of a space often leads to the necessary improvement of its other parts. As a result, the project may be transformed into something entirely new, when the original plans really just called for an alteration. This is what happened at Roland Hall's swimming pool, part of the U.S. Coast Guard Academy facility in New London, CT.

The issue of environmental safety was the impetus that started the ball rolling: Asbestos in the pool area's concrete slab ceiling had to be removed. This clean-up became the driving force behind the much-needed relighting of the natatorium.

"The swimming coach requested that as part of the asbestos removal project, the facility be equipped with a newer and better system that would upgrade the footcandle level," says Norman Falk, president, Voigt Lighting Industries, Inc.

Renovation and installation time was an important consideration, and had to be kept to a minimum, since the pool would remain unused during the construction period.

High-intensity discharge (HID) sources now replace the fluorescent lamps that provided illumination of the pool for its many years of existence. Over the spectator area there are two rows of eight fixtures. Each of these 16 units use 175-watt metal halide lamps. The 32 luminaires over the water, divided into four rows, use 400-watt metal halides.

"We decided to use a group of 400-watt lamps over the pool and a group of 175-watt lamps over the bleachers so that approximately one-third the illumination would be provided over the spectator section as compared to the active pool area," Falk says.

Since a new non-asbestos ceiling was to be suspended below the concrete ceiling, the lighting units had to accommodate not

only the existing orifices in the old surface, but had to extend down sufficiently to penetrate the new ceiling.

Recessed fixtures had been mounted in the concrete, leaving square holes in the ceiling.

"The location of the lights was fixed," Falk says, "but the openings no longer shone on the surface due to the new, hung ceiling that was installed about 5.5 inches below the concrete deck."

The T-bars and acoustic ceiling tiles are hung by wires, providing enough strength to support the tiles, but not enough to carry the weight of a fixture. So the fixtures had to hang from the original ceiling and penetrate the new surface.

The acoustic panels are left out where the new fixtures are placed, making it appear as if the units are installed in the tile. The fixtures' stainless steel faceplates are set against T-rails to further this illusion.

The units are all provided with top-servicing capability, so maintaining the system is relatively easy.

"There's a crawl space above the concrete ceiling," Falk says, "so to replace a lamp you simply reach through the holes that are cut in the old ceiling, lift up the top of the fixture, and relamp from above. It doesn't disturb the lens and the trim, and the process is not visible to those below."

Two systems for emergency lighting were also designed—for long-range and temporary outages. Eight of the 175-watt fixtures, and 16 of the 32 400-watt fixtures are provided with incandescent sockets, which are separately wired to a circuit. The circuit is energized by a motor generator set that provides emergency power in case of a prolonged power outage. Six additional units are supplied with a quartz relay and socket, which are instantly energized when there is a power interruption.

"In the event that the electrical lines lose power for even a second, the metal halides go out," Falk says. "But they don't come on right away—in the nature of all HID sources—and take a few minutes to restrike. So an incandescent lamp burns until the metal halides go back on. During that period of time you want enough light for everyone to feel comfortable and safe; but as soon as the power is restored, you want the auxiliary lights to shut off."

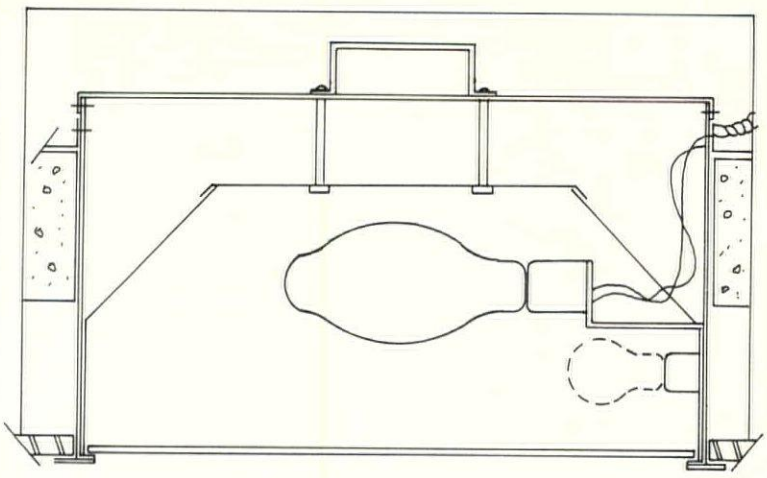
If the power is lost altogether, a back-up motor generator automatically kicks in and produces electricity.

"The power is not enough to drive everything in the whole building, but it does give electricity to incandescent lamps in 16 fixtures over the pool," Falk says. "There's enough light to evacuate people if necessary, or to continue swimming safely. In other words, if you have a long power failure, one set of lights goes on giving you enough light to see.

"What makes the project so interesting is that it's an old existing installation that had to be renovated for reasons other than lighting," Falk says. "It required a rather unique set of solutions using fixtures that were made to fit the very restricted conditions that existed on the job. So, out of need dictated by an asbestos removal requirement, there followed a new lighting system that completely modernized the entire pool area."

It's now a contemporary-looking pool, which is in an old building that does not have the modern, high-tech look the pool has. "They had a dingy looking pool: the fluorescents were old, worn-out, and dirty," Falk says. "And now, it looks like a brand-new environment."

*—Christina Lamb*



**FIT TO A "T": The detailed drawing (above) shows the lighting unit that was developed to be attached to the existing concrete surface and to penetrate the new acoustical ceiling. A 400-watt metal halide lamp is installed beneath a reflector with removable top lid. A 100-watt incandescent emergency lamp can be installed below the metal halide lamp as required.**

## DETAILS

**PROJECT:** *U.S. COAST GUARD ACADEMY SWIMMING POOL*
**LOCATION:** *NEW LONDON, CT*
**CLIENT:** *U.S. COAST GUARD ACADEMY*
**ARCHITECT & LIGHTING DESIGNER:** *W. GEORGE PERKINS; ARCHITECTURAL SECTION, U.S. COAST GUARD ACADEMY*
**PHOTOGRAPHER:** *PETER GOODMAN*
**LIGHTING MANUFACTURER:** *VOIGT LIGHTING INDUSTRIES, INC.*

DESIGN
FOCUS REPORT

# ACCURATE PHOTOMETRIC INFORMATION

**BY TONY J. ADAMS, IES**

*The author, an independent lighting designer, has worked on a variety of commercial, institutional, and public projects, and has gathered, processed, and applied photometric data for computer lighting programs.*

Those who specify lighting need more than just a knowledge of lamp types when creating a layout. They need product information that will help them choose products which fit their design parameters. One way to get the lighting manufacturing industry to respond with the required product information is to let them know about the specifiers' needs.

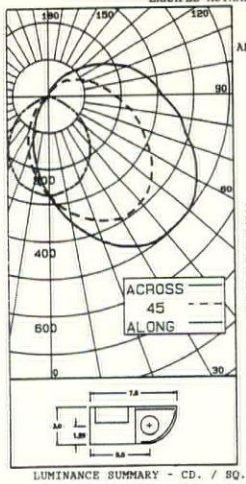
Lighting calculations can be divided into two categories: room averages and specific point-by-point calculations. Averages are easily achieved by the zonal cavity calculation method using coefficient-of-utilization charts.

But point-by-point calculations require complete candlepower distribution information at all vertical angles, and a minimum of three horizontal angles (parallel, 45 degrees, and perpendicular). In the case of a point source, several degrees of horizontal angles are required depending on the reflector design (symmetrical, asymmetrical, wall-washer, etc.). These values allow the designer to plot accurate footcandle measurements at specific points on floors, walls, and ceilings; to determine exitance values for indirect lighting and floodlighting; and to predict cutoff angles for avoiding visual glare and for dramatic feature lighting effects.

