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Progressive Architecture

ARCHITECTURAL DESIGN

Editor in charge: Pilar Viladas

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The Spiral in Tokyo, sponsored by a leading manufacturer, is a public arts and entertainment center by Maki & Associates that responds to a complex setting and program. Sally Woodbridge

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Cover

The Spiral, Tokyo, by Maki & Associates.

Photo by Toshiharu Kitaizumi. Designed by Richelle J. Huff.
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Circle No. 420
NASA's space shuttle disaster is a reminder that professional judgment is useless if it is overruled.

EVERYBODY'S first reaction to the space shuttle explosion in January was that there had been a terrible accident. But many of us almost immediately saw the event as no mere accident; to us, it was a technical blunder, a discouraging failure of that legendary American know-how. Only as the investigation proceeded did it become clear that this was not so much a technical failure as a management lapse.

Of all the prelaunch incidents revealed to date, the most ominous, to me, was when a professional expert was asked to "take off his engineering hat and put on his management hat." The author of this request has testified that he meant that without enough hard data on which to base a decision, there would have to be a judgment call. But to me, as apparently to the investigating panel, the question seemed intended to dismiss technical doubts that stood in the way of management objectives. Whatever the meaning of those words, the outcome of the exchange was that safety was sacrificed for the sake of schedule, income, and—ironically—public image. A further delay was seen as embarrassing to NASA and threatening to its budget.

On management's behalf, it must be said that they were unprepared for this professional warning. Told at the eleventh hour that the low temperatures threatened the success of the launch, the officials responded that they were "appalled." Properly so: The range of safe launching conditions should have been long known to all concerned.

What has this got to do with architecture? Some of the parallels are perhaps obvious. Time pressures and profit concerns can cause drawings and calculations to be reviewed carelessly or by unqualified personnel, raising the possibility of tragic failure. Errors in hastily churned out documents can lead to dubious trade-offs with a contractor who wants to cover his mistakes. Deals made to seduce the client initially may not yield enough income for thorough professional performance.

Carelessness is only one possible result of mismatches between management objectives and professional obligations. At the other extreme, the danger is exaggerated caution: The kind of firm known as "commercial" will avoid failures, meet schedules, and maximize profits by doing only what is safe and familiar. In so doing, it will fail in its professional responsibility to address the client's needs creatively—and it may bring about its eventual business failure when familiar formulas can no longer be fitted to changing demands.

Either carelessness or caution can be manifestations of expediency, which could be defined as meeting stated objectives with limited effort. Where expediency doesn't sink to outright crime, as in bribes, it involves cutting corners—skimping on the process, repeating formulas, yielding indiscriminately to pressures from clients or other sources.

Ideally, professional efforts should be managed so that expertise is fully deployed and there is never a resort to expedients. For architects, approaching that ideal would mean that management would never agree to impossible fees and schedules, that professional staff would never fritter away chargeable time on early day-dreaming, thus curtailing hours for the painstaking final stages, that contracts would allow for any possible contingencies, that various participants would be honest throughout about the limitations in their knowledge or output.

Obviously, as in the case of the space shuttle engineers, one individual may carry both professional and management responsibilities; in architecture, the key people almost always will. But these roles should never be viewed as "hats" that can be removed when they are in the way. Setting aside one's professional judgment, even under duress, is a betrayal of trust and an invitation to disaster.
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Circle No. 361
Richard Meier’s First Highrise: People’s Bank in Bridgeport

Ground will be broken this summer for Richard Meier’s first highrise, in downtown Bridgeport, Conn. The 15-story, 440,000-square-foot headquarters for People’s Bank fills a difficult site adjacent to the elevated Connecticut Turnpike. Although its floor plates are continuous, the office building is articulated as a series of separate structures, buffered from the highway by an arc-shaped parking garage.

The main banking hall at the base of the tower’s concave curve faces a public plaza; a second major entrance on the turnpike side will serve both the garage and pedestrians arriving from nearby bus, train, and ferry terminals. The complex will incorporate the existing onion-domed Barnum Museum (right in photo) which will be renovated and will gain increased space in the Center’s adjoining low wing, which will also house a cafeteria and art gallery.

Graves Designs Sotheby’s Tower

Architect Michael Graves now has his first residential project in New York. His 34-story mixed-use development designed for Sotheby’s, the international art auction house, takes advantage of air rights attached to the present four-story structure converted from a former garage on York Avenue and 72nd Street. This base is to be redesigned and a fifth floor added with expanded exhibition areas and additional viewing rooms. The sixth floor, where structural transfer occurs, will include an outdoor garden for sculpture exhibition, tennis and squash

Venice Futurism

On May 3, a new art center will open in Venice’s Palazzo Grassi. Its inaugural exhibition, “Futurismo e Futurismo,” is being organized by the center’s artistic director, Pontus Hulten, and with 250 works culled from many countries, it is to be the largest Futurism show ever.

AIA Debate: Licensing

A nationwide campaign for the title registration of interior designers is forcing the American Institute of Architects to take a good hard look at licensing. A policy statement on the licensing of other professionals issued by the AIA last March and reaffirmed by its Board in July has been bumped back to the Design Commission, a top-level, in-house body, for review.

The Commission is now soliciting information from a dozen

AIA Debate: Energy/Research

With oil selling in early 1986 at $20 a barrel and falling, the AIA Board may have been prescient when it disbanded the Institute’s national energy committee in late 1985. An AIA staff member refers to the move as “a transfer of concerns,” suggesting that energy issues will find a home in the Institute’s recently reformed Practice committee. To others, however, the move seems not only abrupt and somewhat unceremonious, but worrisome for what it signals about attitudes toward energy.

“it’s not like there’s peace in

(continued on page 27)

(continued on page 36)
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Licensing (continued from page 27) who’ve used the title for one year previous to enactment of legislation), but it remains silent on the rights of architects in the field. (Only in Connecticut have architects been exempted from the provisions of the act and thereby permitted to use the label “interior designer.”)

Title registration, however, isn’t the real bugaboo for the AIA. “A title act has absolutely no meaning,” says Design Commission Chairman Benjamin Brewer. It’s nonexclusive, meaning that anyone can still practice, without the title, and it’s virtually unenforceable. But, asks Brewer, will the interior design profession stop at title registration? Or will they, and their peers in other specialized design professions, press eventually for practice acts, which are both exclusionary and enforceable? Schorsch claims ASID has no intention of pursuing practice legislation. Donald Hackl, president-elect of the AIA, responds that the history of title registration in other fields—architecture included—suggests otherwise.

More to the point, several states have provision only for practice acts, omitting title registration altogether. (Conversely, some states, most notably Texas, still have only title acts for architects. The State of Washington only last year passed a practice act for architecture, which includes an exemption for interior designers.) Hackl personally is “not very high on title registration.” Yet he recognizes the issue as one in which what’s best for the profession may not necessarily correspond to what’s best for the public at large. Architects have traditionally assumed that architecture encompasses all aspects of design, from doorknobs to urban districts. The public at large—or at least its legal watchdogs—might prefer a more concrete clarification of responsibility, and liability. “There’s got to be a shake-down process,” says Hackl, “establishing areas of overlap.” The best course for the AIA now may be to clarify just what architects do, and what they do differently from other professionals in the design field. A consistent policy too seems key. Many local AIA chapters supported the landscape architects’ ongoing drive for registration, successful in 39 states. A blanket policy that opposes the licensing of allied professionals thus may only damage relations, without affecting the outcome. —

Doralice D. Boles

Wood Awards

Three nonresidential buildings and seven houses have been honored in the third biennial American Wood Council’s Wood Design Awards Program. Six projects, selected from 250 national entries, received Honor Awards, including the Wharton House, Nottingham, N.H. (Amsler, Hagenah, MacLean, Boston, Mass., architects); Shelly Ridge Girl Scout Center, Miquon, Penn. (Bohin Powell Larkin Gwinski, Wilkes-Barre, Penn. Sec p. 119 and P/A, Jan. 1982, p. 81); House, Stony Creek, Conn. (Steven Izenour/Venturi, Rauch & Scott Brown, Philadelphia); The AWARE Shelter, Juneau, Alaska (The Miller/Hull Partnership, Seattle, Wash. See pp. 104–107); and the Fisher Winery, Santa Rosa, Calif. (William Turnbull Associates, San Francisco). Four projects received Citations, including: the looss residence, Montauk, N.Y. (Michael A. Geyer, New York); Fitzpatrick Residence, Pasadena, Calif. (Gilbert L. Hershberger, South Pasadena, Calif.); House, Westchester County, N.Y. (R.M. Kliment & Frances Halsband, New York); and Rosewalk Cottage Court, Seaside, Fla. (Orr & Taylor, New Haven, Conn. See P/A, July 1985, pp. 111–118). —

Chunnel Passage

Not for the first time in the stormy history of Anglo-French relations, the governments of Britain and France have agreed on a project to link England with the continent. Unlike predecessor proposals dating back as early as 1751, this one looks as if it will be built: beginning in 1993, Great Britain will be accessible from France, and vice versa, by 31-mile-long, paired rail tunnels to be laid in the ground under the Channel, or Manche (sleeve) as it is called by the French. Stretching between Calais and Folkestone, the rails will carry high-speed passenger trains and railcars designed to carry automobiles and heavy freight. The $37 billion winning tunnel

(continued on page 30)
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Chunnel (continued from page 29)

project is proposed by France-Manche and the Channel Tunnel Group, Ltd., an English-French construction consortium. Travelers are promised that the new crossing, whether by passenger train or with automobiles parked on the "rolling road for cars," will take no more than 30 minutes, at a cost no greater than that of the present ferry service. Ferry workers on both sides of the water, apparently opposed to all schemes, called the decision "the end of cross-Channel shipping." But to anyone who has made the trip in the dead of winter, when rough waters prevent Hovercraft from running and ferries can take a sickening eight hours, this result may not seem so bad.

Thomas Vonier

Building and Book at the Buell Center


The first session, American Architecture through American Eyes: Book Trends and Economics, 1776-1986, will likely be more valuable in transcript form than it was as a live experience. Most speakers mentioned the miniscule number of titles and small editions of architectural books throughout history, when compared with the total number of printed books in America. Only Victoria Newhouse of the Architectural History Foundation, who chaired the day's events, enunciated the reason, at least for the contemporary scene: how little money there is to be made in architectural books by authors, and how great the risk even for publishers.

While all of the participants provided some useful information, it was left to the final speaker, Spiro Kostof of the University of California at Berkeley, to breathe life into the proceedings, through both his delivery and his content. Kostof's most valuable contribution, his wish list, "Needs I see," included histories of building construction; an economic model for American architecture; more work on neglected regions; a reappraisal of the period 1780 to 1850; and a history of urban forms (such as sidewalks).

Two areas were either ignored in the session or barely touched (continued on page 32)
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Contractor: Gervais F. Favrot Co., Inc.
Elevators sold and installed by Dover Elevator Co., New Orleans
P/A News Report

Book (continued from page 30)

upon. While architectural photographer and bibliographer Richard Creek spoke about pre-1940 promotional literature, no one pursued the relationship between promotional and architectural values. And there was a total lack of discussion about the influence of the two-dimensional printed image upon three-dimensional built work.

During the day-long Saturday session chaired by Suzanne Stephens, 11 papers were presented that chronologically traced the history of architectural publishing in the magazines and journals from the 1850s. All of the papers proved exhaustive scholarship, but some seemed content to outline trends and facts without framing analyses or drawing conclusions. Those presentations proved Thomas Bender’s assertion that the present architectural publishing establishment no longer connects architecture to larger political, social, and cultural concerns, as did the writings of Lewis Mumford and Ada Louise Huxtable. The seeds for this attitude were nourished, he said, by the publication of such books as Hitchcock and Johnson’s The International Style of 1932, which could look at Modern architecture mainly as a style, and Giedion’s Space, Time and Architecture of 1941, which “tightened the discourse of architecture, making it self-referential.”

After Suzanne Stephens delivered a lively and very informative exegesis of the recent years of the professional press, analyzing the similarities and differences between the three major publications, Thomas Hines took on Tom Wolfe’s From Bauhaus to Our House, concentrating on the reviews that understood the book primarily as an expose of “The Compound.” The author confirmed that had the original title Inside the Compound been used, subsequent confusion could have been avoided.

This was an ambitious first program for the Buell Center, and the fact that it dealt with publishing can only mean that this center devoted to the study of American architecture finds that of prime importance. Although, as Stephens pointed out, the major professional publications are becoming increasingly more homogeneous, this conference warned that, unlike in other fields, the strengths in architectural publishing traditionally have been in diversity.

David Morton, Susan Doubilet
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Sant’Elia: How the Future Was

The work of Italian architect Antonio Sant’Elia (1886–1916) is the subject of a traveling show, now at the Farish Gallery, Rice University, Houston, through April 19. Originating at the Cooper Union in New York in February, the show will eventually move to New Haven (Yale University Art Gallery) and Miami (Low Art Museum) in the fall. Other stops are as yet undetermined. Curated by art historians Doris Atkinson and Guido Ballo, Antonio Sant’Elia brings together over 80 important drawings for the first time in the United States.

Sant’Elia’s stature as an important figure of the early 20th-Century avant-garde has always been subject to lively debate among Italian art historians; the slender body of work and small number of sketches that survive have led them to question his importance. Even the polemical aspects of the work have come under attack; some charge that F.T. Marinetti, the chief Futurist agitator and theorist, was the actual author of the Manifesto of Futurist Architecture, and that Sant’Elia was a mere figurehead.

The main English language studies of Sant’Elia’s work up to now are chapters in general histories by Reyner Banham and Kenneth Frampton, which mainly synthesized Italian sources. The catalog essays by Atkinson and Ballo do much to bring those interested up to date on current scholarship, and subject Sant’Elia’s reputation to an extensive reevaluation.

The show’s significance is therefore its academic accompaniment—the scholarly catalog. This is not to imply that the drawings themselves are not well worth seeing; they have an astonishing visionary quality that the hindsight of 20th-Century urban experience cannot dilute.

Joanna Wissinger

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In Progress

Shown on these pages are a radio station in Atlanta, a low-budget housing project in So. Florida, the Athletes' Village for the 1988 Olympics in Seoul, a campus plan for Arizona State, and a museum addition on Long Island.

1a, b WQXI Radio Station, Atlanta, Ga. Architect: Parker & Scogin, Atlanta, Ga. The number-one radio station in Atlanta is, say the architects "of dual personality . . . on the one hand, an all-energy, on-the-air emporium; on the other, a stable and highly lucrative business." Their building attempts to be both, with the flat, street facades punctuated by broadcast studios set over a corner entrance. The three-story, 34,000-square-foot headquarters also deliberately enforces the kind of spontaneous interaction that occurred in the former, cramped one-story station through the use of intersecting corridors, diagonal central stairs, and stacked, interpenetrating spaces. The structural steel frame is clad in brick veneer; construction is to be completed in spring, 1987.

2a, b The Williams, Hialeah, Fla. Architects: Andres Duany & Elizabeth Plater-Zyberk, Architects, Miami. These 270 rental apartments are organized in three L-shaped buildings, each providing a portal to parking courts within. The long entrance axis terminates in a clubhouse and pool. Economy of construction (stuccoed concrete block bearing walls) and simple repetition permit a low construction cost of $26 per square foot, despite certain grand features: 10-foot ceilings and mahogany exterior doors throughout, and exterior arcaded lobbies 140 feet long. The first building will open in September.
3a-c 1988 Olympic Athletes' and Reporters' Village, Seoul, Korea. Architect: Woo & Williams, Cambridge, Mass. Selected through an international competition, the Olympic Village houses 13,000 athletes, 7000 reporters, and 2000 service workers in 5700 units. The fan-shaped athletes' village, which terminates the main north-south axis of the adjacent Olympic Park, focuses on a central dining and recreation building to be converted to a shopping arcade after the games. The reporters' village follows the orthogonal grid of adjacent streets. The units themselves are organized as three-, four-, and five-bedroom duplexes or flats with deep, two-story balconies that take the place of courtyards in traditional housing. Sites have been set aside for future schools, churches, and other public structures when the village is converted to a community.

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The building layout responds to seismic design requirements. The concrete masonry interior corridor bearing walls act as a shear wall in the longitudinal direction. The same burgundy colored split face concrete masonry and gray scored units used for the exterior provide design continuity.

Overall view of the structure showing the adaptability of concrete masonry to "period" architecture. Featured in the facade are split face concrete masonry integrally colored burgundy, gray scored units and accents of "waffle" block and glazed face units in blue and green.

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Circle No. 382
4a, b Arizona State University West campus plan, Phoenix, Ariz. Architect: The NBBJ Group, Seattle, Wash. This mixed-use satellite commuter campus in northwest Phoenix is to be built in phases, growing by the 1990s to accommodate 10,000 students. Developer-built office, retail, and market housing totaling 300,000 square feet will complement 1,000,000 square feet of academic buildings. The central square is formed by the library to the south (Anderson, DeBartolo, Pan, Tucson, architects), the main administration building to the north, and four-story, arched academic buildings east and west. An east-west main street curves out from the square to secondary plazas where it intersects north-south shopping streets lined with one-story retail. Infrastructure work is now under way.

5a, b Heckscher Museum of Art Additions, Huntington, New York. Architects: Centerbrook Architects, Essex, Conn. Two additions to either side of the existing Neo-Classical Heckscher Museum will more than double its available exhibition space. Included in the program are 7300 square feet of exhibition galleries, a museum shop, administrative offices, sculpture court, and 154-seat auditorium for community use, totaling 18,000 square feet.

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See Sweets 8.22
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Energy conserving buildings can take many forms. These three houses show a range of formal possibilities, from that of the International Style to that of vernacular building.

1a-c Sawyer Residence, Albuquerque, N.M. Architect: Don Felts and Associates, Albuquerque. The intense sun and daily temperature swings in the desert demand that glass be shaded and that construction be massive. In this Albuquerque, N.M., house, Don Felts and Associates have met both demands with considerable skill. Mass walls run east-west through the H-shaped structure. On the south-facing elevation, a trombe wall stores daytime heat for release at night. Parallel skylights, with curved movable reflectors, run the length of three other mass walls within the house. In the summer, the reflectors shade the skylights and, throughout the year, bathe the interior with daylight. Stepped windows on the east and west elevations visually anchor the ends of the skylights and lighten the building’s blocky, stuccoed mass. The result is a building that is both indigenous and inventive.

