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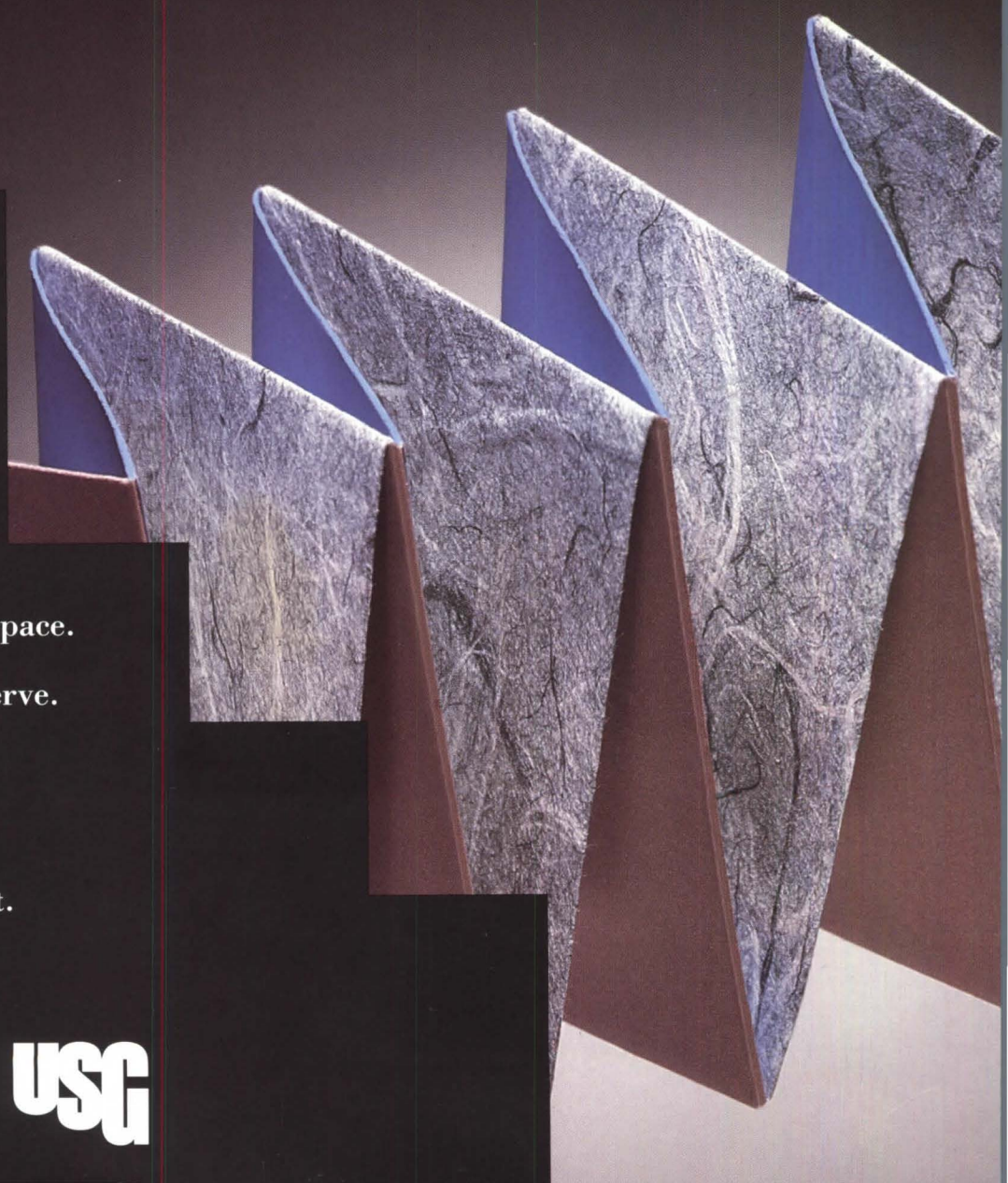

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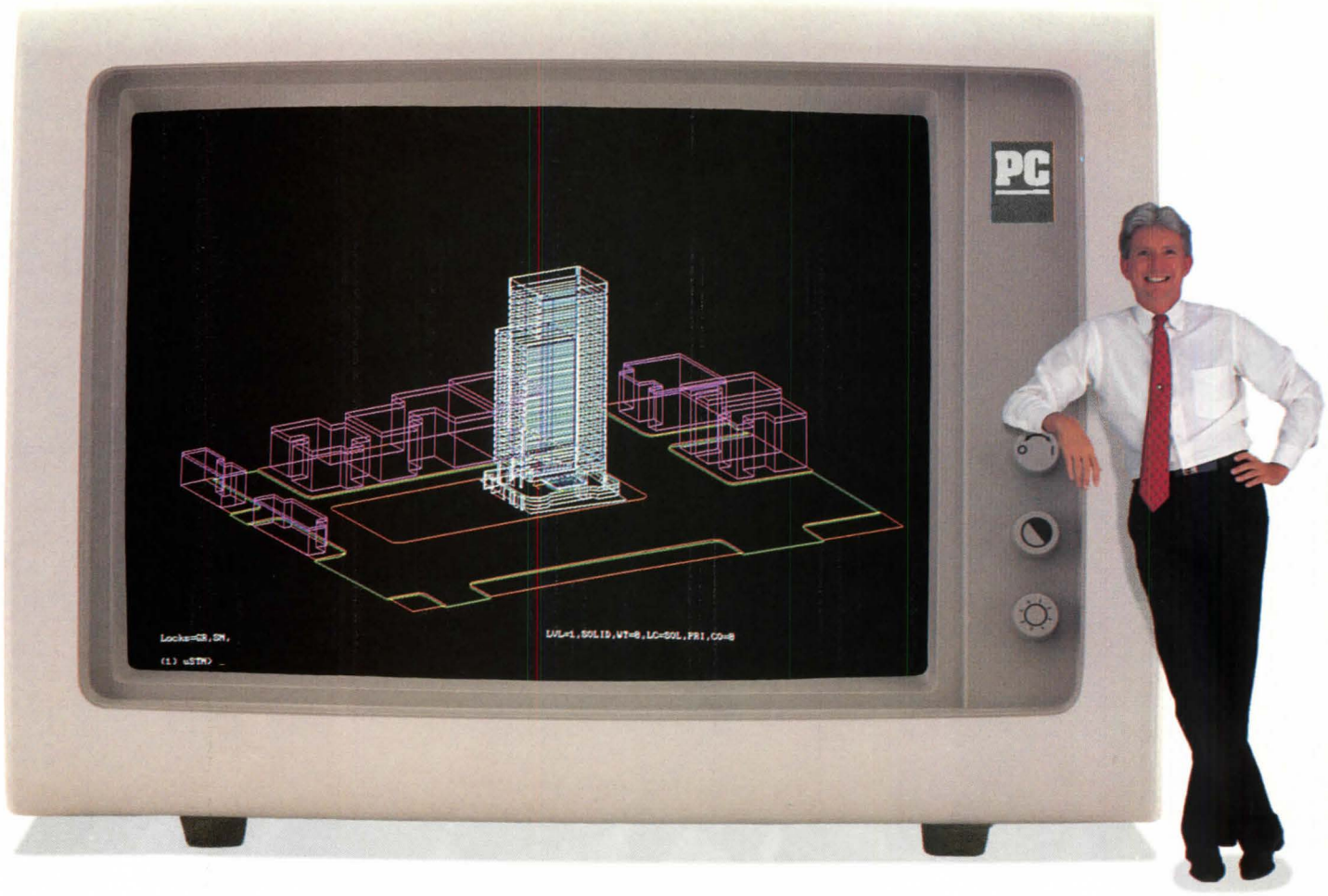

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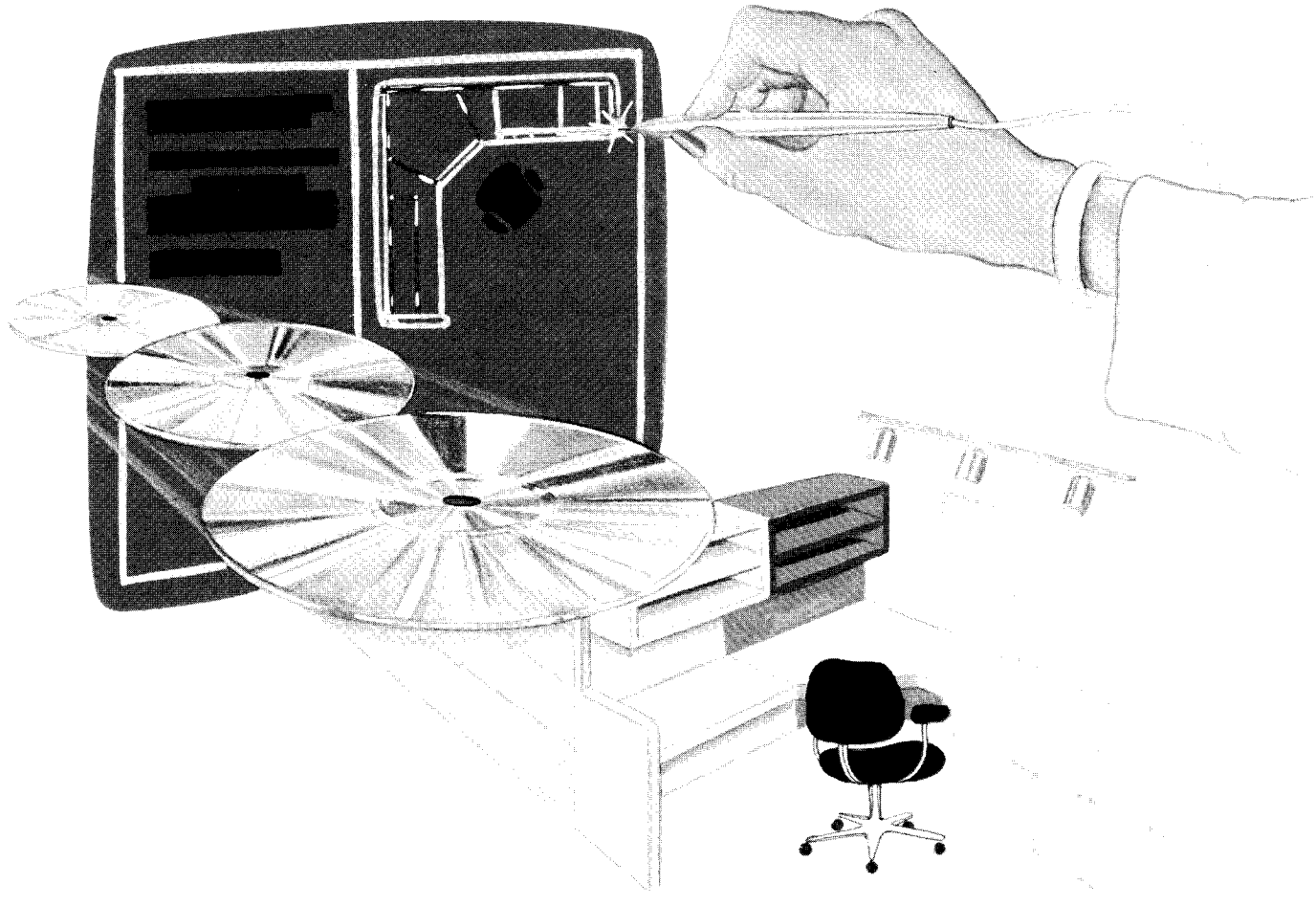

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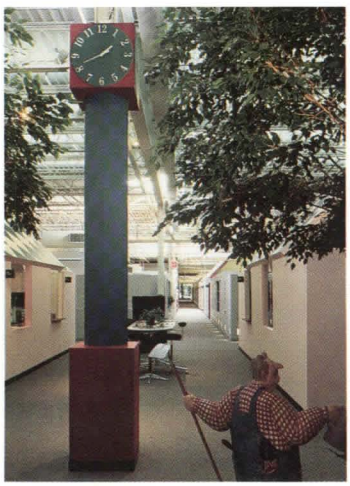

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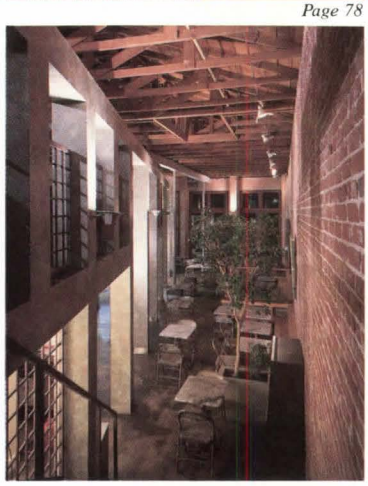

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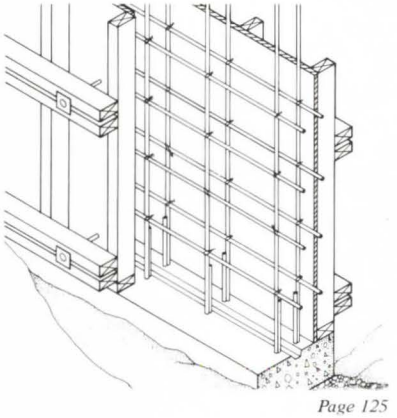

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Exhibit structure in the National Building Museum (see page 64); Frank Gehry, architect. Photograph © Harlan Hambright.

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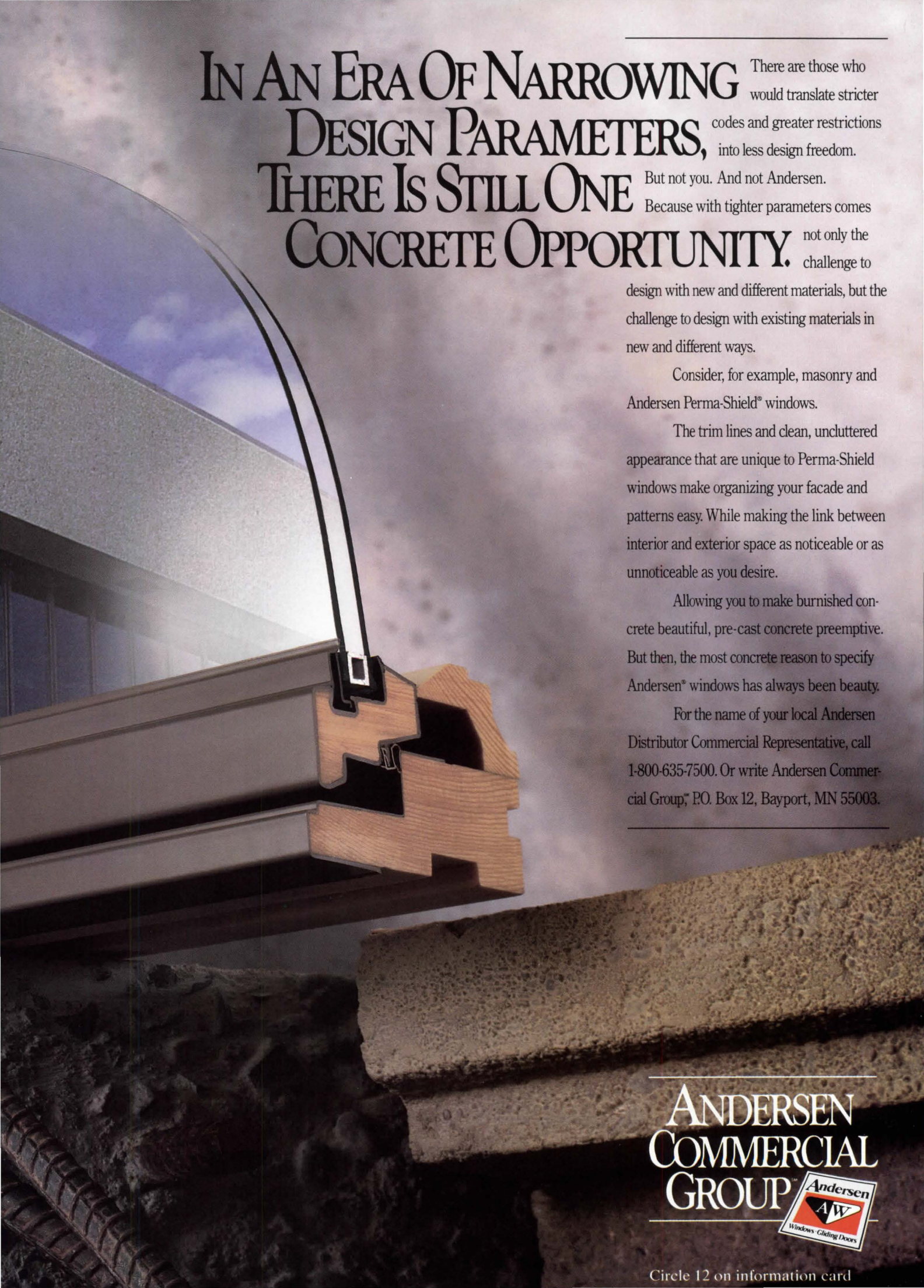

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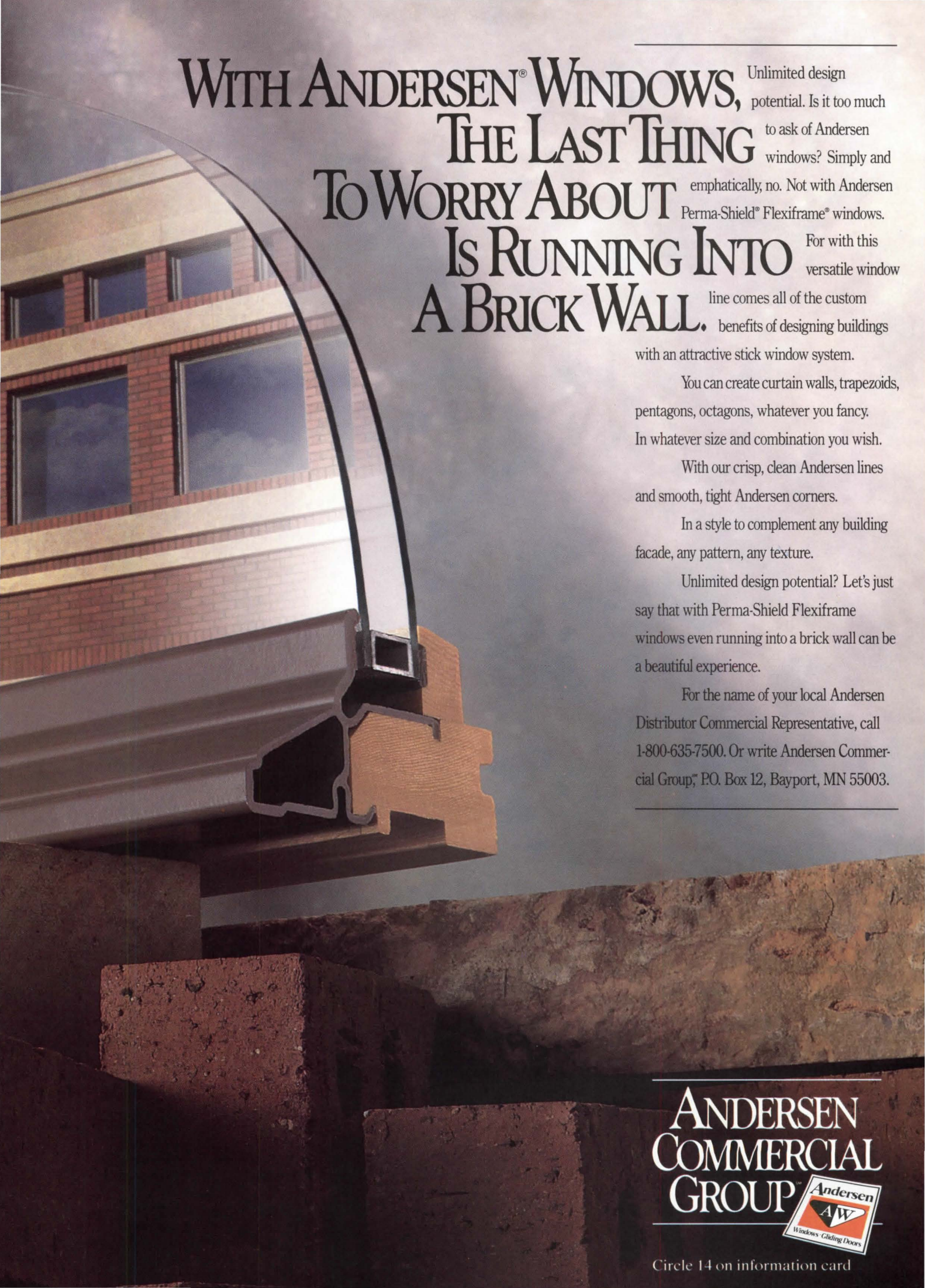

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EVENTS

July 5-8: Conference entitled "Looking Back to the Future," International Association for the Study of People in Their Physical Surroundings (IAPS), Delft, The Netherlands. Contact: Secretariat IAPS-10, Room Bk 12.50, P.O. Box 5043, 2600 GA Delft, The Netherlands.