Recently, I compared library stack lighting alternatives using the same lamp types, mounting heights, stack heights, surface reflectivities and lumen depreciation factors (I obtained all my photometric information from independent test reports). By calculating the luminaires' performances under identical conditions, I was able to label

CERTIFIED TEST REPORT NO. LSI 9995E
COMPUTED BY LSI PROGRAM **TEST-LITE**

MANUFACTURER ABC ASYMMETRIC FLUORESCENT LUMINAIRE CATALOG NO. 2345
SPECULAR REFLECTOR, SNAP-IN ACRYLIC PRISMATIC LENS, ADVANCE H-140 BALLAST
ONE F40T12/WW FLUORESCENT LAMP. LUMEN RATING = 3200 LMS.
EXAMPLE ASYMMETRIC MICRO-TEST LITE RUN






CANDLEPOWER SUMMARY

| ANGLE | ALONG | BEAM SIDE 22.5 | 45 | 67.5 | ACROSS | OUTPUT LUMENS |
|---|---|---|---|---|---|---|
| 0 | 275 | 275 | 275 | 275 | 275 | |
| 5 | 272 | 290 | 302 | 308 | 314 | 14 |
| 15 | 257 | 308 | 347 | 376 | 390 | 48 |
| 25 | 230 | 305 | 380 | 432 | 456 | 84 |
| 35 | 197 | 295 | 393 | 462 | 494 | 117 |
| 45 | 152 | 260 | 381 | 462 | 499 | 138 |
| 55 | 103 | 204 | 345 | 446 | 488 | 144 |
| 65 | 51 | 142 | 294 | 406 | 445 | 135 |
| 75 | 16 | 91 | 250 | 354 | 387 | 119 |
| 85 | 1 | 59 | 205 | 305 | 340 | 101 |
| 90 | 0 | 47 | 183 | 280 | 312 | |
| 95 | 0 | 45 | 165 | 261 | 295 | 84 |
| 105 | 0 | 37 | 132 | 219 | 253 | 68 |
| 115 | 0 | 32 | 103 | 172 | 201 | 51 |
| 125 | 0 | 21 | 72 | 124 | 146 | 33 |
| 135 | 0 | 15 | 47 | 79 | 93 | 19 |
| 145 | 0 | 6 | 28 | 45 | 54 | 9 |
| 155 | 0 | 2 | 11 | 20 | 24 | 3 |
| 165 | 0 | 2 | 1 | 2 | 6 | 0 |
| 175 | 0 | 0 | 0 | 1 | 0 | 0 |
| 180 | 0 | 0 | 0 | 0 | 0 | |

| ZONE | LUMENS | % LAMP | %LUMINAIRE |
|---|---|---|---|
| 0-30 | 219 | 6.87 | 16.67 |
| 0-40 | 367 | 11.48 | 27.87 |
| 0-60 | 687 | 21.49 | 52.15 |
| 0-90 | 1052 | 32.89 | 79.81 |
| 40-90 | 684 | 21.40 | 51.95 |
| 60-90 | 364 | 11.40 | 27.67 |
| 90-180 | 266 | 8.32 | 20.19 |
| 0-180 | 1318 | 41.20 | 100.00 |

** EFFICIENCY = 41.2% **

LUMINANCE SUMMARY - CD. / SQ. M.

| ANGLE | ALONG | 45 | ACROSS |
|---|---|---|---|
| 45 | 1974 | 3173 | 3614 |
| 55 | 1649 | 3067 | 3661 |
| 65 | 1108 | 2897 | 3575 |
| 75 | 567 | 2854 | 3459 |
| 85 | 105 | 2902 | 3545 |

S/MH = 2.3
SC(ALONG) = 1.2, SC(ACROSS) = 2.3
CERTIFIED BY:
DATE: JAN 15, 1989
PREPARED FOR:
MANUFACTURER ABC
ANYTOWN, USA

TESTED ACCORDING TO IES PROCEDURES. TEST DISTANCE EXCEEDS FIVE TIMES THE GREATEST LUMINOUS OPENING OF LUMINAIRE.

**FIGURE 1**

"brand four" as 3:1 uniformity, compared to "brand five" as 8:1 uniformity, based on equivalent design parameters.

Needless to say, brand five's published description stated a 3:1 uniformity ratio, but 3 of what to 1 of what? Maximum to minimum output? Average to minimum output? What type of lamp? What type of ballast? What mounting height? Where were the measurements taken—at the floor or desk height?

Interpreting a luminaire manufacturer's "photometric information" blurb from a catalog can be frustrating, confusing, time-consuming, and lead to occasionally unwarranted mistrust of an otherwise efficient and accommodating manufacturer. Typically, a manufacturer's catalog data caters to the zonal-average calculations with coefficient-of-utilization charts and spacing-to-mounting height ratios.

Coefficient-of-utilization charts are fine for confirming power budget projections, but to design vertical wall illumination, uniformity of illumination, and cutoff angles you need an accurate, complete candlepower curve and accompanying photometric information(Figure 1), not the typical smooth nondescript curve (Figure 2) usually provided by catalog cuts. You can find more realistic curves in manufacturers' catalogs, but sometimes without any candlepower reference values (Figure 3). Some manufacturers don't print a curve at all—relying on coefficient-of-utilization charts (Figure 4). Most of this information is shown as an excerpt from "Independent Testing Lab report #xyz." If the report is available to the manufacturers, why not just print the whole report in the catalogs?

Some companies claim that their photometric information is sensitive and not for public use; they fear another manufacturer will steal the reports and use them to copy a design. Well, anyone can purchase a luminaire and have an independent test performed to easily obtain that

# Photometrics

**Candlepower Distribution**

| Vertical angle | 0 | 45 | 90 |
|---|---|---|---|
| 0 | 256 | 256 | 256 |
| 10 | 240 | 259 | 273 |
| 20 | 241 | 295 | 335 |
| 30 | 212 | 300 | 356 |
| 40 | 171 | 291 | 350 |
| 50 | 122 | 253 | 325 |
| 60 | 85 | 220 | 295 |
| 70 | 44 | 165 | 235 |
| 80 | 12 | 126 | 200 |

Spacing Criteria
1.7 diagonal 1.9 adjacent

FIGURE 2

information. And some design and engineering firms will not give credence to photometric information that does not come from an independent test report.

More and more manufacturers have been supplying photometric data on their products in the Illuminating Engineering Society's (IES) format for use in computer lighting programs. This information almost exclusively comes from independent photometric test reports or from an in-house testing facility. Few lighting manufacturers actually print the report in their catalogs, which to me seems contradictory to the practice of mailing out their complete product line's photometric data on floppy disks for the IES.

The IES has established a standard for testing, be it near-field or far-field photometry. I propose the establishment of a similar standard for presenting the information to specifiers. This information, however, is far too subjective to rate in "overall performance" values; what out-performs similar luminaires in one condition may be next to worthless in the next situation. It is my belief that a catalog's "quick-calc" type of layout charts are valuable only if your conditions perfectly match the example.

So we really need to return to the initial test reports and perform calculations based on actual conditions. And the only way to achieve reliable results is to have the correct photometric curve and associated candle power values. This issue of providing adequate and pertinent photometric data is in my view every bit as important as a UL label, and it would be in the manufacturer's best interest to provide it to the potential specifier in a readily available manner.

*(The topic of accurate photometric data, what it means, and how to interpret it was presented in "How To Use Photometric Data," by Alfred R. Borden IV, in the August 1990 issue of Architectural Lighting.)*

**Providing adequate and pertinent photometric data is every bit as important as a UL label, and it would be in the manufacturer's best interest to provide it to the specifier in a readily available manner.**