2a-d Van Teeckelenburgh Residence, Northern New Jersey. Architect: M. Stephen Zdepski, Newark. Modernists such as Le Corbusier and Gropius paid close attention, particularly in their early work, to solar orientation and wind direction. Architect M. Stephen Zdepski recalls that tradition in this New Jersey residence, using elements of the International Style—pilotis, freestanding walls, an open plan and roof garden—to enhance the building’s thermal performance. The pilotis raise the living areas above the sloping site to take advantage of the prevailing summer breezes. Largely solid north-facing walls screen the house from the winter winds. Inside, the free plan allows cross ventilation, while window insulation, combined with a high mass floor in the south-facing living room, controls daylighting and thermal storage. The roof garden, with an R-value of 54, further insulates the house. Zdepski shows that Modernism is alive and well and as environmentally responsive as ever.
3a-c Anderson Residence, Bristol, VT. Architect: John Anderson, Bristol. Like the modern cow barns often seen in upper New England, architect John Anderson's own house has a roof of laminated wood arches. Spanning 50 feet in an east-west direction, those arches allow the south elevation to be largely glazed as determined by the amount of heat needed to charge the living room's plastered block walls and slate-topped concrete slabs in winter. (A removable awning shades the glazing in summer.) The long span structure also allows an open interior which, along with operable windows and sliding doors, facilitates cross ventilation. An earth berm insulates the house's north face and gives access to its second-floor entry. (Inside the entry, a bridgelike walkway gives access to the bedrooms and, via a circular stair, to living and service spaces.) And a wood stove heats the interior of the house as well as a water pipe used to back up the rooftop solar panels during cloudy weather. If the inspiration for the house came from the local barn vernacular, its image is that of some streamlined vehicle, not inappropriate for a house so efficient.


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Standards: ASHRAE 90

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90 has made the design community most aware of energy's relation to design practice. Published in collaboration with the Illuminating Engineering Society (IES) in 1975 (then known as ASHRAE/IES Standard 90-75), it has been adopted in some form by all 50 states and served as a model standard for several other countries. This first attempt at a national energy standard served the years immediately following the oil embargo extremely well, when many people thought that buildings should be thermally tight, with as little surface area and as few penetrations as possible. However, as designers began to accumulate energy-conscious design experience, a number of problems with the 1975 standard began to emerge. In particular, it had become apparent that the "prescriptive component" approach, on which Standard 90 is based, fails to take into consideration the dynamics that exist between the many components of a building. For example, Standard 90 forces the designer to use insulation values and glazing areas that are extremely questionable in commercial buildings, where internal loads are large.

Cognizant of these problems, ASHRAE, along with the IES and the American National Standards Institute (ANSI), undertook to revise Standard 90 in the late 1970s. Two new sections were proposed to provide a more flexible design approach through the inclusion of renewable energy strategies and the use of whole-building energy performance. Unfortunately, those new sections failed to gain the "consensus" (which is understood to mean much more than a majority but not necessarily unanimity) of those most affected by the standard. With the exclusion of the new sections, the 1980 revision of Standard 90 (known as ANSI/ASHRAE/IES Standard 90A-1980) seemed to many to be little more than a slight facelift of the 1975 document.

During this same period, the U.S. Department of Energy (DOE) was developing its own national energy standard, called Building Energy Performance Standards (BEPS), which many critics of Standard 90 thought would soon become law, replacing Standard 90. Although most experts agreed that the performance-based approach that BEPS took was far superior to that of Standard 90, it could not overcome the deregulatory philosophy of the incoming Reagan administration. By mid-1982, realizing that BEPS was dead, DOE began to refocus its standards research, establishing with ASHRAE a technically infeasible, purely political consensus (known as ANSI/ASHRAE/IES Standard 90A-1980) seemed to many to be little more than a slight facelift of the 1975 document.

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Law: Reviewing Shop Drawings

The lack of a decisive, unambiguous, and accepted delineation of the function and responsibility of architects in dealing with shop drawings is a source of continuing problems and concern. The courts, in determining this function and responsibility, do not have clear guidelines, and the profession itself is divided on the proper approach to this facet of the architect's services. One school of thought is that architects should, to the highest degree possible, limit their involvement and responsibility to minimize liability. The other approach is that only by assuming greater responsibility for the adequacy of shop drawings can architects sufficiently protect themselves.

This subject is of concern to many architects because of charges asserted against the structural engineers for the Kansas City Hyatt Regency Hotel, stemming from the structural failure that occurred there in 1981. The Missouri Attorney General alleged that these engineers were negligent because of their approval of shop drawings prepared by the steel fabricator. The drawings allegedly did not provide for the integrity of certain beam connections, which ultimately failed. The engineers involved took the traditional position that it was not their function or responsibility to determine the load capacity of each connection, but rather that they had approved shop drawings only for conformance with the design concept. Apparently the contractual language that delineated the engineer's duties and obligations was inadequate, allowing the Attorney General to make his charges, or was misinterpreted or disregarded. In any event, the dispute illustrates the fact that the duties of architects or engineers in reviewing shop drawings is ill-defined or misunderstood. The attack on architects arising from their review of shop drawings depends upon the role architects play in the building team.

(continued on page 64)
Law (continued from page 67) drawings is two-pronged. In addition to a defect in construction becoming the responsibility of architects who have approved an inadequate or erroneous shop drawing, it is quite common for contractors to assert claims for delay based upon the lapse of time between the submission and approval of shop drawings. The AIA form documents, in referring to architects' review and approval of shop drawings, state that "such action shall be taken with reasonable promptness so as to cause no delay." This language is almost an invitation for contractors to assert claims for delay damages on the purported failure of architects to approve the shop drawings promptly. First, the standard of "reasonable promptness" is subjective in nature. Second, there is no recognition in this language that, if, after review, architects cannot approve the shop drawings and require revision and resubmission, this may very well cause a delay for which the architect or contractor, should have no responsibility. One approach to this dilemma is to provide in the contract documents a specific minimum period of time to be allotted to architects to review each submission of shop drawings and to make any delay caused by requesting the contractor to correct and resubmit the shop drawings not be chargeable to either the owner or the architect.

Of more significance, however, is the language contained in the AIA form documents describing the services of architects in reviewing shop drawings. The form provides that "the architect shall review and approve or take other appropriate action upon the contractor's submittals such as shop drawings, production, and samples, but only for conformity with the design concept of the work and with the information given in the contract documents." The generalized nature of this language reflects the ambiguity among architects as to what their proper role should be in reviewing shop drawings, but the ambiguity of this language leaves the door open for courts to find architects liable for failing to review properly that they may or may not believe are solely the responsibility of the contractor. To review and approve shop drawings for their conformance with the information contained in the construction contract documents, for example, may be interpreted as an agreement to review and approve the contractor's details, dimensions, and calculations. Unless the owner-architect agreement specifically defines the scope of the review and explicitly excludes the subject matter that is not included in the architects' review, they may be at the mercy of a judicial interpretation inconsistent with the true intent of the owner-contractor agreement.

Many architects have sought to limit their potential liability by stamping shop drawings with language of disclaimer. Some stamps do not use the word "approved" and specifically enumerate what the review of the shop drawing does not include. In too many instances, however, the wording of the owner-architect contract is not changed or correlated with the wording of the stamp and thus the disclaimer of the stamp will appear to be in conflict. Under such circumstances, the contract will govern, and the disclaimer of the stamp will be ineffective. Architects in such a situation, having been lulled into a false sense of security by the wording of their stamps, may well find themselves liable for failing to pick up a defect in the shop drawing that the stamp expressly states is not within their province.

The architects' review and/or approval of shop drawings is not to include a review of dimensions, quantities, calculations, weights, fabrication processes, construction means or methods, the coordination of trades, or safety factors relating to the construction, the owner-architect contract should specifically set forth such exclusions and make it explicit that the contractor has the sole responsibility in connection therewith. It may be difficult for architects to obtain from clients acceptance of a contract that limits their responsibility for review or approval of shop drawings, particularly if the client is not knowledgeable of the construction field. It would, of course, be quite helpful if the AIA modified its forms to incorporate such disclaimer language, since a form contract is more readily acceptable. It is probable, however, that such modification will not occur unless and until there is a consensus in the profession about what the responsibilities and function of architects should be in reviewing and approving shop drawings.

Norman Coplan, Hon. AIA

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Standards (continued from page 63) other versions of Standard 90, by providing flexibility in the form of two parallel and alternative compliance paths: systems/component and building energy cost budget. However, no matter which path is used, several basic requirements must be met.

### Basic Requirements

Basic requirements consist of either good energy-saving practices or prescribed levels of performance in the design of various building subsystems. Such practices as locating lighting switches and thermostats to be readily accessible to the occupants and achieving minimum HVAC system and equipment performance are typical items covered under these sections.

### System/Component Method

This method is one of two major paths used in determining lighting, envelope, HVAC, and service water heating compliance. For lighting and envelope compliance, a designer has the option of either a prescriptive component or a system performance approach, both of which can be used interchangeably.

### Prescriptive Component Approach

This approach provides a series of prescriptive procedures. Lighting compliance requires the use of minimum luminaire and lamp/ballast efficiencies as well as a Unit Lighting Power Allowance (ULPA), which is an extremely simplified version of the Unit Power Density procedure first used in Standard 90A-1980 and IES Standard LEM-1. The ULPA procedure is best used when the building type is known, but the interior layout of rooms has not yet been defined. ULPA values are given in Watts/ft² for seven building types and five increments of gross lighted area. When a building does not fall within one of the building types or area designations, the other system performance approach should be used.

Envelope compliance under the prescriptive approach provides incentives for the use of several important energy strategies such as shading, daylighting, exterior mass, and high performance glazing. The use of any one or a combination of these strategies allows the designer to make trade-offs between the thermal transmittance (U-value) of opaque walls and the percent of allowable glazing. Compliance is easily determined through the use of a series of precalculated tables known as Alternate Component Packages. To use the tables, the designer must know the desired envelope strategy, the site's climatic condition (in degree-days), and the building's internal load (in Watts/ft²). Compliance for other envelope elements, such as roofs and floors, is determined in a manner similar to those in Standard (continued on page 66)
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Standards (continued from page 64) and 90A-1980.

HVAC systems and service water heating compliance make slightly more stringent several provisions of the basic requirements.

System Performance Approach
When greater design freedom is desired, a designer may choose the system performance approach. This approach provides procedures for determining only lighting and envelope compliance. Lighting compliance is essentially the same method as the Unit Power Density procedure used in Standard 90A-1980 and IES Standard LEM-1. Although the approach is the same, the calculation process has been greatly simplified and the base values have been made more stringent to reflect improvements that have been made in lighting system efficiencies. Another change to this procedure is that specific room dimensions are no longer needed. Instead, an Area Factor, which accounts for room configuration and other conditions influencing the effectiveness of the lighting system, corrects the product of the room area and base Unit Power Density. This change makes it possible to determine the building's power density before all the interior spaces have been designed. Such information is essential early in the compliance process, since lighting power density (a major component of the internal load) is a critical factor in the determination of envelope compliance.

Envelope compliance under the system performance approach takes into consideration a number of factors important to successful envelope design, such as building orientation, shading, daylighting, exterior mass, fenestration, and internal load. Compliance is achieved if the calculated annual heating and cooling performance of various envelope elements is less than the values that have been determined through the use of compliance calculations. While the procedures required for the prescriptive component approach could be easily done by hand, most designers would need a microcomputer to use this system performance approach effectively. (The Standard 90.1P Committee has developed a computer program for determining envelope compliance under this section and is in the process of developing ways in which this program can be placed in the public domain.)

Building Cost Budget Method
The building cost budget method is the most flexible of the compliance methods, but requires the most complex analyses. This method provides an opportunity for the use of innovative energy design strategies such as daylighting, passive solar heating and cooling, heat recovery, and thermal storage as well as concepts that use "off-peak" electrical energy and that cannot be adequately evaluated under either the prescriptive or performance approaches. The building cost budget method will require the use of an energy simulation program, such as DOE-2.1, which can perform extremely sophisticated energy analyses. A typical compliance process begins with the proposed building design being simulated by computer, and the resulting value, referred to as Design Energy Consumption, further adjusted by the type of energy used. That gives a Design Energy Cost, which is then compared to the Energy Cost Budget, calculated for either a prototype or reference building. Compliance under this method is achieved when the designer is able to show that the total calculated annual energy cost for a proposed building is less than the calculated annual energy cost of a prototype or reference building. This compliance path is intended only for design comparisons and should not be used to predict either annual energy consumption or annual energy costs.

Present Status of Draft Standard 90.1P
The first public review of Draft Standard 90.1P was held last summer and resulted in over 8000 comments (about two thirds of which were reiterations) from over 300 individuals and organizations. In the months following the closing of the public review, the Standard 90.1P Committee has been addressing the comments and, when warranted, making appropriate changes to the draft. The result is a second public review draft, (continued on page 72)
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Standards (continued from page 66) due to be released this summer. The committee feels confident that it has addressed the bulk of concerns and hopes that the review process is near completion.

Critics of Standard 90.1P believe that in the committee’s effort to create a flexible standard, it has made the compliance process overly complex. Supporters of the new standard are concerned that, if the second public review process produces another deluge of comments, Draft Standard 90.1P will never gain consensus. These individuals argue that, if Draft Standard 90.1P fails to get a consensus, state governments will become impatient and begin developing their own energy standards, which would undermine the considerable influence ASHRAE has had in this area. Such concerns have generated a number of contingencies in case consensus fails. The most obvious would be for ASHRAE to incorporate the sections on basic requirements and prescriptive components into Standard 90A-1980 through the addenda process. The remaining portions of the draft could be modified for another attempt at consensus or for publishing as an ASHRAE Guideline rather than a Standard.

No matter how ASHRAE resolves this issue, DOE is in the process of publishing a Notice of Proposed Rulemaking (NOPR) which is, except for minor format changes, identical to the Draft Standard 90.1P published for ASHRAE’s first public review last summer. If, after a 90-day review period, the NOPR is accepted, it will be put forth as an interim standard, which will allow a period of testing and possible revisions to take place. If, after this period, the proposed standard continues to be acceptable, it will be published in its final form and become mandatory for the design of federal buildings and serve as a model energy standard for state governments and the private sector.

Conclusion
Although some of the formulas, tables, and compliance charts in Draft Standard 90.1P may seem a little overwhelming at first, they become clear with use. By allowing interactions and trade-offs among various building components, this draft makes a major break from the closed, inflexible approaches of the past. Previous standards have focused on controlling mediocre practices at the low end of the design market and, in so doing, have overloaded the standards with too many rules that frustrate innovative design. The multiple compliance approach of Draft Standard 90.1P creates an equitable distribution of design responsibilities; neither low-end buildings nor advanced projects will feel unduly restrained by this standard. If Draft Standard 90.1P achieves consensus without major changes, it may well provide the design community with a model standard that will go beyond energy—a model of flexible compliance that can be replicated by other standards.

Harvey Bryan

The author, an architect and researcher, is a member of ASHRAE’s SSPC 90R committee and a professor at MIT.
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The Spiral in Tokyo by Maki & Associates is most unusual in its sponsorship, function, and design. Built as a public arts and entertainment center by a leading manufacturer, it shows a unique response to its highly complex setting as well as to its equally complicated program of uses.
TODAY's observers of cities generally acknowledge the vitality of Tokyo's kaleidoscopic urban environment. Having adjusted to the stultifying effects of streetscapes of gaudy signs and jumbled buildings, we may agree with Roland Barthes in his *Empire of Signs* that "Tokyo reminds us that the rational is merely one system among others." More so than Las Vegas, Tokyo seems a place where anything goes and no one worries much about where and how it fits in. Yet, Japanese architects are increasingly concerned with issues of context. No one among them has grappled longer or more persistently with the urban design implications of his buildings than Fumihiko Maki.

Here, Maki has adopted from the context the themes of street façade and fragmented building volumes, drawing them into a composition that involves spirals: a spiral of building volumes up to a central penthouse; a flattened spiral of stairways zigzagging up the façade; and a deeper spiral that loops up through the interior.

The latter, the restaurant manufacturer Wacoal, wished to strengthen the ties between the worlds of fashion and the arts by incorporating a mixture of corporate-sponsored commercial and cultural activities into a new arts center building. Accordingly, the first five floors of the Spiral have art galleries, a 300-seat theater, video and recording studios, designers' shops, cafés, bars, a restaurant, a roof garden, and a multistory atrium for exhibitions, fashion shows, and performances. The sixth and seventh floors, including the room beneath the prominent conical form, house a display of costumes from the company collection. The club on the eighth and ninth floors accommodates a variety of activities: receptions, conferences, private fashion shows, etc. This complex program is neatly nested in a structure nine stories high in front and four in back. The lower back section and stepped-back top are responses to sunlight access codes.

The building faces Aoyama Avenue, Tokyo's most fashionable shopping street. A cursory view of the façade suggests that its composition is simply a response to the fragmentary nature of the streetscape. Closer study reveals that several strategies or games are going on here. First, there are the moves by which the building is embedded in its context. Second, there is orchestration of movement across the façade. Third, there is a complex iconography involving symbolic forms and elements abstracted from early Modernism.

Some planes of the façade are aligned with the broad avenue, but the form as a whole responds to the geometry of narrow side streets, which meet the avenue at an angle. The play of slight angles is also apparent in surrounding buildings. The avenue line is acknowledged mainly in the large canted section of façade treated as an urban-scaled "shoji" screen, thrust into a prominent position like a blank, inscrutable sign—a sign of no sign. The different angles also allow for a shallow plaza at the main entrance, while the automobile entrance is close to the street. As a whole, the façade takes its place deferentially in the Aoyama streetscape: It is unframed, and the shifts and angles suggest a diffusion of the front into its context.

Movement in a zigzag pattern across the façade dominates the composition. Columns—pilots—mark the main plane of the façade and support a promenade, just inside the glass, which ascends diagonally in stages across it. In each glazed section, mullions spaced at intervals of graduated width indicate the direction of movement. Maki wished to serve the cause of urbanity by setting up a reciprocating spectacle between the people moving up and down this promenade and those out on the sidewalk and the street below. Although such reciprocity between inside and outside public spaces is increasingly the norm in America, in Japan the contents of buildings are, by tradition, generally well hidden.

But the movement does not stop with the promenade. Glazed sections, voids in the wall, mark a continuing ascent toward a cube-shaped opening at the top of the first stage of the building. Within it is a monumental cone lighted artificially from below and naturally through a large square opening in the outside wall. Next to the inside wall stands a white column, which rises through the roof. It both marks the location of the tension member indicated by the stainless steel crevice running up the wall below and redirects the pattern of movement on the façade.