July 6-9: Canadian Society of Landscape Architects Congress '88 and Trade Show, Winnipeg, Manitoba. Contact: Alf Simon, 403-63 Albert St., Winnipeg, Manitoba, Canada, R3B 1G4.

July 9-10: 24th Annual Joint Propulsion Conference, Boston. Contact: David Thomas, ASME Professional Development Dept., 345 E. 47th St., New York, N.Y. 10017.

July 9-11: AIA Committe on Design Meeting entitled, "19th-Century American Architecture," St. Louis. Contact: Michael Cohn at Institute headquarters, (202) 626-7366.

July 10-12: Conference of the International Architects, Designers, Planners for the Prevention of Nuclear War, Stockholm, Sweden. Contact: ADPSR, 225 Lafayette St., New York, N.Y. 10012.

July 11-12: Seminar on Repair and Remodeling Estimating, Minneapolis. Contact: Seminar Registrar, R.S. Means Co. Inc., 100 Construction Plaza, Kingston, Mass. 02364.

July 11-15: Course on the Application of Infrared Scanners to Detect Building Energy Losses, San Diego. Contact: Paul Grover, Infraspection Institute, 33 Juniper Ridge, Shelburne, Vt. 05482.

July 23-27: Joint Conference of the American Society of Mechanical Engineers and the Japan Society of Mechanical Engineers, Honolulu. Contact: A'ndrea Elyse Messer, ASME, 345 E. 47th St., New York, N.Y. 10017.

July 30: Post-Neocon Trade Show, Orlando. Contact: Institute of Business Designers, 122 N. Orange Ave., Suite E, Orlando, Fla. 32801.

July 30-Aug. 2: International Computers in Engineering Conference and Exhibition, Anaheim, Calif. Contact: A'ndrea Elyse Messer, American Society of Mechanical Engineers, 345 E. 47th St., New York, N.Y. 10017.

July 30-Aug. 3: Seminar on "Managing Change—Preparing for the Nineties," Quebec City, Quebec. Contact: National Wood, Window & Door Association, 1400 E. Touhy Ave., Suite G-54, Des Plaines, Ill. 60018.

Aug. 1-5: Conference on Computer Graphics and Interactive Techniques, Atlanta. Contact: Ellen Frisbie, SIGGRAPH '88 Conference Management, Smith Bucklin and Associates, 111 E. Wacker Drive, Suite 600, Chicago, Ill. 60601.

Aug. 4-6: The Society of Environmental Graphic Designers' Annual Conference, Bloomfield Hills, Mich. Contact: Sarah Speare, SEGD, 47 Third St., Cambridge, Mass. 02141.

LETTERS

The Hancock Accounts: "Learning from the Hancock" [March, page 68] was excellent and a great service to the profession. After 10 years of rumors about the causes of the failures and finger-pointing at the building's architects, Robert Campbell's interviews with William LeMessurier and Victor Mahler made me feel a whole lot better about my profession and its responsibility—even its capability.

How much less damaging is this insight into the truth about the Hancock and its problems than were the suspicions, fears, and nervous jokes. Surely the owners, architects, contractors, and their counselors have had more to lose from the lack of public disclosure than from the facts as revealed.

I hope that one day my own performance as an architect will merit something like the testimony given by LeMessurier about Harry Cobb in the concluding paragraph, however not in such traumatic circumstances.

Alfred Staehli, AIA
Portland, Ore.

March Issue: Congratulations on a fine March issue. You managed to do what eludes nearly all other editors—notably, discuss technology intricately but always as integral to the art of architecture. Your issue, I am confident, will elevate architects' thoughts on architecture.

Jefferson B. Riley, AIA
Essex, Conn.

Precast Concrete's Performance: Speaking on behalf of the Prestressed Concrete Institute, I wish to express our deep concern at the approach taken in the March article "Causes of Deterioration in Reinforced Concrete" [page 132] by Elena Marcheso Moreno. There is an air of inevitability about the piece that suggests that those who seek the advantages of reinforced concrete's durability are destined to be disappointed with its performance. Nothing could be further from the truth, particularly with plant-produced components.

The fact that poor-quality concrete is subject to corrosion is not news. The problem has long been recognized, and a great deal has been done to resolve it. As a result, it is possible to obtain concrete of the highest quality, capable of resisting corrosion and deterioration with a reliability equal to that of any comparable materials. Standards have long been in place to assure this reliability.

The Prestessed Concrete Institute, as a part of its PCI Plant Certification Program, has developed its own rigorous standards and certification procedures that provide for proper inspection and testing at every stage of the fabrication process. In fact, most if not all of the problems identified in the article, including improper water/cement ratios, lack of sufficient clear cover over reinforcement, improper curing, etc., are commonly associated with concrete cast in the field where the very precise conditions necessary to produce the highest quality and most corrosion-resistant concrete can rarely be met. In contrast, precast concrete is cast under precisely controlled factory conditions designed to ensure that it will be of sufficient strength and durability to successfully resist even the worst-case chloride conditions found in parking garages.

Ms. Moreno also suggests that poor construction techniques, particularly with regard to connections and anchors, may lead to problems ranging from cracking to outright failure. While this is certainly true, it is unfortunate that the article presents the problem as if it were widespread in current construction.

Thanks in part to research sponsored by PCI, the movements of prestressed concrete elements are well understood, and strategies for dealing effectively with these forces have been established for many years. Because these standards have been set, structural failure of precast/prestressed concrete members is extremely rare. Architects can specify precast/prestressed concrete without feeling that they are in any way compromising the safety or load-bearing capability of a structure.

It is unfortunate that Ms. Moreno did not elect to more clearly indicate that these problems cannot be viewed as universal and inevitable. Had she chosen to focus on the relatively simple and straightforward actions the architect must take to ensure the concrete quality, your readership would have been better served.

Thomas B. Battles, AIA
Precast Concrete Institute
Chicago

The author responds: I agree that today the advantages of reinforced concrete far outweigh any potential problems that may arise. However, one irrefutable architectural legacy of the 1950s and 1960s is quite a number of reinforced concrete buildings with fairly advanced materials degradation.

While architects and structural engineers were performing conscientiously, designing according to the state of the art at the time, we now know that they were mistaken in some of their assumptions. Much has been done to resolve those problems, and high-quality reinforced concrete can be designed and erected today with a great deal of confidence by knowledgeable professionals. Still, mistakes are sometimes being made based on outmoded concepts. The purpose of the article was to alert architects to potential problems.

I regret that Thomas Battles found in the article an air of disappointment in the performance of concrete. It was not at all intended. There are advantages and disadvantages to any materials system, and all materials are subject to deterioration when exposed to the environment. Reinforced concrete is a splendid choice for many building applications.

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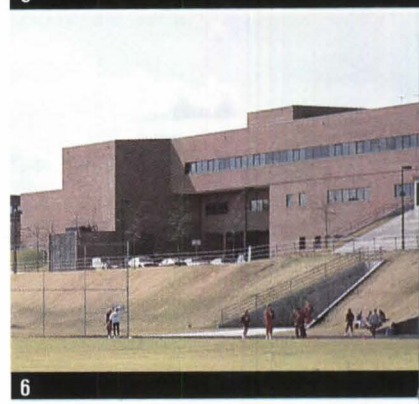
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1. Psychiatric Center of Michigan Hospital, New Baltimore, MI **2.** YMCA of Raleigh, NC
3. Barnett Bank, Tampa, FL **4.** S.E. Louisiana University School of Nursing, Baton Rouge, LA
5. Southwest Financial Plaza, Phoenix, AZ **6.** North Central High School, Spokane, WA

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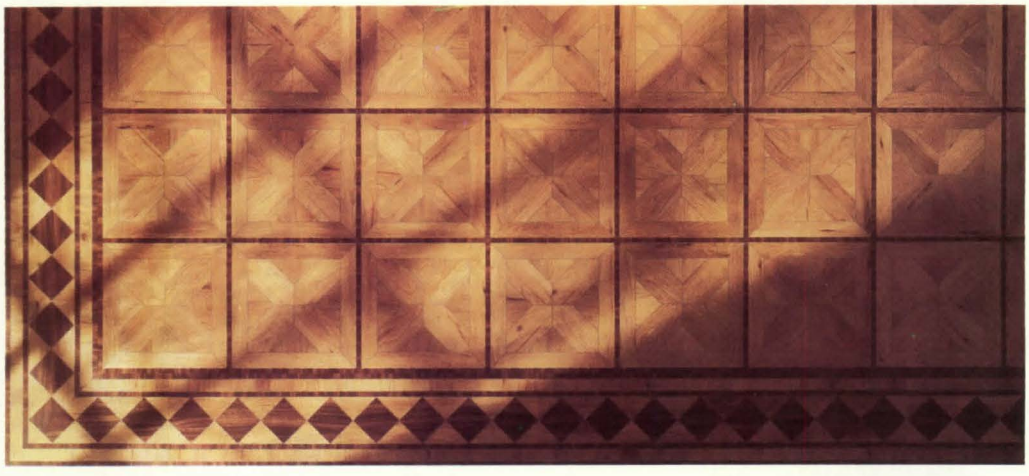

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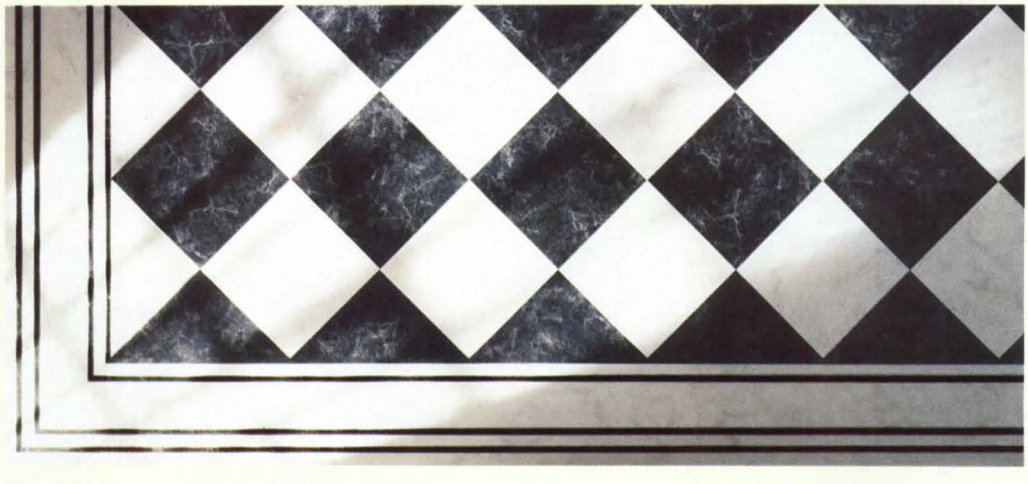

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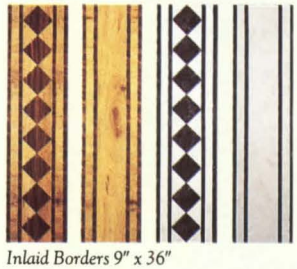

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Awards

Bunshaft and Niemeyer Named Joint Winners of Tenth Pritzker Prize

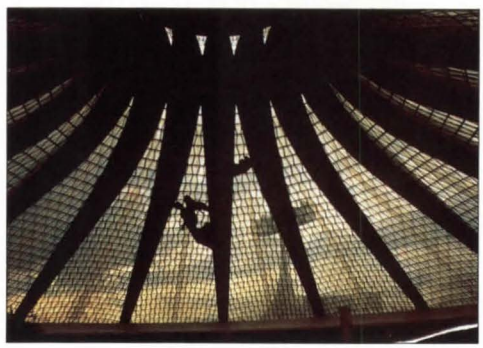
This year's Pritzker prize jury reached for the safer ground of architectural history. Gordon Bunshaft, FAIA, and Oscar Niemeyer, Hon. FAIA, joined by their common homage to Le Corbusier, are titans of mature modernism.

The Pritzker architecture prize is this year closing its first decade. Named for Jay A. Pritzker, Chicago attorney and chairman of the Hyatt Foundation (Hyatt as in hotel) and conceived by the late Carleton Smith, chairman of the International Awards Foundation, the annual prize is notable for the continuity of its highly distinguished jury. The prize has been given to Americans Philip Johnson, Kevin Roche, I.M. Pei, and Richard Meier; and international architects Luis Barragán, James Stirling, Hans Hollein, Gottfried Böhm, and Kenzo Tange.

Bunshaft, now 79, rose above the corporate anonymity of Skidmore, Owings & Merrill/New York to become the individual designer of such landmark buildings as the Beinecke Rare Book and Manuscript Library at Yale and the Hirshhorn Art Museum and Sculpture Garden in Washington, D.C. He further left his mark on the national capital city by his decisions while a member of the Commission of Fine Arts from 1963 to 1972.

Bunshaft's most memorable buildings are his earlier ones beginning with that Fifth Avenue lantern, the Manufacturers Hanover bank, whose glass facade gave a new definition to institutional security; Lever House, which set a new pace for Park Avenue and opened the way for the Seagram Building; the Connecticut General Life Insurance building, which pioneered suburban sophistication; and the carefully studied and detailed Banque Lambert in Brussels. Important but less distinctive and probably less influential are the Reynolds Aluminum headquarters in Richmond, the Lyndon Johnson Presidential Library, the American Can Co. headquarters, and Richardson Hall at the University of Texas.

But all of these and more are buildings that differ from the high-rise structures for the business community that seemed most characteristic of SOM as a firm. And, predictably, Bunshaft was frequently at odds with the firm and often appeared to distance himself from his associates to assert his individuality. He must be considered to have succeeded, except for which there would have been no Pritzker prize.



Top, Niemeyer's expressive cathedral in Brasília. Above, Bunshaft's Hirshhorn art museum in Washington, D.C.

To many Americans Oscar Niemeyer's Brazil pavilion at the New York World's Fair of 1939 was his first recognition, but his Ministry of Education building in Rio de Janeiro—a collaboration with Le Corbusier—was a close runner-up that became familiar from the photographs by G.E. Kidder Smith in *Brazil Builds.*

Born in 1907, Niemeyer has had a career polarized between his role as the leading national architect and an impressive international practice that has produced buildings in France, Italy, Israel, Algeria, Germany, Venezuela, and the United States. From 1957 to 1965 he closed his office in Rio to become totally absorbed in the creation (with Lucio Costa) of the new capital city of Brasília that had been ordered up by Niemeyer's friend, President Juscelino Kubitscheck. What united his separate roles was Niemeyer's continuing search for an architectural as well as a personal expression of Brazilian nationality. That is how his work at Brasília must be judged. But it does not explain his wide influence—the specific condition of the Pritzker award.

One would like to know more about Niemeyer's part in the design of the United Nations headquarters buildings. He seems to have tamed Le Corbusier's initial sketch, which became the basis for the architects' committee version that Wallace Harrison took to completion. But neither Le Corbusier nor Niemeyer was outstanding as a team player. Apparently, the Pritzker judges accepted Niemeyer's version: "Le Corbusier asked me to collaborate on the project with him, and not submit a solution of my own. His design, known as Number 23, was beautiful, but I felt it was not suited to the site. Chairman Harrison insisted that I submit my own suggestion, known as Number 32. In the end, Le Corbusier and I submitted the project together as 23-32 and it was selected." This experience and the earlier collaboration on the Ministry of Education building (now known as the Palace of Culture), which also involved Lucio Costa, Jorge Machado Moreira, and Alfonso Eduardo Reidy, invite further research.

The 10th Pritzker jury divided its $100,000 award for the first time. It could not choose between the Brazilian who became a Communist in 1945 and the creator of American corporate "signature" architecture. It might be considered a statement that politics in architecture does not matter. Or perhaps the opposite conclusion can be drawn: that only politics, or some other deep commitment, can produce great architecture.

—Frederick Gutheim

Mr. Gutheim is a Washington, D.C., planner, educator, and author.

News continued on page 22

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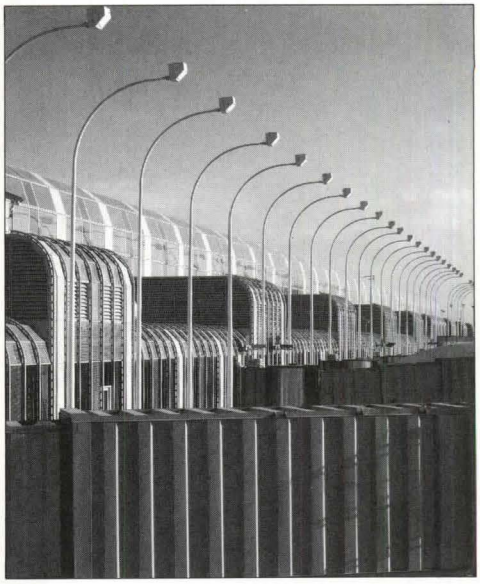
Jahn's United Terminal Wins R.S. Reynolds Award

United Airlines Terminal 1 at Chicago's O'Hare International Airport has been selected for the 1988 R.S. Reynolds award for distinguished architecture. The jury cited the terminal, designed by Helmut Jahn, FAIA, of Murphy/Jahn Associates, as an "outstanding example of public architecture" that "celebrates in late-20th-century terms much of the same splendor captured in the best of the grand railway terminals of the late 19th century." Jury members were Donald J. Hackl, FAIA, chair; Gunnar Birkerts, FAIA; and Fumihiko Maki, Hon. FAIA.



© Timothy Hursley/The Arkansas Office

Winner of an AIA national honor award this year, Jahn's terminal is a highly expressionistic building that incorporates finely crafted contemporary materials and well-organized open spaces. The vaulted hallway of Concourse B has a steel frame clad with a system of insulated aluminum sandwich panels and patterned glass components. The main ticketing area repeats the patterned terrazzo floors and has a folded truss roof with a linear metal ceiling. Running the length of the truss section are skylights shielded by baffles. The terminal successfully combines natural and artificial lighting to produce an ever-changing sense of volumes on the interior.

In our May issue, senior editor Nora Richter Greer compared Jahn's terminal to Saarinen's Dulles Airport. She found the buildings most alike "in the clarity of detail, the skillful use of materials, the brilliant execution, and the search for an original, dynamic design esthetic." Both terminals, she wrote, "lift the spirits of the traveler" and "represent symbolically the aerodynamic nature of flight."

Praising the building as an appropriate "high-tech solution" for air transporation, the jury honored the United terminal for "expressing a kind of optimism about the future that elevates rather than depresses the human spirit."

News continued on page 26

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Exhibition

Deconstructivist Architecture Show To Open at MoMA Late This Month

Late this month the first exhibition curated by Philip Johnson in more than 30 years will open at the Musuem of Modern Art. Entitled "Deconstructivist Architecture," the show focuses on seven international architects whose recent work, in the words of the museum's public information office, "marks the emergence of a new sensibility in architecture."

The exhibition comprises drawings and models for built works by Peter Eisenman, FAIA, Frank Gehry, FAIA, Zaha M. Hadid, Rem Koolhaas, Daniel Libeskind, Bernard Tschumi, and the Viennese firm Coop Himmelblau. The show also will include constructivist paintings and sculptures from the museum's permanent collection.

Accompanying the exhibition is a catalogue with an introduction by Johnson and an essay by Mark Wigley, an architect and lecturer at Princeton who is serving as the associate curator.

Although the architects in the show have become known for their irregular forms, colliding planes, diagonals, arcs, industrial imagery, and nontraditional materials, Wigley insists that the show is not attempting to suggest that these architects represent either a stylistic or ideological movement. He also declines to define deconstructivist architecture. "We are exhibiting seven artists who are utterly independent and whose work is not esthetically similar," said Wigley. "The show is about the uneasy alliance between these seven, but it is as much about the uneasiness as about the alliance. We are as much concerned with the differences as with the similarities."

This "uneasy" architecture has been around for more than a decade, and the oldest project in the show is Gehry's famous house that dates from 1978 (and won an AIA honor award in 1980). According to Wigley, the timing of the show is ironic. "These architects have been working this way for about 10 years," he said. "They are now being taken seriously at exactly the moment that postmodernism is not being taken seriously. I guess in a way the show marks the forgetting of postmodernism."

However, Wigley believes that the show is not about a new kind of architecture but a new way of looking at architecture. "This is not intended as an architecture that replaces modern architecture or replaces postmodern architecture," he said.

When asked if he was afraid that when you mount a show like "Deconstructivist Architecture" a style will follow, Wigley responded that he wasn't worried but agreed that it's bound to happen. "This is an ideological show linked by certain theoretical conceptual questions, not certain esthetic questions. But the architectural world is a world that deals with the questions of style. So without a doubt, one huge reaction to the show will be an attempt to contain this work by reducing it and watering it down into a style."

Wigley disagrees with the premise that deconstructivist architecture reflects the chaos and confusion of our time. "It would seem extremely dangerous to say that things are more chaotic today than they were in medieval times," he said.