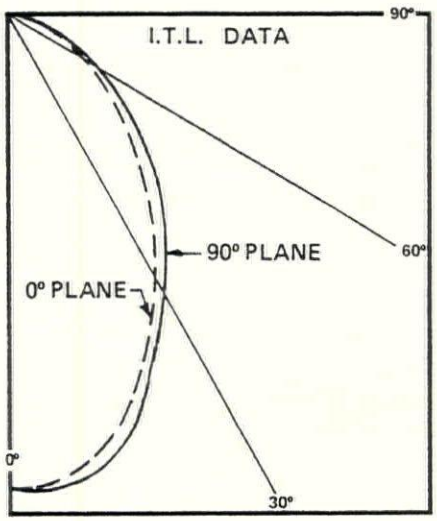



FIGURE 3

ENGINEERING DATA [redacted]

| ZONAL CAVITY METHOD ITL Report No. [redacted] | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Effective Floor Cavity Reflectance 0.20 | | | | | | | | | | | |
| RC | 80 | | | | 70 | | | | 50 | | |
| RW | 70 | 50 | 30 | 10 | 70 | 50 | 30 | 10 | 50 | 30 | 10 |
| 1 | 76 | 74 | 71 | 69 | 74 | 72 | 70 | 68 | 69 | 67 | 66 |
| 2 | 71 | 66 | 62 | 59 | 69 | 65 | 62 | 59 | 63 | 60 | 57 |
| 3 | 66 | 60 | 55 | 52 | 64 | 59 | 55 | 51 | 57 | 53 | 50 |
| 4 | 61 | 54 | 49 | 45 | 60 | 53 | 49 | 45 | 52 | 48 | 44 |
| 5 | 56 | 49 | 43 | 39 | 55 | 48 | 43 | 39 | 47 | 42 | 39 |
| 6 | 52 | 44 | 39 | 35 | 51 | 44 | 39 | 35 | 43 | 38 | 35 |
| 7 | 49 | 40 | 35 | 31 | 47 | 40 | 34 | 31 | 39 | 34 | 31 |
| 8 | 45 | 36 | 31 | 27 | 44 | 36 | 31 | 27 | 35 | 30 | 27 |
| 9 | 41 | 33 | 27 | 24 | 40 | 32 | 27 | 24 | 32 | 27 | 24 |
| 10 | 38 | 30 | 25 | 21 | 38 | 29 | 24 | 21 | 29 | 24 | 21 |

FIGURE 4

DESIGN
FOCUS REPORT

## AUDUBON ZOO AVIARY

# DAYLIGHTING FOR THE BIRDS

**SUBSTITUTE SKY: Translucent glass cuts heat and glare to provide comfort for both the birds and the visitors to the Tropical Bird House at the Audubon Zoo.**

The bali mynas, wrinkled hornbills, and Micronesian kingfishers that are native to a tiny island off Guam are only three of 175 exotic species brought together to inhabit the lush greenery, indigenous to the rain forests of Malaysia and Brazil, in the Tropical Bird House at New Orleans' Audubon Zoo.

The bird house, which is the centerpiece of a new $1.5 million addition known as the Oppenheimer Complex, is over 12,000-square feet and 26 feet at its highest point. Maintaining a proper habitat for these valuable birds, many of which are endangered species, is critical to their survival and to the enjoyment of zoo patrons. Since the abundant flora is a key to sustaining the bird house's tropical environment, a substantial amount of sunlight is required for the delicate plant life to flourish.

Design Consortium Ltd., a New Orleans architectural firm with a 15-year relationship with Audubon, enclosed the aviary with insulated translucent sandwich glass panels, which transmit and diffuse light.

"Maintaining a constant 75-degree temperature inside the aviary, regardless of external weather conditions, is essential," says Design Consortium's project manager, Carlos Cashio. "Any significant fluctuations could have serious consequences, and the heat can be pretty brutal in New Orleans. The comfort of visitors has been insured as well. We didn't want them looking up and seeing bright spots."

Cashio says traditional glazing was not considered for the project.

"Clear glass gets dirty, glare obstructs the view," Cashio says.

A translucent glass was selected instead because it transmits a soft, warm glow. The exterior is protected by a permanent glass erosion barrier that requires little in the way of maintenance.

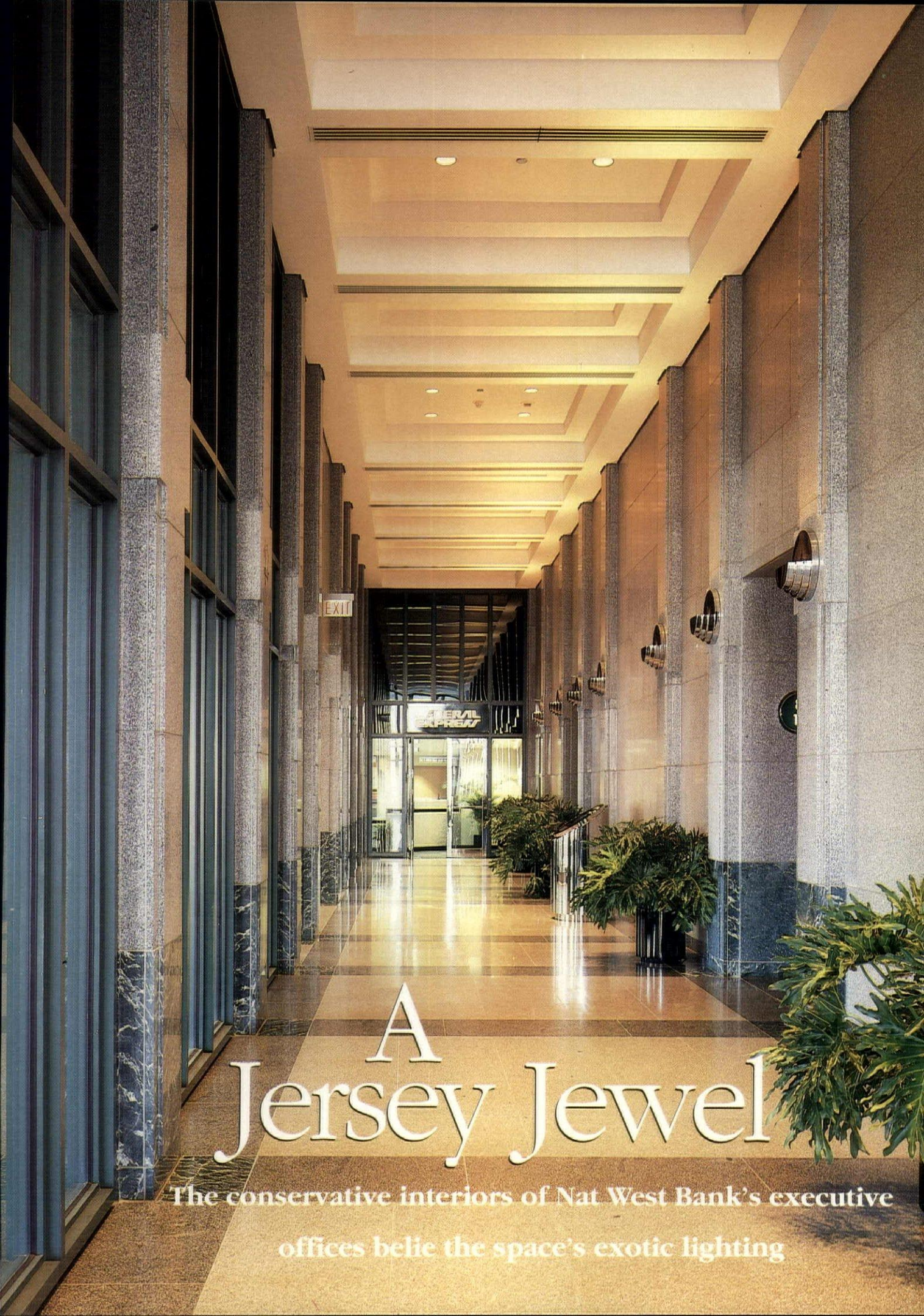
Two walls have been constructed using clear glass panels, so visitors will be able to look at outdoor exhibits planned for future installation.

Four fixtures with R-11 lamps are mounted on each of four columns in the bird house's center and two single fixtures at the exit door. They provide security lighting and illumination at night for guests at parties held at the zoo throughout the year.

Meanwhile, the ornithologists at the zoo continue to administer a government-sanctioned propagation program to perpetuate the imperiled species in their care. Breeding, they say, has always been possible, but now they have ample room to allow free flying among many specimens. The birds will never be able to live in their native environments, but the Audubon Zoo is the next best thing to being there.

### DETAILS

**PROJECT:** *TROPICAL BIRD HOUSE, AUDUBON ZOO*
**LOCATION:** *NEW ORLEANS*
**CLIENT:** *AUDUBON ZOO*
**ARCHITECT & LIGHTING DESIGNER:** *CARLOS CASHIO, DESIGN CONSORTIUM LTD, project manager*
**LIGHTING MANUFACTURER:** *KALWALL CORPORATION: translucent composite sandwich building panels; RAB ELECTRIC: security fixtures*




# A Jersey Jewel

**The conservative interiors of Nat West Bank's executive offices belie the space's exotic lighting**

**BY CATHERINE SCHETTING SALFINO**
MANAGING EDITOR

After suffering through a calamitous past, Hoboken, NJ, spent the '80s reviving itself, eventually becoming a spot of choice for the twenty- and thirty-something crowd to live, work, and play.