Though the five-part glazed section between the void with the cone and the shoji is slightly off the building center, its mullions are spaced symmetrically as though to indicate a center. The glazed penthouse wall above has a regular a-b-a rhythm and extends one bay closer to the other side. This bay is partly screened by and tied into an undulating wall that moves back on a diagonal to meet two stacked cubes. The lighting rod marks the axis of the spiral expressed two-dimensionally in the façade and, in depth, in the plan of the building.

Completing this meticulously detailed diagonal movement in a relatively shallow spatial layer behind the façade is another, interior sequence of spaces that spirals upward. This movement is discontinuous and more analogous to the Japanese art of packaging, in which the idea is not so much to encase the contents but to postpone their discovery through spatial layering.

From the ground-floor entrance lobby—also an art gallery—where the spiral of façade promenade begins, the curving ramp in the atrium at the back of the building is visible from three vantage points: at the end of a sloped passageway on the left side of the lobby, through the café in the center, and from the first landing of the promenade at the end of the art gallery.

The atrium is the "oku," or heart space, of the building. Oku is a concept that continues to intrigue Maki, who wrote the essay "The City and Inner Space" about it in 1979. The word has long been used to connote a characteristically Japanese concept of place as inner, hidden, profound, and unfathomable. Yet, in spite of its marked spiritual dimension, Maki points out that "The innermost space as the ultimate destination often lacks a climactic quality. Instead, it is in the process of reaching the goal that drama and ritual are sought. . . ." Although the circular area described by the ramp is a dynamic space with great potential for drama and display, it is still just one of many events in an unfolding scenario rather than the final destination. Continuing action is indicated by the upward sweep of the ramp leading to a mezzanine. The atrium walls rise to a glazed, fan-framed skylight that peaks at the fifth level, where it is visible from the edge of the roof garden.

A 300-seat theater, well equipped technically for a range of performances of music, dance, and drama, occupies the central rear part of the third and fourth levels. The foyer is on the third level; video and recording studios occupy the corresponding area on the fourth level. The fifth level is devoted to social activities, with a restaurant that opens to a roof garden. A domed bar adjoining it occupies a central, transitional place. This square room has the quality of another "oku," the inner space of the ascending layers of spatial wrapping. The dome is exquisitely fashioned of painted steel triangles affixed to a perforated steel shell so that it appears to be stitched together. The bar's cave like quality is enhanced by the view out to the roof garden.

Removed from the din of the street, the roof garden has a surreal
quality. Maki has capitalized on this by setting up two overlapping perspectives in the plan. The central vista is bounded by a paved area lined with trees on one side and by a reflecting pool on the other. These edges converge, creating the illusion of a greater depth. The reflecting pool is cut into by another landscaped area lined with trees at its outer edge. Just off the central vista, a white granite pyramid with water flowing from a slot near its apex appears to float on the pool's surface.

And so the ritual ascension ends. But there is yet another game to play. While the interior spaces must satisfy programmatic needs, Maki has yielded to the impulse to recognize history through references abstracted from Modernism rather than the Classicism that has so dominated Post-Modern design in the U.S. Since the use of the principles of Modernism transformed Japanese architecture more than a generation ago—given the acceleration of change—the Movement has now passed into the realm of history and is ripe for reuse as reference material.

Maki has sought to nourish our intellect through quotations from early Modernism. Although he alludes to various aspects of the movement and the work of masters such as Mies, Aalto, and Loos, the most quoted source is Le Corbusier. The use of geometric solids—the cone, the cube, and the pyramid—salutes Purism. The squares of varying sizes, the lines of mullions or columns used as controlling elements on the façade, the pilotis that lift the façade off the ground, the “free” façade and flowing plan, the roof garden—all remind us of the man whose work and writing changed the course of architecture in Japan (not to mention other parts of the world).

Maki is often credited with designing in an internationally intelligible aesthetic. His skill in adapting traditional Japanese forms to contemporary uses, as expressed in the Fujisawa Municipal Sports Complex (P/A, June 1985, pp. 71–80), is polished further in the Spiral's archaeology of Modernism. Le Corbusier’s motto sums up the process: “Creation is a patient search.”

Sally Woodbridge

The author is an architectural historian, lecturer, coauthor of several books on West Coast architecture, and a P/A correspondent. Her Historical American Buildings Survey Catalogue for California will be published this year.
From the main lobby, a sequence of stairs (above left) rises just behind façade toward theater and upper floors. Dalmatian marble walls and spare stainless steel railings and light sconces are characteristic details; plaster soffits swoop in gentle curves above stairs. Moving from entrance toward rear of complex (below), one passes through low café area toward skylighted atrium (facing page). The finely proportioned ramp here (also in background, below) can be used for fashion shows or other events; the skylight or the array of theater lighting can enhance the dramatic qualities of the space. Walls here are of a custom-woven fabric above the marble dado; steel rings can hold fabric. Galleries flanking the café (above) can be used with the atrium for art exhibitions.
In the theater foyer (above), lighting in ceiling recesses expresses the traditional concept of columns as generators of space. The slashes and curves of light are complemented by details of Art Deco character. Roof garden (below) takes advantage of view over low buildings. Converging lines of trees and pool exaggerate distance. Pavilion-like bar (left foreground, below, and facing page) has dome with interior of stainless steel panels.

**Project:** The Spiral, Tokyo, Japan.  
**Architect:** Maki & Associates, Tokyo (Fumihiko Maki, Morikazu Shibuya, Tomoyoshi Fukunaga, Keisuke Yamamoto, Eiji Watanabe, Kiyohide Sawaoka, Naruya Kamiyama).  
**Client:** Wacoal Corporation.  
**Site:** a 100' x 200' lot on shopping boulevard, center city.  
**Program:** multiaspect arts, theater, dining, retail, social functions; 9 floors, 113,645 sq ft.  

**Structural system:** steel frame, reinforced concrete.  
**Major materials:** aluminum panels, porcelain tiles, exposed concrete; marble and plaster walls, granite, carpet, and hardwood floors.  
**Mechanical system:** central gas-fired water heater/chiller; individual air handling each floor.  
**Consultants:** Takami Design House, Harutoshi Kada, Hidetoshi Ohno + API, Null Haus, Yamamoto-Nishihara Architects & Associates, interiors; Kimura Structural Engineers, structural; Sogo Consultants, mechanical; Sumio Yoshit, theater; Minoru Nagata Acoustic Engineer & Associates, acoustics; Masayoshi Nakajo, signage; Kazuko Fujie, furniture; Kei Miyazaki, carpet.  
**General contractor:** Takenaka Komuten Co., Ltd.  
**Costs:** Not available.  
**Photos:** Toshiharu Kitajima, except as noted.
The nation's first independent residential rehabilitation center for the treatment of eating disorders, a 1985 P/A Citation winner designed by Atkin, Voith & Associates of Philadelphia, opened last June.

RENFREW Center is quite literally the first of its kind. This independent center, dedicated solely to the treatment of the eating disorders anorexia nervosa and bulimia, departs from the institutional norm, both programmatically and architecturally, to establish a prototype for residential health-care facilities. Like all experiments, Renfrew has its wrinkles, some the product of changes in program after construction was completed, others relating to the absence of a clear-cut code. The basic solution, however, seems proven sound with practice.

Eating disorders have only recently emerged as a major health-care problem. Anorexia nervosa, a pattern of self-starvation taken to life-threatening extremes, is considered the more immediately dangerous disease; however, bulimics, caught in a binge/purge cycle, can suffer serious physical side effects ranging from rapid tooth deterioration to severe chemical imbalance. The American Anorexia/Bulimia Association estimates that 1 to 4 percent of all high school and college women are anorexic, 6.5 to 18.6 percent bulimic. The typical anorexic or bulimic is a woman, white, middle- to upper-middle-class, between the ages of 13 and 30.

The "care" must treat both physical or behavioral problems and their psychological roots. Yet few existing facilities are equipped to handle both aspects equally well. Medical hospitals tend to concentrate on the physical symptoms—stabilizing body weight or restoring chemical imbalances—without treating the psycho-social symptoms. Anorexics or bulimics do no better in psychiatric settings. They don't identify with other patients suffering from more serious psychological disorders and may well resist hospitalization altogether. Outpatient treatment has a mixed record.

In building a freestanding clinic dedicated solely to the treatment of eating disorders, Allen R. Davis and Samuel E. Menaged, Renfrew's founders, sought to fill this gap between medical and psychiatric care. At the same time, they saw the opportunity to reduce the cost of care. Medical and psychiatric hospitals, they reasoned, must provide staff and equipment for all types of diseases; Renfrew could streamline, supplying only those services required for treatment of eating disorders. This "unbundling of health care," Davis claims, leads to cheaper service and shorter stays; Renfrew's rates at $295 a day are, he says, roughly half the comparable costs of a hospital-based facility.

The Renfrew Farm was a lucky find, and at $620,000, a great buy. The 27-acre Houston family estate in Upper Roxborough, Pa., is isolated, yet not remote. Architects Tony Atkin and Daniela Voith of Atkin, Voith & Associates, Philadelphia, prescribed only minor alterations to the original 1929 manor house designed by Robert Rodes McGoodwin, bringing it up to code but otherwise retaining the main rooms intact for administrative or therapy use.

McGoodwin's site plan left little room for maneuvering. The manor house is informally situated, set not at the crown but into the side of a steep hill. The entrance drive slips by the front facade, and the carriage house, court, manor house, and terrace are strung out in one long line along the road. Atkin's entrance to the new "wing," hidden behind the drive's original end wall, is if anything still more informal and less prepossessing: a private way in for residents only. The new building, set back further into the hillside, defers to the main house, echoing its roof silouette and details. In matching the manor house, the architects not only complement the original villa but disguise their own structure, complying with the clients' request that Renfrew appear "residential."

It is this aspect of Renfrew's design that the P/A jury debated, praising the functional solution and siting, while arguing over the imagery appropriate to a new building type that is neither hospital nor home but something in between.

For all its reassuringly domestic detail, Renfrew is a licensed rehabilitation center, as the interior, more than the exterior, makes evident. In the absence of a specific role model, the architects relied on state standards developed for substance-abuse (drug and alcohol treatment) centers. They also followed quite closely the treatment schedule devised for Renfrew by Dr. Steven W. Emmett of Boston. Emmett's program, based upon individual therapeutic "contracts" through which patients set their own goals for treatment with staff guidance, stressed group interaction, physical and art therapy, communal meals, and family counseling—all group activities—in addition to individual psychotherapy sessions carried out over a 45–60-day stay. Thus the Renfrew "dorm" has at its heart...
a pair of large living rooms that are the loci for social interaction and group therapy sessions. The main stair, a natural means of social contact, opens directly into these rooms. The units themselves, all doubles with shared baths, are deliberately furnished and finished in a noninstitutional fashion, the only hospital item a call button. (Renfrew does not accept acute care cases, defined as patients more than 20 percent below ideal body weight, or those with evidence of "severe thought disorder" better treated in a psychiatric hospital.) Bedrooms open onto a corridor whose overwide proportions, set in compliance with the wheelchair regulations of the substance-abuse code, afford additional opportunities for casual contact. These corridors in turn open directly into the living rooms, a critical connection for the program and one that required a code variance. Similarly, the usual requirement that juveniles be separated from adults was waived so that the small group of patients (40 maximum) could function as a single unit split up only for therapeutic purposes.

The program as actually practiced by the Renfrew staff takes Emmett's contract system a step further, and in so doing renders some of the more specifically institutional aspects of the facility unnecessary or underutilized. The lock-out bathrooms, designed with special vestibules for staff-controlled access, have never been used that way, although they could be, should a patient request external control as part of her contract. The "time-out" rooms, designed for monitored isolation, function instead as special units for patients who require the privacy of a single room. Renfrew's clinical director, Dr. Leonard S. Levitz, finds the glass-enclosed nurses' stations, another carry-over from the substance-abuse code, too hospitallike. Neither station is used as designed, serving instead as impromptu art room or coffee corner, fully accessible to patients. Levitz would also add more recreational space, both indoors and out (the center has only one all-purpose rec room on the second floor), and hopes to convert the existing carriage house to that purpose. Overall, however, the director praises the prototype, saying, "The building works amazingly well for not having a model to follow."

Davis and Menaged are equally pleased. While it is too early to assess the success of Renfrew's program, the current patient population of 18 (60 total since the opening) is ahead of their schedule. Last November the pair bought an additional acres adjacent to the farm, and they are now exploring a number of possible programs, including a conference center for the study of eating disorders or a stress management clinic. While Renfrew has as yet no imitators, the center has generated considerable national and international interest and inquiries from as far away as Australia, Italy, and Israel, suggesting that this type of small-scale, specialized health care, offered potentially on a regional basis, may well be the wave of the future.

Daralice D. Boles

Progressive Architecture 4:86
By setting the new building back from the old, the architects have preserved views of the valley and farm buildings from the manor house and its formal terrace (see site plan and photo, facing page). Although far greater in size than the main house, the new facility draws its domestic details from the older McGoodwin design, echoing its roof silhouette and dormers (these were to light attic recreation rooms belatedly cut from the program), its cast-stone banding and stuccoed walls, projected center bay, and casement windows.

A second terrace and vegetable garden to be built this spring at the northwest end of the new building will complete the complex. The main public spaces—entrance porch, stacked living rooms, dining room, and veranda—look out over the valley (above). Renfrew's rear façade, set into the hillside and seldom seen (below), is a far more austere and functional composition of bedroom windows with only the simplest cast-stone banding for relief.
Thickness is an important aspect of the building, as can be seen both on the exterior (facing page and above left) and the interior lobbies (above right). The building is constructed of concrete block, thickest at the base; the doctors' offices have balconies recessed deeply into the building; and the individual office suites are entered through deep niches off the lobbies. The base of the building is roughly textured to encourage climbing plants, and the windows at this level are round to respond to the fuzzy effect of the greenery.


Site: typical inland Florida site: flat, no significant vegetation, neighboring buildings of varied size and type, 300' x 250'.

Program: 18 medical offices averaging 1500 sq ft; 108 parking spaces; entrance to rear (facing associated hospital) and front.


Major materials: stucco finish, exterior and lobby walls. Coral stone trimmed with concrete tile on lobby floors (see Building Materials, p. 216).

Mechanical system: HVAC split systems in each office.

Consultants: Santiago & Associates, Engineers Inc., structural; Martin & Vilato, mechanical.

General contractor: Santiago Development Company.

Costs: $1,100,000 (1984). Building: $30.10 per sq ft. Site: $2.60 per sq ft.

Photos: Steven Brooke, except as noted.
Helping to restore some sense of order to lives disrupted by abuse, Juneau's AWARE Shelter by the Miller/Hull Partnership with Frank Maier reflects the residential yet communal nature of its purpose.

IN the best of all worlds, certain building types would be unnecessary. But it is our misfortune not to live in such a world. A center for victims of domestic violence is a relatively new building type, part of an effort to ameliorate an age-old tragedy. Long thought of as a private shame, the only domestic battles acknowledged were those that required police intervention.

Some studies indicate a direct correlation between various frustrations and aggressive behavior in the home. Among the numerous stultifying factors can be such things as an oppressive climate, which sometimes contributes to a sense of isolation and to alcoholism. While Juneau, Alaska, is a far cry from Prudhoe Bay—it is even south of the Yukon—the nights there can still get pretty long, the weather inhospitable. The AWARE Shelter—by the Miller/Hull Partnership of Seattle and Frank Maier Architect, the associated Juneau firm—provides shelter for abuse and rape victims.

AWARE (Aiding Women from Abuse and Rape Emergencies) has named the shelter "Dove Cottage," after Alaska resident Dove Kull, an advocate on behalf of women and the elderly. As many as 48 women and children can be housed in the shelter for up to six weeks at a time, and they can return if necessary. As a temporary "home," the facility is a cross between a lodge and a residence. It stresses a communal atmosphere, which allows for group interaction and children's play areas, yet provides private facilities for counseling, contemplation, and sleeping. In addition, AWARE's directors wanted the building to set an architectural example, raising Juneau's design standards. They wanted a modern building, but one recalling residential architecture common to Southeast Alaska.

Even though the climate is harsh, with heavy rain and strong winds, the area shares the compensations common to coastal areas south to Oregon—beautiful forests and, when clear, breathtaking mountain and water scenery. Dove Cottage perches on a wooded hillside, the site dropping some 40 feet from the entry road to the west. It is at the base of Mt. Juneau, and provides western views of the Gastineau Channel. The topography is skillfully used to accomplish several connected objectives. Because domestic strife is the reason the facility exists, visitor access is controlled.

Entry from the parking area is limited to two points, reached by what are, effectively, bridges over a lower areaway. Much of the building's base is impenetrable, and by virtue of the grade drop, the entry-level perimeter is protected from all but welcome guests. Decks on the south and west can be used on the nice days without fear of intrusion. Sharing the western view on this level are the children's area, dining, advocate and office areas, and a small library raised a few steps above the lobby. The largest meeting area occupies the rounded north end. The upper, more private level comprises bedrooms and lounge on the south end, and offices and another meeting room on the north.

Chosen by the U.S. Attorney General's office as a national model for such shelters, the AWARE center is staffed by an extremely dedicated group under executive director Caren Robinson. Resisting the conventional wisdom that these facilities should be secret hideouts, Robinson has seen accomplishments more in the way of community and governmental support by making AWARE visible. This very visibility seems to make it clearly off limits to intruders, and therefore somewhat self-policing.

Dove Cottage would have to be characterized as a humanist venture. While AWARE strives to build self-esteem in the women it serves, Robinson does not consider herself or the center primarily feminist in nature. The building offers the full range of spaces needed for recharging the troubled psyche. On the outside it takes its cues from building forms and elements seen all over Juneau. Inside, its residential scale and cheerful spaces help it avoid being cool or institutional. Its reason for being is grim; its aura is anything but.
From the marshy area and the highway on the west (facing page), the regular pattern of the bedroom protrusions common to both long elevations overlays the sweep of the deck and the projecting library to the left. The scale of the entry side (above) is apparently reduced by the slope of the site. References to local residential forms are more pronounced here, in appropriate deference to the neighborhood.

In the lower level meeting room (center, right), a pointed opening marks the area for an intended fireplace the clients decided they would be too busy to use. Offices flanking this area borrow light from the meeting room glazing. From the dining room (bottom, right) broad views of the channel are afforded by maximum glazing and doors to the deck.
Tokyo: Form and Spirit

Japan’s innovative contemporary artists, architects, and designers are well aware of their cultural past. An exhibition examining the link between continuity and invention will open this month at the Walker Art Center in Minneapolis.