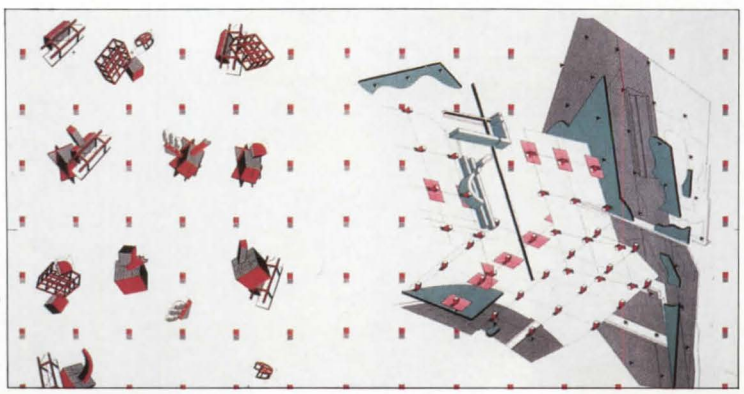
Nor does he think the work featured in the show is in any way reflective of our culture. "I think it is culturally subversive work. It does engage with culture, but I don't think that it is a reflection of it. And I don't think that an uneasy world leads to an uneasy architecture," said Wigley.

Months before the show was scheduled to open, it already had generated great interest in academic circles and the architectural press. In *The Village Voice,* critic Michael Sorkin reported that, soon after the final selection of architects was announced, Eisenman, in a lecture at Columbia University, heralded the upcoming exhibition as the most important such event since the 1932 "International Style" show at MoMA.

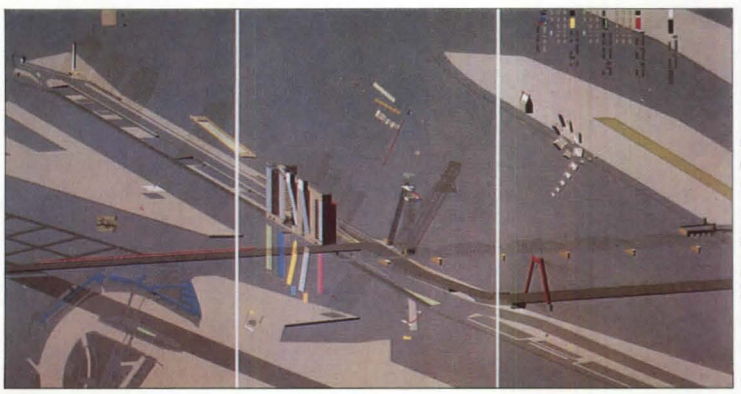
However, both Johnson and Wigley have been reticent about making such sweeping claims about the potential influence of the exhibition. "Nothing has happened for so long, we are all desperate to talk about something," said Wigley. "It's a very small exhibition with a very narrow agenda about a tight set of ideas. Because there hasn't been a big show in a long time, everybody is putting too much emphasis on this exhibition."—Lynn Nesmith

News continued on page 32

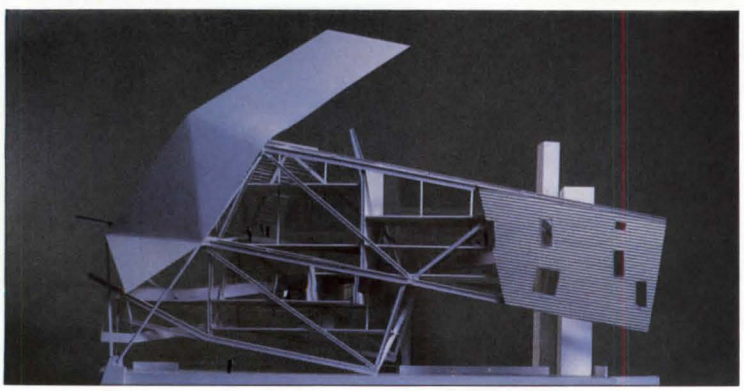
Clockwise from upper left: Tschumi's Parc de la Villette; Koolhaas's Rotterdam building and tower; Eisenman's biology center at the University of Frankfurt; Coop Himmelblau's apartment building.



Gerald Zugmann



Courtesy of Max Protetch Gallery



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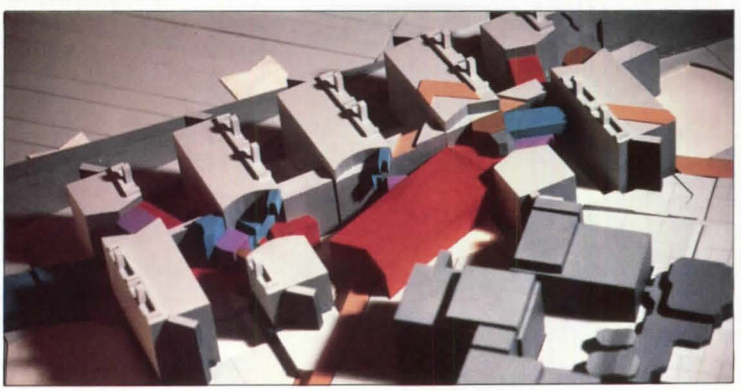

Dick Frank

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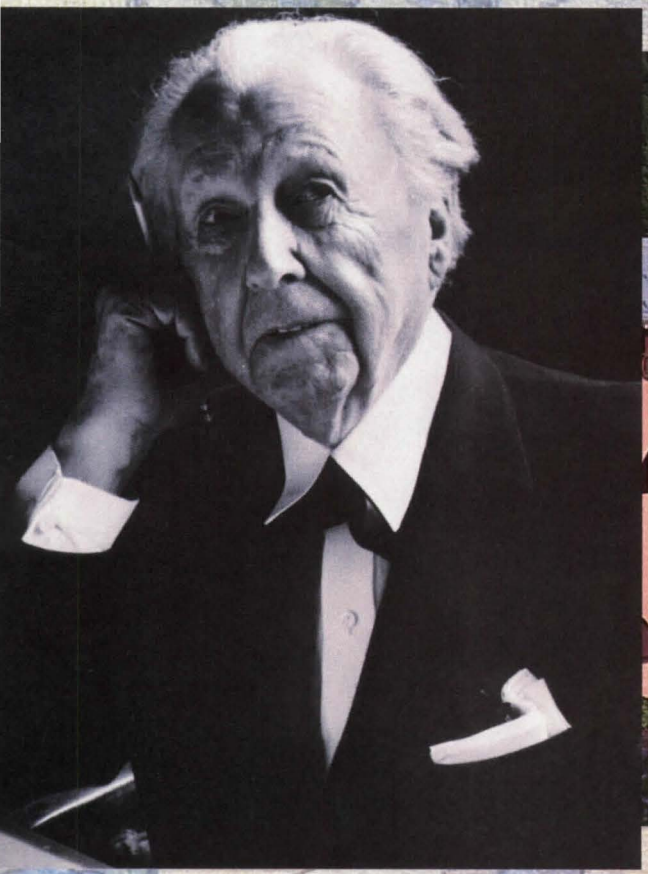

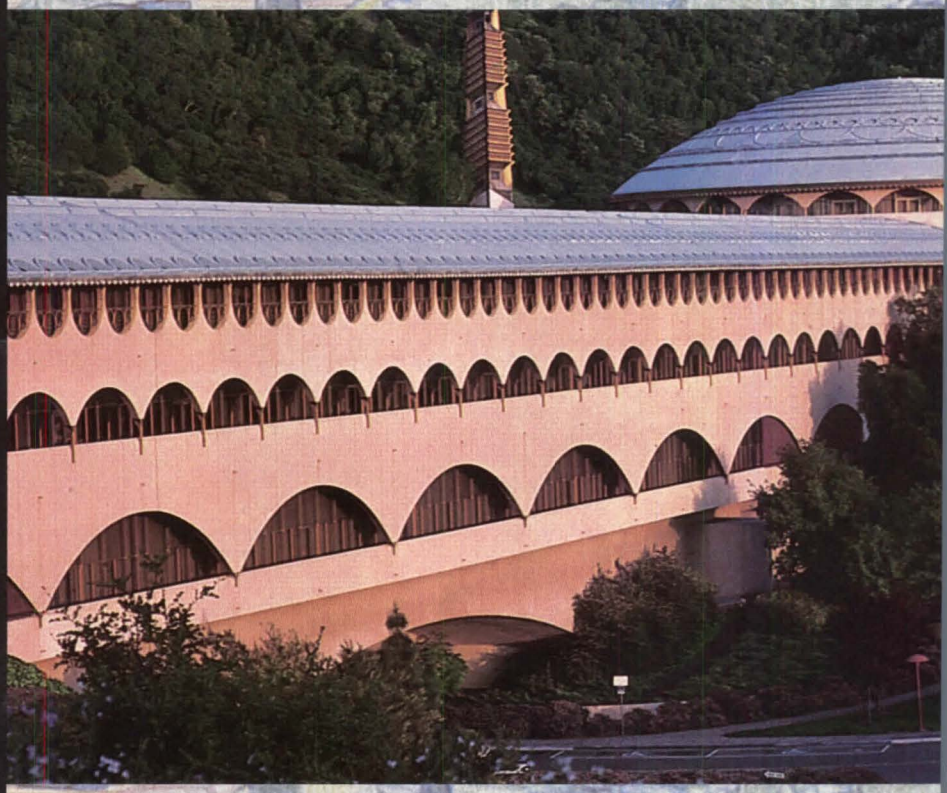

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Government

Legislation Proposed to Strengthen Copyright Protection for Architects

Legislation is pending before the U.S. Congress to strengthen international copyright laws and to widen the protection of architectural works. These proposed changes in copyright laws come at a time when the thin line between design influence and plagiarism has increasingly been questioned in lawsuits.

For more than 100 years, the most effective mechanism for protecting copyrights internationally was a treaty called the Berne Convention for the Protection of Literary and Artistic Works. The United States has not participated in the treaty because of disparities between American law and the minimum copyright standards that each member country of the Berne Convention must maintain.

The U.S. copyright act of 1909 did not include protection for architectural plans, blueprints, or designs, nor did the 1976 act explicitly mention architectural works. However, it is generally accepted that the existing copyright law protects architectural drawings under the "pictorial, graphic, and sculptural works" category.

The need for stronger copyright protection for architects has been emphasized by AIA representatives at recent congressional hearings. In testimony before a subcommittee of the House judiciary committee, David E. Lawson, AIA, called for legislation that protects the actual buildings and that recognizes "architects' contributions to the arts and society."

In an article on copyright protection for architectural works that was published in the *South Carolina Law Review,* David E. Shipley wrote, "The designs of functional structures are worthy of copyright protection, and the creative efforts of architects are trivialized when protection is limited to plans and physically separable decorations and embellishments of the building."

While AIA supports implementation of the Berne Convention's protection for architectural works, Lawson expressed reservations about several provisions of both the Senate and House bills and warned that the ambiguous wording of the proposed legislation might lead to increased litigation regarding architectural copyrights. In the proposed legislation, the definition of architectural work includes plans, blueprints, designs, models, sketches, drawings, and diagrams. Completed buildings are not differentiated from two-dimensional representations.

According to Lawson, the provision that the copyright of an architectural work is not infringed by photographs or pictorial representations implies that the copyright is infringed by unauthorized building from the plans or an architectural reproduction of the work. "We believe that the very significant benefits of the implications should be made explicit," said Lawson. "If the legislative intent is clear, some future litigation may be avoided."

In addition, Lawson strongly objected to the artistic character requirement for copyright protection. According to Lawson, the artistic criterion does not appear anywhere else in U.S. copyright law, and it is not a requirement for literature, drama, music, or other subject matter. In his testimony, Lawson quoted a 1903 Supreme Court opinion by Justice Oliver Wendell Holmes: "It would be a dangerous undertaking for persons trained only in the law to constitute themselves final judges of the worth of pictorial illustrations, outside of the narrowest and most obvious limits. At the one extreme some works of genius would be sure to miss appreciation. . . . At the other end, copyright would be denied to pictures which appeal to a public less educated than the judge."

Objecting to protection that applies only to the "artistic character and design of the work, and shall not extend to processes or methods of construction," Lawson asked, "If, as Louis Sullivan taught, 'form follows function' in architecture, how can artistic design elements be separated from utilitarian ones?"

In two recent copyright disputes in courts, the builders rather than the architects have filed suit over architectural copyright violations. Earlier this year, a federal judge in New York impounded the "infringing copies" of architectural plans used by a Scarsdale couple to construct a $2.4 million house nearly identical to one less than 100 yards away. However, the judge refused to order construction to be halted on the second house, and in his ruling he noted that, "although individuals are not free to make unauthorized copies of copyrighted architectural plans, they remain free to duplicate houses depicted in those plans unless and until the designs embodied in such plans are secured by patents."

In the 30-page opinion, the judge wrote that, to determine the compensation to be awarded to the plaintiffs, the court "must come to grips with an aspect of copyright law that presents formidable intellectual basis."

The original house, designed by Nadler Philopena & Associates of Mount Kisco, N.Y., was constructed by Chris Demetriades, a speculative developer/builder of expensive custom houses. Last No-

continued on page 36

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Government *from page 32*
vember, Demetriades filed the copyright infringement suit against Nicholas and Cheryl Kaufman, a couple who had tried unsuccessfully to purchase the original house, and against the contractor and the engineer for the house.

Although he did not initiate the lawsuit, Kenneth Nadler, AIA, has taken an active role in the dispute. "I think it is incredible that in this country architects get so little protection," said Nadler. "In Western Europe architects have more protection, and other artists in our country are protected. No one seems to take what we do seriously."

The case has generated a great deal of public interest in Westchester County, N.Y., a suburban New York City area where houses in the range of $1 million to $5 million are not uncommon. The owners of the first house are understandably upset, Nadler said, because an almost identical house practically next door significantly reduces the value of theirs.

In the court ruling the judge wrote, "Just why a family who could afford a $2 million home would contract for a design substantially similar to the design of a home on the very same street is, to say the least, puzzling."

According to Nadler, the most surprising aspect of the case is the arrogance of the defendants. In describing their attitude, he said, "The client admitted stealing the drawings, but they asked, 'What are you going to do about it?' and then they said, 'Now that the frame is up, here are the drawings, you can have them back.'"

In another recent dispute over design plagiarism, Cardinal Industries of Columbus, Ohio, the country's second-largest home builder, sued U.S. Home Corp. of Houston, alleging copyright infringement and unfair competition.

In the settlement, U.S. Home Corp. agreed to surrender architectural drawings and plans that were used in the construction of two apartment complexes in Texas and Utah. Although U.S. Home denied any copyright violations, the company did agree not to construct any apartment units based on architectural drawings so similar to Cardinal's copyrighted plans that they would cause confusion.

In recent years, Cardinal Industries has charged two other contractors with copyright violations and unfair business practices. In a similar out-of-court settlement, American Quality Builders of Nashville admitted no wrongdoing but agreed to surrender all disputed architectural drawings and plans.

According to Cardinal spokesperson Robin Hepler, the company is committed to protecting its intellectual property through every possible channel and is very aggressive about protecting its designs. "One of our goals is to get a favorable ruling that would set a precedent for increased copyright protection," said Hepler.—Lynn Nesmith

Deaths

Reyner Banham: Critic, Historian Of Contemporary Architecture

Americans first became aware of Reyner Banham in the 1950s in the pages of the British *Architectural Review* (obligatory reading in those days for anyone interested in architecture), where his subject might be Italian lapses from proper modernism or early figures in the development of modern architecture. Whatever one made of Scheerbart, the Tauts, Marinetti, or Sant'Elia before they found their respective places in Banham's first book, *Theory and Design in the First Machine Age* (1960), Banham's writing was clearly remarkable from the beginning for his gift of language and for the way he made processes—his own as a critic and historian and those of architectural design and 20th-century technology—exciting.

His attitude toward technology (or science) was made explicit by his part in a discussion (under his editorship) in the June 1960 *Review*. His boss, H. de C. Hastings, had said in part that one should leave science to scientists ("for whom science is a tremendous lark"). Banham agreed that for its proper practitioners science, like architecture, is a whole way of life but argues that "the man who doesn't get a kick out of science will, by definition, get no kick either from the Twentieth Century . . . and if he doesn't feel the pulse of his time he is clearly unfitted to put up monuments symbolizing or otherwise expressing its values. . . . The insistence that science must be taken seriously too often means that science must be taken owlishly, solemnly, reverently. . . . The man who plays science for kicks is committed to a growing enjoyment of a growing body of ideas and experience. He is in for life—unless his nerve fails."

Banham, originally trained as an engineer, not an architect, can be seen to have been into architecture too for kicks, and eventually into America for kicks. If he romanticized architecture (and technology and America), which I think is what one does when into something for kicks, he also romanticized architects, perversely expecting them to say coherent things when they spoke. "[Louis] Kahn," he wrote in 1962, " . . . uses 'form' to mean 'function' and 'design' to mean what the architect does in arriving at what most people call 'form.' . . . This willful obscurantism, in which 'form' is made to mean 'formless' and 'design' is made to mean 'form,' should prepare us for a degree of willfulness, or obscurity, in Kahn's functional solutions, even if one refrains from using the word 'formalism' for fear of being double-talked right round the bend."

Banham probably made the developments of 20th-century architecture more exciting and coherent than they seemed to those who took part in them, and he provided critic/historians with the ultimate vicarious ego trip by writing his second book, *The New Brutalism* (1966), as something of a participant.

Banham left the *Review* in 1964 and taught for eight years at the University of London. He moved to the United States in 1976 and spent four years at the State University of New York at Buffalo, an experience that bore fruit in the last of his nine books, *A Concrete Atlantis* (1986). (He also wrote 780 magazine articles and reviews.) After four years at the University of California, Santa Cruz, he was to have taken up an appointment as Sheldon H. Solow professor of architecture history at the Institute of Fine Arts of New York University at the time of his death. Banham died in late March at the age of 66.

—Cervin Robinson

Mr. Robinson is an architectural photographer and writer in New York City.

Louise Nevelson: Prolific 'Bird of Paradise'

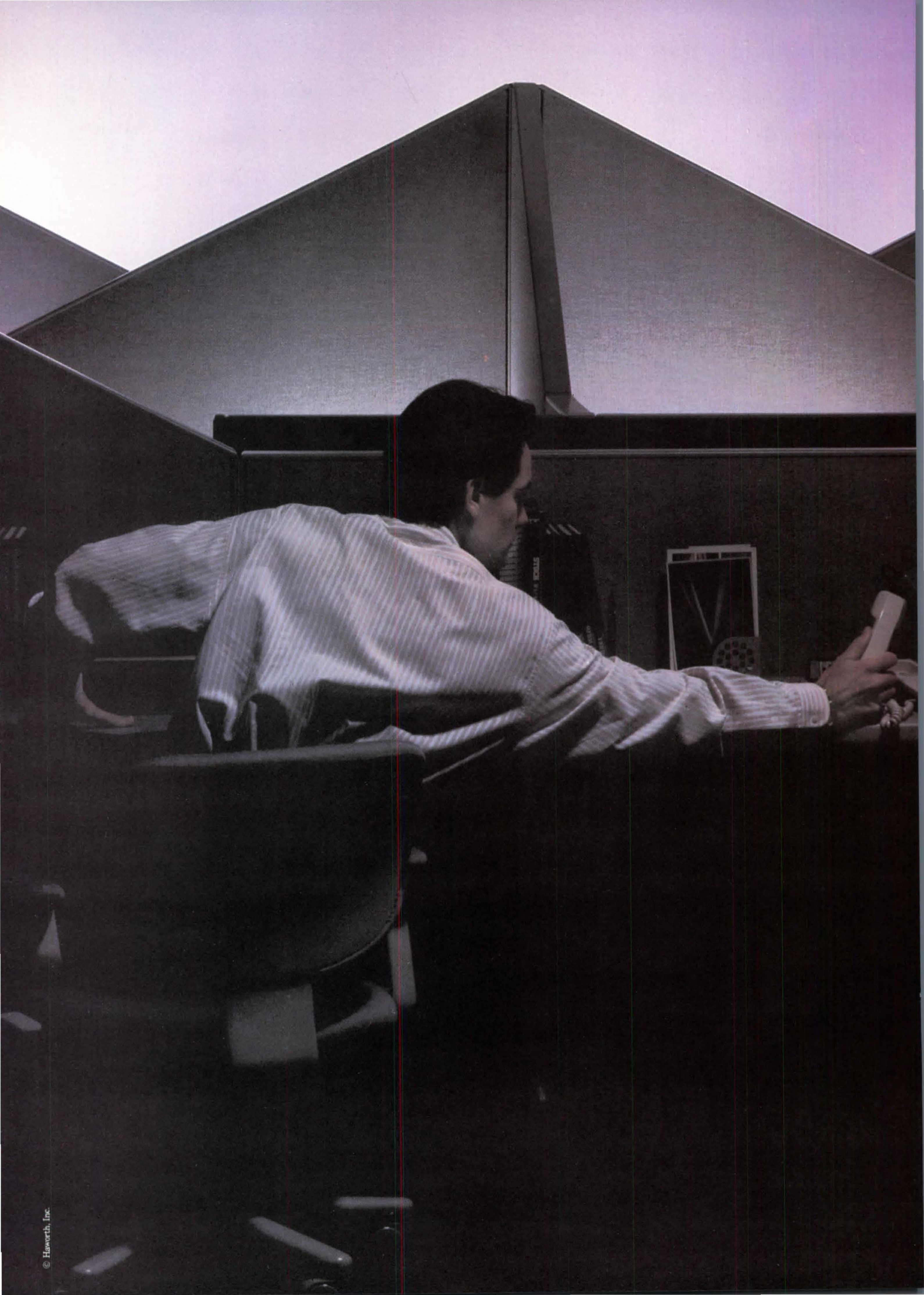
Louise Nevelson, renowned for her dense, deeply shadowed, wall-sized sculptures, died April 17 at age 89.