After watching this dramatic and lucrative resurrection, it seems neighboring Jersey City is claiming the '90s as its renaissance period. Already home to a major mall, condominium projects, and office buildings, the Hudson River town has acquired the unofficial title of "The Gold Coast."

One new building, Exchange Place, is a major part of the changing scene. Thirty-two stories tall with a magnificent view of Manhattan, the building's top seven floors serve as New Jersey headquarters to the National Westminster Bank.

The new tower, which was completed in the fall of 1989, was designed by The Grad Partnership, a firm that also provided the interior contracting. Lighting for the two executive and dining floors, and the lower five service department floors was provided by Martin Shaffer, principal of Martin Shaffer Associates, Hoboken, NJ.

To make the most of the view, an extensive glass envelope wraps around the floors letting light pour in, especially in the main reception area by the grand staircase.

"This area sets the tone for what the bank and the architects were trying to do," Shaffer says. "They wanted to project an image of traditional strength and stability housed in an extraordinary building with an extraordinary panorama. The decor and the lighting in the executive areas were to represent timeless strength of a very successful bank."

However, the abundance of sunlight proved to be a stumbling block when creating a complementary lighting design in that area.

"Two different wattages of lamps were used because even though the ceiling height is about 10 feet, the other 14 feet above the stairs caused a brightness problem," Shaffer says.

PHOTOS BY ROBERT I. FAULKNER

**A FABULOUS FOYER:** Incandescent A lamps work with plentiful daylighting to emphasize the many textures found in National Westminster's main entrance.

"We needed to control the light level of vertical surfaces in the other areas and the general brightness of the stairs. Except where there are pictures, the lamps are straight downlights, so that they wouldn't have to be re-aimed during a relamping."

A combination of 100-watt A 19 and 150-watt A 21 lamps, housed in 4- and 6-inch open reflector downlights with gold alzak cones, balanced the brightness in the space.

The stairs connect the executive and boardroom floor with the dining/meeting rooms on the second level. For all of their conservatism, these areas feature a rather exotic lighting and dimming system, Shaffer says.

Three different lamp types were incorporated into the executive secretarial space. Existing is a fine mix of fluorescent cove lighting in the backdrops; 40-watt triphosphor fluorescents in 3-foot x 3-foot parabolic troffers for general ambient lighting; and incandescent halogen downlighting, which provides the key to the richness of the soft color. All of this is controlled by dimmers.

"The fluorescent is for the work surfaces and the files," Shaffer says. "The vertical surfaces carry a consistent tone with the fluorescent and halogen mix, except in areas where artwork is highlighted."

The fluorescents work because they aren't overly bright, yet they provide economical task lighting, he says. The cove lighting not only illuminates the painting but provides functional task lighting.

"One of the fundamental things we have to realize as contemporary lighting designers is that in these executive offices, where aesthetics are very important, we're dealing with an electronic office," Shaffer says. "In these sprawling opulent spaces are little computers that people have to work with. The problem we face is how to enhance the space and still end up with technically correct lighting that allows people to see well."

Shaffer says the fluorescents provide good color and ambient values at relatively low maintenance costs. The incandescents add texture to the wood and metal surfaces, while providing warmth without shadows.

The combination of fluorescent 3-foot x 3-foot troffers, and incandescent accent and wall-washing was put to use again in the executive passageways. Only here, a decorative pendant that uplights the ceiling recess was added.

"The fixture was used to enhance the architectural feature," Shaffer says. "Without light in there, the detail just wouldn't work."

The passage leads to the executive boardroom. This space, Shaffer says, presented unique challenges because the combination of lighting fixtures had to be coordinated with the dome.

The 24-foot diameter dome is illuminated with

dimmable, 40-watt triphosphor fluorescents.

"The warm, 3,000K lamps are staggered," Shaffer says. "And the way the dome is designed, there is a minimum amount of shadowing."

Fluorescent downlighting is present over the pictures of the bank's founders. The columns are washed with illumination from 500-watt tungsten halogen lamps. Incandescent 150-watt PAR 38 quartz fixtures are recessed over the doors to highlight and color the wood.

"Also, the architects decided that localized task lights would complement the design and give each board member individual lighting control at their seats with the brass lamps," Shaffer says.

The boardroom lighting is also on a dimming system to control the intensity of the fluorescent and incandescent sources.

"If they want to warm up the room, they can simply dim it," Shaffer says. "The system is also preset for meetings and other affairs they might hold in the room."

The splendorous dining rooms bask in warm, recessed cove lighting. There are main and private dining quarters. The goal for both, Shaffer says, was to provide a dimmable system with warm color characteristics.

The intricate patterns of the ceiling coffers in both dining areas are individually lit with 3,000K triphosphor lighting. The private dining room receives special treatment with the frosted bowl pendant.

"In certain areas like the entries, there is some incandescent downlighting," Shaffer says. "But the general feeling was that the triphosphors provided the richness and texture we needed."

The success of the project, Shaffer says, was due to the architect and, in no small part, the client and vice president, Tom Yuen.

"He understood the importance of good lighting and was able to get the right budget (which is undisclosed) and maintain the right influences on the space," Shaffer says. ■

## Details

**PROJECT:** *NATIONAL WESTMINSTER BANK/NEW JERSEY*
**LOCATION:** *EXCHANGE PLACE, JERSEY CITY, NJ*
**CLIENT:** *NATIONAL WESTMINSTER BANK*
**LIGHTING DESIGNER:** *MARTIN SHAFFER, MARTIN SHAFFER ASSOCIATES,*
**ARCHITECT:** *GRAD PARTNERSHIP*
**INTERIOR DESIGNER:** *GRAD PARTNERSHIP*
**ELECTRICAL CONTRACTOR:** *FOREST ELECTRIC*
**PHOTOGRAPHER:** *ROBERT I. FAULKNER*
**LIGHTING MANUFACTURERS:** *LIGHTOLIER: dimming system, 26-watt compact fluorescent lamps; KURT VERSEN: A 19, A 21 lamps; COLUMBIA LIGHTING: 3-foot x 3-foot 40-watt fluorescents; LINEAR LIGHTING CORP.: indirect cove lighting; NATIONAL CATHODE: 200-watt cove lighting system; LIGHTING TECHNIQUES: 500-watt quartz lamps*

**OFFICE OPULENCE: Warm triphosphor lamps gently illuminate the main (opposite page, top) and single dining rooms (above) in the bank's headquarters. The executive corridor (opposite page, bottom) features a decorative pendant that generously uplights the ceiling recess. The secretarial work space (below) is illuminated with a combination of fluorescent cove lighting, 40-watt triphosphors in 3-foot x 3-foot troffers, and incandescent halogen downlighting. Dimmers control light levels for all fixtures.**

# ARCHITECTS' PERCEPTIONS OF DAYLIGHTING IN COMMERCIAL BUILDING DESIGN

BY MARK P. HATTRUP AND RICHARD O. WEIJO

*The authors are a research scientist, Pacific Northwest Laboratory, Richland, WA, and senior project manager, Portland General Electric, Portland, OR, respectively.*

During the past 15 or 20 years, significant resources have been expended by the U.S. Department of Energy to develop new daylighting technologies, yet many of them are not sufficiently used. Factors that might affect the likely market acceptance and adoption of these technologies have largely been ignored.

In response to this lack of knowledge, an effort has been made to systematically identify, catalog, and understand architects' and engineers' perceptions of daylighting products and systems. B.F.Roberson and S.A. Harkreader at Pacific Northwest Laboratory (*see reference*) conducted focus group discussions with these professionals to elucidate the reasons why they do or do not use daylighting systems. Insight gained from these sessions was used to develop a national survey of daylighting practices.

This survey focused on developing an accurate profile of architects' knowledge, perceptions, and use of daylighting in commercial building designs. The survey findings aimed to identify some of the barriers that exist in the commercialization or use of daylighting technologies.