THE well-known Japanese talent for innovation is matched by an equally strong sense of cultural, spiritual, and artistic tradition. This gift for integrating new information with the lessons of the past has produced some of the world’s most inventive contemporary architecture, graphic, and product design. An exhibition that attempts to put these twin currents of innovation and tradition into artistic perspective will open April 20th at the Walker Art Center in Minneapolis. *Tokyo: Form and Spirit*, organized in association with Japan House Gallery, New York, and curated by the Walker’s director, Martin Friedman, and its design curator, Mildred S. Friedman, will exhibit both important artworks from the Edo period (1603–1868) and commissioned installations by Japan’s leading contemporary architects and designers.

Martin Friedman, in his introductory essay for the show’s impressive catalog, calls the exhibition “an effort to illuminate the relationship of Japanese artistic activity to various aspects of urban existence and to stress the durability of Japanese artistic attitudes from historical times to the present.” Tokyo was chosen as the context for this relationship because it is the center of contemporary activity in Japanese arts and architecture, and because it epitomizes the contradictions of modern urban life, where McDonald’s stands and Shinto shrines crowd the same streets. Nonetheless, according to Friedman, “An identifiable Japanese sensibility continues to survive the impact of outside influences by incorporating and ‘Japanizing’ them.”

While this sensibility traces its roots back to ancient times, its modern genesis is in the Edo period, so named for the palace that became Japan’s new capital when shogun Tokugawa Ieyasu moved it there from Kyoto in 1590. For nearly three centuries, while Japan was virtually closed to outsiders, the rise of the merchant class triggered the growth of private patronage, and the resulting boom in artistic production saw the rise of the individual artist and a flourishing of craftsmanship and arts such as lacquer, ceramics, printmaking, theater, and literature. The forced opening of Japan to the West and the Meiji Restoration of 1868—when Edo was renamed Tokyo—brought Japan into the modern world, and completed the evolution of the arts from an elitist pursuit to a part of popular culture.

Because the arts in Japan are so integral to everyday life, the exhibition pairs “artistic phenomena with urban existence,” in Friedman’s words. Six aspects of daily life, each introduced by a group of Edo-period objects and artworks, are each represented by a contemporary thematic space: *Walking*, by the street; *Living*, by the house; *Working*, by the shop and factory; *Performing*, by the theater; *Reflecting*, by the temple; and *Playing*, by the playground. The contemporary spaces, which address urban themes in a “Philosophical, conceptual manner,” were designed by architects Tadao Ando, Hiroshi Hara, Arata Isozaki, Toyo Ito, and Fumihiko Maki, and designers Kiyoshi Awazu, Shigeo Fukuda, Eiko Isono, Shiro Kuramata, Kohei Sugiura, and Tadanori Yokoo. After its initial run ends on July 20th, *Tokyo: Form and Spirit* will travel to Los Angeles, New York, and San Francisco. The following pages offer an advance look at the exhibition; a review will follow in the June issue of P/A. Pilar Viladas

An introductory gallery (see exhibition layout, facing page) outlines Japanese history and artistic styles from the Edo period (1603–1868) to the present. Maps, photos, everyday objects, and wood-block prints such as the View of First Street, Nihonbashi (above) from Ando Hiroshige's renowned One Hundred Views of Edo of 1858 (collection Art Museum of Elvehjem), will illustrate Tokyo's history, as will two pairs of screens, one from the 18th Century, the other by contemporary painter Masami Teraoka.
For the theme of Walking, The Street is introduced by a number of Edo kanban, highly descriptive tradesmen's signs, such as the one for a pharmacy advertising a stomach remedy (left, collection Peabody Museum of Salem). In the thematic space for this section (below), Arata Isozaki designed seven frameworks that contain Tadanori Yokoo's silkscreen paintings on ceramic tiles. The paintings combine historical and contemporary images of buildings and figures, and street imagery from Japan's passage through history, from Edo times through the "Near Future."
The Tokyo Spirit space, introduced by Keirin’s Bird’s-Eye View of Great Edo, a wood-block print from 1860 (left, collection Tokyo Metropolitan Central Library), houses a procession of six descriptive columns, designed by Fumihiko Maki and Kiyoshi Awazu, that recall Japanese architectural traditions, from the ancient (the Festival column, above, far left, with references to shrines and rituals) to the modern (second from right, with Tokyo’s streets, buildings, and freeways wrapped around the column).

Among the Edo objects in the Living section are a portable teahouse (facing page, middle left, collection Urasenke Tea Society). Tadao Ando and Shiro Kuramata’s thematic space (facing page, bottom) evokes the ambiguities of the Japanese house in its public/private and formal/informal roles, with red-and-white columns, walls draped "softly" with polymer-stiffened cloth, a glass chair and illuminated glass table, a hologram of an Ikebana floral arrangement, and tatami-like rectangles of cracked glass hovering over a metallic floor.
A pair of screens depicting craftsmen at work, by Edo artist Shokunin Zukushi-e (top left and facing page, collection Wadsworth Atheneum), are among the objects that introduce the Working section. Its thematic space (above), designed by Hiroshi Hara, contains rows of robotlike figures incised on plastic; wire filaments and diodes embedded in their surfaces project moving patterns of light on both gallery walls and visitors. Hara believes that “Earlier machines were an imitation of the human body; today’s machines have come to resemble the human mind. Architecture that now conforms to the body will, in future, become an architecture of the mind.”
Toys and games from the Edo period, including kites, dolls, playing cards, board games, and an *ina hariko*, a nine-inch-high papier-mâché dog (above, a 1920s version, collection Brooklyn Museum), introduce *Playing*. Shigeo Fukuda chose this engaging creature, traditionally offered at Shinto shrines by parents on behalf of their children, as the central image for his thematic space. Since that space is the Walker's outdoor terrace, Fukuda translated the paper original into a steel-structured animal, fifteen feet high (left). While painted in a traditional manner, its rather cubistic forms are contemporary. Visitors will be able to look through peepholes in the giant *ina hariko*, to see illusionistic games invented by Fukuda.
Edo religious objects such as a bronze Buddha, Shinto shrine, and a gong (left, collection Peabody Museum of Salem) introduce the Reflecting section. Toyo Itō and Kohel Sugiura's thematic space (drawing, facing page, bottom) represents the Buddhist "universe." Walking through an entryway shaped like a seated Buddha, visitors proceed across a series of panels (illuminated from below by 1,500 electric candles) representing the four natural elements: a square of earth; a circle of water; a triangle of wind; and a semicircle of ether.

A 19th-Century festival drum (top, collection Peabody Museum of Salem), Bunraku puppets, and Kabuki theater costumes set the historical backdrop for the performing section. Arata Isozaki and Eiko Ishioka's performance space (above) consists of a himorogi (sacred space) made of black-painted rice straw, and a glass-topped stage organized like a bento (partitioned lunchbox) and housing fifty television monitors. These two designs represent the universal traditions of performance—the first the sacred dances at Shinto shrines, the second the plays of ancient Greece—while the televisions refer to contemporary entertainment. The monitors in both the himorogi and the stage broadcast Ishioka's video program of recent Japanese television commercials. Triangular ladders, placed around the space and draped with brilliantly colored cloth, offer visitors vantage points from which to view both the video programs and the live performances that will be staged there. The sounds and sights generated by the combination of live instrumental and vocal performances, and the images of the television commercials, according to the designers, "symbolically express the source of Tokyo's intricate energy—a mixture of tradition and modernity."
Energy Past and Future

For seven years each April, P/A has devoted all or part of its feature section to the subject of energy conservation. This year, with our coverage of the subject, we begin what will be an ongoing series of post-occupancy evaluations of buildings, many of which have been published in P/A.

HINDSIGHT, said Henry Ward Beecher, is always better than foresight. What he didn’t say is that both are essential to progress in any area.

The following four articles offer both hindsight and foresight in the area of energy conservation. The first two evaluate the operation of and user response to several passive solar buildings. One article, written by Jean Wineman and Craig Zimring of Georgia Tech, looks at the use, operation, and maintenance of the Florida A&M School of Architecture (P/A, April 1985, pp. 74–79) now one year old. The other article, by Min Kantrowitz of Min Kantrowitz and Associates, examines seven passive solar buildings in terms of their performance and acceptance by users. Both articles take “a lessons learned approach,” as Zimring and Wineman put it, “where the post-occupancy evaluation is used as a way of improving subsequent decisions rather than of assigning blame.”

The second pair of articles discuss energy-related changes occurring in the fields of mechanical and electrical engineering. One article, by Robert Logan of Syska & Hennessy, emphasizes the impact electronics will have on the design and more efficient operation of buildings in the future. The other article, by Norman Kurtz of Flack & Kurtz, looks at the effect energy conservation has had and will continue to have on a building’s configuration, envelope, and mechanical equipment. Related to both articles is a review in the P/A Practice section (p. 63), by Harvey Bryan of MIT, of the proposed revisions to ASHRAE’s Standard 90.1P governing energy conservation in nonresidential and high-rise residential buildings.

With these articles, P/A marks its seventh year of energy-related coverage—and the beginning of the series on post-occupancy evaluations (POEs). It’s appropriate that the beginning of one coincide with the continuation of the other, for in many respects, they depend upon each other. “To understand more about how buildings use energy,” says Min Kantrowitz, “we must understand more about how people use buildings, since no one ever designed and built a building just to save energy.”

Energy conservation and post-occupancy evaluation also relate to each other through the issue of building performance. “People and buildings,” says Kantrowitz, “have a strongly interdependent, even symbiotic relationship. The performance of a building directly influences its inhabitants; in turn, user behavior directly influences building performance.”

The desire on the part of many clients to improve building performance (and thus operating costs and employee productivity) has increased the interest in POEs. At the same time, the POEs have become more interesting. “Post-occupancy evaluation,” says Craig Zimring, “started in the 1960s and 1970s as academic studies of people using buildings. Recently, it has been adopted as a routine business practice by a wide range of client organizations and architecture firms. Gray, dust-gathering reports are giving way to punchier presentations... and care is being taken in matching methods and presentation format to the needs of the users.”

This POE series also comes at a time when the architectural profession, faced with a growth in litigation, must increasingly justify past decisions. “Architects,” says Kantrowitz, “traditionally learn from experience and from analyzing the exemplary work of peers. Post-occupancy evaluation is a systematic way to do just that. The goal of POE research is to analyze systematically the reality of buildings in use.” As the courts hold architects to an ever stricter liability, the conducting of POEs may become as common as consumer research is to product manufacturers.

While “the approach to POEs varies widely,” says Zimring, with some amounting to “intensive engineering studies” and others focusing “on the experience of building users,” the goals of most POEs remain fairly constant. Those goals, says Kantrowitz, include “debugging,” which “systematically analyzes the process of settling into the building”; “fine-tuning,” which sets up a process of “continual feedback and adjustment to a set of constantly changing occupancy conditions”; “generalization,” which applies “lessons learned to other similar buildings that already exist”; and “design education,” which integrates the POE’s results into “the design of new buildings.”

Other professions have established ways that members can learn from each other’s experience. The architectural profession must do the same. The POE series, along with the articles on building failures in the Practice section, are efforts in that direction. They reflect a conviction that, just as the discussion of energy conservation shouldn’t stop with the temporary downturn in oil prices, the discussion of buildings shouldn’t stop with their completion.
Jean Wineman and Craig Zimring of Georgia Tech discuss the results of an evaluation of the Florida A&M School of Architecture, conducted by a multidisciplinary team of researchers. The article shows how much we can learn from thorough POEs.

THE Florida A & M School of Architecture building was featured in *Progressive Architecture* (April 1985, pp. 74–77) a few months after occupancy. Now, a year later, a nearly completed post-occupancy evaluation (POE) is shedding new light on the building. The POE reflects measurements and analysis of the building, and active and enthusiastic participation by students, faculty, staff, and an Advisory Task Force of key decision-makers from the university and state government. The Task Force includes people responsible for implementing recommendations from the POE and for using POE in future projects. In a meeting in late Spring 1986, the Task Force will work with the POE team to turn the descriptive information summarized in this article into recommendations for updating the Board of Regents space standards and building delivery process, fine-tuning the building to fit the architecture school’s needs, rethinking maintenance scheduling, providing an ongoing evaluation system, and providing design recommendations for academic buildings.

Major goals of the original design competition and program were to produce a building that “pushed the limits of current definitions of architecture” and that provided a symbol of the “leading edge” quality of the school. Many of those aspirations have been realized. The building has become a standard feature of the school’s publica­

An overall concern, in the Dean’s words, is that the building is not “forgiving enough” of a state university’s low maintenance budget and high need for flexibility, and of the extreme wear and tear caused by the activities of an architecture school.

How the POE Was Performed

The Florida Legislature was not only interested in producing a high quality, energy-conserving building, they also permitted a number of procedural innovations for Florida such as selecting the architect by competition, shortcutting some steps in the normal state building delivery process, and allowing some normal codes and standards to be relaxed. The POE was initiated to study systematically the building and building delivery process to help the state understand how to deliver higher quality buildings more quickly.

The POE team, a multidisciplinary group from Georgia Tech and Min Kantrowitz & Associates, studied six goals of the original program, which were to: create an image that would be advanced, yet humanly scaled and inviting; create a comfortable, state-of-the-art HVAC system that demonstrates energy conservation; increase building use; provide effective workspace; promote social interaction among students and faculty; and provide security in a building open 24 hours. The Advisory Task Force, which met early in the project to help establish goals, added a number of issues, such as: how well the innovative building-delivery system functioned; how easily the building could be maintained; and how easily it could accommodate changing needs of the architecture school or future occupants.

The POE team studied the school’s former makeshift quarters, monitored the construction process, conducted a check visit ten months after occupancy. Now, a year later, a nearly completed post-occupancy evaluation (POE) is shedding new light on the building. The diversity of materials and details provides interest but also creates maintenance problems. An overall concern, in the Dean’s words, is that the building is not “forgiving enough” of a state university’s low maintenance budget and high need for flexibility, and of the extreme wear and tear caused by the activities of an architecture school.

The Florida A&M School of Architecture, by Clements/Rumphill & Associates, has a front block (above) related in scale and material to the facing houses. The studio wings (far left) contain south-facing thermal chimneys, ridge ventilators, and operable windows. The open walkways (left) overlook the courtyards and outdoor amphitheater, promoting interaction among students and faculty.

Students and faculty are proud of their new building and bring visitors often. The school is a campus landmark. As one student
reports. "If I say I'm from the architecture school, everyone knows the building." Many students and faculty commented that the building is particularly dramatic at night when it is fully lighted. At night, especially from the west, it has a wonderful playful quality described by a student as a "Disneyland version of a factory."

Part of the building's visual interest is in the variety of materials. That, however, has created difficulties in construction and maintenance. The joining of materials is of particular concern to several administrators involved in the project. Unusual and complex construction details caused difficulty for construction trades inexperienced with them. Depending on sealant for weatherproofing joints may become a maintenance problem, since leaks attributed to joint conditions have been common during the first year of use. There is also a question about the long-term durability of some materials such as fiberglass, not previously used in Board of Regents' buildings.

The exposed steel trusses and HVAC ductwork are "dust collectors" and not within the routine care of the custodial staff. Their inaccessibility, as well as that of lights and HVAC controls, requires special equipment for maintenance or repair. A truss spanning the atrium in the administrative wing had a plaintive "dust me" written on it for weeks before it was attended to.

Lessons Learned from the Energy and HVAC Systems

The elements of the passive energy system provide students an instructive model. In terms of performance, however, the passive energy system may be overly experimental; and the computerized control system, too difficult to program and fine-tune.

The design concept for the passive system—south-facing solar chimneys—was based on its use in a residential project in the Northeast where, according to the passive design consultant, it seemed to work well. Although he acknowledges the system might provide only marginal thermal performance, the educational value of the system was of primary concern.

The system operates somewhat differently from that originally conceived because of budget constraints and changed procedures. The passive heating mode was originally intended for the entire building. Because of cost cutting, it is functional in only one of the four wings. The ventilating mode operates in three wings. There was also an expectation by the architect that mechanical cooling and ventilation would not occur in the same seasons; the central chiller was to be shut down during moderate seasons. Paddle fans specified for the studios and a desiccant bed included in the original concept ultimately had to be eliminated because of cost.

A major complaint of students, faculty, and staff is thermal comfort. They are often too warm or too cold with little ability to control conditions either mechanically or through adjustments such as opening windows. Some students have taken the situation into their own hands by dismantling the computer-operated ventilation panels and opening them manually.

There have been a number of "settling-in" problems that may contribute to users' responses, including difficulties in "tuning" the system and a major power outage during which the manual override for the system was unworkable. However, it may be difficult to provide thermal comfort using the system as built for several reasons. Heat is conducted into mechanically cooled space in the summer and out of heated space in the winter through steel trusses penetrating the building's skin, and through steel columns in both interior and exterior walls. Steel studs and trusses also transfer heat from the thermal chimney to interior spaces without a thermal break. On a sunny day, as one walks across the studio space, a clear temperature differential can be felt, with the wall adjoining the thermal chimney radiating heat to the interior. With a number of visible cracks in gypsum board and at joints, there is concern about the long-term effects of thermal stress on the building.

Humidity is a major drawback to the success of the passive cooling system. Students complain that if drawings are left out for any length of time, they bubble and curl because of humidity. When the exterior temperature drops below 75 degrees, the system switches into the ventilating mode (mode switches are based on temperature alone). However, if the thermal chimney is not charged by the sun, such as at night or on a cloudy day, sufficient cooling does not occur. (It had been hoped that adequate nighttime cooling would be provided by the wind-assisted ridge ventilation.) Humidity absorbed by interior materials while the system is in the ventilating mode puts additional load on the system during mechanical cooling, potentially offsetting energy savings.

There is a question whether the complex computer-run system is appropriate for a state-owned educational building. The system requires a fully trained building engineer to run it and no such person is available at the university. Fortuitously, the school of architecture has faculty who understand the system and have taken on the responsibility of operation. The original program for the system had many "bugs" and has had to be reprogrammed to meet occupant needs and to provide for greater overall energy efficiency.