In her work Nevelson used found junk (chair rails, newel posts, pieces of molding, bits of trash) to create stacked up, boxed reliefs that are usually black, orderly, and gridded, yet redolent of heroic myths, fantasy, mystery. In life she was, like Frank Lloyd Wright, an original, an exotic, a bird of paradise. Beautiful as a young woman, she was known to her public only as the fantastical, exaggeratedly Gypsy-looking being into which she increasingly transformed herself as she aged. Nevelson referred to herself as "an atmospheric dresser" and wore layers of black, and/or vividly colored, patterned, and textured floor-length skirts and capes and shawls and ornamental beads and bones and headdresses.

She was born in Kiev in 1899 to a Jewish timber merchant. When Louise was still a baby, her father, Isaac Berliawsky, emigrated to Maine, where the rest of the family joined him once he was established. During Louise's childhood, Berliawsky insisted that his family dress expensively and flamboyantly, underscoring their foreignness. About Maine, Louise would later tell her longtime companion Diana

continued on page 40

Great minds don't think alike.



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Deaths *from page 36*

KacKown (for a volume titled *Dawns + Dusks*), "That was such a WASP country. Now it's better. But think of 1905 when you have a name like BER-LI-AWSKY, and you come to Maine. . . . By the time I was 9 I had thoroughly decided I would never—in principle—work for anyone as long as I lived. . . . I *chose* to be an outsider."

By the time Louise was 6 she was working with bits of wood scavenged from her father's lumber yard. On the way to becoming a sculptor she grew into a determined, rangy young women who experimented with painting, piano, acting, singing, and modern dance. She adopted as her own her family's radical political tendencies and passionate convictions about personal freedom, independence of thought, and women's rights. Although she later recalled never making friends "because I didn't intend to stay in Rockland, and I didn't want anything to tie me down," Nevelson married in 1920. Her life as an artist began when she separated from Myron Nevelson in 1929.

She studied at the Art Students League in New York City and at Hans Hoffmann's school in Munich. She assisted Diego Rivera while he worked on his murals for Rockefeller Center and was influenced, like many of her generation, first by pre-Columbian Mexico, then by African art. She was introduced to the New York art world via a group exhibit at the A.C.A. gallery in 1936. The New York *Times* described her sculpture as "unlike anything we've ever seen before."

But it would be another two decades before Nevelson came into her own, and she was in her 60s before she could count on a reliable income from art. Her mature style grew out of a simple observation, which reputedly came to her after close scrutiny of an empty liquor crate. It was that such boxes could be used not only to support her sculpture but to enclose it and thereby create for it an expandable grid.

The last quarter-century of Nevelson's life brought major commissions and exhibitions, international fame, and—important for the perennial (albeit exotic) outsider—recognition as a great American artist.

—Andrea Oppenheimer Dean

BRIEFS

Downtown Housing Competition

The City of Seattle is sponsoring a competition for the design of downtown housing. The focus is on innovative unit design, general livability, and compatibility with the existing urban context. There are four design categories, and the registration fee of $60 entitles individuals or teams to enter all four categories. A total of $32,000 in prizes will be awarded—four first prizes of $6,000 each; four second prizes of $1,500; four third prizes of $500; and up to five merit awards in each category. The deadline for submissions is June 20. For registration and the complete program package, contact Seattle Design Competition, Dept. of Community Development, City of Seattle, 400 Yesler Way, Seattle, Wash. 98104.

Architectural Reference

The 1987 edition of *The Architectural Index* references Architecture, *Architectural Record, Builder, Interior Design, Interiors, Journal of Architectural Education, Landscape Architecture, Progressive Architecture,* and *Progressive Builder Custom Builder.* Articles are listed by project type, location, and architect or designer. Copies are $19 each from The Architectural Index, P.O. Box 1168, Boulder, Colo. 80306.

Glass Association Awards

The National Glass Association has chosen six entries out of 250 in its second annual competition. Awards were presented for excellence in four categories: craftsmanship, specialty glazing (non-building applications), residential design, and commercial design. The winning projects are:

- John A. Sibley Horticultural Center, Callaway Gardens, Pine Mountain, Ga.; Craig, Gaulden & Davis Inc., Greenville, S.C.
- The Limited Flagship Store, New York City; Beyer Blinder Belle, New York City.
- United Airlines Terminal 1, O'Hare Inter-

continued on page 41

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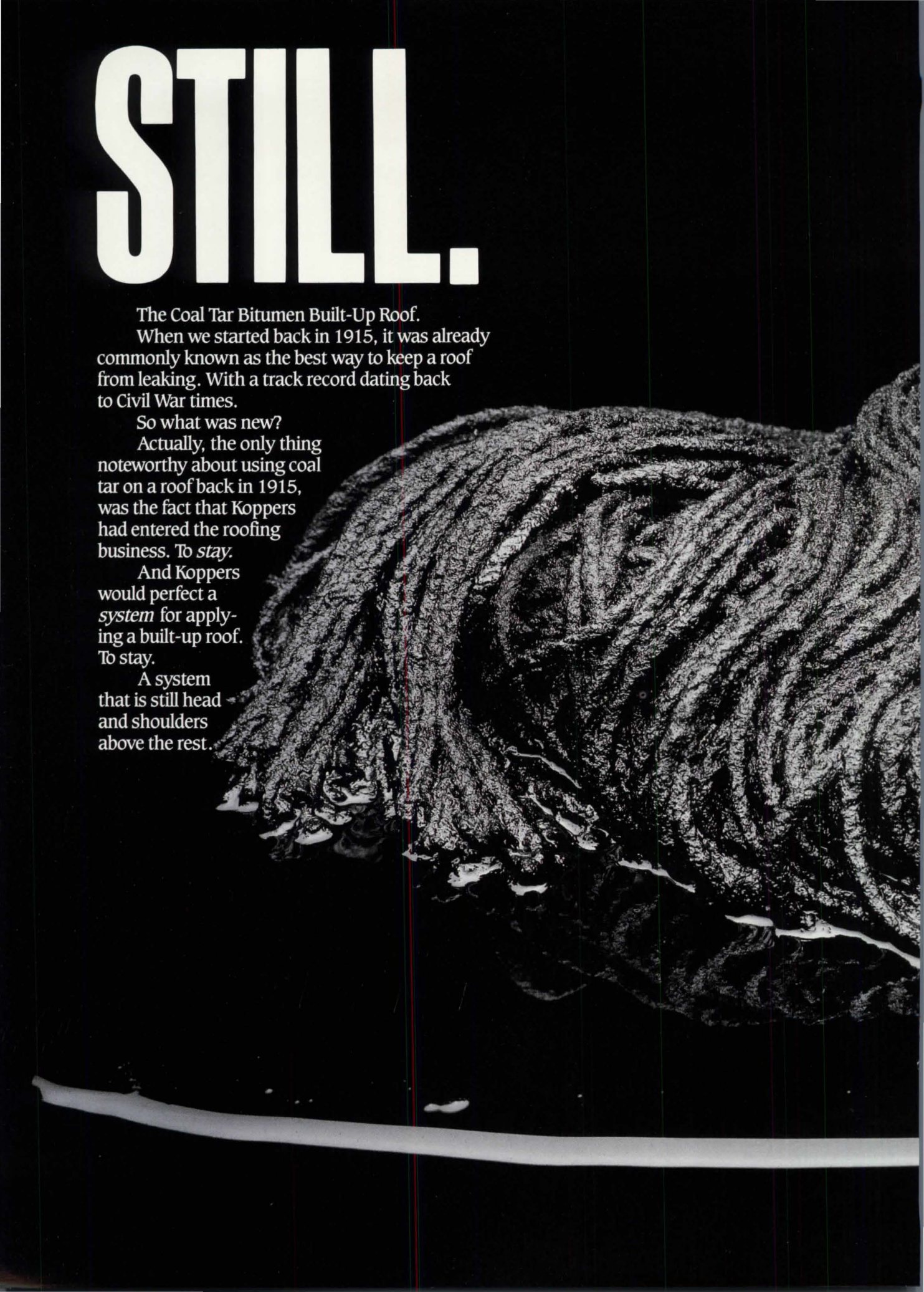

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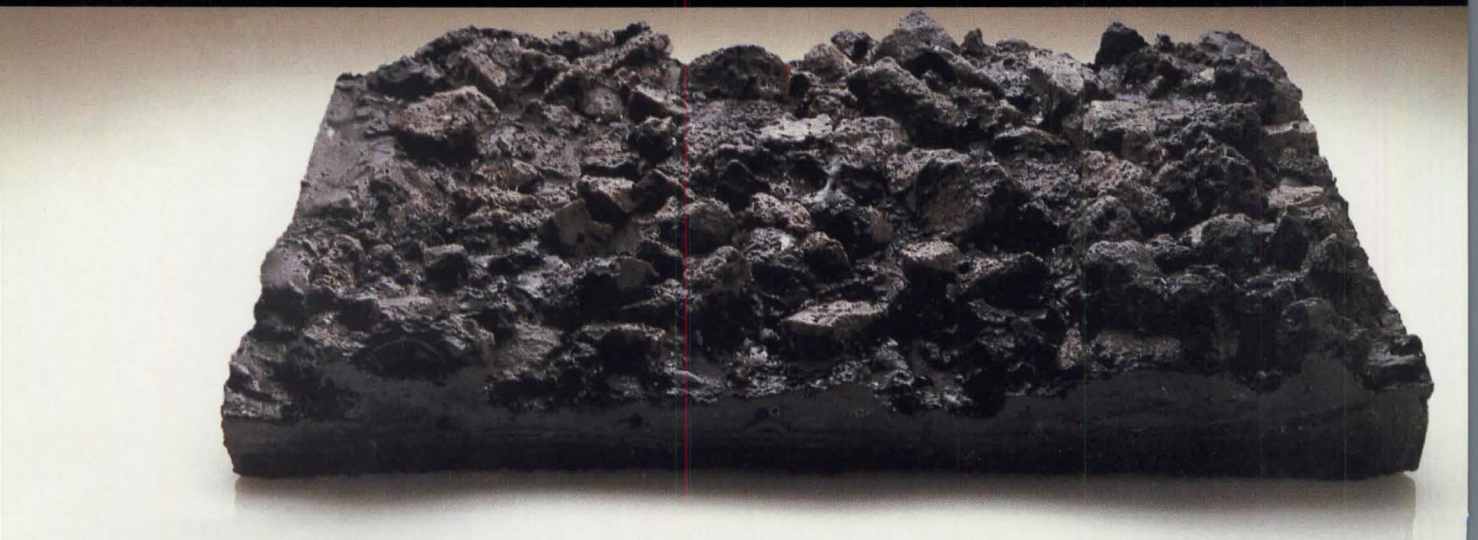

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Briefs *from page 40*
national Airport, Chicago; Murphy/Jahn, Chicago.
• Executive Suites Hotel and The Library Restaurant, Schiller Park, Ill.; ASC Inc., Architects, Arlington Heights, Ill.
• Enron Building, Houston; Lloyd Jones Fillpot Associates, Houston.
• Private residence, Miami; Charles Harrison Pawley, Architect, Coral Gables, Fla.
• Private residence, Waterbury, Vt.; James Goldstein & Partners, Millburn, N.J.
• Spectral Light Dome, Portland Center for Performing Arts, Portland, Ore.; ELS Architects and BOOR/A Architects, Portland, Ore.
• Flight of the Rainbow Goblins, Willard B. Ice Building, Springfield, Ill.; Ralph Hahn & Associates, Springfield, Ill.
• RTA Rapid Transit Station at Shaker Square, Cleveland; Gould Associates, Cleveland.
• Field Museum of Natural History, Chicago; Harry Weese & Associates, Chicago.

Miller Cook's Air Force Award
Miller Cook Architects of Portland, Ore., received a merit award in the 1987 U.S. Air Force design competition for the firm's design of a helicopter maintenance hangar for the 304th ARRS located at Oregon Air National Guard Base in Portland. The project is one of three facilities designed by Miller Cook Architects for the base.

Rome Prize Winners
The American Academy in Rome has named four winners of the 1988-89 Rome fellowships in architecture. They are Linda Cook, senior landscape architect with the Boston public facilities department; Douglas Darden, lecturer at Columbia University and the New Jersey Institute of Technology; David Mayernik, painter and architect; and Thomas Silva, project architect with Richard Meier & Partners.

Student Awards in Acoustics
Five architectural students have been awarded the Robert Bradford Newman medal for excellence in the study of acoustics and its application to architecture. The medalists are Edward Clautice, University of Florida; Antonio Lacapra, Rhode Island School of Design; Walter A. Nurmi, Clemson University; Mark G. Stefanak, Pennsylvania State University; and Philip R. Thompson, Massachusetts Institute of Technology.

Masonry Design Winners
Nine students in the school of architecture at Lawrence Institute of Technology were recognized for outstanding entries in the seventh biennial masonry design competition sponsored by the Masonry Institute of Michigan. The winners are Steven G. Gerrard; David A. Mexico; Todd R. Outman; Anthony P. Esson; Niels J. Guldager; Brian E. Howard; Scott A. Morrison; Keith D. Kosik; and Sean T. O'Brien.

Paris Prize Winner
Greg Hall, a 1985 graduate of the University of Texas at Austin, has been awarded the 74th Paris Prize by the National Institute for Architectural Education. The competition for recent graduates of U.S. architectural schools gave entrants a program written for the NIAE by Albuquerque architect Antoine Predock, FAIA, which called for the design of a shrine, shelter, and observation point to "recognize the inherent sanctity" of a site near Taos, N.M. Hall designed two intersecting chasms cut into the edge of the canyon site. The Paris Prize is $8,000 for eight months of foreign study or travel.

Construction Products Council Awards
The St. Louis Union Station renovation, by Hellmuth, Obata & Kassabaum Inc., and Louderman Hall at Washington University, by Ittner & Bowersox, won top honors in the 12th triennial architectural achievement awards competition sponsored by the Construction Products Council of St. Louis and endorsed by the St. Louis Chapter/AIA.

Vignelli Associates Honored
Massimo and Lella Vignelli of Vignelli Associates recently received an award for excellence in design from COLLAB, The Contemporary Design Group in support of the Philadelphia Museum of Art.

Gas Turbine Institute Scholarships
The American Society of Mechanical Engineers' International Gas Turbine Institute will award $1,000 scholarships to undergraduate mechanical engineering students from 70 U.S. colleges and universities. For more information contact A'ndrea Elyse Messer, ASME, 345 E. 47th St., New York, N.Y. 10017. □

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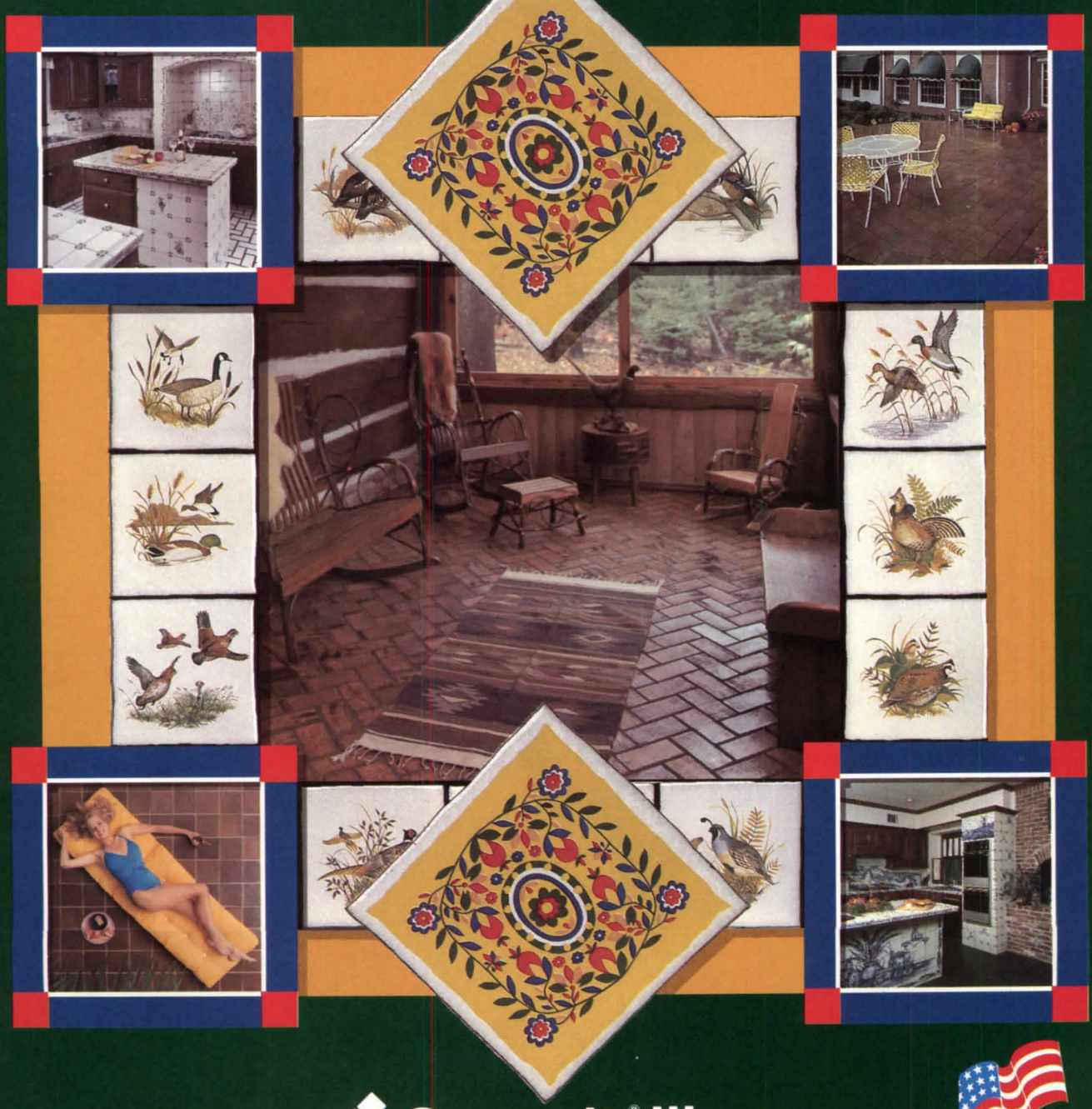

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Keeping Alive the Memory of A Great Wright Building

Frank Lloyd Wright's Larkin Building: Myth and Fact. Jack Quinan. (The Architectural History Foundation and MIT Press, $30.)

Since its destruction in 1950, Frank Lloyd Wright's Larkin building has been known, like another icon of modern architecture, the Barcelona Pavilion, only from a small number of black-and-white photographs. One of Wright's most powerful creations, the Larkin building is a *gesamtkunstwerk*—a total work of art, from the overall architectural form to the desks, chairs, filing cabinets, and lighting fixtures, and including innovations such as one of the earliest uses of mechanical airconditioning. Its great extruded towers of brick, the dramatic procession of spaces, and its binuclear parti have inspired major works as diverse as Louis Kahn's Richards medical labs at Penn and Paul Rudolph's art and architecture building at Yale.

The demolition of the Larkin building occurred while Wright was alive, in spite of protests (where was Jackie Onassis then?), and is comparable to that of Pennsylvania Station as destruction of a building identified with its city. This unbelievable act of self-inflicted amnesia was one of the motivations behind historian Jack Quinan's remarkable book on the Larkin building. Upon his arrival in Buffalo he drove around looking for the Larkin, or some part of it, thinking perhaps a mistake had been made. In a sense, the book is a successful attempt at recreating the building through words and photographs—a means of entering into its past reality.