In this survey daylighting was defined as the intentional use of natural light as a partial substitute for artificially generated light.

A phone survey of commercial design architects throughout the United States, whose names were drawn from the 1987-1988 membership directory of the American Institute of Architects (AIA), was conducted from January 11-February 8, 1989. The actual usable sample consisted of 593 architects, of which 308 responded to the survey.

Issues addressed in this survey included architects' understanding of daylighting, the major influences in the daylighting decision process, the appropriateness of specific building types for daylighting, the sources relied on by architects for technical and product information, and the design aids they prefer for the future.

Thirteen categories of daylighting benefits (Table 1) were created from the architects' responses. Ninety-four percent of the architects were able to provide at least one benefit associated with daylighting. On average, architects cited two benefits of daylighting. The most frequently mentioned advantages relate to energy conservation or efficiency, improved aesthetics or atmosphere, and reduced operation costs or monetary savings.

The responses based on an architect's familiarity with daylighting showed that those more familiar with daylighting tend to cite more benefits than those who are not. One possible explanation for this is that those who are more familiar with daylighting have used it more and, as a result, are more knowledgeable about the benefits.

**TABLE 1—THE MAJOR BENEFITS OF USING DAYLIGHTING**

| Category | Frequency |
|---|---|
| Energy Conservation/Energy Efficiency | 155 |
| Aesthetics/Pleasant Psychological Feelings | 142 |
| Economy/Operating Costs/Money Savings | 78 |
| Quality of Light | 60 |
| Natural/Connection to Outdoors/Nature Beauty | 52 |
| Color of Light/Color Balance/Color Rendition | 33 |
| Worker Morale/Occupant Productivity | 20 |
| Makes Room Look Bigger/Perception of Space | 11 |
| Design Quality/Beauty of Facility/Appeal | 11 |
| Comfort | 8 |
| Easy on Eyes/Visual Comfort | 6 |
| Reduced Project Costs/Development Costs | 4 |
| Other | 23 |
| Total | 603 |

## DAYLIGHTING PROBLEMS

When asked about the major problems associated with daylighting designs, 91 percent of the architects provided at least one with an average of 1.7 problems per architect. The most frequently cited problems relate to lighting control and heat gains (Table 2).

Segmenting the problems by an architect's familiarity with daylighting showed that architects who are very familiar with daylighting cited more problems (1.78 on average) than did architects who were somewhat familiar and not very familiar with the subject (1.60 and 1.47, respectively). This finding would seem to suggest that architects who are very familiar with daylighting view it more negatively.

To avoid drawing the wrong conclu-

sion, it is important to note that these architects cited more benefits than problems with daylighting and, therefore, appear to view daylighting positively. Indeed as one daylighting expert pointed out, daylighting's best or strongest proponents (i.e., those who have used it extensively) are more knowledgeable about this technology, and therefore, can probably cite more potential problems than the typical architect.

### Payback Periods

The payback period is the number of years required for the savings from a new product to pay back its higher initial cost. Architects generally felt that the longest payback period a client would accept is seven years. The architects were then asked what they thought the payback period for daylighting was; again, their average response was seven years.

**Architects do not consider energy savings to be the primary or major benefit of daylighting.**

Familiarity with daylighting appears to influence architects' estimates of payback periods. The results indicate that architects who are very familiar with daylighting estimate a shorter payback than do those who are less familiar with daylighting. The average estimate from those who are very familiar was six years; those who are somewhat familiar estimated seven years; and those who are not very familiar estimated eight years.

This pattern also holds for the responses to the question about the payback period a client would accept. Again, the architects who are very familiar with daylighting estimated six years; both other groups estimated that a seven-year payback period is the longest a client would accept. Thus, those who are not very familiar with daylighting perceive its payback period to be longer than what their clients would accept. This suggests that an educational campaign directed toward architects should focus on the actual payback of daylighting systems.

The surveyed architects were asked whether they agreed or disagreed with 10 different statements about daylighting. Six of the statements are positive; four are negative.

The architects tended to agree with the six positive statements and to disagree with the four negative statements. Thus, architects generally have a positive opinion of daylighting.

The six positive statements listed in order of agreement (strongest agreement first) are that daylighting systems:

*1) improve the satisfaction of building occupants*

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*2) make a building more attractive*
*3) improve the productivity of building occupants*
*4) are a good value*
*5) are reliable*
*6) save energy*

These results clearly illustrate that architects do not consider energy savings to be the primary or major benefit of daylighting. Rather, visual appeal, which improves aesthetics and worker satisfaction, is the primary benefit of daylighting. This finding has implications for those who are trying to increase the use of daylighting systems. The impact of daylighting systems on aesthetics or their visual appeal should be emphasized more than energy consumption if they are to appeal to architects. Though this might appear to contradict the results in Table 1, closer examination of that table reveals that most responses relate to visual effects rather than to energy efficiency.

The four negative statements listed in order of disagreement (strongest disagreement first) are that daylighting systems:

*1) introduce more problems than they solve*
*2) are difficult to integrate with other systems*
*3) increase building maintenance costs*
*4) are expensive to purchase and install*

Over 80 percent of the architectural industry disagreed with the statement that daylighting systems introduce more problems than they solve, and nearly 60 percent disagreed with the statement that they are difficult to integrate with other systems.

The industry seems uncertain about the costs associated with daylighting systems. Statements that daylighting systems are expensive to purchase and install, and that they increase building maintenance costs met with agreement from 57 percent and 53 percent of the industry, respectively. These concerns need to be addressed in educational programs about daylighting offered to architects.

Fifty-five percent of the architects thought architects have the most influence on the decision to use daylighting; 36 percent said clients have the most influence; and only 9 percent said lighting engineers have the most influence. As to who is the second most influential, 39 percent thought clients were; 37 percent chose architects; and 24 percent picked lighting engineers. Just over two-thirds of the architects surveyed thought lighting engineers have the least amount of influence on the decision. More than 25 percent thought clients, and only about 8 percent thought architects have the least amount of influence on the daylighting decision.

**TABLE 2—THE MAJOR PROBLEMS WITH USING DAYLIGHTING**

| Category | Frequency |
|---|---|
| Limited Control/Lack of Control | 83 |
| Heat Gain | 81 |
| Glare/Light Intensity | 55 |
| Weather/Cloudy Days/Night/Light Availability | 49 |
| Heat Loss | 43 |
| Difficulty of Design/Meeting Codes | 41 |
| Installation Cost/Initial System Cost | 40 |
| Reliability/Leakiness of Skylights | 23 |
| Maintenance | 10 |
| Client Reluctance/Hesitancy | 9 |
| Photo Degradation/Fading/Discoloration | 6 |
| Occupant Behavior | 2 |
| Other | 43 |
| Total | 485 |

## DECISION FACTORS

The architects were also asked to rate six situational factors that can influence the decision to use daylighting in a commercial building design as very important, somewhat important, somewhat unimportant, or very unimportant.

Architects feel the building's intended function is the most important of the situational factors listed. The local climate and the building's intended occupants are also important factors in the minds of the architects. Based on the mean scores, the next most important factors are the initial costs compared with the costs of alternatives, followed by utility rate incentive programs and, finally, building codes.

Even though building codes had the lowest mean score, 40 percent of the architects still said this factor was very important. A possible explanation for this is that the impact (positive or negative) of building codes on the use of daylighting varies from area to area in the United States. Roberson and Harkreader found that focus group participants in Los Angeles encountered problems meeting building codes when using daylighting design features, while architects in Chicago encountered no problems with building codes. Although assessing the impact of building codes is beyond the scope of this study, future research to explore this area would be beneficial.

Architects were asked to rate 11 different building types according to appropriateness for daylighting. The building types included warehouses, high-rise office buildings, schools, libraries, museums, hospitals, low-rise office buildings, hotels/motels, retail stores, restaurants, and apartment complexes.

Architects felt schools were the most appropriate place to use daylighting designs (80 percent).

Low-rise office buildings and libraries ranked next (just over 50 percent). Roberson and Harkreader found that the focus group participants also thought daylighting was very appropriate for low-rise office buildings and libraries.