The lack of adequate ventilation may be appropriate for a building used only from 9 to 5, such as a professional office building, but has resulted in cries of outrage from architecture students who often inhabit the buildings around the clock. It was proposed by the architect as a "hands-on laboratory," yet little can be done to alter uncomfortable conditions.
Making a Workable Building

In addition to presenting an appropriate image and energy-conserving HVAC system, the client and architect were concerned with making a building that would be flexible and efficient for a school of architecture. The planning and overall building organization are clear and contribute to the easy inside/outside movement. A gallery space off the main entry to the administrative wing is heavily used and provides a constantly changing view of student work and traveling shows. Segregating faculty into an administrative wing with access controlled by a receptionist remains controversial, with some faculty liking the refuge and faculty interaction and others feeling isolated by the separation; students were uniformly negative about it.

The open walkways and high nighttime light levels have contributed to increased security. The clustering of functions used during the evening and night, including the student lounge and heavily used graduate studio, has contributed to students being present to look out for each other. Surveillance is reduced, however, by the height of the studio windowsills, which reduces direct visual contact with the outside. Nonetheless, the outdoor circulation system allows students 24-hour access by providing them with keys to a single studio.

One of the primary goals of the school was to create spaces that would encourage faculty as well as students to work in the building. The faculty offices appear to be successful in this respect: Faculty appreciated having private offices, even of 84 square feet. They found it quite workable to move to a small conference room for larger meetings. Studios, in contrast, fall short of expectations. Even on bright sunny days, the studios are dim: Students refer to them as "caverns." Windows on the north wall have sills too high to see out from a seated position and provide little light because they are shaded by overhanging roofs or walkways. When the automatic ventilation panels on the south wall are closed, natural illumination is further reduced. Students and faculty unanimously agree that the library is the nicest space in the building, particularly the lounge area adjacent to the entry, where floor-to-ceiling windows provide natural light and capture the exceptional views to the west.

Students and faculty are enthusiastic about the openness of the plan. They enjoy the easy relationship between interior and exterior spaces, often taking advantage of good weather to hold classes and meetings outside. Students play frisbee, socialize, relax, and eat lunch in the plaza area on the ground level. The stairs to the street form a natural amphitheater. Yet while most students and faculty feel social interaction is enhanced by the ability to see one another on the open walkways, some report greater isolation of faculty from students because of the "wing" organization of the building.

Graduate students, for example, must go out of their ground-floor studio and up three levels to converse with most of their professors.

Flexibility, a major programmatic objective, has been limited by providing studios for less than 20 workstations. Although allowing students to feel some identity with their studio group, it is problematic for administrators to schedule unusually large or small classes. Students also felt a bit isolated from each other and wished they could more easily see the work of other classes. Although the exposed HVAC system makes it difficult to subdivide space or move partitions, the 50-foot structural spans allow studio walls to be removed without major changes in structure or mechanical systems.

Summary

The POE team, with the Task Force, is developing a plan to implement recommendations. The benefits of the POE project go beyond space standards, building delivery, fine-tuning, maintenance scheduling, or design recommendations. It has helped students and faculty to think about and take control of their building and has helped decision-makers to reconsider the process they use to produce and manage buildings.

In sum, the building is exciting but shows some disturbing lapses in the design of the energy system, flexibility, and attention to maintainability and to user comfort. The bottom line was best expressed by a faculty member who said: "The students learn a lot from the fine qualities of this building—form, scale, structure, zoning, materials, lighting. They also learn from its flaws. What more can we ask?" Jean Wineman, Craig Zimring

Jean Wineman, Associate Professor of Architecture at Georgia Institute of Technology, received her Ph.D. from the University of Michigan. She recently edited the book Behavioral Issues in Office Design (Van Nostrand Reinhold, 1986). Craig Zimring, Associate Professor of Architecture and Psychology at Georgia Tech, received his Ph.D. from the University of Massachusetts. He has done POEs for public and private clients.

Project Team

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Min Kantrouzis & Associates, Inc.: Richard D. Barnes, Randolph-Macon Woman's College, project associate; Jay Farbstein, Jay Farbstein & Associates, analysis of construction process; Min Kantrouzis, Min Kantrouzis & Associates, project manager, energy issues; Robert Shibley, Caucus Partnership, advisory task force organization and coordination; Lynda Schneekloth, Caucus Partnership, landscape, contextual issues.

Florida A&M School of Architecture: Edward T. White, project officer.

Jean Wineman, Associate Professor of Architecture, Georgia Institute of Technology, received her Ph.D. from the University of Michigan. She recently edited the book Behavioral Issues in Office Design (Van Nostrand Reinhold, 1986). Craig Zimring, Associate Professor of Architecture and Psychology at Georgia Tech, received his Ph.D. from the University of Massachusetts. He has done POEs for public and private clients.
Min Kantrowitz, who heads her own research firm in Albuquerque, N.M., summarizes the findings of her post-occupancy evaluations of sixteen passive solar buildings, seven of which are discussed here. She found that passive solar features are well liked but easily foiled.

THE only reason that buildings use energy is that people use buildings. In order to understand how buildings use energy, we must understand how people use buildings, since no one ever designed and built a building just to save energy. Buildings serve a wide variety of purposes, some symbolic, some functional, some aesthetic. The challenge of energy-conserving design is to design, construct, and occupy a building that provides the best environment to support and enhance it, while saving auxiliary energy.

People and buildings have a strongly interdependent, even symbiotic relationship. The performance of a building directly influences its inhabitants; in turn, user behavior directly influences building performance. This interaction is even stronger in passive solar buildings, which are dynamic systems, continually responding to changes in the internal and external environment. In more traditional buildings, a "steady state" is assumed, one in which there is often little fluctuation between the work environment (e.g., stringent requirements for a narrow comfort band—workers can't move to another room if they are uncomfortable—rigid working hours, security concerns). The second reason related to uncertainty about how building users would respond to an energy-conserving building in which they had no direct "stake" (e.g., no direct financial payoff, no philosophical commitment, no "pioneer" spirit). Can people who don't stand to benefit directly from financial or philosophical rewards be satisfied in passive solar buildings? Can these users successfully learn to operate these dynamic, flexible, buildings to optimize energy savings?

Even with the increasing use of passive solar techniques in commercial buildings, most building evaluations and published descriptions have concentrated almost exclusively on the design and performance of the technical aspects of buildings' energy systems, with some discussion of architectural design issues and concepts. The questions of how well commercial passive solar buildings support the activities that they house, how comfort is actually experienced by building users, how the unique characteristics of these energy systems influence building users, and how users influence building energy use patterns have rarely been examined. This article reports on the most extensive of these efforts, the Post Occupancy Evaluation of passive solar buildings in the Department of Energy Passive Solar Non-residential Buildings Program. This is the largest known attempt to evaluate simultaneously construction and operational costs, actual energy use and occupancy effects and reactions in passive solar non-residential buildings.

In 1979, the Department of Energy initiated the Passive Solar Nonresidential Experimental Buildings Program to assist in the design, construction, and evaluation of a diverse set of passive solar commercial buildings. Twenty-two buildings throughout the United States completed the design phase of the program; they use advanced conservation techniques as well as passive solar heating, cooling, and daylighting. Designers provided information including expectations about building occupancy patterns, operational assumptions, and estimates of anticipated energy performance. During the one-year evaluation phase, a team of design and research consultants measured each building's energy use and, through site visits and extensive reporting, examined building use patterns and occupant responses. Each month, actual energy use was compared to predicted energy use and occupancy assumptions, and then analyzed in light of weather data, building use patterns, and user comfort. Of the 16 buildings that completed the evaluation phase of the program, this article concentrates on 7 of them that illustrate a wide range of design approaches and occupancy issues.

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**REFERENCE ENTRY**

P A POE

Light Shelf Sawtooth Clerestories

The Mt. Airy (N.C.) Public Library, designed by J.N. Pewz Associates and Mazria/Schiff & Associates, 13,500-square-foot building. It has south-facing windows containing light shelves to bounce daylight into the space and south-facing sawtooth clerestories with interior baffles to diffuse the daylight entering the central portion of the library.
A 15,750-square-foot elementary school located outside Fairbanks, Alaska, the Two Rivers School was designed by Charles Bettisworth and Company. Intended as a prototype passive solar school responsive to Alaska’s harsh climate and high energy and construction costs, the building features an earth berm and a thermal shuttering system over the south-facing triple glazing.

This community education facility, a 5700-square-foot building designed by Bohlin Powell Larkin Cywinski, is at the Shelly Ridge Girl Scout Center near Philadelphia. It uses direct solar gain and a trombe wall to spread heat delivery throughout the day.
Findings
Overall, people are very satisfied with these buildings. Although satisfaction did vary some among individual buildings, the annual pattern indicates a high degree of satisfaction with all buildings in all climates in all seasons. A large majority of people said they liked the appearance of the buildings more than other buildings serving similar functions. Most also felt that the fact that the building was solar had a positive effect on their feelings about its attractiveness.

The popularity of these buildings led to many operational changes, including longer hours of operations and significantly increased occupancy levels. In all seven of these buildings, the number of users increased dramatically over predicted levels after the buildings were opened. For example, more than twice as many people use the new Mt. Airy library each day than was originally anticipated. The popularity led management to expand operating hours from 53 to 66 hours per week. In Wells, Minn., Security State Bank management was pleased when many new customers came into their new bank building to look, and then opened accounts.

Some of these operational changes strongly influenced building energy use. For example, in the Two Rivers School located in a rural area outside of Fairbanks, Alaska, some use by community groups was predicted. However, the school was so popular for evening events that the custodian had to switch to working the 11 P.M. to 7 A.M. shift, explaining the unexpected heating demand during these hours.

Buildings were frequently so popular that spaces originally designed to be unoccupied (transition spaces, storage areas, etc.) were pressed into use. The south-facing sunspace at the RPI Visitor Center, with its mass floor and walls and movable insulating curtain, was designed to contribute to the center’s space heating needs and to act as a thermal buffer area. When this area was temporarily filled with blackboards and used as a classroom, the students were uncomfortably warm. To reduce overheating and glare, the insulating shades were closed, reducing the solar gain that the sunspace was designed to provide. In addition, the adjoining offices, which depended on borrowed light from the sunspace, found that the blackboards blocked their light source, which had already been reduced by the use of the insulating curtains. Auxiliary energy had to be used to establish comfortable thermal and lighting conditions.

People were basically satisfied with thermal comfort, but some complaints about cool mornings and warm afternoons leads to questions about the design of thermal mass. Comfort was generally high throughout the year, with more complaints during the winter and summer seasons than during the swing seasons. There are, however, some consistent patterns of “too cool in the morning” and “too warm in the afternoon” complaints. “Cool mornings” may be due to:

- Thermostat setback strategies in high mass buildings that were initially too deep and/or long. At Mt. Airy, for example, user feedback led to trying alternative setback approaches (e.g., shallower set back, stepped and/or earlier start up) until a satisfactory balance between user comfort and energy use was achieved. This is a good example of how the fine-tuning function of POE allowed feedback from building users to influence directly patterns of building operation.

- Changed timing of building use. In several buildings, users occupied the building earlier in the day than predicted, thus making planned timing of the heat release inappropriate. For example, a community college building in Colorado was supposed to operate only during afternoon and evening hours. The passive system was carefully designed to provide comfort conditions during those times. However, the building was so popular that people started demanding that it open at 8 A.M., necessitating the use of auxiliary heating systems.

“Warm afternoons” may be related to:

- Increased building use.

- Ventilation problems. Shading to decrease solar gain, to reduce glare or darken a room sometimes interfered with ventilation. At Essex Dorsey Senior Center and at Two Rivers School, for example, when users felt too warm in the afternoon, they lowered the insulating shades to reduce solar gain. This effectively eliminated the use of windows for natural ventilation.

Designers tried various passive ventilation approaches; some worked well, others had a number of design and user related problems. All the buildings used natural passive and hybrid ventilation systems as an integral part of the cooling strategy. The POE revealed that:

- Assumptions about using air movement within buildings for cooling were sometimes incorrect. A number of designers based their cooling design strategies on assumed paths of interior ventilative currents. While most of these worked well, drawings of other assumed paths showed “magic arrows” indicating air currents turning corners or traveling along indirect pathways to deliver cooler air to occupants. Users, however, often reported feeling too warm in some of those areas.

- Reliance on purely passive “chimney effect(stack effect)” cooling was frequently unsuccessful from the point of view of user comfort. Further examination revealed that this was either because the balance between inlet and outlet aperture size was not optimal, or, more frequently, because one or the other would be closed. For example, at Mt. Airy Public Library, the high windows located along the north walls were to be opened to increase ventilation. However, the librar-
ians chose not to use the awkward poles and just left the windows closed.

Similarly, at the Essex Dorsey Senior Center, the high outlet windows were awkward to operate and were used inconsistently. The deep porch overhang and plantings in the courtyard also interfered with the free flow of air that designers had predicted would enter through the courtyard. Hybrid systems using exhaust fans to draw out the warm air, such as the one cleverly designed into the east façade of the Shelly Ridge Girl Scout Center, were more effective.

- Night flushing strategies sometimes fell victim to security concerns. Both Comal County Mental Health Center and Essex Dorsey Senior Center are community facilities in suburban areas with little crime. Yet their management personnel would not cooperate with a night flushing strategy requiring open windows because of security concerns. At Shelly Ridge Girl Scout Center, however, the inlet apertures in the north wall were too small for an intruder to enter and were used as intended.

- Complex window assemblies caused difficult compromises. Multipurpose window assemblies were tried in a number of these buildings. By combining windows with a variety of insulating and shading devices, a multipurpose assembly (for view, light, heat, ventilation, insulation, darkening, solar gain reduction, and glare control) might occupy a very small area of the wall. But, to be effective for ventilation, the opening must remain unobstructed. Conflict sometimes occurred when shading devices were used for darkening, solar gain reduction, or glare control, and impeded the inflow of air. At Essex Dorsey Senior Center and at Two Rivers School the users were left with the choice of being too warm while the room was dark enough to show slides, or allowing ventilation, but not showing slides. At RPI, the thermal curtain was initially lowered automatically when the temperature in the sunspace exceeded 85 F, lowering the light levels dramatically. In one building, users taped a black plastic garbage bag over a carefully designed skylight to darken the room for a performance, but never went back to remove it.

Users were delighted with the daylighting. Daylighting was used as a passive design strategy in all of the buildings and was usually very well received. Users mentioned it spontaneously more frequently than they brought up anything else about any of the buildings. Some people specifically commented that they enjoyed knowing when clouds were passing, even if they were not sitting by a window, just by the change in daylighting. Fewer than 5 percent of all occupants complained about "too dim" or "too bright" conditions, across all buildings and types of daylighting design. In some buildings, people who initially worried about the natural lighting approach "got used to it" and said they enjoyed its variable, dynamic quality.

Even distribution is the most important aspect of successful daylighting. When the light was well distributed, the buildings were visually comfortable, and largely glare-free. Those buildings where beam sunlight was allowed to enter the space directly were less successful. As the late Si Daryanani, a prominent engineer said: "trying to light a space with beam daylighting is like trying to take a sip of water from a fire hose." The most successful daylighting solutions were those in which glare and contrast were controlled by:

- not allowing beam daylighting to enter an occupied space directly. Baffles, diffusing reflecting surface, and/or diffusing glazing were used to control and break up strong sunbeams. The daylighting at Security State Bank and Mt. Airy was very effective; both used carefully designed baffles for diffusion.

- using apertures in the roof or high on the wall plane (clerestories, skylights, roof monitors) rather than daylighting sources on the building perimeter (windows, with or without light shelves).

- providing a number of smaller roof apertures rather than a few large openings.

Daylighting was often sufficient for task lighting as well as ambient illumination. In many buildings, the designer depends on daylight only for background lighting. In five of these buildings, however, Mt. Airy Library, Security State Bank, Essex Dorsey, Shelly Ridge, and St. Mary's School Gymnasium, daylight provided the majority of the task lighting, although artificial lighting systems were available. Sometimes manual lighting controls can save more energy than automated systems. Correct manual lighting control can result in both energy savings and acceptable lighting levels. Special studies carried out by Lawrence Berkeley Laboratory (Andersson et al., 1984), concluded that in the Mt. Airy Library, and one other building studied in depth (Community United Methodist Church educational addition), users operated manual lighting controls in a more energy-efficient manner than simple automated control systems would have under the same occupancy and daylight conditions. One reason is that, given the opportunity to control lighting levels, people were often satisfied at lower illumination levels than recommended by current industry standards.

Despite the fact that building users can operate manual lighting controls to save energy while achieving comfort, many still turn on the lights almost automatically at the beginning of the work day, irrespective of their actual illumination requirements. This may be a symbolic way of saying, "I am open for business and ready to work." Once lights have been turned on, people tend not to turn them off.

Several designers used light shelves to bounce light deeper into interior spaces. When they were located within reach, users put plants on them. While this was wonderful for the plants, the result for
distribution of light was less successful.

There were some complaints about acoustics in the majority of buildings, and four types of problems were examined: people being disturbed by overhearing things, having difficulty on the telephone or with conversations, and having difficulty concentrating. Concentration and conversation problems were most frequent. In addition to the increased use of the buildings adding noise, there were some design problems relating to sound isolation and sound absorption.

- Effective sound isolation is difficult in open-plan passive solar buildings, since the designs enhance convective flow for heating and ventilation. For example, in the Security State Bank, the manager's office had four walls, but no ceiling, so that the office would exchange air with the rest of the building. In addition, the office was designed to receive daylight reflected from above. However, since sound was also exchanged and reflected, the office had little acoustic privacy.

- Large expanses of wall and floor surfaces designed for thermal storage mass also reflect sound since they are constructed of non-sound-absorptive materials. Users at St. Mary's Gymnasium and Shelly Ridge Girl Scout Center both reported this concern.

In some buildings, management added acoustic treatment as the fine tuning of the building progressed.

Air quality was generally satisfactory in all buildings. During the settling-in period, a few people reported feeling drafts, usually related to construction problems that were then remedied. Later reports of stuffy, smoky, or drafty conditions occurred in areas not originally designed to be occupied.

In some situations, contrast effects magnified discomfort. Contrast situations seemed to magnify people's awareness of differences in thermal, acoustic, and lighting conditions. For example, in the hot, humid summers in Baltimore, senior citizens using the Essex Dorsey senior center entered the front door into an air-conditioned space, then passed into a lounge area cooled by passive ventilation. By contrast, the lounge area felt too warm. At the Johnson Controls Branch office building, a dark colored carpet contrasted strongly with the light work surface and caused initial discomfort. Later reports of stuffy, smoky, or drafty conditions occurred in areas not originally designed to be occupied.