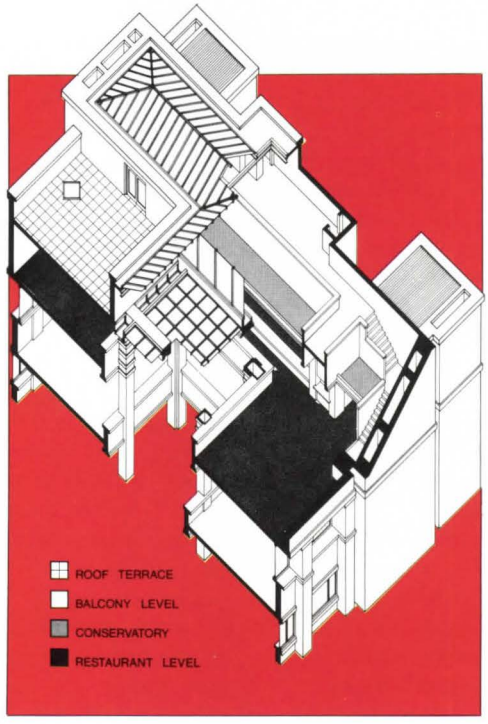
The book is a superb example of architectural historical scholarship, based on documentary evidence that only recently came to light. A cache of letters from the family of Darwin Martin, secretary of the Larkin company, that was in danger of being dispersed, was saved at the last moment by Quinan. The cache includes letters to Wright and internal memos from within the Larkin company regarding the commission.

Quinan, while explicating the creation of a building so often obscured by Wright's self-mythology, makes it nonetheless a remarkable feat. He clearly separates the complex strands of the story, discussing and analyzing aspects of the building including the development of the Larkin company and the intricate web of psychological tension within its corporate family. This is social and architectural history in context, showing how, in a larger sense, architecture can be understood as a product of economics, personality, function, and form.

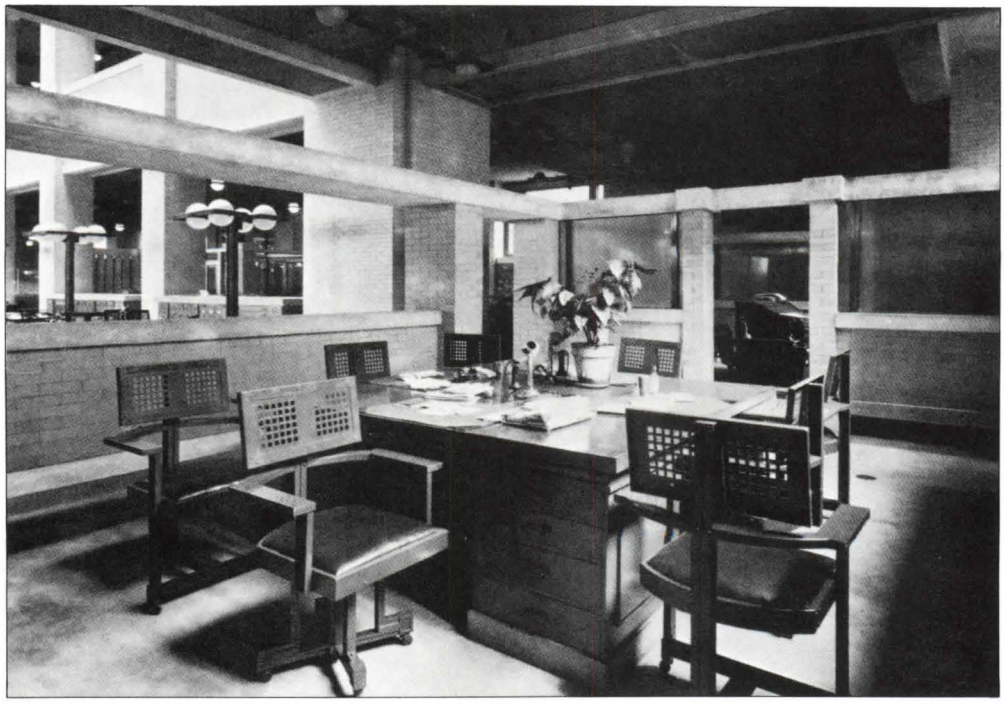
The tone of the book is critical, still rare for Wright scholarship, avoiding the more common Wrightian hagiography, yet it is in complete contrast to the more recent sarcastic tone of Brendan Gill's gossip-tabloid "biography." Quinan carefully explodes Wright's contention that the Larkin's design appeared to him "in a flash," like Athena full-blown from the head of Zeus. Through documentary evidence and analysis of a succession of drawings, the historian reveals Wright's creative struggle in incremental stages.

It is Darwin Martin, not founder John D. Larkin, who emerges as the hero of the tale. Larkin originally had considered hiring Adler & Sullivan, who recently had completed the Guaranty building in Buffalo, to design the Larkin headquarters. But Martin's enthusiastic support of Wright, who at this point in his practice had only built houses, was crucial in the awarding of the commission to him.

continued on page 48



Above, axonometric view of the Larkin building's fifth-floor restaurant, conservatory, and balcony levels. Below, main-floor 'open plan' executive office.



Books *from page 47*
Quinan nonetheless describes Wright as "ruthless" in his pursuit of the job, heeding Daniel Burnham's advice on the three most important things for an architect to do: "Get the job, second, get the job, and thirdly, get the job."

Essential to an understanding of the eventual form of the Larkin building is a detailed account of the rise of the company. It started in 1875 as a small soap company and by century's end had grown into a mail-order business, awarding special premiums such as furniture and lamps to customers who ordered large quantities of soap. Martin devised a filing system that kept track of Larkin's vast accounts (the company was receiving as many as 5,000 pieces of mail a day in 1900).

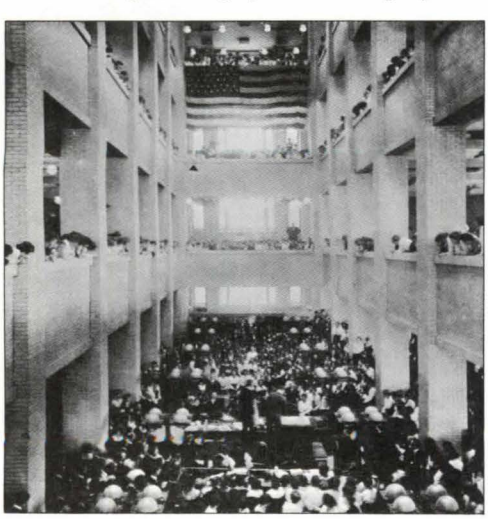
Quinan aptly compares the building's interior with its gridded gallery space to that of a vast filing cabinet. The company's incoming mail was brought to the top floor, sorted, and then circulated down to the respective departments, following the organic, natural force of gravity. The circulation scheme would appear again in Wright's design of the Guggenheim museum a half-century later, where visitors ascend to the top floor and circulate down the ramp.

The Larkin building went beyond the merely functional into the realm of the sacred and symbolic virtue of work, articulated by inscriptions throughout the building and in the space itself. So perfect in fact was the fit between client and building that, after the death of John D. Larkin, the company's new management was at odds with the building. For example, top executives no longer wished to sit on the main floor in full view of all.

The building was subject to a number of disfiguring mutilations, including windows punched into the wall of the fifth floor. The Larkin company failed to adapt to the changing economic climate as department stores supplanted mail-order houses, and the company went bankrupt in 1943. The city of Buffalo acquired the building in settlement for back taxes owed, left it abandoned, and, unable to attract what it considered a reasonable sum for the property, ordered it demolished. But Frank Lloyd Wright's revenge was played out as the building came down—it was a long and costly demolition, thanks to its substantial construction.

—Alexander Gorlin, AIA

Early photograph of the central light court with gathering of Larkin employees.



Mr. Gorlin is a practicing architect in New York City and teaches at Yale.

Truth Against the World: Frank Lloyd Wright Speaks for an Organic Architecture. Edited with introductions by Patrick J. Meehan, AIA. (Wiley, $39.95.)

In this magazine's January issue (page 39), the perceptive reviewer of Brendan Gill's recent book *Many Masks: A Life of Frank Lloyd Wright* commented that "Wright will never meet his match in a biographer." If this be true, we must go to the architect's own words in an attempt to understand his singular personality and to analyze his purposes in the architectural legacy he has bequeathed to us. Fortunately, he wrote and talked prolifically, with the same poetic verve that is demonstrated in the creation of his architectural masterpieces. In addition to his autobiography and his other published books, especially helpful are his letters edited so discerningly by Bruce Brooks Pfeiffer—*Letters to Apprentices, Letters to Architects, Letters to Clients*, and, most notably perhaps in our search for Wright's philosophical concepts, *The Guggenheim Correspondences.*

In addition to this bulky correspondence, there are Wright's public speeches that offer elucidating and insightful glimpes into his thought processes and mercurial personality. Such is the case with *Truth Against the World: Frank Lloyd Wright Speaks for an Organic Architecture.* In this volume, Patrick J. Meehan, AIA, has compiled the texts of 32 speeches, three never before published in written form. The book is companion to Meehan's earlier work, *The Master Architect: Conversations with Frank Lloyd Wright* (Wiley, 1984), which contains the text of Wright's more informal audio and audiovisual talks.

Meehan's introductory comments that set the scene for each of the speeches are helpful, as are comments by various personages who introduced Wright to his audiences and the questions and answers following the speeches. The speeches are not presented in chronological order but according to nine groupings devised by the editor, among them Wright's thoughts on organic architecture and its components, the machine and architectural production, education, and architecture in a democratic society.

Wright considered an array of subjects—organic architecture, prefabricated structures, the design of cemeteries, ornamentation, buildings for the sick and for local and federal governments, city planning, the arts, and industry. In addition to his speeches to such groups as AIA, the National Institute of Arts and Letters, and the Franklin Institute, Wright talked to hardware contractors, business executives, realtors, social scientists, high school and architecture students, college faculties, government officials, hospital planners, and crafters. There is the record of an informal talk to the editors of *Arts in Society,* a meeting with Ludwig Mies van der Rohe on Broadacre City, and a *New Yorker* magazine account of Wright's message to a student symposium at a "Forum on Current Thought" sponsored by the New York *Herald-Tribune.* Wright reached countless people.

In the speeches, Wright stressed his concept of architecture as a search for truth, as "an adventure in the realm of the human spirit, searching for a greater harmony, a greater truth of being." He spoke of architecture as the "humanizing of building," declaring that, the more humane architecture becomes, the more it becomes the basis of a true culture. The architect needed by society, he says, "is a master builder who will make a perfect welding between his building, trees, and life."

The book's title comes from the Druid symbol of three inverted rays of the sun signifying "Truth Against the World." The symbol became the crest of the Lloyd-Jones family, Wright's maternal ancestors. Inscribed in wood above the fireplace in the living room of Wright's Oak Park, Ill., home are the words: "Truth Is Life."

Ralph Walker, FAIA, then vice president of AIA, introduced Wright in 1953 to the National Institute of Arts and Letters upon the occasion of Wright's receiving the gold medal for architecture. Walker said that Wright was "a Promethean bringing the stirring flame of a new architecture, a Moses leading an eclectic benighted into the Promised Land of organic creation. . . . All your life you have denied the minimum and have reached for the stars." Wright's response was given in words that are still a challenge: "If we are to have an architecture of our own that will be the basis of a culture of our own—if we ever have one—it will be based upon a sound philosophy. . . . A civilization we have. It is a way of life, and that is all it is. But a culture would be a way of making, ways of making that life beautiful, and we have not begun upon it."

The book is lavishly illustrated with black and white photographs, many taken by the editor. Although some of the reproductions are muddy and dim, they add a dimension to the volume. Particularly intriguing are the portraits of Wright himself—as a handsome young man, in mid-career, and as an octogenarian. He was always spiffily turned out.

—Mary E. Osman, Hon. AIA

Mrs. Osman, who was a staff member at AIA's headquarters for more than two decades, worked part of that time as books editor for this magazine. □

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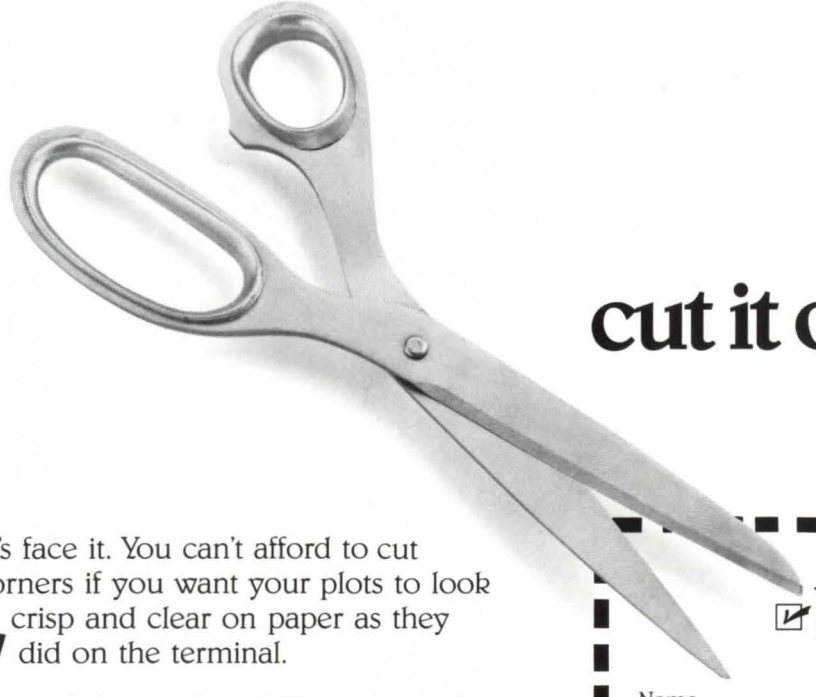

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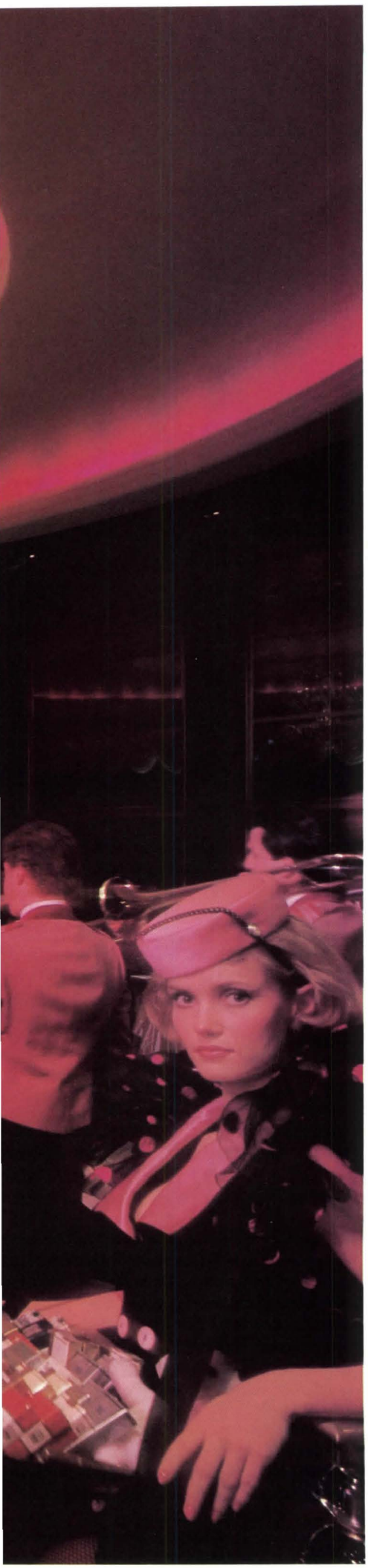
ARCHITECTURE

Architecture is about to be taken on its third ideological roller-coaster ride of the century. First came modernism, a style masquerading as a social movement. Then came postmodernism, whose monuments were virtually festooned with ideology—to the point where they were incomprehensible without a 90-minute lecture by the architect, and even that didn't always help.

Now comes deconstructivism (see News), an ideology born of literature and fashionable in certain architectural schools for as long as a decade, now making its official debut at the Museum of Modern Art. We and others will have much more to say about deconstructivism in coming months, before it too passes.

Paradoxically, this month, in an issue on interiors, we deal in considerable part with a new constructivism. Several of the more interesting works are constructions within constructions. A metaphor used more than once is that they are villages or cities of "buildings and streets" within large enclosed spaces. It is a pleasing, and particularly architectural, approach to interior design.

Also in the News section is a tribute to the late Reyner Banham, to which I would like to add a personal note. We only met in recent years, but in a very real way he was my mentor. I grew up professionally on his writings. They combined wisdom and wit, erudition and clarity. I am proud to say that some of them eventually appeared in this magazine. When he moved to New York I hoped there would be more. Were he here he would have been one of the first people I'd have turned to to help make sense of deconstructivism.—*D.C.*



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The Only Possible Word Is 'Swank'

Restoration and 'reinterpretation' of the Rainbow Room at Rockefeller Center.
By Sandy Heck

Courtesy of The Rockefeller Group

When the Rainbow Room opened on Oct. 3, 1934, one newspaper described it as "the ultimate in swank"—*the* New York night spot for dining, dancing, romance. Located on the 65th floor of the RCA Building, Rainbow was the height of elegance in the depths of the Depression, a most urbane room in what was arguably "the greatest urban complex of the 20th century"—Rockefeller Center.

Closed during the war and for partial restorations in 1962 and 1975, Rainbow again closed in January 1986, its reputation no less faded than its decor. On Dec. 29, 1987, it reopened—the room itself completely restored and associated spaces elsewhere on the 64th and 65th floors "reinterpreted" in a style that restoration architect Hugh Hardy, FAIA, insists is "American modernism," not art deco. Part of a $250 million Rockefeller Center capital enhancement program, renovation of the 45,000-square-foot Rainbow complex cost $25 million; at $555.55 per square foot, Rainbow is one of the most expensive restaurants ever built in America.

Like the construction of Rockefeller Center itself, the Rainbow renovation was a collaborative effort among designers and experts from a variety of fields. While the program to which they worked included the usual functional requirements, budget, and schedule, it also included what might be construed as notes for costumes, props, sets, actors, actresses, action, and ambience. The program, in short, read with the theatrical detail of stage directions for an O'Neill drama. Characters in this architectural mise-en-scéne included these:

Client: The Rockefeller Group; restaurant: Joseph Baum & Michael Whiteman Inc.; architecture: Hardy Holzman Pfeiffer Associates; graphic design and art program: Milton Glaser Inc.; uniforms: Carrie Robbins Designage Inc.; lighting: Jules Fischer

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Mr. Heck, a freelance architecture critic in New York City, contributes to Architectural Review, A+U, *and the New York* Times.

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& Paul Marantz Inc.; sound: Peter George Associates; construction management: Tishman Realty & Construction Inc.

Hardy has noted that the Rainbow renovation cast the architect in an unfamiliar role, not as hero but rather as participant in a collaboration—one, moreover, in which Hardy gives restaurateur Joseph Baum the role of "impresario."

The Rainbow concept began with restoring the room itself. That restoration was to be undertaken in terms not only of architectural authenticity but also of evocation of emotions and of an era remembered: "What you always *imagined* was there," says Baum.

A second component of the Rainbow concept was reinterpreting the '30s in general and Rockefeller Center in particular throughout the complex's associated spaces. That reinterpretation was to be neither postmodern nor pseudo-deco, but rather an abstraction and resynthesis of moods, motifs, and period details accumulated in sourcebooks Hardy's interior designer Amy Wolk calls the project "bibles."

Enhancing both period character and the identity of individual spaces was a $1 million art program directed by Milton Glaser. Advised by a distinguished committee of experts, Glaser purchased or commissioned some 30 pieces of period and contemporary art "compatible with the spirit . . . of Rockefeller Center." In addition, Glaser himself designed various "stylistic references" including logotypes, an alphabet, and signage.

As the project developed, two other concepts emerged. One was an almost *gesamtkunstwerk* consistency among the different designers: for example, a sawtooth pattern found on the lintel above the entrance to the RCA building was utilized by Hardy on his interior columns, by Glaser on his Rainbow dinner plates, and by Carrie Robbins on the cuffs of her staff uniforms. The other concept was what Baum calls "a congruent level of quality"—not only (as David Rockefeller insisted) a high level of quality but also a congruence of period reference, from dress to drinks to dinner. Robbins's six-gore skirt is a contemporary equivalent of the "bias" couture of the '30s; Baum's partner Michael Whiteman's "Between the Sheets" is one of the wickedly delicious cocktails popular after Prohibition's repeal in 1933; and Baum's Lobster Thermidor and Baked Alaska are dishes to delight cafe society.

Whiteman has remarked that he and Baum began writing their program by considering the desired demeanor of both customers and spaces, at night and during the day. Because the Rainbow complex was intended for the exclusive use of the executive Rockefeller Center Club until 3 p.m. and for public use thereafter, the room and its associated spaces had to be designed for dual personalities: club members for breakfast, lunch, and a full range of business services, and the sophisticated New Yorker for drinks, dinner, and private parties.