The focus group participants felt warehouses, hospitals, and museums were among the more appropriate building types for daylighting; and high-rise office buildings the least appropriate. These finds are not supported by the results from this survey, which are shown in Table 3.

High-rise office buildings were the fourth most appropriate building type. This is an intriguing result, as previous research found that high-rises were viewed as inappropriate. Apartment complexes rank fifth, followed by hospitals, hotels/motels, restaurants, museums, warehouses, and retail stores.

The view that retail stores are the least appropriate for daylighting should also be evaluated in future research. It would be useful to know what features associated with retails stores, warehouses, museums, etc., make them less appropriate for daylighting.

**The view that retail stores are the least appropriate for daylighting should be evaluated in future research.**

The architects' responses were segmented by their familiarity with daylighting. Architects considered very familiar with daylighting are thought to have the most accurate knowledge of its use. In general, the architects in this group have stronger positive opinions than the other groups on the appropriateness of daylighting for each of the building types except libraries, museums, and warehouses.

The most interesting observation resulting from the segmentation was that libraries, ranked third by the entire sample, dropped to seventh among the architects who are very familiar with daylighting. This result is especially interesting because libraries were viewed by the architects in the focus groups, and most of the architects in this survey, as being appropriate buildings for for daylighting.

Architects very familiar with daylighting ranked apartment complexes and hotels/motels higher (relative to other building types) than did other architects. Sixty percent of the architects who are very familiar with daylighting felt that apartment complexes were very appropriate, while less than 40 percent of the architects who were less familiar felt this way. More than 50 percent of those very familiar with daylighting also thought hotels/motels very appropriate; only 34 percent of those somewhat familiar and 14 percent of those not familiar with daylighting felt this way.

The architects were asked to rate the importance of six generic information sources. This rating establishes the relative importance of each source and will be useful in choosing the best channel for disseminating information.

It was found that professional jour-

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nals and publications are the most important sources of information for architects. Informal discussions with other architects (word of mouth) is the second most important information source, followed by sales people. Seminars, conferences, and trade shows are rated as less important.

University courses are reported to be the least important source of information on new building materials, products, and designs. More than half of the architects felt university courses were either not very or not at all important as information sources. This finding is somewhat surprising; one industry expert claimed the reason may be because architects do not have the time to take a full university course. Another possibility is that the curriculum may not have included much on daylighting design when the respondents were in universities.

**TABLE 3—APPROPRIATENESS OF BUILDING TYPES FOR DAYLIGHTING DESIGNS**

| Building Type | V | S | Nv | Na | MS |
|---|---|---|---|---|---|
| Schools | 80 | 18 | 1 | 0 | 3.78 |
| Low-Rise Office Building | 54 | 42 | 3 | 1 | 3.49 |
| Libraries | 53 | 36 | 9 | 2 | 3.40 |
| High-Rise Office Building | 43 | 43 | 13 | 1 | 3.28 |
| Apartment Complexes | 44 | 40 | 15 | 1 | 3.27 |
| Hospitals | 35 | 48 | 15 | 2 | 3.15 |
| Hotels/Motels | 35 | 41 | 21 | 2 | 3.10 |
| Restaurants | 29 | 46 | 22 | 2 | 3.02 |
| Museums | 30 | 39 | 24 | 7 | 2.91 |
| Warehouses | 25 | 35 | 26 | 14 | 2.70 |
| Retail Stores | 13 | 38 | 40 | 8 | 2.57 |

Headings Key: V=very appropriate; S=somewhat appropriate; Nv= not very appropriate; Na=not at all appropriate; MS=mean score.

## COMPUTER SIMULATIONS

One of the objectives of this study was to determine ways to increase the use of daylighting designs. As part of this, architects were asked to rate the usefulness of a computer model that would graphically simulate the effect of daylighting features on illumination levels in proposed buildings. Thirty-five percent said it would be very useful; 39 percent said somewhat useful; 14 percent said not very useful; and 12 percent said not at all useful.

All the architects, except those who found no use for a computer model, were then asked how many hours they would be willing to spend to obtain a simulation for the average project. Ten percent said they would spend no time; 21 percent said one to three hours; 20 percent said four to six hours; 20 percent said seven to 10 hours; 18 percent said 11 to 24 hours; and 12 percent said 25 to 200 hours. The average response was about 123 hours. This average was somewhat skewed by the 1 percent of the industry who said they would spend between 80 and 200 hours to obtain a simulation. Eliminating this group drops the average response to about 10 hours.

The most important finding for a software developer is that approximately 30 percent of all architects said they would spend no more than six hours with the software. Thus, if simulation software is developed, it must be easy to use and provide accurate simulations quickly.

Architects were first asked if they would prefer to use a computer model or a physical scale model to estimate the effects of daylighting features. Sixty-one percent prefer computer models; 31 percent prefer physical models; 7 percent like both equally; and 2 percent do not have a preference.

Architects were then asked to rate the usefulness of rules-of-thumb in making decisions about lighting. Twenty-three percent said they were very useful; 53 percent said they were somewhat useful; 19 percent said they were not very useful; and 5 percent said they were not at all useful. These results suggest that rules-of-thumb are not extremely useful as a decision aid.

Finally, architects were asked if they preferred rules-of-thumb or a computer-based program to estimate energy use. Twenty percent prefer rules-of-thumb; 67 percent prefer a computer-based program; 11 percent like both equally; and 2 percent did not like either option. Although the architectural industry clearly prefers computer-based programs, previous results suggest that even a functional computer model may not be met with much enthusiasm.

## CONCLUSIONS

Survey results suggest that a major barrier to the use of daylight is simply that most architects do not have a basic understanding of daylighting. Programs aimed at educating practicing architects about the correct application of daylighting should be developed.

Roberson and Harkreader found that none of the architects in the focus groups had tried to convince their clients to use daylighting features to reduce energy costs. Rather, the primary advantage that they presented to clients was the aesthetic effect. The survey results indicate this is common throughout the industry. Although positive energy effects were mentioned a number of times as benefits, the underlying theme of the benefits mentioned had to do with different aspects of daylighting's aesthetic effects.

The results suggest that any education campaign should emphasize the positive impacts that daylighting can have on a structure's total energy use. To change architects' perceptions of

daylighting's performance, there appears to be a need for additional and clearer evidence regarding daylighting's operational effectiveness.

Until precise, credible performance information is available and architects know about it, most will continue to be apprehensive about promoting the use of daylighting. Information on the payback period, the costs and energy savings, and the most appropriate building types for daylighting should also be included in any education program.

## Where To Channel Information

Based on the survey results, it is apparent that educational information should be written up in professional journals and publications, which were cited as the most important source of information for architects.

The second most used channel of communication, or source of information, is informal discussion among architects. This suggests that another possible way to communicate daylighting information is identifying key experts in each state or in major communities. It might also be feasible to recruit architects to become daylighting design experts for their home community, and as such, serve as information sources for fellow architects in the community. These community or regional daylighting experts could also receive training in the use of the latest computer-based design aids being developed by government and private industry. It might even be possible to fund their time when they help other architects with daylighting design.

In some regions of the United States, utility programs are available to provide technical design assistance to encourage the construction of energy-efficient commercial and industrial buildings. One example is the Energy Smart Design Assistance program sponsored by Bonneville Power Administration. Daylighting design could be incorporated into these utility programs to encourage its use.

The survey results show that while architects want future design aids to be computer-based, they do not want to devote much time to generating computer simulations of illumination levels or energy usage. Access to a recognized local expert or a toll-free technical support line for help in the application of the software (much like the support lines offered by makers of word processing software) might encourage architects to use the software more extensively. If the software is used more often, it follows that daylighting systems would likely be included in building designs more often.

The survey results suggest that 49 percent of the buildings designed by survey respondents in the past two years included a daylighting component. Several daylighting experts who reviewed the survey results felt this number was very high and had to do with how daylighting was defined. They felt the usage of the more complex "active" daylighting systems, which employed the newer daylighting technologies and controls, was much lower. Experts tend to define an "active" daylighting design as any aperture that has fenestration controls designed in conjunction with a photoelectric system which will control electric lights to reduce energy consumption. The experts were certain that the 49 percent of the buildings designed by survey respondents in the past two years had to include "passive" systems, which simply allow natural light in but do not use the more complex daylighting technologies and controls.