In some situations, contrast effects magnified discomfort. Contrast situations seemed to magnify people's awareness of differences in thermal, acoustic, and lighting conditions. For example, in the hot, humid summers in Baltimore, senior citizens using the Essex Dorsey senior center entered the front door into an air-conditioned space, then passed into a lounge area cooled by passive ventilation. By contrast, the lounge area felt too warm. At the Johnson Controls Branch office building, a dark colored carpet contrasted strongly with the light work surface and caused initial discomfort. Later reports of stuffy, smoky, or drafty conditions occurred in areas not originally designed to be occupied.

People want the opportunity to control comfort conditions in their buildings. Architect/engineers' conversations are full of anecdotes about how users "interfere" with automatic thermal and lighting controls. Among these seven buildings, users broke into locked panel boxes to gain access to the central controls in two of the buildings, routinely overrode the automatic thermal shutter systems in two of the buildings, broke the locked protective boxes covering programmable thermostats in one building, and demanded an increase in the number of building systems under manual control in another building. This is consistent with other findings that people are most satisfied with their environments if they have opportunities to interact with them in meaningful ways.

People controlled comfort conditions best when the operations were simple and clearly understandable, and when controls were familiar, located close to users, and had some noticeable effect when used. Manual controls were managed most effectively when a few full-time building users were in charge. For example, Shelly Ridge Girl Scout Center and Mt. Airy had full-time users who learned how to operate the buildings' manual controls well. When instructions were communicated appropriately for the group's level of education and sophistication, part-time users could understand and help operate the buildings; Shelly Ridge added simple Plexiglass explanation panels near each building element that contributed to the passive solar system. St. Mary's Gymnasium designers wrote a short illustrated manual describing how (and why) to operate the building's passive solar components.

Users had the most trouble operating manual controls that were complex, ineffective, counter-intuitive (i.e., closed glass fireplace doors to keep the building warmer), or demanded a hierarchy of actions. At RPI, building occupants seemed overwhelmed by the
many different systems. Despite frequent orientations, users often followed the most expedient route when several options were available, which did not always result in the best energy conservation practices.

Post-Occupancy Evaluation provided early feedback that building managers used to improve building function. A number of building owners and managers commented about how useful they found the monitoring and post-occupancy evaluation. They, together with the evaluation team, were able to use feedback about the buildings in discussions with users in fine-tuning the building's operation.

Conclusions

The buildings in the Department of Energy Passive Solar Nonresidential Experimental Buildings Program saved energy while providing comfortable, functional environments for their users. The Post-Occupancy Evaluation identified how light distribution, thermal mass, and acoustics influence user comfort. It isolated important building/user interactions, finding that user behavior in these buildings strongly affected energy use, sometimes positively and sometimes negatively. And it helped accomplish the fine-tuning necessary to obtain optimal building energy performance.

The POE also found that programmatic assumptions about building use patterns were often too specific, as if the concern for buildings' energy performance obscured the architects' concern for building flexibility. In two buildings, for example, the comfort of full-time users was well addressed, but that of the large number of transient users was not. Frequently, assumptions about user interactions with the building were not at all explicit, resulting in some operational problems. A specific energy component in a building's program would address these issues. Written building operation manuals, as well as regular feedback on building function through post-occupancy evaluation, could result in even better building performance.

Further research on energy-efficient design must systematically address both user comfort and user interaction issues, if total building function is to be understood and improved. These issues include thermal mass effects and perceived thermal comfort (timing of heat delivery to space, relationship between mean radiant temperature and ambient temperature, proximity to thermal storage mass, effect of air movement), acoustical concerns (effective sound isolation and absorption in passive solar buildings), psychological effects of daylighting, and the relationship between environmental control and perceived comfort.

The Post-Occupancy Evaluation not only accomplished the debugging and fine-tuning of individual buildings, but its results were generalized to other buildings in the program. Designers, evaluators and building owners directly involved in the program are already using its results in the next generation of design. Rather than evaluation being seen as a dreaded judgment by uninvolved outsiders, this POE demonstrated the importance and usefulness of systematic learning from experience in buildings. Min Kantrowitz

The author, who holds graduate degrees in both architecture and psychology, heads her own research firm in Albuquerque, N.M.

References


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Major participants in the multidisciplinary team include: Burt Hill Kosar Rittelmann Associates, prime contractor for technical assistance, review, and administration services; Lawrence Berkeley Laboratory, program support and systems studies on daylighting, thermal mass, and occupancy impact on energy performance; Booz, Allen and Hamilton, program support and case studies; Sizemore/Floyd, technical monitoring; Hart, McMurphy and Parks, economic analysis and performance overview; Architectural Energy Corporation, energy data monitoring services; W.I. Whiddon & Associates, case studies and design overview.

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(The complete design and performance overview of the project, including a number of in-depth building case studies, is due to be published in an edited volume by Van Nostrand Reinhold in the Fall of 1986).
Energy-Conserving Engineering

WHEN oil prices skyrocketed in the early 1970s, Americans realized painfully that energy costs had a sharp effect on everyday life. The sudden concern for conservation prompted exploration of new techniques and rapid development of new products, which dramatically changed the way buildings are designed. Electrical and mechanical engineers now employ tools once considered interesting but discretionary options that have become standard in design of all types of buildings.

Energy conservation, still important, is likely to cause evolutionary rather than revolutionary changes in building engineering systems. We can at the same time expect changes driven by new forces, including a concern for health and safety and increasingly sophisticated demands for information processing.

Where We Are

Economic incentives created by the energy crisis have stimulated activity in four arenas: changes in building management, exploration of new techniques, development of new products, and government incentives for research and application of technology. These efforts have required close interaction of all team members in the design process: architect, engineer, developer/owner, contractor, and vendor. Architects in particular have become sensitive to what could be accomplished with the right technology.

Today's energy-related building systems reflect ten years of experience, fine-tuning successful solutions and weeding out those that proved less cost-effective. The following is a summary of the tools that are today considered not only accepted but expected in building design.

- **Building Configuration and Design.** Architects have explored a number of ways of locating buildings on a site and of shaping their bulk either to make use of or to protect the interior from natural elements such as the sun. These measures go hand-in-hand with the design of fenestration. In hot climates, thicker walls, smaller and/or recessed windows, and northern orientation reduce heat gain. Light shelves turn unwanted direct sunlight into diffuse light in light wells and perimeter offices. Atriums serve as buffer zones for heating and cooling and as a means of bringing...
natural light to interior offices. These architectural solutions all tie in closely with engineering systems designed specifically to accommodate them.

- **Window Walls.** Improvements in the window wall have led to a number of changes. Reflective glass has cut heat gain. Double glazing has reduced heat loss in winter. Tighter seals have cut the air volume required to heat and cool by as much as 10 percent; they also preserve building heat better during weekends, requiring shorter warm-up periods. As a result of these changes, the location of the heat supply source no longer has to be under the window, which allows greater freedom in design.

- **Building Automation Systems.** One of the biggest revolutions has been the development and use of building automation systems. They have enabled many other changes that require automatic, sensitive, quick, precise, and reliable controls. Direct digital systems now incorporate many different pieces of information (weather conditions, time of day, weekends/holidays, occupancy, prevailing rate structures, equipment performance, etc.) and automatically issue precisely calibrated commands to banks of controls and machinery.

- **Lighting.** Changes in lighting have been extensive. Most evident is the growing use of task lighting, which means fewer fixtures, lower levels of ambient light, and more focused light on work surfaces. New, sophisticated control systems react to the time of day, occupancy, and availability of natural light to tailor output without relying on human effort. Improvements in lighting have reduced total power requirements by cutting electricity needed for lighting and by lowering cooling requirements. Improvements also have taken place in fixtures, lamps, and ballasts; today designers have a wide variety of choices, although care is still needed to select the truly efficient fixtures from those that simply look efficient. Examples of new developments include parabolic luminaires, energy-saving and electronic ballasts, Octron lamps, and lighting provided within furniture and partition systems.

- **HVAC Equipment.** HVAC equipment has become more efficient, reliable, compact, and varied. Variable air volume systems have almost completely replaced constant air volume systems, relying on concurrent improvements in controls and monitoring systems.

Axial flow, pitch-in-motion fans are a good example of existing technology not readily used until incentives overcame inertia. Today they are fully accepted and in frequent use in a variety of buildings.

Manufacturers have developed high-efficiency chillers and boiler, both electric and gas-fired, whose performance and reliability outstrip those in use ten years ago. Their slightly higher initial cost is easily justified by short payback periods and long-term reduction in maintenance and operation cost.

- **Natural Resources.** Passive solar heating has frequently proved very effective, in some cases doing away with the need for a boiler. The system used at Codex Corporation in Canton, Mass., burns no fuel, requires small booster chillers only 5–10 days a year, takes up less floor space than conventional HVAC systems, and is less expensive to operate.

Methods for using river water are similar to those for using ground water. The World Financial Center at Battery Park City in New York (P/A, July 1985, pp. 79–86) draws water from the Hudson River, cleans and purifies it, runs it through a heat exchanger to cool building condenser water, and returns it to the river.

- **Thermal Storage.** Thermal storage systems, which chill water at off-peak rates and store it for use during peak rate periods, have proved useful when space for storage tanks is available. The World Financial Center uses a thermal storage system in conjunction with cooling systems, required to offset heat gain from high-tech equipment has further increased the load. An average one-million-square-foot commercial building today requires supply capacity of 9000 kilowatts, as compared with 4500 kilowatts 20 years ago. To provide the added power, the electrical supply components—its switchgear, transformers, and electrical panels—must be larger and equipment sized accordingly.

Computer-based equipment creates the need for power of higher quality as well. Higher quality power supply is characterized by reliability—the ability to guard against power failure from public utility outages—and uniformity—the ability to prevent inconsistencies in voltage and frequency.

To provide these characteristics, engineers are transplanting techniques and equipment developed for use in computer facilities to electrical systems for general work space. To ensure uniformity, surge suppressors, isolation transformers, voltage regulators, and line conditioners are included in more and more power supply systems, and distribution systems are being carefully grounded. To ensure reliability, engineers are beginning electrical design with studies of the local utility’s history, and equipping buildings with uninterruptible power supply (UPS) systems and backup generators. UPS equipment provides instantaneous backup power during the time required for orderly computer shutdown or emergency generator activation. Emergency generators are being designed to higher power standards. By-pass and isolation capabilities are being built into supply systems, and multiple services from the utility are being provided for entire buildings or selected internal areas. In combination, these subsystems can provide practically failureproof electrical supply.

Today’s power distribution systems must also be more carefully engineered than ever before. Power must be brought to more points, and because of the frequency of moves and changes in the office, the system must be extremely flexible. Proliferating cabling must be effectively managed.

One solution is to use access flooring, combined with various types of flexible, modular cable and outlet components. But unless these are matched with effective management of both power and communications cabling, access flooring will conceal, rather than solve, the problem of wire proliferation brought on by computers.

An alternate or complementary solution employs uniform wiring plans—fixed cabling networks that distribute both power and communications wiring to numerous outlets on a grid, so that most equipment can be moved without cable changes. By reducing the need for space under the floor, a uniform wiring plan also offers the possibility of reducing floor-to-floor height requirements. Wide-scale adoption of such networks is becoming more likely as computer manufacturers gravitate towards common standards for communication cabling, and as communications networks begin to be integrated with power distribution systems.

Engineers are focusing more attention than before on lighting as a part of electrical design, and are adapting designs to the increased use of video display terminals and to the growing awareness of lighting’s effect on occupants. Low-glare systems employing parabolic louver shading or indirect lighting, paired with more extensive task lighting, are becoming the norms to improve occupants’ performance and morale.

- **HVAC Systems.** Along with increased demands on the electrical system, computers and automated workstations in today’s buildings have created an increased demand for cooling capacity, cool air distribution, and HVAC system flexibility. Since electronic equipment will not tolerate sharp temperature changes, maintaining constant temperatures throughout the office space is more critical than ever before.

Despite reductions in heat gain from light fixtures and external sources, and despite anticipated changes in computer technology
SNAP energy management system controls air conditioners, exhaust fans, refrigeration, heating, and lighting, reducing energy costs by matching operation to actual needs. SNAP/NET software provides a means for supervising multiple SNAP installations from a single location. It is compatible with IBM's PC Jr., PC, and PC XT. SNAP controls a small facility or multiple, widely scattered facilities via a telephone network. AMF Control Systems.

Circle 249 on reader service card

JC/85 Building Automation System performs complex HVAC functions, energy, maintenance, and security and lighting control. One or more computer components and associated controls can be combined to create a customized system for specific installations. Components vary from mini and personal computers to microprocessor-based direct digital controls. The system is UL listed for fire, security, and process management systems and conforms to National Fire Protection Association codes. Johnson Controls, Systems & Services Div. Circle 250 on reader service card

The Facilitec master controller is a menu-driven energy management system and a programmable controller for building automation. It has universal output capability and allows both analog and digital inputs. The master unit can connect with up to 15 slave units as far as a mile away. Both master and slave units contain 16 outputs and 32 inputs. Triangle Microsystems. Circle 251 on reader service card

Ultra Edition load design is a new software program for the Customer Direct Service Network that links building system designers, consulting engineers, and contractors to the Trane mainframe computer. It can analyze a dozen different HVAC systems located in different parts of a proposed building, allowing system designers to analyze existing building systems or modifications to existing systems. Also new is an acoustics program that automates calculations necessary in acoustical studies of proposed and existing HVAC systems. The Trane Company. Circle 252 on reader service card

Network 2100 integrated building management system comprises energy management, life safety and security, facilities management, and direct digital control. It automates HVAC, lighting, refrigeration, and other plant equipment. Functions include proportional + integrated + derivative control, positionable motor control, optimum start/stop, comfort-compensated duty cycling, and demand limiting. Network 2100 is also a facilities management system that monitors status and run times of many types of building equipment. Barber-Colman Company, Environmental Controls Div. Circle 253 on reader service card

Cascade evaporative air-conditioning units for applications in the 20,000-50,000 CFM size range include an indirect cooling section and a direct cooling section, with primary and secondary fans, outside air louvers, dampers, filters, and controls. In larger buildings, multiple units can be combined for higher air flow requirements. Standard layouts are available for 100 percent outside air constant volume cooling, economizer cycle operation, and variable air volume control. A six-page brochure describes the system, illustrates its features, and includes a psychrometric chart. Norsaire Systems. Circle 254 on reader service card

Building Energy System Analysis (BESA) microcomputer programs for building retrofit analysis in three software packages address specific user groups: architects, engineers, and A/E. The user can evaluate retrofit strategies, exercise any of more than 50 energy conservation measures contained in the program, or use the built-in parametric analysis option. BESA programs provide a cost effective means for retrofit analysis simulation. An average application requires less than three minutes of microcomputer run time. Candapan Resources. Circle 255 on reader service card

Time Control Units 4000 or 16000 enable commercial, industrial, and institutional facility managers to control lighting, security systems, industrial machinery, heating, and air conditioning with the press of a button. The system automatically adjusts for leap years and daylight-saving time, and can accommodate up to 20 holidays. The system's capabilities can grow as needs change. Touch-Plate International, Inc. Circle 256 on reader service card

The Evolution® Packaged Air Conditioner houses compressor, condenser coil, evaporator coil, and blower in one unit. An optional prewired electric heat package is offered with a choice of four heating capacities. The service panel provides easy access to the electric wiring and other components. A molecular sieve removes moisture and contaminants from the system's refrigerant to help prolong the life of the unit. The Coleman Company, Inc. Circle 257 on reader service card

Encon 400 and 800 microprocessor-based electronic controllers provide energy management, environmental control, and facility monitoring. They are designed to control HVAC, refrigeration, lighting, boilers, and other energy-consuming equipment efficiently and effectively. A two-page data sheet lists the features, control strategies, and alarm capabilities, and includes specifications. Encon Systems. Circle 258 on reader service card

Zone-All® computerized system controls different zones in two ways. Used with any heating and cooling device, it controls the volume and air flow to different zones. As a reheat/recool system, used with incremental water-source heat pump, it controls the temperature of air flow to different zones without disturbing total air flow to the zones. Zone-All controls are described in a four-page brochure that includes specifications. American Air Filter. Circle 259 on reader service card

The VAV Office Building Challenge brochure traces the expansion of rooftop applications from single-story and shopping-center applications to multistory office building applications. Major topics include: motor heat and blow-through coils; blow-through sound attenuation; high office building sensible load; importance of sensible capacity; blow-through vs draw-through CFM selection. McQuay Air Conditioning. Circle 260 on reader service card

York® CodePak® centrifugal liquid chillers, described in a 14-page, full-color brochure, have capacities of 150 through 1000 tons. The brochure explains functions and use of the York MicroComputer Control Center, the standard control panel for all CodePak chillers, and the optional Turbo-Modulator variable speed chiller control. Borg-Warner Air Conditioning, Inc. Circle 261 on reader service card

(continued on page 130)
11.4 TO BE EXACT. The Enercon II Console Water-Source Heat Pump also offers coefficients of performance (COP's) up to 3.7 to go along with the high energy efficiency ratios, which explains why this unit provides remarkably low energy consumption and operating costs.

Other performance features include sleek, stylish cabinetry; field reversibility of cabinet and chassis; and a wide range of control options including a boilerless option so units can heat electrically. This can eliminate the need for a supplemental heater in some cases. The unit is also available with a Climate Director that heats and cools two rooms with one unit.

For more information and a copy of our new Enercon II product bulletin, contact your local AAF representative. Or write American Air Filter Co., Environmental Control Division, P. O. Box 35690, Louisville, KY 40232-5690.