Where Hardy gives Baum full credit as the renovation "impresario," the restaurateur in turn credits the architect with "genius" for resolving critical problems in the existing Rainbow conditions, including characterless spaces, lack of view, and unworkable circulation. Before the renovation, elevators arrived at a 65th-floor lobby enclosed by revolving doors at each end; the arrival wanted both ceremony and orientation. In the old grill, the bar faced an inside wall, and views out were blocked by parapets so high that Baum with poetic accuracy described them as "ramparts." Elsewhere, circulation around the perimeter was blocked by an office, a pantry, a coatroom, even air-handling equipment. Circulation patterns crossed staff working out of the main kitchen on the 64th floor with customers they served on the 65th.

In his resolution of these conditions, Hardy first reconfigured the basic architectural spaces in which everyone would work, then redefined various programmatic elements, and, finally, did

Top, the Rainbow Room, although almost square, seems round. Middle, terrazzo floor and bronze inlaid strips mimic serpentine curves of the bar. Left, the Buffet/Pavillion with three perimeter exposures and blown glassworks as a frieze. Right, Norman Bel Geddes's five-foot-long 'Vision of the 20th-Century Boat' suspended under mirrored and etched glass at the bar.

© Dennis Marsico

it all in a quintessentially New York sort of way—making the most of very confined and very valuable space.

"The great lady," Hardy calls the Rainbow Room. "She's gotta look just swell." Almost square (72 feet east-west by 62 feet north-south), the room nonetheless seems round. One enters from the concierge desk in the southwest corner and makes a diagonal descent down terraces and steps on which a fretwork carpet inconspicuously reorients its pattern from 90 degrees to 45, back and forth repeatedly. This rotational impetus is reinforced by the revolving, circular dance floor, by the illuminated double dome, and by the three seating levels terraced up toward the room's four corners; that the terraces themselves are quarter-circles tangent to the center circle merely adds to the tendentious, swirling sensation.

When the dance floor rotates, the room feels centripetal; when still, it seems to lack discernible boundaries. As in the original Rainbow, the restored north and south walls as well as ceiling soffit have been covered in aubergine purple silk; no material distinction is made between vertical and horizontal surfaces. Again as in the original, east and west walls are mirrored and space seems to turn back in on itself. Further confounding space, jambs in the room's 24 floor-to-ceiling windows are mirrored. When you look east you see west.

Roger Berk re-created the 32-foot-diameter dance floor, a compass-rose inlay of maple and fumed oak. Berk's grandfather laid the original floor in the 1930s, and his father laid a replacement in the 1950s. Hardy removed a wooden bandstand installed in the '60s and designed his own '30s reinterpretation: a low, concave podium at the west end of the dance floor, and concave music stands laminated with pearlescent blue-gray plastic and horizontal bands of brushed aluminium. The maître d's desk was designed in the same vocabulary, as was the ziggurat bandstand behind the podium; the ziggurat screens service entrance and exit doors.

Suspended from the ceiling is a segmental speaker cluster. Jay Panzer of Peter George Associates, the sound engineer, says that the speakers were hung directly above the bandstand in order to "localize" the sound source. Abutting the dome's circumference, the speakers minimize the room's major acoustical problem—heels echoing hard off the wooden floor onto the fabric-covered plaster dome. To keep the speakers visually unobtrusive, the cluster was made as shallow as possible (18 inches) and covered in an "acoustically transparent" fabric the same color as the bandstand. (One small consequence, however, of a leak in the HVAC supply duct that passes through the speaker cluster is the venturi effect: dust is sucked in, noticeably graying the fabric against the frame.)

Behind the ziggurat a mirror wall has been restored, resilvered

by hand. Behind the wall, paired, curving staircases lead up to a narrow balcony. Behind the balcony is the room's only new feature, Dan Dailey's glass block mural "Orbit." A bas-relief depicting space-probe detritus, the mural references a '30s glass wall above the building's entrance lintel. Illuminated from behind by footlights reflected off a painted backdrop, "Orbit" quietly glows with variegated colors. As you enter the Rainbow Room, you first see this west wall reflected in the east mirrors; then you turn, and the mural's colors, curve, and very title launch it and place it in sympathetic orbit around the dome. This is one instance, says Whiteman, of intended "narrative quality."

For club lunches, the dance floor is covered by the fretwork carpet. The carpet's pattern was re-created from period photos and press releases. Its original background color was interpreted as an emerald green, its fretwork a bit darker.

At night, the carpet comes off the dance floor, silver lamé replaces dove-gray tablecloths, and waiters change from short Eton jackets in aubergine purple to pastel tails reminiscent of Fred Astaire. Tying even tighter the *gesamtkunstwerk* knot, waiters also wear deep, double-pleated period pants with RAINBOWRAINBOW running down the leg; Robbins's computer-loomed repeat was adapted from Glaser's alphabet. During dinner, Glaser's Rainbow logotypes appear on service plates, menus, and wine list. Dailey lamps are set on each table. In congruence, wine glasses' ribbed stems recall Teague and Fuerst's "Embassy" pattern of 1939.

Even though Hardy considers them "bad French," the room's original Czechoslovakian crystal chandeliers and wall sconces have been restored. New theatrical spots have been installed, and new ambient lighting has computer-controlled dimmers. "The big difference today," says Paul Marantz, "is that the patrons—dining, dancing, actors in the drama—are lit directly." Adding to the drama is the restored dome. Its gold bands have been releafed, and its 41-foot diameter again reflects the colored lights that first gave the room its name. In the '30s, so the story goes, an RCA Victor "color organ" converted musical tones into a rainbow of colors and played the lights up onto the dome—hence, the Rainbow Room.

According to Baum, Hardy's genius lay in uncovering and recovering the hidden secrets of Rockefeller Center. To do so, he made a number of major architectural moves on the 65th floor. First, he closed the northern end and opened the southern end of the elevator lobby; this immediately provided a strong sense of orientation and visual drama—drop-dead views focusing downtown on the World Trade Center and midtown on the Empire State Building (a contemporary of Rockefeller Center). Second, he relocated the air-handling equipment and removed various accretions from the building's perimeter, making it possible to circumambulate virtually the entire 65th floor. Third, he relocated the Rainbow Room's entrance from the northwest to the southwest corner, making space available that previously had served only as a circuitous preamble (amble, mostly) to the room, at the east end of the building. Hardy's fourth move was to convert what had been a freight elevator lobby into an open-ended corridor running north-south through the middle of the 65th floor; holding the middle of the corridor is the Rockefeller Center Club's central concierge desk.

© Dennis Marsico

Finally, since the building's landmarked parapets could not be touched, Hardy boldly raised levels on the 65th floor 16 inches to the south, 24 inches to the west, and 12 inches to the north. This not only made available far views of three horizons and near views of the RCA Building's exterior detail, it also established a spatial matrix for "the variety of reasons to be here" specified in the Baum & Whiteman program. In the end, the Rainbow Room remained in its place, and new restaurants were designed for each of the 65th floor's three other orientations.

The lobby of the RCA Building Hardy finds "sepulchral." The elevator cabs are replacements. But take the Rainbow Express for 37 seconds (at 1,400 feet per minute), step out into the lobby, and you're on top of the world—a world of power, élan, and elegance.

Hardy's new lobby columns, rotated through 45 degrees, introduce several of his themes and organizing devices. First, the rotation immediately establishes a more animated orientation than did the orthogonals of the original building. The columns themselves are horizontal stripes of mahogany and ebonized mahogany alternating with glass cast from a special mold; running vertically through both the wood and the glass is the sawtooth pattern taken from the entrance lintel below.

In the elevator lobby, both the coffered ceiling and the terrazzo floor are rotated to align with the columns. Taken together, rotated columns, ceiling, and floor form an organizing device used throughout the 65th floor to signal transition from one major space to another.

Aligned with the north-south axis of the elevator lobby, three steps carry the reception-area carpet up into the south restaurant, called by day The New Grill and by night The Promenade. On sunny mornings, this space is effulgent, expansive, magisterially opening out over the Brooklyn Bridge, the Statue of Liberty, the Palisades. Even so, and although The Promenade extends the full length of the enclosed southern terrace, Hardy remarks, "I can't emphasize strongly enough how tiny all of this is."

More critically tiny than the space's plan, however, is its section. Raising the floor—a calculated risk—effectively lowered the ceiling height to 7½ feet. A variety of devices mitigate this lowness. At its outer edge, the ceiling has been mirrored; therefore, as it reflects the city below, the confining edge simply disappears. The rest of the ceiling was kept uncluttered and goes unnoticed, except for the downlights' dropped brass rings.

The centerpiece of The New Grill/Promenade is an extravagantly baroque, four-toned, mahogany bar inlaid with ebony and bronze strips. Like waves receding on the sand, the bar's serpentine contours and brass strips are repeated in a terrazzo floor leading up to a carpeted lounge. So as not to block the view, bar stools are backless. The only metal furniture in the room, they have one-inch, chrome-plated steel frames that maintain a dimension consistent with other tubular furniture elsewhere in the project. The stools were modified from the re-issuing of a 1928 Pierre Chareau design; their black leather seats were made 50 percent thicker for a more luxurious look and feel.

If, as Wolk says, the bar represents "a crash of materials," one might also say that the bar and the ceiling above represent a clash of formal geometries. Rotated through 45 degrees, the ceiling itself is mirrored and then dropped as four different levels of glass etched in three different patterns. (Dimensional coordination, says Tishman Inc. project manager Peter Spiegel, was one hell of a job.) Lighted from the side by a lens with a five-degree vertical spread, the several layers of glass appear to float independently of one another.

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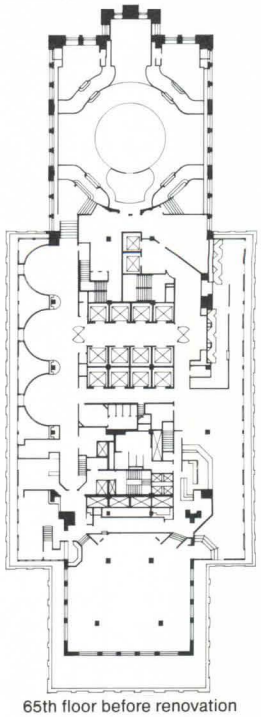
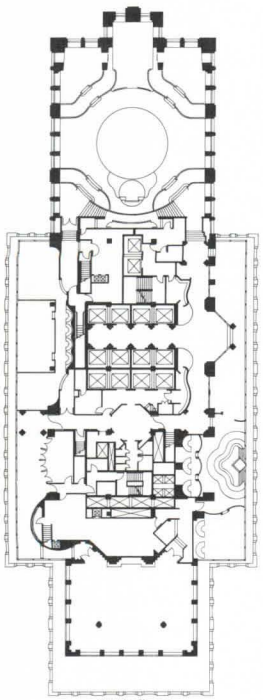
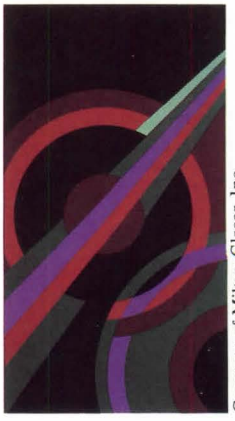


65th floor before renovation



65th floor



Courtesy of Milton Glaser Inc.

Opposite, 'Athena' by Arman, part of an art collection combining period and contemporary pieces compatible in spirit with the '30s ambience. Photo above, fiber-optic 'wiggley wall' by Hugh Hardy and Milton Glaser over curved banquettes in the Evergreen/Rainbow and Stars restaurant. Above and right, Glaser's graphics for wine list, menu, and club and service plates.

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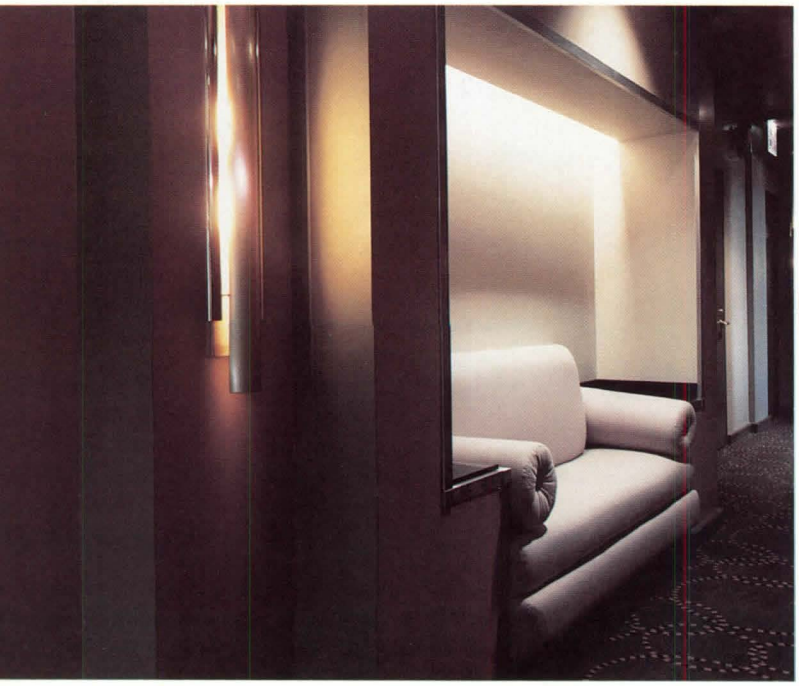

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At the west end of the 65th floor is the renovation's third restaurant, called the Buffet for club lunches and the Pavillion for evening private parties. With exterior views on three sides, an interior cornice ledge, and a raised central ceiling, the space has an almost Wrightian feel for "destruction of the box." Featured in the frieze above the cornice ledge is a series of mutable, blown-glass sculptures—Dale Chihuly's "Floral and Marine Forms."

Basically a facility for banquets, conferences, and receptions, the 64th floor has been functionally and thematically laid out as a series of three suites. South of the elevator lobby a long internal corridor runs east-west, connecting the suites and giving access to telephones, toilets, and the main kitchen to the north. East of a sliced bronze "Athena," by Arman, the corridor takes an S-curve between double, etched glass doors on one side and the concentric, black-and-white Larsen fabric on the other. Like the sewer tiles fixed reverse side out in the architects' own New York City office, the fabric here is applied obverse to the wall. Behind the seven pairs of double doors are two prefunction rooms divisible by a sliding pocket door; suites on the 64th floor are flexible, accommodating 12 to 450.

Entered off the corridor are three rooms called the Center Suites. One features Thurman Rotan's "Skyscrapers," a photomontage commissioned in 1932 by the Museum of Modern Art. The other two rooms are divisible by a folding screen decorated with Glaser's "Rainbow" logotype. All the Center Suites face south. On the west wall of the west room the architects designed a floor-to-ceiling, millwork cabinet. Hardy's homage to Donald Desky (with, perhaps, a nod to Paul Frankl's "Skyscraper Bookcases"), the cabinet is a syncopated design of mahogany and bird's-eye maple veneers, brushed aluminium handles, and stencil patterns evocative of period graphics.

Adding authenticity to the Center Suites are two of Desky's famous torchères, retrieved from Radio City Music Hall and repaired. The aluminium and wood torchères are extremely valuable: last year a lesser Desky lamp sold at auction for more than $50,000.

At the west end of the long corridor is the Radio City Suite. Although its function room has an abstract triptych by Frank Roth and brother-and-sister credenzas by the architect, this suite is but a poor, utilitarian relation to Hardy's rich, reminiscent reception area. The reception area features other Desky pieces rescued from Radio City: tables, lounge chairs, sofas. Chairs and sofas have been re-upholstered in a period fabric designed by Walter Gropius. Restoring one of the tables, Wolk discovered that its circular supports were not stainless, but aluminum; its black surface not—as insurance records indicated—Bakelite, but first-generation Formica.

Also in the reception area is a collection of streamlined, Bakelite radio sets—Emerson, Bendix, Fada, the '30s brands that brought you Cole Porter, Josephine Baker, and the Big Band sound. The radios still play. Curved and streamlined like a gigantic set, their cabinets cunningly reprise Hardy's own illuminated columns on the 65th floor. In fact, the whole reception area is a knowing reprise of both project and period: "crumpled laundry" from Rainbow and Stars, dropped downlight rings from The Promenade; an implied double dome and actual fretwork carpet from the Rainbow Room itself. Turn on one of the radio sets, and you just might hear Noel Coward singing "Love, Life and Laughter."

While building his center, John D. Rockefeller Jr. wrote, "The importance of a beautiful and unified architectural whole must constantly be kept in mind and attained, to the fullest extent compatible with an adequate return on investment." The restored Rainbow Room is booked six weeks in advance. The renovated complex is indeed architecturally "beautiful and unified." It's all, as they say, very sophisticated and not a little swank. □

Top, reception desk, custom carpet, and elevator lobby columns on 65th floor. Middle, Hardy's millwork cabinet and (at right in photo) original Radio City torchére. Left, 64th-floor corridor. Right, period radios and appropriate attire in Radio City Suite.

Interiors and Innovation

They are early barometers of design trends. By Andrea Oppenheimer Dean

rchitectural trends surface first in interiors. "Interiors are more ephemeral and vulnerable to blips," as Eric Moss, AIA, of Culver City, Calif., says. Because they are less costly and more cosmetic, clients are often willing to take greater risks and give designers freer reign. "In interiors designers can be closer to artists, more off-the-wall, more intuitive," as Stanley Tigerman, FAIA, puts it. Too, interiors are often the only work available to talented, young architects who seek in them testing grounds for ideas about exterior as well as interior design. This is especially true in competitive East Coast cities. In the 1970s, such architects as Graves, Eisenman, Meier, Gwathmey, Gehry, Stern, Venturi, and Ambasz became known through their interiors work. That raises the for now rhetorical question, has a comparable cohort arisen in the '80s?

If the work of the Venturi generation was a reaction to the prevailing modernism of its youth, the current crop of young designers had no such accepted wisdom against which to define themselves. They cut their teeth on pluralism. The last three or so years have "brought an even broader acceptance that there is no prevailing direction," says Paul Haigh, 37, of Haigh Space in New York City.

The consensus is that the influence of postmodernism, as a style of collaged and mannered posts and pediments, has run its course. The reasons are several. As Pat Conway of Kohn Pedersen Fox Conway says, the style "is devalued by the cheapness of its imitators." Such young architects as Peter Wheelwright, 37, of New York City, fault "postmodernism's concern with image" at the expense of spatial experience. Anthony Tsirantonakis, 32, who recently left Kohn Pedersen Fox Conway to start his own New York firm, finds the typically static, sequential, postmodern plan too confining and says the tendency is toward "more exploded, chaotic plans resembling those of modernism."

Among the legacies of postmodernism is that interior design has greatly broadened its purview. Says Tsirantonakis, "We're all designing artworks, fixtures, furniture. It started with the established architects and spread to people like me who are just beginning. There's more interest in nuances, details, materials. Ten years ago when Michael Graves started taking on interior design as an architectural art form, that became very important for my generation. First the tendency was to emulate his style. Now it's to emulate his method, which is to control everything, the space, the furnishings, objects, everything."

This desire for control, which seems to rise in direct proportion to feelings of powerlessness over the exterior political and cultural environment, is underscored by a recent essay in *Interiors.* In it editor Beverly Russell described her magazine's "policy of supporting the new integration of disciplines, furniture design, lighting, graphics, interior design, and architecture."

The demise of postmodernism as a style seems to have coincided with the demise of interest in styles themselves and in short-lived isms. "People are searching for authenticity," according to Martin Filler, critic for *The New York Review of Books,* among other publications. Thirty-nine-year-old Wade Killefer, AIA, of Carde, Killefer, Flammang in Los Angeles, explains, "Design is less direct, *more idiosyncratic,* less dogmatic, maybe less clear. It's far more personal."

But even the most personal statements are recognizably late-1980s. They tend to share attitudes toward materials, color, and lighting. And most will tend to fit into one of three divergent directions dominating today's interiors work. These are comfy historicism, neomodernism, and deconstructivism. More about each later. Let's begin with the particulars—materials, color, light.

Young architects are using exterior materials—and forms—in interiors. In the West it's partly because indigenous construction methods are lighter, architects are less burdened by convention, and there's a casualness that has accustomed people to seeing things put together in unusual ways. In the East it's different. As Wheelwright says, "Much of my work has a tremendous amount to do with stuff that's outside—mimicking the texture of the city, appropriating a particular building into the space, blurring the boundaries between inside and out." With his first large building commission not yet in sight, Wheelwright, among others, "abstracts the interior envelope so that it becomes metaphorically a site." The result, frequently, is to build an interior on the analogy of a townscape or streetscape, as is seen in four of the recently completed projects shown in subsequent pages.

Ross Anderson, AIA, of Anderson/Schwartz in New York City, adds that "using exterior materials makes interiors richer." Among other devices being used to achieve a feeling of density are layering and peeling back to reveal tiers. The emphasis is on natural materials. New technologies have made available inexpensive marbles and granite tiles, among other materials. One result, laments Kenneth Walker, FAIA, of the Walker Group in New York City, is that marble "has become the linoleum of the 1980s."