## Acknowledgements

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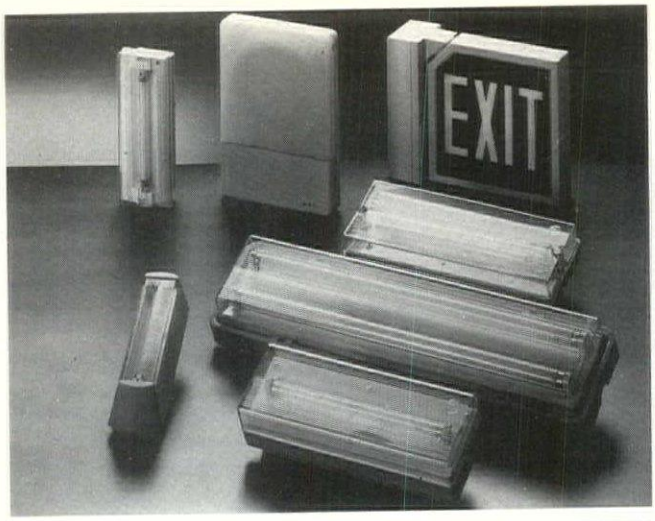


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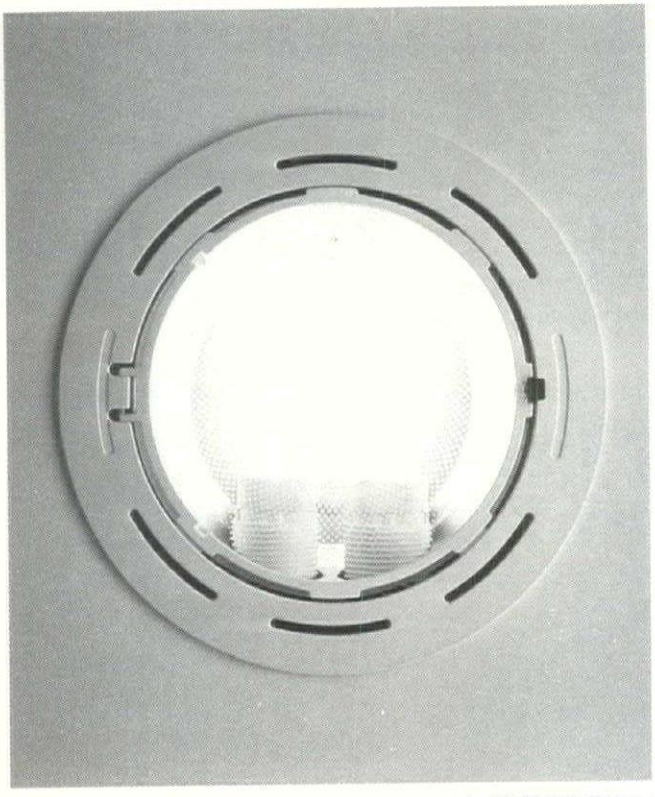
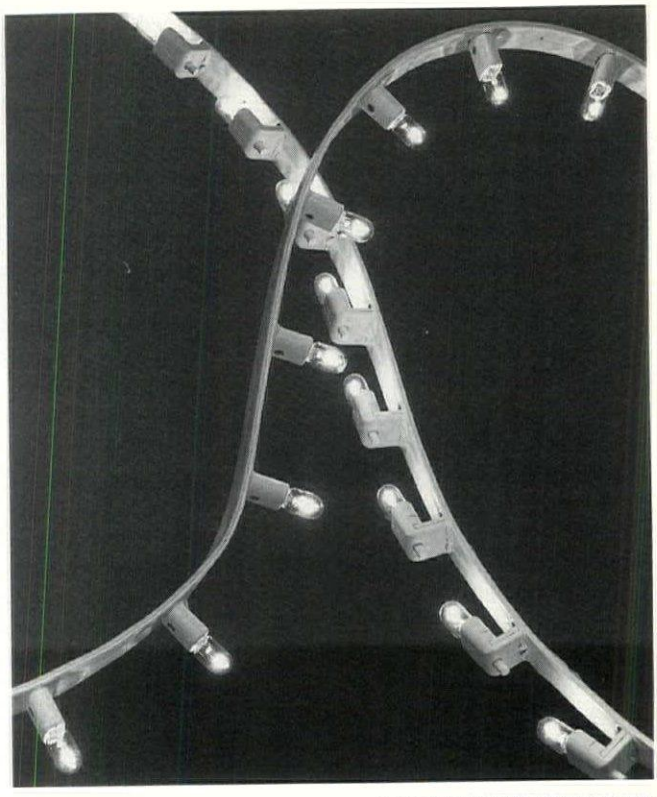
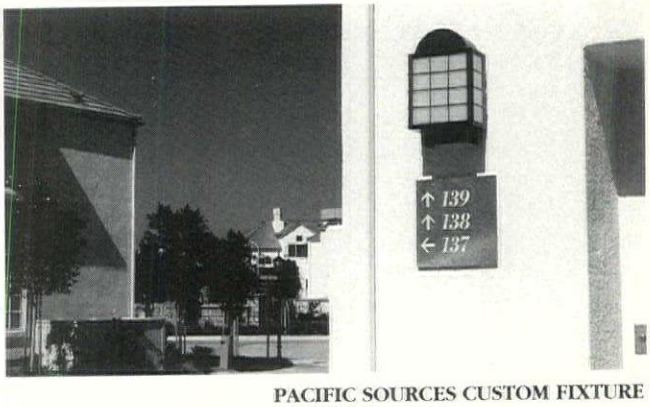


REGGIANI TECHNE SERIES



LIGHTWORKS RIBBONLITE




PACIFIC SOURCES CUSTOM FIXTURE

### EMERGENCY LIGHTING FIXTURE

A series of fluorescent emergency lighting fixtures provide a mounting bracket system for easy installation and maintenance. All fixtures are available in PL and 9 watts, 120 and 277 volts. Beghelli Inc., Jacksonville, FL. ***Circle 30***

### RECESSED DOWNLIGHTING

The Techne series of downlights are available for use with compact fluorescent, HID, and line voltage sources. The fixtures are designed to fit popular ceiling systems and have flow-through ventilation systems, providing excellent lamp life and reduced operating temperatures. The downlights include a protective glass closure that improves fixture utilization ratios and allows for easy cleaning. Reggiani USA, New Windsor, NY. ***Circle 36***

### VERSATILE LIGHTING

RB Series RibbonLite can be used for straight or curved runs inside bookcases, cabinets, and showcases. RibbonLite can also be used for ambient lighting, downlighting countertops from beneath overhanging cabinets, and uplighting ceilings from cove niches. As an accent fixture, it can be used to delineate architectural lines and outline buildings, bridges, and other structures. RibbonLite comes with a halogen lamp option, vertical or horizontal sockets, six lamp wattages, seven socket spacings from 1.2 to 12 inches and operates on low voltage. Lightworks, Philadelphia. ***Circle 46***

### CUSTOM DESIGN

This opal acrylic fixture was custom designed for California's Turtlerock Canyon Apartments. The fixture measures 15.5 inches high, 9.25 inches wide, and is 5.75 inches deep. It is finished in custom color paint and uses a PL 13 fluorescent lamp. Pacific Sources, City of Commerce, CA. ***Circle 45***

### MINIATURE DISPLAY LIGHTING

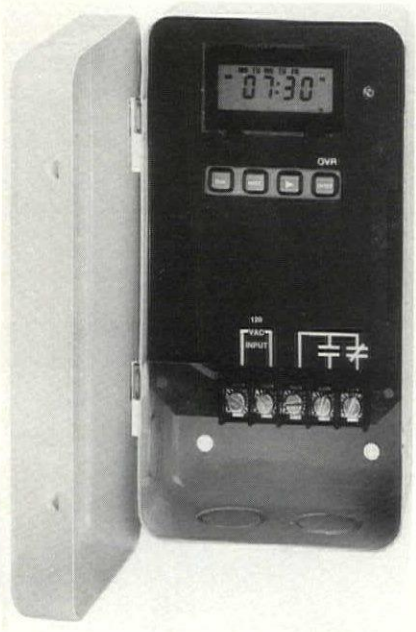
Accent Pro features a finned lampholder that allows for excellent ventilation without allowing light to escape. Ranging in length from 2 7/8 inches to 5 inches, it is well suited for display areas. Accent Pro fixtures are available with various accessory fittings and can be mounted on raceways, tracks, or canopies. Norbert Belfer Lighting, Ocean, NJ. ***Circle 32***