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Circle No. 313 on Reader Service Card
The Roomtop air conditioner is a low, above-ceiling unit—16¾ inches high in 2- and 3-ton models; 23⅞ inches high in 4- and 5-ton models—that is 66 inches long, 49 inches wide. With features similar to rooftop units, it has rubber vibration isolators on compressor and fan motors and heavily insulated cabinet panels for quiet operation. Roomtop can be installed as one package, or split, separating condenser and evaporator sections. A four-page brochure explains the features, key to a diagram, and provides a table of data about four models. Carrier Corp. Circle 262 on reader service card

Energy/PC energy analysis program for buildings is designed for use in predicting building and system energy use, as a comparative tool in making design decisions or to meet energy standards. It allows the user to develop the building load profiles on a zone by zone basis, and to simulate virtually any type of heating, cooling, or ventilation system. Energy/PC is designed to run on an IBM/PC with a two-diskette drive system and 256K memory. Engineering Applications Specialists. Circle 263 on reader service card

System 600 Stand-alone Energy Management System monitors and controls HVAC equipment in one or many buildings. Using networking to collect building-wide control data, it provides energy management advantages without requiring a central computer. Designed for control of buildings from 50,000 to 100,000 square feet, it can be upgraded to full capability System 600 Building Management System by the addition of a central computer. MCC Powers. Circle 264 on reader service card

The SA 203 microprocessor-based programmable timer can vary the control points of up to 20 remote thermostats by supplying an electrical signal to a KA200 control module installed in each controlled thermostat. It controls heating systems with multiple line voltage thermostats, electric baseboard, ceiling cable, and radiant panel heaters; hot water, steam, and warm-air heating systems with zone thermostats. It can be used to program the operation of water heaters, ventilating equipment, lights, security systems, sound equipment, and irrigation systems. Sunne Controls. Circle 265 on reader service card

AET 448 equipment and DDC controller for medium-sized buildings features four digital inputs, four digital outputs, eight analog inputs, and a fail-safe output. User-programmable control strategies include DDC (direct digital control), PID (proportional + integral + derivative control), and PWM (pulse width modulation) algebra, duty cycling, setback, load-shedding, enthalphy, and other building automation functions. The dedicated fail-safe internal relay can shut down equipment or signal in the event of power or equipment failure. Atlantic Energy Technologies. Circle 266 on reader service card

Distributed Control Station DCS-95 provides energy management and facility control for many commercial structures, such as shopping centers, offices, light industrial plants, and schools. DCS-95 is equipped with 56 interface ports for monitoring and controlling HVAC, lighting, and other electrical loads; fire, security, and other tasks within a building. A WS-100 workstation allows the building manager to supervise, schedule, and modify or override the automated operations. DCS, Inc. Circle 268 on reader service card

Energy Commander control systems for paralleling multiple power sources permit the use of multiple smaller engine generator sets instead of one large set. A new six-page brochure describes the systems available for emergency power, prime power, and peak shaving applications. Energy Commander is a modular system with an optional programmable controller for reliability and ease of maintenance. It can accommodate additional generators as the system is expanded. Zenith Controls, Inc. Circle 269 on reader service card

Eight Architectural Wonders

1 I wonder what new developments there are in awning fabrics.
2 I wonder what awning fabrics are best suited for interior use.
3 I wonder what types of materials are available.
4 I wonder what styles, designs and colors are offered.
5 I wonder what fabrics are best suited for back-lighting.
6 I wonder what the energy-saving qualities of various fabrics are.
7 I wonder what kinds of flame resistant fabrics are offered.
8 I wonder what types of awning hardware are recommended.

Stop wondering. Call Astrup for information and advice about awning fabrics and hardware. Samples and literature are available. Circle No. 325 on Reader Service Card

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39 years ago Fry Reglet applied a lap-joint feature to our springlok flashing systems. Similar to the overlapping feathers of a bird, water rolls off our flashing and onto the roof, without any possibility of penetration. Our system even moults — the flashing is removable for re-roofing and can be snapped back into place when the job is done.

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The Suburban Dynaline represents the first major advance in PTACs (Packaged Terminal Air Conditioners) in 20 years.

Combining the conventional features of compact zone control systems with an industry exclusive—economical gas heat—Dynaline offers many advantages over every electric system. For starters, here are just four.

First, savings. As much as 67% in operating costs over electric resistance heat and 45% over heat pumps, as documented for a typical Mid-Western installation.

Second, comfort. Gas heat is far more comfortable than either electric resistance heating or heat pumps.

Third, silence. Dynaline's gas heat is blissfully quiet. Heat pumps are anything but.

Fourth, ease of installation. Standard 42" x 16" wall cases make Dynaline the right choice for both new construction and replacement.

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Lighting World

May 11, 12, 13, 1986
Los Angeles Convention Center
Los Angeles, California

Sponsored by:
The International Association of Lighting Designers
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The best architects and designers know there is one source of quality lighting that meets all their needs: Vista, the industry leader in creative interior lighting.

Let Vista give form to the flights of your imagination. Create a constellation, enhance a solarium or simply illuminate the aisles of a theatre, mall or store. Wrap a spiral staircase, drop a light curtain, suspend a chandelier; add splash to a fountain… Vista offers a creative solution for all your design challenges.

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Registration Information—Exhibits, Seminars, Workshops and Special Events

LIGHTING WORLD 4 is the largest trade show in the United States dealing solely and specifically with the many aspects of architectural lighting. It is an international event designed to facilitate the exchange of information and the transaction of business within the industry.

LIGHTING WORLD 4 is open to all professionals active in the industry including: architects, lighting designers, engineers, interior designers, consultants, specifiers, distributors, contractors, facility managers, manufacturers, representatives, educators, and the working press. Children under twelve years of age will not be admitted to the exhibition.

All seminars and workshops will take place on the second floor of the Los Angeles Convention Center. Registration fees for seminars and workshops vary. Please consult registration form for fee schedule.

LIGHTING WORLD wishes to express its gratitude to:

- Panel Optics for providing the illuminated directional signs which can be seen at various points in the exhibition.
- Progressive Architecture magazine for producing the LIGHTING WORLD 4 Official Show Directory.
- Visual Impact for supplying the electronic message boards in the registration area and exhibition as well as the message center located at the entrance to the exhibition.

Exhibit hours

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Registration

Registration will take place in the main lobby of the Los Angeles Convention Center, 1201 South Figueroa Street, Los Angeles.

Registration hours

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A badge allowing entrance to the exhibition for all three show days is $5.00.

Badges

Where the information has been furnished, attendees will be provided with a color-coded badge indicating their occupation. The coding is as follows:

- Architect: Blue
- Lighting Designer: Brown
- Engineer: Black
- Interior Designer: Green
- Contractor: Purple
- Representative: Orange
- Exhibitor: Red
- Other: Yellow

Offices

Show Management office will be located on the second floor of the Los Angeles Convention Center. In addition, a concession stand with seating is available in the rear of the exhibition for your convenience.

Press Room

Working press are invited to make full use of the Press Room located on the second floor of the Los Angeles Convention Center in Room 5-2. Information regarding LIGHTING WORLD 5 will be available throughout the show.

Services

- Lost and Found—located at the Security Desk in the main lobby of the Convention Center.
- First Aid Room—located in the north corridor off the main lobby of the Convention Center. The first aid room will be staffed with a registered nurse.
- Message Center—Messages may be left for an attendee or an exhibitor at the message center located at the entrance to the exhibition.
- Bus Service—Shuttle buses will run continuously during show hours between the Convention Center and the Los Angeles Hil-
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The Aton Modular Lighting System
Design: Ernesto Gismondi
Do functions, use, and personnel change frequently in your space? Has the lighting been poorly planned or forgotten entirely? Is your space temporary; are you planning a move or expansion?

64" fluorescent module, double tube
2 x 32 Watts with screen diffusor

20" halogen module
1 x 300 Watts with antidazzling grille

Model Pilade low voltage, 50 W
PAR 36 spotlamp on track module

Model Sintesi spotlamp
1 x 100 W on connection module

Speaker on connection module

90° elbow connector

4-way connector

Model Pilade low voltage, 50 W
MR 16 spotlamp on connection module

4LW Progressive Architecture 4:86
Flexibility Above All

Yes your space need more than just regular fluorescent lighting? Do you need lighting for CRT terminals, indirect lighting, ottlighting, track lighting, halogen lighting, incandescent lighting, signage, electrical tiles, or loudspeakers?

Finally, would you like a lighting system that, with a change, will enhance the design of your space?

If your answer to any of these questions is yes, Artemide strongly suggests that you take a close look at its Aton Modular Lighting System.

The flexibility of the Aton Modular System lets you adjust its many options to fit the changing needs of your space. Energy efficient and easy to install, the Aton Modular System helps you reduce lighting costs while increasing comfort and productivity.

Artemide can provide for you, free of charge, a computerized layout showing how the Aton Modular System can meet the lighting requirements of your particular space. Would you like a color brochure? Write to Artemide on your letterhead, or circle number 324.

UL Listed

Signage on fluorescent module

2-way flexible connector

Parabolic fluorescent reflector for CRT terminals

3-way connector with Aton 300 W spotlight
The Glasgow incorporates hardwood, finished in a classic black lacquer or a white limed natural finish. Glasgow is available with translucent panels of either handcrafted white flash glass, or the subtle elegance of silver mica. Designed by Jack Griffith Mitchell.

Width: 20" Square or 51 cm
Overall Height: 26" or 66 cm

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Circle No. 327
Schedule of Events

Sunday, May 11, 1986

8:30–10:00 A.M. Opening Breakfast Room 217
Keynote Speaker: Charles Moore, FAIA

LIGHTING WORLD 4 will open officially with a breakfast attended by a varied cross section of architects, interior designers, engineers, lighting designers, manufacturers representatives, politicians, and the press. Charles Moore, noted architect and leading proponent of the California School of Design, will speak on daylighting and the ways that artificial lighting can supply parallel excitement. The week of May 11 will be proclaimed Lighting Week, and Los Angeles Mayor Tom Bradley has been invited to present the official proclamation in person.

Charles Moore is head of the architecture program at the University of California at Los Angeles, and formerly head of the School of Architecture at Yale University. He is also in private practice in Los Angeles with the firm of Moore, Ruble, Yudell and with Urban Innovations Group, the research and practice arm of the UCLA School of Architecture and Urban Planning. Among his many projects are Sea Ranch, site planning and theme buildings for the New Orleans World's Fair, the Beverly Hills Civic Center, and the San Antonio Art Institute. The Christian Science Monitor said of him a few years ago, "He is a wonderfully warm person . . . who looks like he might belong to a barbershop quartet, but who, in fact, goes about the country building wonderfully warm places for people to spend their time."

11:00–12:00 NOON, Session 1 Lighting the Tops of Buildings: An Image for Major Cities Room 212
Speaker: Douglas Leigh

A city is changed immeasurably when the tops of its buildings are lighted. Though usually undertaken by corporate owners, it is the city that reaps the benefits when the lighting begins to form a collective image for the city itself. This talk will make the point that buildings of the early 20th Century, and many of those being built today, are the best candidates because of their high degree of ornamentation at the top. Each building must be different from the others so that there is no sameness, but taken together they create an image that comes to stand for the city itself.

Douglas Leigh, more than perhaps anyone else, has been responsible for the collective lighted image of New York City. His recent projects include the Empire State Building, the Helmsley Building on Park Avenue, Madison Square Garden, the Citicorp Building, the Con Edison Building, and the Crown Building at Fifth Avenue and 57th Street. His "spectacular" sign revolutionized viewing in Times Square some four and a half decades ago, and his Camel smoke-ring sign, installed in 1941, lasted 27 years. He was appointed to be in charge of City decor for the Democratic Conventions in 1976 and 1980, and for the 1976 Bicentennial celebration.

2:00–4:30 P.M., Session 2 Atrium Lighting Workshop Room 216
Moderator: Alfred Scholze, Alfred Scholze Associates

The special problems of lighting an atrium will be discussed in workshop format by an architect, a horticulturist, and two lighting designers. The presentations will discuss the history of the atrium in its present form, and suggest architectural reasons for its current popularity; the lighting requirements and suitable light sources for interior landscaping; a technique for analyzing an atrium space for design purposes, using a typical multiuse atrium as an example; and the use and misuse of decorative lighting to enhance the atrium environment. The workshop will close with a question and answer period. Handout material will be provided.

Craig Combs, AIA, is a principal of the architecture/interior design firm of Craig Combs Associates. A graduate of the University of Southern California School of Architecture, he incorporates atriums into projects as a "humanistic" touch. Cristos C. Mpelkas is a plant physiologist and manager of horticultural lighting technology at GTE Products Corporation. John Levy is a Los Angeles-based lighting consultant who, through his diverse theatrical and architectural background, has developed an innovative and dramatic style of lighting large spaces. John Lomeli is an industrial designer and lighting consultant whose design experience has included interiors, architecture, graphics, landscape architecture, and product design. He has been a member of the faculty of UCLA. Alfred Scholze founded the lighting consulting firm of Alfred Scholze Associates in 1977. The firm now has offices in New Canaan, Connecticut, and Los Angeles, California, and has completed several hundred projects of varying types.

7:00 P.M. A Night at the Spruce Goose Dome and the Queen Mary
Speaker: Imero Fiorentino

Howard Hughes' famous airplane, the Spruce Goose, now rests in Long Beach, under the world's largest clear-span aluminum dome and next to the Queen Mary. The dome itself is a mammoth arena that can accommodate 3,500 guests. During an evening under the dome, the plane itself and exhibits relating to its history and flight can be visited. The festivities will begin with a cocktail reception and...
ing variety of light sources, a cultural drift toward visual sensationalism for its own sake, new directions in lighting equipment design, and further energy restrictions. Using slides of his own work and that of others, Mr. Baker will illustrate solutions to these problems. Lamps and equipment will be demonstrated.

Mr. Baker has been in private practice as a lighting consultant since 1968. His clients are principally architects and interior designers, and he provides services for all types of spaces. Current retail clients include Neiman-Marcus Hermes, Woodward and Lothrop, Circuit City Stores, Coca-Cola Clothes ("Fizzazz").

2:30-3:30 P.M., Session 10
A Lighting Consultant’s Approach to Residential Lighting
Room 212
Speaker: James L. Nuckolls, Luxco, Ltd.

Residences, the most personal of spaces, require a special design approach. There must be room within the designer’s own design sensibility for the client’s needs, wishes, and personality. In this talk, a designer will discuss the importance of natural and artificial light to residential interiors.

James L. Nuckolls, President of Luxco, Ltd., is a lighting design consultant, author, editor, and teacher. He is the lighting editor of Interiors magazine and the author of “Interior Lighting for Environmental Designers.” Among his other publications are the Architectural Lighting Equipment Directory. He is a founding corporate member and past president of the International Association of Lighting Designers.

4:00-5:00 P.M., Session 11
Neon in Art, Architecture, and Consumer Lighting
Room 212
Speakers: Eric Zimmerman, Archigraphics; Michael Hayden, sculptor in light

Neon light as an art form and in architectural and consumer lighting, including its uses and misuses, will be discussed. Slides will be used extensively during a presentation, which will include background on the process of making neon, low voltage and amperage power supplies, and dedicated logic developed to address architectonic scale sculptures. Recent major installations will be shown.

Eric Zimmerman specializes in design, fabrication, and installation of custom neon lighting and its related components for lighting designers, architects, and interior designers. His work has been represented in exhibitions and appears in public and private collections. Michael Hayden is a sculptor in light whose work appears in hundreds of public places and private collections throughout the United States, Canada, and Europe. He creates art by diffracting light and using color in new and brilliant ways, incorporating computer technology to make movement and patterns.

ShowLight ’86

The Theatre, Television and Film Lighting Committee of the IESNA will hold its annual conference, ShowLight ’86, in conjunction with LIGHTING WORLD 4. Leading lighting designers and cameramen from the entertainment industry will discuss and demonstrate their art and craft, at a variety of exciting locations in Los Angeles, including the Los Angeles Convention Center. Registrants for ShowLight ’86 will receive complimentary admission to the exhibition at LIGHTING WORLD 4, where many theater lighting and controls manufacturers have booths. Transportation will be provided for tours.

Sunday, May 11, 1986
Day
Arrival, Registration at ShowLight Headquarters Hotel, LIGHTING WORLD 4 Exhibits, and Events at L.A. Convention Center

Evening
A Night At the Spruce Goose
(See LIGHTING WORLD schedule and use registration form in this brochure)

Monday, May 12, 1986
Day
Transportation to L.A. Convention Center for presentation of ShowLight Papers (Room 211). LIGHTING WORLD 4 exhibits and events also available.

Evening
Podside cocktail party, Hollywood Roosevelt Hotel

Tuesday, May 13, 1986
Morning
Tour of Los Angeles Theatre Center, papers on theater lighting, paper on theater design by John Fisher

Afternoon
Papers session including Disco Lighting by Tim Tunks at ShowLight Hotel

Evening
New Products Session

Wednesday, May 14, 1986
Morning
Tour of television studio and presentation of papers headed by Bill Klages

Afternoon
Tour of film studio sound stage. Presentation of papers headed by George Dibie

Evening
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No matter what the period or the plan, specify LAM indirect lighting systems. Turn light into day.

LAM LIGHTING SYSTEMS, 94 New Salem Street, Wakefield, MA 01880, 617-245-5115.
The light bulb "Feeling Flame," an artificial electronic candle light with a unique similarity to a real candle and with a flickering flame.

Booth 455
General Electric Lighting Control
225 Service Ave.
Warwick, RI 02886
(401) 886-6200

Relay-based lighting controls: remote control—flexible switching components; smart remote control—low cost lighting automation panels; programmable control—integrated system for intelligent buildings.

Booth 437
General Electric Co./Lighting Systems Dept.
Spartanburg Hwy.
Hendersonville, NC 28799
(704) 693-2000

High intensity discharge lighting systems for use in roadway, industrial, hazardous location, area-floodlighting and post-tops, and commercial applications.

Booth 339
Guardian Light Co.
5125 W. Lake St.
Chicago, IL 60644
(312) 378-2200

Energy efficient decorative outdoor area lights; floodlights; security, canopy and sign lights.

Booth 105
2615 Washington Blvd.
St. Louis, MO 63103
(314) 333-3200

H.I.D. indirect; interior wall sconces; exterior wall and canopy H.I.D. and fluorescent units; clean room fluorescents.

Booth 324
Hadco
100 Craftway/P.O. Box 128
Littlestown, PA 17340
(717) 359-7131

Architectural Outdoor Lighting: contemporary and traditional fixtures, poles, landscape lighting, custom and accessories.

Booth 231
Halo Lighting/Div. Cooper Inds.
400 Busse Rd.
Elk Grove Village, IL 60007
(312) 956-8400

Recessed, track, H.I.D. and emergency lighting systems for commercial and residential use.

Booth 555
Highline Products Corp.
330 Boston Post Rd.
Old Saybrook, CT 06475
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Fiberglass lighting poles; polymer composite replica lighting standards.

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New technology area lighting; decorative interior, exterior luminaires, H.I.D., incandescent.
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Whatever environment you seek to create, the Integralite Designer Series' variety of styles and colors reflect an understanding of the importance of lighting design to any setting.

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From entryways to executive suites, from corridors to conference areas, energy-efficient Integralite designs fit virtually any lighting need. A variety of extruded aluminum architectural profiles and a complete assortment of connectors, diffusers and mounting arrangements provide maximum design flexibility—ensuring that form is not forgotten.