More exciting, says Tsirantonakis, "designers are rediscovering things like plaster, doing new things with wood surfaces," and showing more concern with how materials come together. He adds that "great things are happening in carpeting," which has been revolutionized by computers to permit inexpensive, accurate, custom coloring and patterning. This frees the designer to leave the carpet until the end, rather than having to start with it and match everything else to it. To a lesser extent the same is true of wood finishes.

While the result is broader choices, designers have generally elected to tone things down from three or so years ago. "Jokey Formica and leopard skins are out," says *Interior Design* editor Stanley Abercrombie, FAIA. "Even the crazy Italian stuff has quieted down—both interest in it and the stuff itself. There has been a shift to more substantial and fine materials."

olor tastes are the most ephemeral of all. With the decline of postmodernism, the mauving and salmonizing of America has about ceased. Momentarily popular is a range of neutral colors from whites through beiges and grays, with the occasional bright accent. As Filler says, "the tendency toward monochromatic ivories cools down the supersaturated atmosphere of heavy 1980s interiors in whatever style."

A major change in the approach to color is explained by a pronouncement of John Hejduk, FAIA. It is that "architecture ain't paint." Pat Conway adds, "The paint that looks marvelous the day after it was put on the wall looks dreary a year later, and nobody is willing to get out the 42 cans to freshen it up." Renewed interest in neutrals and in materials that are stained or chosen for their color (like metals) is a natural consequence of regarding color as an integral part of design rather than as appliqué.

What designers seem most excited about is light—both natural and artificial. Says Barbara Knox, editor of *Lighting Dimen-*

sions, "Lighting is everybody's favorite new bandwagon. It's chic to be knowledgeable."

The attempt, as with color and materials, is to make lighting an inseparable part of architecture, if possible, "to make the whole design a fixture," as Larry Booth, FAIA, of Chicago puts it. "Light becomes like a paintbrush," he adds. "It's what you make architecture with." Lighting design, too, has greatly benefited from new technologies. There are new tubes, new bulbs, new fixtures that allow great play with light and by extension with color. Some new uplights look like chandeliers, and indirect lighting has become more sophisticated. Uplighting and illumination built into partitions are revolutionizing offices, says Robert A.M. Stern, FAIA, so that "big open spaces have become airy, clean, and spacious where they were cluttered 10 years ago."

Just a word, then, about offices. As in other interiors work there is much more custom design. "We're putting technology back to work for us," says Stern. "You don't have to buy something that seems extruded for 10 miles. There has been a reintroduction of architecture into the design of a host of products." But office design generally is more conservative than retail (which is more trendy) or residential work (which tends toward the experimental). "Developers don't want what's next but what's current," says Deborah Berke, a 34-year-old New York City architect. Offices are still adapting to the advent of technology, the need to coordinate helpings of spaghetti wiring, to add space for new electronics, while visually playing down the dominance of technology. Hence, an attempt to make offices seem more residential and homey.

The general feeling is that the splashiness of 1980s office design—and especially the grandiosity of its lobbies "celebrating the developer as hero," as Conway describes it—will give way to a new frugality. There is a reaction generally to the "unbridled consumption, the sickening surplus of the Reagan years," says Martin Filler. It coincides with fears that the economy will falter and require belt-tightening that will affect design in all building types. But even before last October's stock market crash and widespread criticism of American greed, younger designers, especially, began paring down and simplifying their work. Their efforts contrast sharply with the school of historical, cozy-comfy (generally pricey-looking) design.

These polarized approaches—neomodernism and historicism—plus deconstructivism, which sometimes verges on neomodernism but is antimodern in important ways, constitute the most discernible design directions of the late 1980s.

An example of the increasingly spare, abstract, neomodernist approach is that of Billie Tsien, 38, a partner in Tod Williams, Billie Tsien & Associates in New York City. Tsien talks about her firm's interest in the "art of construction, in a refined and elegant sense of structure, in stripping away unnecessary things and then coming back in and overlaying them."

Neomodernism looks more to the esthetics than to the beliefs or attitudes of modernism. There is renewed interest in industrial materials but not in high-tech, in materials and finishes but less in space. For one thing, neomodernism has absorbed the lessons of postmodernism. It has benefited from postmodernism's interest in ornament, context, history, materials, textures, and craftsmanship. "We're looking," says Filler, "at a more vigorous and romantic view of modernism."

In the fall of 1986, educator and architect Andrew McNair described neomodernism as "more abstract than representational . . . more simple than complex . . . more utopic than dystopic . . . more iconographic than scenographic . . . more global than regional . . . more new than old." He went on to say, "Neomodernism is serious, functional, optimistic, simple, constructional, and permanent in the northland of architecture. . . . [But] this is the Age of Reagan. There is little of the pop hedonism of the '60s or '70s. Conservatism is high. While architecture ventures into new territories, it also treads lightly."

Treading far less lightly as it approaches mainstream is the deliberately unsettling deconstructivism. It is a direct challenge, especially, to the cozy-comfy school. As Columbia University's Bernard Tschumi has said, "Our time and age are not about being comfortable, but about disturbance and uneasiness and stress."

Since decon challenges all intellectual constructs and is deeply pessimistic, it stands opposed also to modernism. Decon is also referred to as "post-Holocaust" design. As Russell of *Interiors* explains, it's "what's left after the bomb, all the strong statements suggesting disintegration, something to do with chaos. It's an exaggerated way of expressing things."

Although decon, unlike neomodernism, is based in theory—in fact, literary theory—it has been translated into an esthetic and has emerged as a look that is also called zig-zag. McNair wrote about it in 1986 in *Interiors:* "The zig-zag style floods all realms of architecture and design. It is conspicuous in many works where grids are rotated, columns skewed, walls broken into diagonal fragments, rooms lift off the ground, stairs float."

Decon or zig-zag can include lots of black, gray, and white with sharp color accents, some more brutal materials such as concrete, garage floor terrazzo, sharp glass, plastic finishes, unfinished lumber, rusted metal, and other usually hidden materials. It often takes its inspiration from the leftover stuff we usually bury, cover, or disregard.

A main reason why decon/zig-zag will be widely discussed and influential, if it isn't already, is this month's MoMA exhibition on deconstructivism organized by Philip Johnson, FAIA.

The principal criticism of decon is that, being an appropriation from literary criticism, it is a diagnostic, not a prognostic method. Or, as Emilio Ambasz, FAIA, says, "It is a critical method for disassembling any value and not proposing any new one. It is a necessary but insufficient device for architecture."

Thinking about the future of decon, says Alan Chimacoff, AIA, of Princeton, reminds him of a quip made by Barry Goldwater while nominating a Republican challenger to Jimmy Carter. He remembers Goldwater saying, "I have seen Carter's future and it is Lyndon Johnson's past." "Deconstructivism's future is Russian constructivism's past," predicts Chimacoff.

That is the lesser evil. For deconstructivism in the hands of lesser talents will make the sins of postmodernism—its superficiality, silliness, smugness—look like very minor foibles. If you can't imagine what an everyday, commercial decon building might look like, think for a minute: deconstructivism provides no rules, no reproducible models, nor guides. Think also of decon's nihilistic disregard for accepted design constructs, its tacit flirtation with chaos, its penchant for rough materials, strident colors, jagged, sharp, and tilting edges. Enough? Run-of-the-mill, downtown decon might make even the brutish, blank-faced behemoths of the '60s spell relief.

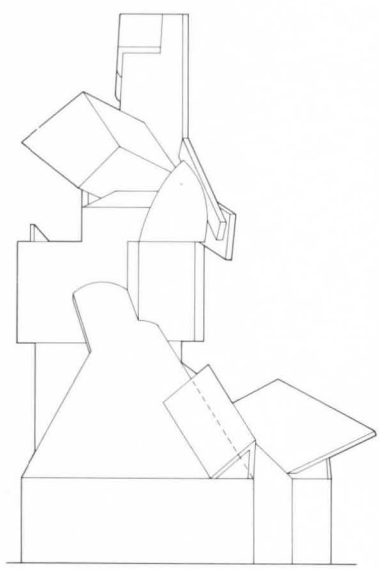
Of more immediate consequence, young designers like 33-year-old Julie Eizenberg of Koning/Eizenberg in Los Angeles say they're tired of designs "that are overworked and don't push the boundaries." Berke foresees "more use of generic materials like plywood and corrugated glass fiber panel in subtle ways, as well as affordable, accessible, off-the-shelf materials." Her prediction is based in part on the belief that we're coming into economic hard times. "We'll go back to shopping at Sears—away from the pretension of Sunar showrooms and the preciousness of minimalism," says Berke.

Something we tend to forget when thinking of the decons, such as Frank Gehry, FAIA, Eric Moss, Thom Mayne and Michael Rotondi of Morphosis, all in Los Angeles, and even Austria's Coop Himmelblau, is their sense of fantasy. Tim Street-Porter, an architectural photographer who has watched and evaluated the Los Angeles scene, is buoyant about what he sees. "It's more glamorous and fun, doesn't bow to history, and clients are ready to go along with fantasy. We're becoming freer," he says. "We're coming out of an era of conservatism."

What is one to make of these contradictory prognoses? Well, for one thing, even the Great Depression didn't stop art deco (also once called zig-zag), but it certainly stripped away the extras and, especially, literal historical references. □

Deconstructivist Construction

Exhibit structure, Frank Gehry, National Building Museum. By Andrea Oppenheimer Dean



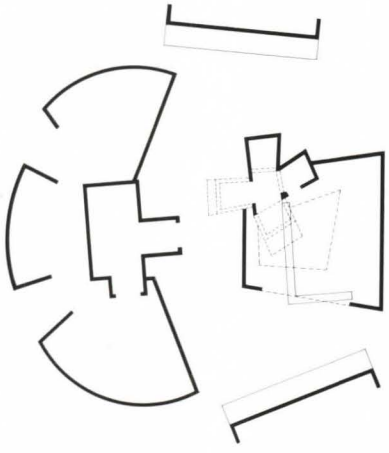
It is an archetypal example of deconstructivism. Its joints are wrenched, its volumes twisted, its perspective distorted, the squareness of its walls and openings upset. As the primacy of the whole is shattered, the authority of individual elements is strengthened—yet also weakened. Since their framework and relationships to each other are undermined, their deployment begins to look helter-skelter.

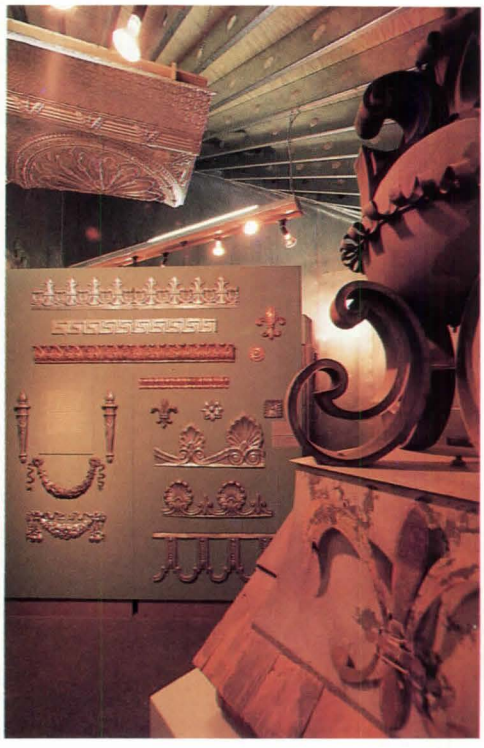
Bursting with energy to the point of being strident, Frank Gehry's giant, sheet metal building within a building also challenges the well mannered, quiet authority of Gen. Montgomery Meigs's neoclassical Pension Building of 1883, now the National Building Museum in Washington, D.C. Gehry's 65-foot-high exhibition structure, celebrating the centennial of the Sheet Metal Workers International Association, fits (barely) under Meigs's five-story atrium ceiling. Gehry says he wanted his composition "to thrust upward—it was cut down by 12 feet. I wanted it to press the space, be almost too big for the room." His feelings for the museum cooled when he first saw it about a year ago. Phony-looking paint was (and is) chipping from its colossal columns; scaffolding was (and remains) in place for renovations.

As one who frequently clads buildings in materials usually reserved for undergarments, including sheet metal, Gehry was the obvious choice as designer for a construction displaying sheet metal fabrication techniques and products. He once told an interviewer, "I don't look for the soft stuff, the pretty stuff. It puts me off because it seems unreal. . . . Buildings under construction look nicer than buildings finished."

A study in contrasts, Gehry's highly charged, off-center, off-kilter sheet metal colossus is caged by gigantic Corinthian columns. Above, much of its appeal comes from its juxtaposition of different materials in an unsettling composition.

Glimpses of the exhibition: up into the tower (bottom) of Gehry's construction, and out one of its almost-squared openings (below). Facing page, the entrance to the exhibition spaces, which receive 'natural' light from a congeries of differently shaped openings.





Photographs © Harlan Hambright

Gehry's work for the National Building Museum consists of two freestanding elements—one for display, the other for live demonstrations. Their parts form a collage of disparate shapes that collide and spring apart, push out and thrust upward, looking ready for blast-off. Appearing to have just slid onto overhead, sloped surfaces, a couple of geometric shapes perch precariously. On the floor, a few feet from the exhibition structure is a copper-clad triangular form that looks as if it had peeled off and tumbled down.

There is a sense here of barely contained physical energy that is underscored, yet also given organization, by the use of four different cladding materials—copper, polished brass, galvanized iron, and a gray, lead and tin steel called terne plate. Gehry uses the materials like four colors of paint, the variously sized panels like brush strokes.

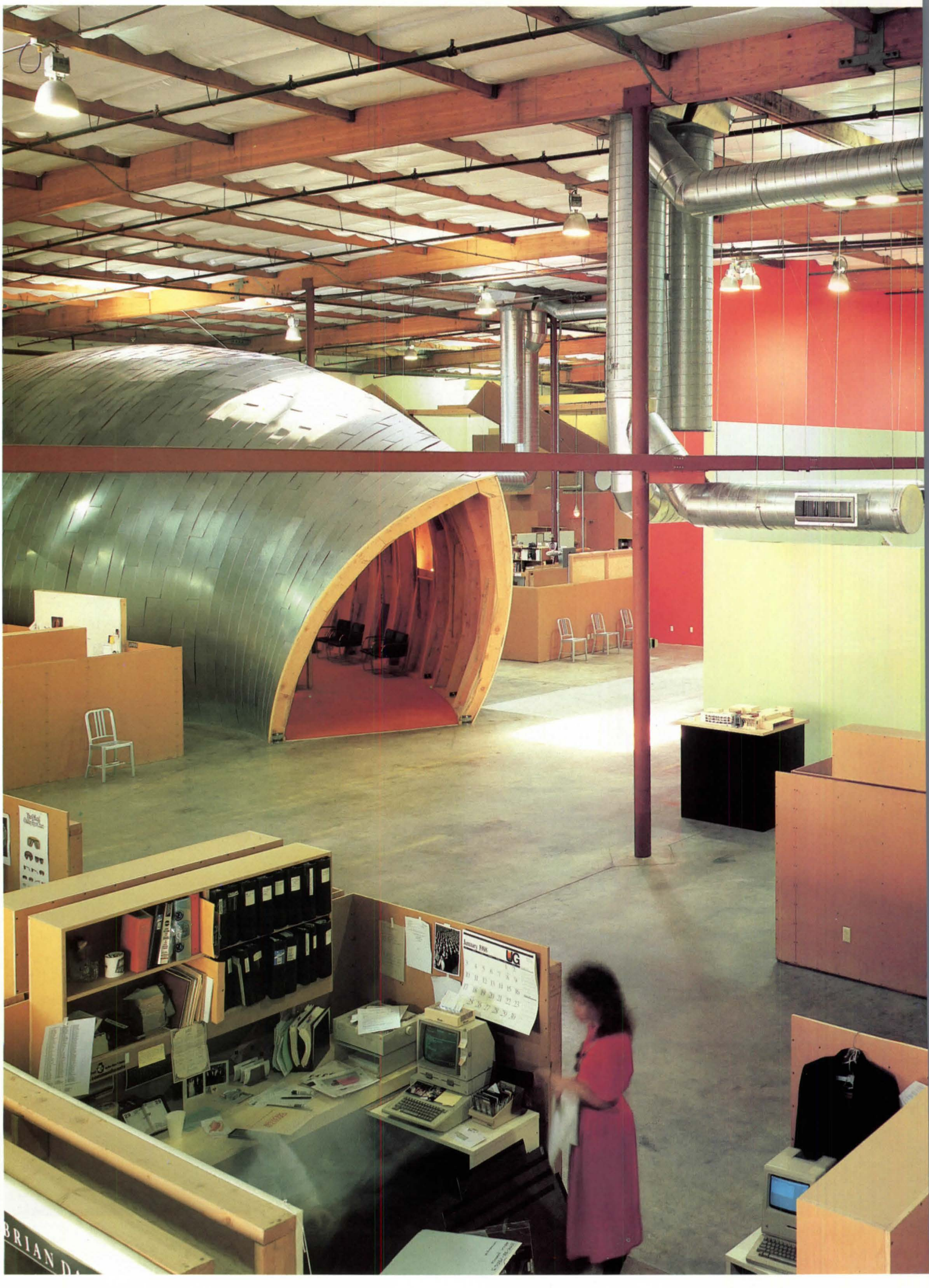
The display area interiors are cavelike, labyrinthian, and often overpowered by their contents, over whose disposition Gehry had no control. The demonstration area is an open shed. There is hardly a squared opening in either structure, and in both you get surreal, off-kilter views upward into the winding, angled innards of Gehry's late-20th-century vision and out to Meigs's late-19th-century superbuilding.

About his process, Gehry explains, "I tried to build as I always do, creating a metaphor for a city with towers and turrets, odd passages and strange collisions. It grows out of the stuff where I make villages. It's a very childlike exploration of forms."

And the result? "It's like if you threw a bunch of objects into a can. You would still recognize them all. That's what a city is to me, a collage of disparate pieces," says Gehry.

His installation will remain through August. The Los Angeles architect hasn't seen its completed version but talks as if he'd love to get his hands on it to do a final editing. □


SHEET METAL CRAFTSMANSHIP
PROGRESS IN BUILDING



Photographs © Tom Bonner

Architectural Forms Floating in A Large Space

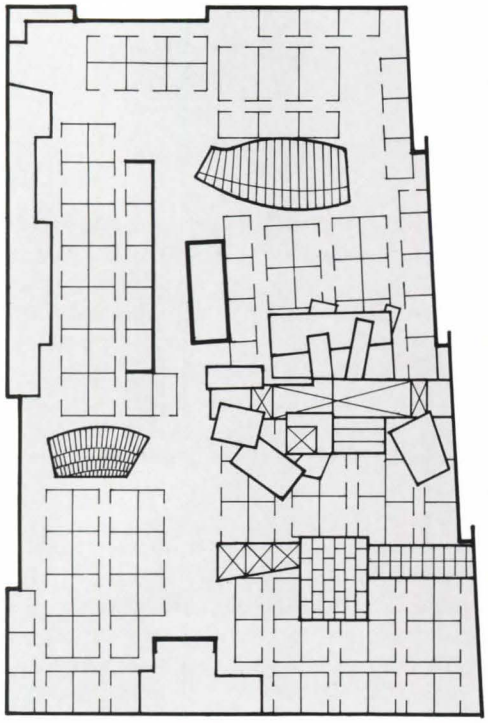
Temporary advertising agency offices, Frank Gehry. By John Pastier.

The day before an internationally circulating exhibit of Frank Gehry's work opened in Los Angeles, there was a party celebrating his temporary quarters for the Chiat/Day advertising agency a few miles away to the west. Both installations embodied the concept of unusual architectural forms floating in a large space, but the installation at the Museum of Contemporary Art did not fare well in the comparison. The finely sheathed pavilions of the show had little room to breathe in the smallish, Isozaki-designed museum, while the larger but more ordinarily clad forms of the office design, installed in a spacious warehouse, were clearly more convincing as objects in space.

The theoretical connection between the two is interesting. The exhibit, which was originated by the Walker Art Center of Minneapolis (see Nov. '86, page 20), used archetypal Gehry structures to house the models, drawings, and photographs on display while also representing his notions of form, space, and materials at more or less full scale. Then, in a case of life imitating art, this symbolic representation of the architect's thinking became the conceptual basis for the advertisng agency offices.

The similarity between the designs also reflects an unexpected similarity between the patrons. The Walker Art Center has long been known as an originator of imaginative architecture and design exhibits. Chiat/Day, the largest locally based ad agency in Los Angeles, is no less innovative. In addition to producing advertising such as the Macintosh computer commercial of New

Left, open offices and Gehryesque forms under the 25-foot ceiling of an early '70s warehouse. The silver fish at far left is the main meeting room, constructed of galvanized metal over wood ribs. Below, a corridor enclosure called 'Battleship Galactica.'



Top, an arrangement of Gehry's corrugated cardboard furniture. Above, view through the main meeting room shows exposed wood frame. Facing page, 'Three Mile Island' houses a single conference room and a space for a photocopier. Plywood workstation partitions, five feet high, expose 2x4s to the corridors.