### FUTURISTIC DESIGN

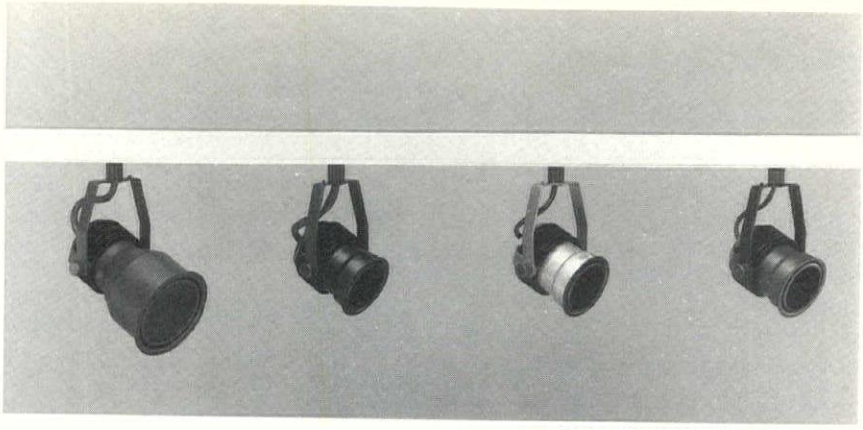
Technos is constructed of high-quality anodized aluminum and features a matte silver bivergence louver, which provides glare-free light. Technos is available in a single unit of 4 or 5 feet as well a continuous row. It is equipped with one or two T8 Octron lamps and an energy-saving rapid start ballast. Electronic and dimming ballasts are further options. Zumtobel Lighting, Inc., Garfield, NJ. ***Circle 37***

### ELECTRONIC TIME CONTROL

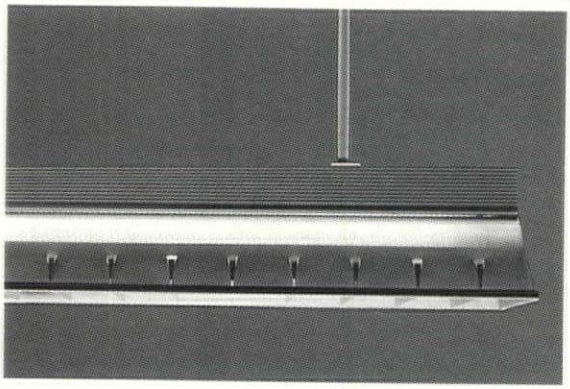
The EC7000 series of electronic time controls are single-channel devices that can function 24-hours, seven-days a week. This allows for a different schedule each day of the week. With 16 setpoints available, these controls provide ample programming versatility. They feature battery-less carry-over and a capacitor that can maintain time and program memory in the event of a power outage for at least four days without battery back-up. Paragon Electric Co., Inc., Two Rivers, WI. ***Circle 31***




PARAGON EC7000



NORBERT BELFER ACCENT PRO



ZUMTOBEL TECHNOS

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## Calendar
## Conferences & Expositions

**June 11-14** IFI World Congress. The Merchandise Mart, Chicago; (312) 527-7550.
**June 11-14** NEOCON 23. The Merchandise Mart, Chicago; (312) 527-7752.
**June 14-17** WAVM Market & Conference. San Diego Convention Center; (415) 431-1234.
**June 28-30** Eco Expo. Colorado Convention Center, Denver; (619) 295-3461.
**July 3-5** Illuminex 91. World Congress Centre, Melbourne, Australia; (613) 646-4044.
**September 6-8** Eco Expo. Jacob K. Javits Convention Center, New York City; (619) 295-3461.
**September 20-21** IBD/ASID Con-Quest III. Marriott Hotel, New Orleans; (601) 863-3325.
**September 25-29** Isabelle C. Greene's Mid-Atlantic Tour: Longwood Silver Garden and others. (805) 963-4364.
**October 20-22** Electrical Industry Exposition and Fiber Optic Expo. Moscone Center, San Francisco; (301) 657-3110.
**November 21-24** Metropolitan Home Show. Jacob K. Javits Convention Center, New York City; (212) 686-6070.

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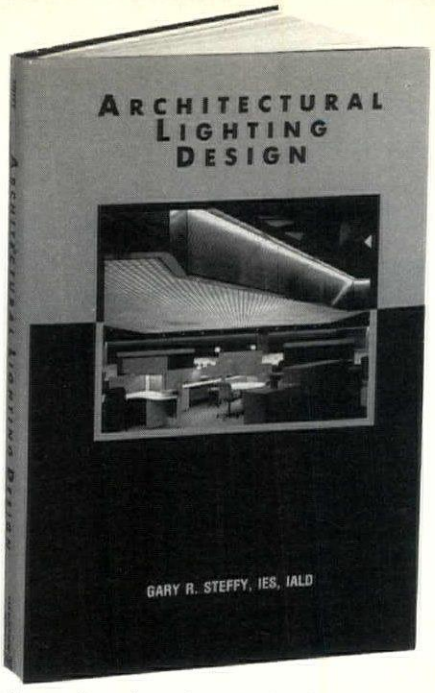
## BOOK REVIEW

***ARCHITECTURAL LIGHTING DESIGN***
**BY GARY STEFFY, IES, IALD**
PUBLISHED BY VAN NOSTRAND REINHOLD, 1990, 240 PAGES, $39.95

**REVIEWED BY**
**DAVID L. DILAURA, FIES**

*The reviewer is director of engineering, Lighting Technologies, Inc., Boulder, CO, and associate professor, Department of Civil and Architectural Engineering, University of Colorado at Boulder.*




Gary Steffy has written a book that teaches architectural lighting design. Considering the content and tone of the text, it is an ideal guide to the lighting design process for architects and interior designers. The book has also proven successful in its use in the University of Colorado's illumination design course for architectural engineers.

The text works because a technically or design-oriented layperson can open it, read it with care, and close it knowing a good deal about lighting. It accomplishes this task because of the structure and order of the material presented, and the clarity with which it is written. Examples are abundant and revealing.

A "technically or design oriented layperson" is an apt description of a student new to the lighting field. For their sake, the book begins with a description of light and an overview of the problems of bringing illumination to architecture. The practical nature of this summary is refreshing for a seasoned practitioner and unusually down-to-earth for the student.

This is followed by a detailed description of lighting concept development, covering the assessment of the job conditions, establishing design goals, and considering lighting's psychological and physiological factors. To augment the text, the author provides at least one photographic example for each of these issues.

Electric light sources and luminaires are then introduced. The discussion of lamps is particularly well done. In addition to the customary recitation of their electrical and photometric properties, the author describes in detail how the lamps can be used. In tables that summarize this experience, he gives examples of, and guidance for, solving design problems using modern electric lamps.

The book also includes a description of the tools used in the design process. These include observation, drawing, photography, and computation. Again, examples are provided for each, and the descriptions are very clear.

The book concludes with a description of lighting design documentation. The level of detail here is excellent. The troubling process of communicating in drawing and language—both descriptive and rigid—is described with a candor not often read. The author knows the problems and is straightforward about offering his solutions.

As good as the book is, one still wishes for exercises that ask the reader to apply the principles laid out in the text. Missing is a description of the foundations for the subjective impression analysis the author uses. Also missing is a fuller description of how a designer is to use the flood of quantitative information gushing from computers.

Nevertheless, Steffy has provided a valuable book for educators and those who desire lighting design education. He has avoided both the desiccated engineering approach to architectural lighting as well as the uselessly vague metaphors that fill many books which purport to be design texts. With clarity and concision the author has turned his professional experiences into a very useful book.

As a first text for the study of lighting design, I recommend Steffy's *Architectural Lighting Design* without reservation.

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