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1-800-833-8371 (In Texas)
Since 1923, the authoritative monthly magazine of the residential lighting business, for retailers, electrical distributors, manufacturers and all lighting professionals.

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Sylmar, CA 91342
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Booth 735
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Meadville, PA 16335
(814) 336-4460
Extended service lighting products. Incandescent; fluorescent; SB mercury quartz; Saf-T-Cote lighting products.

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939 Grayson St.
Berkeley, CA 94710
(415) 849-1067
Streamlined duo circuit track lighting; display lighting; low voltage lighting; modern applications of directional lighting.
She's Been A Light For Millions.

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When night falls on July 4, the lights will come on in New York Harbor. They will separate the folds of fabric, paint life into her face, define the thrust of her arm, show her as she's meant to be seen.

Designers of the Liberty fixtures, Lighting World IV Booth 447
General Electric Lighting Systems, Hendersonville, NC 28792

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(401) 295-2533

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Booth 237
Illuminating Engineering Society of North America
345 E. 47th St.
New York, NY 10017
(212) 705-7926

"Lighting Design and Application," publications including technical, design, application, and recommended practices. Membership, seminars; education for lighting community.

Booth 750
Illuminating Engineering Society–Southern California Section
P.O. Box 800/G01/Room 390
Rosemead, CA 91770
(805) 257-0286

The exhibit illustrates activities of the Southern California Section Illuminating Engineering Society, the Roadway Lighting Forum Subcommittee, Southern California Section and the San Diego Section current events and membership requirements.

Booth 314
Imperial Bronzelite
2300 I.H. 35 South
San Marcos, TX 78666
(512) 392-8957

Architectural fountain systems; landscape, underwater and architectural lighting.

Booth 837
Institute of Business Designers
8087 Melrose Ave./Suite M-50
West Hollywood, CA 90069
(213) 637-7730

Promoting higher ethical and design standards; provide educational programming; seek legal recognition; increase public awareness; advance the practice of contract design.

Booth 216
Integralite
P.O. Box 45919
Houston, TX 77245
(713) 433-4511

Linear fluorescent fixtures—tubular and rectangular; aluminum and steel recessed and surface perimeter fixtures.

Booth 1036
Interior Design Magazine/A Cahners Publication
475 Park Ave. South
New York, NY 10016
(212) 576-4141

Magazine literature.

Booth 822
Interiors Magazine
1515 Broadway
New York, NY 10016
(212) 764-7521

All contract design publication featuring a total directory of lighting suppliers. Available at the show. Monthly lighting editorial section.

Booth 540
International Association of Lighting Designers, Inc.
30 W. 22nd St.
New York, NY 10010
(212) 206-1281
Contact: Marion Greene, Administrator

IALD, a co-sponsor of Lighting World, is the professional association of the architectural lighting designer. Founded in 1969 in recognition of the importance of the role of light in architecture and interior design, IALD sponsors programs for both the established lighting designer and the student just entering the field. In addition to Lighting World, IALD administers a student internship program, an awards program, an educational program, and is involved in energy conservation standards and research.

Booth 637
International Conservation Systems, Inc.
4020 S. Industrial Blvd./Suite 100
Austin, TX 78744
(512) 444-5821

Sonilight/ultralight occupancy sensing technology automatically turns off the lights in unoccupied areas. Saves energy in numerous commercial/residential areas.

Booth 635
International Express Manufacturing
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Santa Fe Springs, CA 90670
(213) 921-1999

Table lamps; floor lamps; ceiling lamps; touch lamps; brass lamps; brass switch plates.

Booth 354
International Lighting Review
P.O. Box 721
5600 As Eindhoven, Netherlands
+ 31 40 755252

The international lighting magazine.

Booth 230
Interstate Marketing System Inc.
P.O. Box 34278
San Francisco, CA 94134
(415) 822-5111

Space frames; triangle truss systems; fluorescent lighting; temporary accessories.

Booth 846
Ismos Spa
Via Torino 5
Borgo a Buggiano, Italy
572/32985

Lighting fixtures.

Booth 216
JPL Lighting
P.O. Box 45919
Houston, TX 77245
(713) 433-4511

Outdoor H.I.D. cutoff luminaires; floodlights; wall lights; canopy lights/plates.

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(713) 521-9490
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Reno, NV 89502
(702) 322-3100

Low voltage and decorative lighting. Low voltage, micro processor based lighting controllers.
Most of today's lighting simply wasn't designed for today's office.

Now partitioned furniture systems block off the light, energy codes demand lower light levels and VDT screens cause eyestrain.

Even the most sophisticated low-brightness downlights dictate the exact placement of computer terminals. If you rearrange the work stations, bright spots of glare appear on the screens.

These problems don't exist in the office shown below. The difference comes from a highly-engineered indirect lighting system that's based on a better understanding of what office lighting should do.

**Keeping glare off the VDTs**

There's been much talk about "ergonomic lighting" lately, especially for VDT installations.

Downlighting isn't the answer, even though over 90% of America's offices use it. Any down light puts a bright light source in an unlit ceiling. The resulting strong contrast produces glare on any reflective surface: the cover of a magazine, a polished desk top or, unfortunately, a VDT screen.

To correct the problem, you need an indirect system designed with exceptionally wide distribution. This produces an evenly-lit ceiling which reflects as a soft, barely-noticeable veil. Since the VDTs don't reflect hot spots from the fixtures, workers are more comfortable. And since the screens can face in any direction, the floor plan becomes flexible.

There's a research study from a major university that discusses this in depth. Ask us and we'll send you the results.

**Getting good light on the work surfaces**

Footcandle levels tell us how much light there is on the work surfaces, but they don't tell us how much light we think there is. And if we don't think there's enough light, there isn't.

Another recent university study offered an important new insight: if you add a low-brightness visible source to an indirect fixture, you'll immediately perceive 10% to 25% more light.

We'll be happy to send you those results, too. They show how much the visible strip of low brightness lens on the fixture in this picture actually does. It spreads the light evenly over the ceiling and upper walls and, just because it's there, it creates a higher level of perceived illumination.

The fixtures in the photo are 6" Round High Efficiency Softshine Indirect by Peerless. Under ceilings 8'6" or higher, Softshine Indirect fixtures give more good light per watt than any other fixtures made. Research computers at Peerless generated this diagram to show how the fixture's lensed optics distribute the light facet by facet into precisely the right viewing areas.

No other fixture in the world has been so carefully designed for the exact purpose of lighting a workspace.

Peerless invented and patented it. Only Peerless makes it.

It's the lighting of the future. If you'd like to see what else the future holds, just call.

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Rt. 13 & Beaver St./P.O. Box 700
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(215) 788-0811

Commercial and industrial fluorescent lighting fixtures (recessed and surface mounted), including a line of decorative, solid wood trimmed fluorescent luminaires.

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Long Island City, NY 11101
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59-25 Little Neck Pkwy.
Little Neck, NY 11362
(718) 229-4040

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Pico Rivera, CA 90660
(213) 949-6575

Designer line of wiring devices, dimmers, and lighting controls.

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Ansonia, CT 06401
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Three Twin Beam Lite Capsulls™ neatly spaced and aligned on the ceiling, to the right, illuminate every object in the room.

Prescolite’s Lite Capsull™ series of low voltage, quartz and compact fluorescent fixtures highlight an entirely new line of innovative track lighting products. The Twin Beam model affords the designer an unprecedented opportunity to reduce by one half the number of fixtures required resulting in a remarkably uncluttered ceiling appearance.

Circle No. 401  *Patent Pending

Lite Trac® is a precision engineered system of track lighting products with high quality features such as aiming locks, glare-reducing baffles, rugged diecast adaptors, and innovative designs including dimmable solid state transformers and an extensive package of unique optical accessories. For free 48-page Lite Trac® brochure, call Prescolite 800-824-2709.

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The unique SERIES 7™ design enables skilled professionals to create striking visual environments and yet retain the simplest possible day-to-day operation. Up to 12 zones of control and 11 pre-recorded scenes are available in a highly reliable 'off-the-shelf' product both visually attractive and extremely compact.

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or digital control from manual
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ongoing research and future
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Lazin Lighting: The Grip 36 is available as both track and surface-mounted units. Formed of wrapped aluminum rods, the Grip 36 holds line or low voltage PAR 36 lamps. UL listed.

Kim Lighting: The Outdoor Tube System, in single, dual or quad mounting configurations, combines pure aesthetics with high performance optics and functional installation and maintenance features.

Koch + Lowy: Nottingham, designed by Antony Howard, features a shade finished in gray Nextel, with stem finish options of polished metal or glossy enamel. A PL 13-watt bulb is included.

Lazin Lighting: The Grip 36 is available as both track and surface-mounted units. Formed of wrapped aluminum rods, the Grip 36 holds line or low voltage PAR 36 lamps. UL listed.

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Thorn EMI Lighting: The new 2D Hyform energy-efficient, compact commercial luminaire provides an economical alternative to standard linear fluorescent fixtures. Circle 240 on reader service card

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This prestigious award is sponsored annually by General Electric to acknowledge outstanding achievement and excellence in lighting system design.

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Last year's award winner was Janet Lennox Moyer, of Luminae, Inc., Oakland, CA, whose creative use of GE 12-volt Precise® display lamps added dynamic sparkle, ambiance and drama to the Franco Ferrini Shoes retail store.

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Mies van der Rohe

The 1986 centennial of the birth­day of Ludwig Mies van der Rohe provides the welcomed occasion for a reexamination of one of the 20th Century's greatest and most influential architects.

Before and after World War I, Mies designed imposing country and suburban villas in stripped variants of traditional styles, but following the war, he announced his commitment to Modernism with a series of designs that would leave a lasting impact. Several trenchant, though un­built, projects for villas and office buildings were followed in the mid- and late-1920s by a series of built structures that would quickly become monuments of Modern architecture, including the Liebknecht-Luxemburg Monument, Berlin, 1926; the apartment building at the Weissenhofsiedlung, Stuttgart, 1927; the Lange and Esterh houses, built side by side in Krefeld, Germany, 1928; the German Pavilion at the Bar­celona Exposition, 1928-29; and the Tugendhat House, Brno, Czechoslovakia, 1928-30.

Mies was the last director of the German Bauhaus from 1930 to 1933, when it was finally closed by the Nazis. With steadily dwindling work and influence, he remained in Berlin until 1938, when political and eco­nomical pressures forced him to emigrate to Chicago. There he became director of architecture at the Armour Institute, sub­sequently renamed the Illinois Institute of Technology. Be­tween his arrival in America and his death in 1969, he designed the new IIT campus (1940s and 1950s); the elegant and contro­versial Farnsworth House, Plano, Ill. (1945-50); the canoni­cal steel and glass office towers of the 1950s and 1960s, most notably the Seagram Building, New York, and the Federal Center, Chicago; and several museum pavilions, of which the most significant was the New National Gallery, Berlin (1962-68).

Three new books interpret this achievement. Wolf Tegethoff's exhaustive study of Mies's villas and country houses is an English translation of a work first published in German in 1981. Originally conceived as a doctoral dissertation in conjunc­tion with an exhibition sponsored by the Krefeld museums, the study ignores Mies's work before 1920 and concentrates on 21 house designs that were indis­putably "Modern," of which 8 were built. The work follows the "no stone left unturned" approach of traditional Germanic scholar­ship. Practically all major draw­ings and most extant photo­graphs are reproduced. For each project, there is a painstaking assessment of all the available verbal and visual documents, a history of the origins, prece­dents, and legacies of each de­sign, and a comparative analysis, in staggering detail, of all major elements (e.g., fenestration pat­terns) of each building through its various design stages.

For Mies scholars and True Believers, Tegethoff's work will surely yield the Rhine gold. Other readers may simply drown in the details. The author makes numerous astute observations such as that the concrete country house design of 1923 was not just a visionary fantasy, but was likely a house the architect inten­ded for himself. Its ground plan, Tegethoff also argues, influenc­ed Walter Gropius's de­sign of the Dessau Bauhaus. Yet such nuggets infrequently get lost in the labyrinth. Tighter editing and more distilled conclusions would have made a valuable work even more useful.

If Tegethoff's catalog errs on the side of thoroughness, David Spaeth's essay does the same on behalf of brevity. His Mies van der Rohe is, in essence, an intro­ductory sketch. Though it con­tains occasional inaccuracies in such matters as dating, it still provides a useful synthesis of Mies's life and work. Moreover, the volume's physical design by John Bradford is perhaps the most appropriately elegant of any Mies book to date.

Between these extremes of thoroughness and brevity, Franz Schulze's Mies van der Rohe: A Critical Biography strikes an almost perfect balance. Schulze presents a sufficiently detailed but carefully shaped analysis of the integral relationship of Mies's life and work. He is espe­cially effective in his vivid evoca­tion of time and place, the ambi­ence of Mies's milieu in Aachen, Berlin, Dessau, and Chicago. Skillfully integrated flashback portraits of Schinkel, Paul, Behrens, and others explicate the major influences on his sub­ject's art. In Schulzke's hands, Mies is no longer the impassive monolith he has sometimes seemed to be, but a complex human being whose varying moods reflected and affected the vicissitudes of his life and work.

Schulze sensitively explores Mies's strained marriage to Ada Bruhn and his closer, more last­ing relationships with Lilly Reich, Lora Marx, his daughters Marianne, Dorothea, and Wal­traut, and his grandson, Dirk Urban, who, with Gene Sum­mers, provided crucial profes­sional support in Mies's last years. The analysis of Mies's puzzlingly slow disengagement from Nazi Germany is the most convincing treatment of that issue to date. The fascinating stories of his relationships with clients and how commissions were won and lost are told with an appropriate sense of drama. Finally and most important, the buildings themselves are beauti­fully explicated with both ap­preciative empathy and critical distance. Schulze never loses sight of the fact that the work, itself, is the raison d'être of his probing. Yet in this model archi­tectural biography, he also knows and brilliantly demon­strates the integral nexus of archi­tecture and life.

Thomas S. Hines

The reviewer teaches cultural and archi­tectural history at UCLA. He is the author of Burnham of Chicago: Architect and Planner and Richard Neutra and the Search for Modern Architecture.
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Cerasarda.

The Julia Morgan tile collection consists of 11 trim styles, hand pressed from patterns she used at Hearst Castle, San Simeon, Calif., and other buildings worldwide. The cloisonné-type low-fired tiles have hand-inlaid glazes. The current line can be ordered in custom colors. Later additions will include murals, interlocking patterns, and Art Deco, Victorian, Spanish, and Moorish images.
Deer Creek Pottery.
Wall sconce Model 3012 combines polished brass, perforated and types. It is also available with custom color finishes. Harry Gitlin Lighting, Inc.

Commercial windows catalog features projectcased casement, top-hinged, fixed, double-hung, and horizontal slider windows. The four-color, 12-page catalog illustrates each product in detail and contains product specifications and performance information. A section on accessory items includes panning systems, hardware, trim, and anchors. Capitol Products.

BeamBoss® interactive graphics driven 2-D frame analysis system analyzes 2-D structures composed of beam and/or truss members. It runs on IBM-PC or compatible, 256K RAM with two diskette drives and color graphics board. Software Consulting Specialists, Inc.

The Ambiance faucet line is one of six faucets among the 60 new products introduced by Eljer at the NAHB show. The high-arched spout incorporates an aerator. Faucet handles are available in round or oval designs, both offered in a combination of chrome and polished brass finishes. Eljer Plumbingware.

The Antares III floor lamp, designed by architect/sculptor Utkan Salman, is constructed of anodized aluminum. It uses two 12-volt MR 16 quartz halogen bulbs, one spotlight, one floodlight. Set into two hinge-action light heads, the bulbs provide varied lighting. Power is changed at the base by means of an electronic transformer into 12-volt direct current. The lamp has a four-position, touch-operated dimmer switch, which is activated through the center strip. Antares Incorporated.

Advanced Function Penta® Task Seating brochure illustrates its swivel-tilt articulation and tension adjustment; adjustable, lockable backrest and seating angles; free-float back and seat; and free-float back with fixed seat angle. The four-page, full-color literature shows how freedom of choice to the user enhances comfort and productivity. All-Steel, Inc.

HI-Fi kitchen faucets of solid brass, designed for single-hole installation, have a durable epoxy finish. Available in chrome, brass, or colors, HI-Fi features convenient single-lever control, washerless valve, and a wear-resistant ceramic disc cartridge. Shorter lengths are available for bathroom sink. Hasting's Tile & Il Bagno Collection.

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Neatniks accessories, designed by Paul Mayén, include ash/trash containers, umbrella stands, and wall hooks, for use in high traffic areas. The accessories, described and illustrated in a 40-page, four-color brochure, are available in several sizes and shapes. There are metallic finishes and 16 nonmetallic colors that match the company's other furniture and accessories. Ash/trash containers, some with marble tops, are floor or wall-mounted.

Architectural metal products catalog lists bars, channels, tubing, and other components such as brackets, baluster collars and spindles, starting posts, and post collars. There are also post caps, finials, and pikes, and ornamental scrolls and panels. Drawings show installation details. J.G. Braun Co.

Bituthene® waterproofing is a self-adhering membrane of high-strength polyethylene and rubberized asphalt. It forms a continuous impervious water barrier that stays flexible. A 12-page brochure that describes the product and its applications includes detail drawings of its use on decks, foundation walls, tunnels, and underground structures. A table of properties is provided. Construction Products Div., W.R. Grace & Co.

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Inn for a Garden Setting
Prominently featured in this issue will be the Middleton Inn, adjoining one of South Carolina's famous gardens. The first nationally published work of Charleston architects Clark & Menefee, the low-rise complex impressed P/A's editors for its simple elegance.

P/A Inquiry: Public Housing Rehab
Something now has to be done with the vast stock of aging public housing in the U.S., much of which is deteriorating physically or socially, or both. Analysis, expert opinions, and numerous examples will indicate options open in this expanding area of practice.

P/A Technics: High-Tech Labs
In this technical feature, the planning and environmental demands of various kinds of research labs will be analyzed; effective solutions will be illustrated and discussed.

P/A International Furniture Competition
A report on the sixth annual P/A competition for furniture design will be illustrated with winning designs and jury commentary.

NEOCON
P/A's annual special section on the Chicago interiors conference and show, scheduled for June 10-13, will include information on the latest product introductions.

Future Issues of P/A
Look for special features on Computers in Architecture in the June issue, along with information on the A/E Systems show to be held in late June in Chicago. The July P/A will include a number of new houses. All of the spring issues will present work by architects not previously published in the national architecture magazines.
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