Year's Day 1984 and a series of large murals of athletes for Nike sports shoes, it had commissioned Gehry and Claes Oldenberg to design its permanent office space in the California beach community of Venice. When toxic soil problems delayed that project, the present one came into being just across the street.

The temporary offices occupy a not very characterful, 40,000-square-foot warehouse built in the early 1970s. Gehry added white-faced insulation and numerous skylights to the 25-foot-high ceilings, and, since everyone works in low, open cubicles, there is a strong enveloping sense of space and light. Punctuating the basic field of 115 workstations is a series of independent forms, some sculptural and free-floating, others ordinary in shape but distinguished by bright colors, housing conference and meeting rooms as well as a Cray supercomputer.

The main meeting room is a wood-ribbed, galvanized-metal-scaled fish that, ironically, had to be sprinklered to meet the fire code. This element is the same shape as one of the museum exhibit structures, but with each dimension doubled. The change of scale creates an impressive presence and a generous internal space. With its exposed interior ribbing, it casts an observer in the role of Jonah or Pinocchio. Indeed, such a sense of fantasy is strong in the project, and, accordingly, the clients have dubbed the various meeting rooms with fanciful names. A suite of three is called Huey, Dewey, and Louie; two pairs are called Huntley and Brinkley and Laurel and Hardy; and a single conference room housed in a tall, curved, metal-clad form has been named Three Mile Island. Likewise, a large, fortresslike corridor enclosure is Battlestar Galactica. The computer room is called Big Blue, not for IBM equipment but for its exterior paint job.

There are also smaller-scaled touches of color, form, and unusual but typically Gehryesque materials. Pieces of the architect's recent squishy corrugated cardboard furniture are spotted throughout the circulation areas, and the principal one, known perhaps predictably as Main Street, sports a bright red restored 1960s Datsun station wagon with a surfboard hanging out its back. (Nissan Motors is a major account of Chiat/Day.) The most heavily trafficked paths are the original exposed concrete floors, but most of the floor space and all of the workstation interiors are carpeted in soft shades of rose, beige, green, or blue-gray.

These muted colors contrast with the painted sheetrock forms that house the office's enclosed spaces. There, deep but smoldering and slightly nasty shades of red, blue, and yellow, as well as a paler mint green, convey a sense of artificiality or arbitrariness that is intellectually appropriate to the notion of paint as opposed to color that is integral to a material. The four shaped forms derive their colors from silvery galvanized steel, reddish-brown epoxy-coated Finnply plywood normally used for concrete formwork, and kraft-paper-faced MDO plywood that is used for hand-painted billboards. Initially, the painted elements were also to have similar finishes, but when a contractor's bid revision eliminated that possibility paint was substituted.

Gehry's reaction at that point was to dramatize the contrast between integral finish and applied paint. He explains the choice of colors by saying, "I picked them so I wouldn't like them, so

Photographs © Tom Bonner

that they would play against the forms and materials that I did like. I shuddered when I first saw it." This approach is not as odd as it first sounds, since the quarters are temporary and paint is easily altered. The client chose Gehry for precisely such surprising tactics and encouraged him to go further than usual. And Gehry's work does not represent the final condition of the offices. Chiat/Day plans to install art, including a neon piece that will be mounted on the blue wall, and the firm's 230 employees already have made a major mark simply by inhabiting and personalizing their work spaces.

The workstations are basically identical—10x15½ feet in plan and five feet high. Each is sheathed in MDO plywood on the inside, and most have exposed 2x4 studs on the corridor side. Chiat/Day has long had a policy of "no closed doors," and the top executives' spaces are no different from anyone else's except that each of them occupies a full cubicle rather than sharing it with a workmate. Each space has a U-shaped counter that serves as a desk, a pair of eye-level bookcases, a large tackboard, and a pair of recessed lights. The space below the counter can be used for low files or other storage. What strikes a visitor to these offices is not how similar they are but rather how diversely they have been occupied. Chiat/Day is a notably creative organization, and the work products and personal memorabilia on display in the offices make up a show in themselves. It is just as stimulating to see how people have arranged their spaces as it is to see what Gehry has given them.

Of course, the contents of the offices will continue to change, and the design itself is not yet complete either. In Gehry's estimation, the best is yet to come. He has designed a conference room and media center that will occupy a smaller existing building close by. Primary client contact will take place in this building, and the budget will permit materials and finishes closer to the architect's heart. Much of the main space installation reflects pragmatic standards of workmanship, not only because of a $40 per square foot construction cost but also because of a tight, 90-day window between the start of the work and move-in. As a result, there is a rough-and-ready quality to some of the construction, especially where framing is exposed in the exterior workstation walls and the interiors of the large Finnply and MDO plywood volumes. There, many of the studs are damaged or discolored, misdriven nails sometimes protrude from splintered wood, and electrical conduit snakes though the framing where the overhead network of red steel cable trays was unable to service a particular area. The architects accepted these incidents as inevitable within their time and cost constraints, and of course Gehry has long prided himself on an esthetic that embraces mundane materials and the inevitable sloppiness of normal Southern California construction practice.

In perspective, the Chiat/Day temporary offices are a considerable accomplishment. They embody a spirit of improvisation and risk-taking that rarely survives in large and "important" projects. During the temporary quarters' brief history, many observers have suggested that the clients remain in them and lease the permanent offices to some other tenant. Something similar occurred at the Museum of Contemporary Art, where the trustees decided to retain Gehry's splendid temporary garage remodeling even after the permanent Isozaki building was put into operation. By celebrating the informality and impermanence of his local culture, Frank Gehry has created temporary environments that seem eminently worthy of perpetuation. □

Herman Miller Puts Its Own House in Cheerful Order

Headquarters Building B becomes a city in miniature.
By Sharon Lee Ryder

Photographs © Lea Babcock

For a company known for design excellence and innovative products in office systems, Herman Miller's own corporate offices in Building B were a mess. Building B was a factory building designed by George Nelson in 1958 and converted to office use in 1980 by Caudill, Rowlett, Scott. In a few short years, the space had become an open office nightmare, a warren of cubbies and corridors that filled the 80,000-square-foot former manufacturing plant from wall to wall. "We evolved, we grew, we expanded, we lost our continuity," said one employee. "Eventually we got spread all over the place with some departments split up in different locations in the building. You could walk down an aisle and end up in somebody's workstation even though you thought you were traveling down a main corridor." The joke around Herman Miller was that when they finally dismantled this maze they would find all the people who had gotten lost.

It wasn't difficult to recognize there was a problem. The company was spending almost $1 million a year to accommodate individual employee requests for different components to customize workstations, and the wait seemed interminable ("longer than for any customer," said one employee). There were no signs and no enclosed spaces for privacy; lighting was barely adequate and acoustic control was nonexistent. "People were dissatisfied and were using constant change as a means of expressing it," said Jeffrey Scherer, AIA, one of the consulting architects on the project. "There was a big message being sent."

The company's initial response to the problem was yet another furniture redo for which it budgeted $600,000 and a few months' time. "We focused on product because that's what we know best," said Doug Zimmerman, head of facilities management for Herman Miller. "We assumed that product could solve a lot of the problems. It was the very foundation on which the company was based. For a manufacturer, product was an expendable commodity that was eminently flexible. But we were just creating problems for ourselves." Eventually, Zimmerman saw an opportunity for a new approach. "I had spent a great deal of time researching city planning concepts of Kevin Lynch," he recalled, "and I wanted to test some of those ideas at this scale and see what they would mean."

While the original building was an elegant lesson in modern industrial architecture in glass, steel, and brick, many saw it only as a shell with 22-foot ceilings that kept out the rain. The vast expanse of uninterrupted interior space demanded definition. "It was so big it was almost the size of a village," one project designer recalled. "The city metaphor seemed appropriate." That metaphor offered an intellectual framework for solving many of the problems Zimmerman and others felt were inherent in the building. A coherent city plan made the space legible and gave its occupants a sense of where they were relative to where they were going within the whole. The city-plan vocabulary provided a variety of spaces suitable for organizing an office. Corridors became streets; departments became neighborhoods; conference, coffee, and copy centers became parks and recreational areas. Each space could be defined and separated from others, and the intersection or conjunction of two would become a node or landmark.

With this conceptual framework, the company team of designers began as any manufacturer of office systems would—with its own product—and laid out a fairly literal schematic plan of Lynch's ideas—common areas, streets, landmarks. What the designers soon discovered was that open office components such as freestanding panels, desks, and storage units had a limited capacity to give form to these ideas. The components only made workstations, which, side by side, were just another sea of workstations. A coherent city plan required elements on a scale between the whole (in this case, the building) and the individual parts (the workstations). These needed to be idiosyncratic, specialized interventions, something that Herman Miller's office products, conforming to a systems approach geared to repetition and consistency, could not achieve.

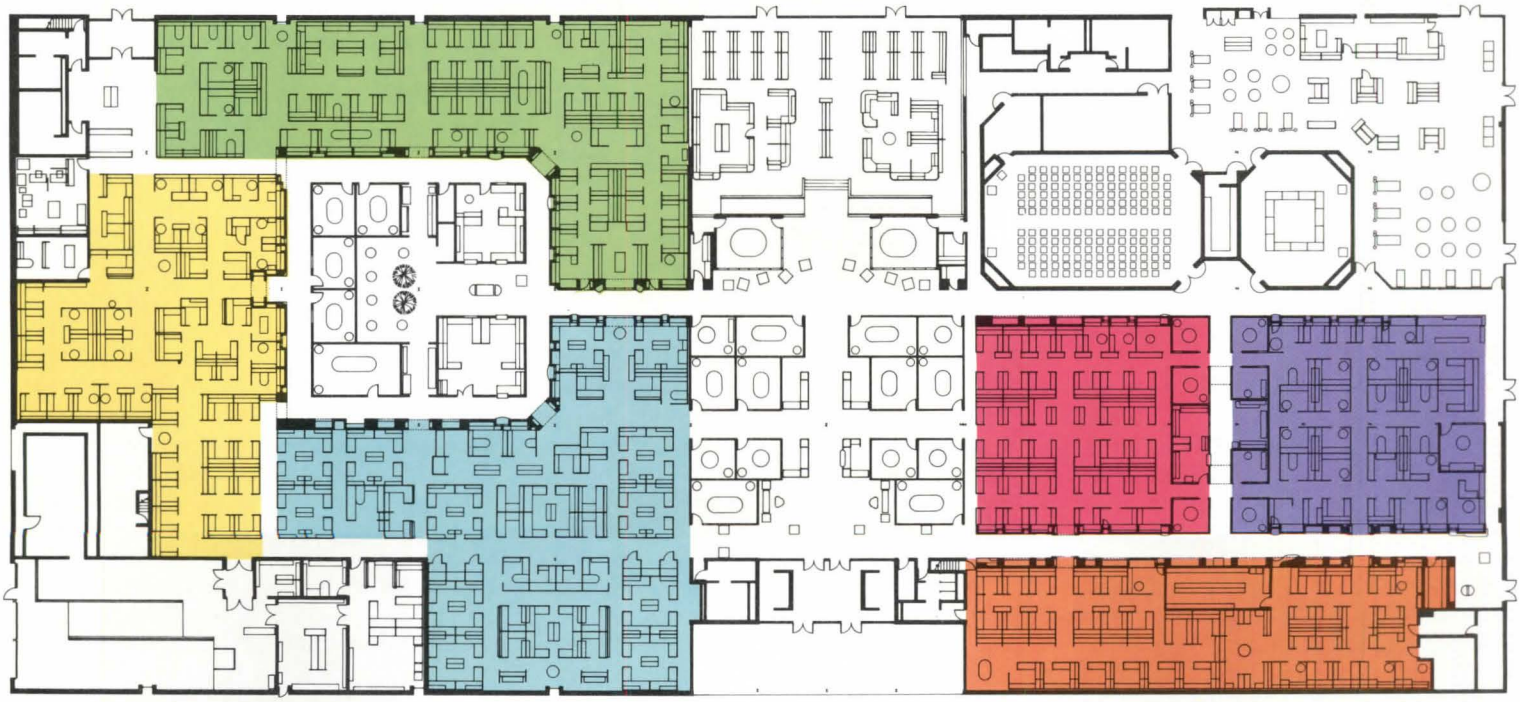
Recognizing the limitations inherent in what they were doing, the team called in Scherer and Thomas Meyer, AIA, of the Minneapolis firm Meyer Scherer Rockcastle Ltd., who were already at work on several projects for Herman Miller, one of which was a study of what a wall was and what it was supposed to do for a recently acquired subsidiary, Vaughan Walls. The conceptual result of their meeting was the marriage of systems products with interior architecture. The architecture would be suitable for the fixed, permanent aspects of the plan—the copy, conference, kitchen, and other common areas—while the office systems would be free to do only what they do best—workstations. The architecture would also bridge the scale between individual workstations and the building's shell and could take on all the idiosyncratic qualities necessary for making places special.

The architectural intervention became known as the "fat wall," since it is almost three feet thick rather than the usual four inches. Thus the wall can be carved out on one side or another and become part of the area it is adjacent to. On the neighborhood side, it is part of someone's workstation; on the corridor side, it may have a niche displaying a sculpture; on the commons side, it may provide storage space. Windows pierce the wall, opening up views through and beyond. As architecture, it affords designers the freedom to give shape and form to an interior space far beyond what is possible with any of the standard open office furniture systems. Functionally, the fat wall surrounds the common areas and separates them from the neighborhoods, gives a sense of solidity and permanence usually lacking, and defines major circulation routes that cannot be intruded upon. Although it is constructed of drywall, none of the team regards it as any more permanent than any other element of the design. "It's not as precious as everyone assumes," said Scherer. "You just paint it or knock it down if you need to make a change. But the idea is to give a sense of permanence, then just fine-tune the rest."

Following the concept of a city plan, the team developed "zoning ordinances," rules by which the office community agrees to live. These include population density limits, definition and boundaries of neighborhoods, colors and finishes on workstations,

Sharon Lee Ryder is a New York City-based editor who writes frequently about interiors. She is a former senior editor of Architecture *and former editor of* Metropolis.

Left, coordinated graphics and colors define the individual 'neighborhoods.' A lavender cloud announces the 'People' work area. Above, cutouts allow long views through space.



Finance

Corporate risk and insurance
Corporate taxes
Credit
General accounting
Capital assets
Internal audit

Customer Service

Product distribution and services
New products and custom *choices*
Operations planning
Order administration

Customer Service

Sales service

Finance

General accounting
Accounts payable
General ledger

Finance/People

Cost profit analysis
Participative ownership programs
Development and training
Personnel services
Compensation
Payroll

People

Equal opportunity affairs
Health and wellness
Organizational development
Participative ownership programs
Scanlon programs
Personnel services
Benefits
Staffing administration

the types of components available for workstations, and the extent of individual freedom to accessorize and personalize office space. Based on these guidelines, two different Herman Miller systems were specified for the east and west sides of the building.

While some major elements of the design were fixed, others could change, as the streets and parks of a city remain constant while buildings are added to or demolished. Following the decision to reduce the latitude for individual customization of work spaces, some means had to be found to ensure that individual users' needs would be met. The team spent a great deal of time with the users mocking up typical workstations and learning what worked well. The result was 22 workstation types from which individuals could select, all based on a 30-inch-wide module with only two possible vertical components—a high one separating neighborhoods and a lower one separating workstations within a neighborhood.

This degree of office standardization was offset by a series of newly developed work tools from which employees could select to accommodate their individual work style preferences. With a simple requisition form, they could order and exchange at will accessories such as organizer trays, message holders, bins, files, lights, and shelf organizers. The team also worked with each department to lay out the standard workstations in ways that would best accommodate differing departmental needs. Some, such as Customer Service, required open, visually accessible spaces; others, such as Finance, needed more privacy. With these parameters determined, the designers laid out the entire space with many workstations no larger than 7x7 feet. "Because they were so well organized, no one seemed to mind their smaller size," said one designer.

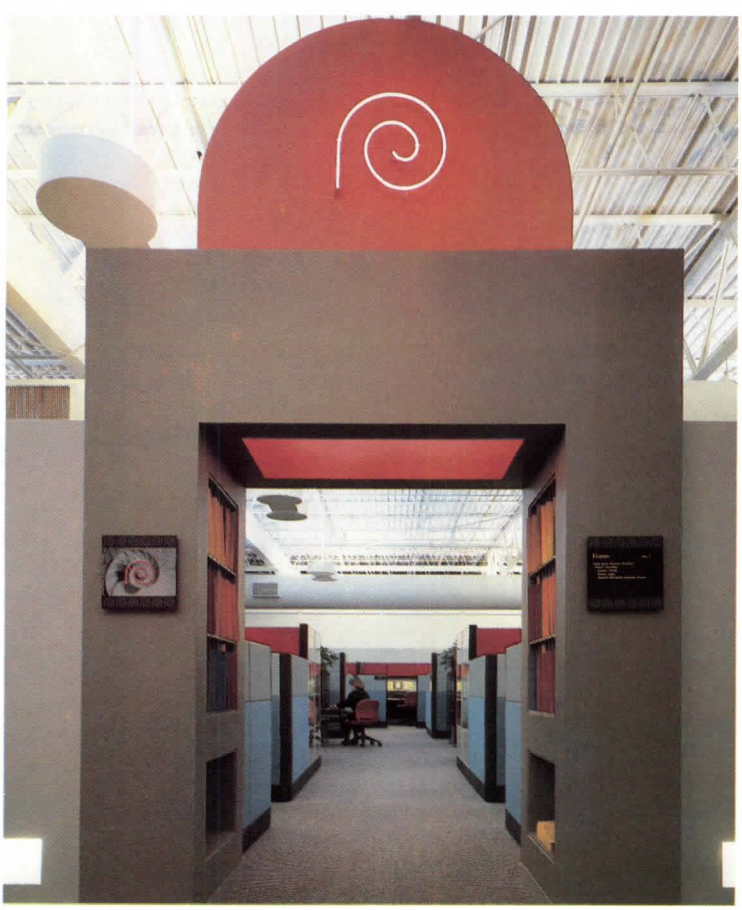
Integral to the project was a concept for graphics and signage developed by a consulting firm. It was based on a set of six abstract, linear symbols derived from natural forms—mountains, hedgerows, waves, nautilus, clouds, and pyramids—each used to represent one neighborhood. A plaque at the building entrance denotes each department with its symbol, and the symbols reappear in both solid volume and neon signage forming gateways to the major entrances to each neighborhood along the corridors. In theory, the employee or visitor is supposed to associate a symbol with its department and therefore know at every turn where he or she is. In practice, however, since the symbols have nothing at all to do with the departmental functions, and since there are no maps other than at entrances, many people still get lost. The real means for visual identification is the different colors of the neighborhoods and the patterns of colors painted on the common-area roofs in the two sections of the building. The symbols have become mere window dressing for what people now refer to as the blue area or the yellow area.

The graphic design is the weakest link in the concept for the space, but other problems also are apparent. The common areas seem to have too few people and too little activity to lend any sense of vitality to those spaces. The landmarks denoting nodes or places of intersection are not strong enough to be read from any distance; they defeat their own purpose of drawing people down a corridor. But these failures are minor compared with the accomplishments of this design.

For the people at Herman Miller, the process of getting to the design was as important as the design itself. The use of facilities, the involvement of the user, and the impact of design decisions on facilities management were issues the team thought through along the way. Another major objective of the new design was a facility that would be a strong sales tool; all agreed the old one was not. Two years ago, salespersons were embarrassed to bring clients to Building B because the facility represented everything that was wrong with open office systems. The consensus now is that the building is a strong sales tool because it's believable. "We didn't design something to flatter the product," said Zimmerman. "There is nothing that isn't standard here. We could have done a more lavish installation or a considerably less expensive one, but this one strikes an average. It's very typical, and lots of customers can relate to that."

Architecturally, many of the ideas that found their way into this project are not new or revolutionary. Ideas of village, path, landmark, and place-making have been the basis of Charles Moore's work for many years, while Frank Gehry, for all his un-

Left, the clock tower serves as a landmark for one of the project's metaphorical 'town squares.' Below, 'fat walls' three feet thick form a gateway between departments. Below right, individual workstations along the Finance department corridor.



Right, glazed offices framed in various colors line 'Main Street.' Below, the Customer Service corridor terminates in a playful clock element. Below right, conference areas with doors and taller wall partitions set off private spaces throughout. Facing page, forms atop the thick wall provide visual relief in corridors.

orthodoxy, has used such vernacular concepts in several of his office projects. What makes this installation unusual is that it is not a one-off solution of the type done by most architects. Rather, the Herman Miller offices integrate office systems with more idiosyncratic, architectural components in an application that could well appear in any standard office building anywhere. It is a solution that comes to terms with the fact that office systems can't do or be everything in an office—quite an acknowledgement for a company whose investment in its original Action Office system propelled it from a $30 million company in 1968 to a $500 million company in 1986.

While Zimmerman doesn't see replicating this approach in all the company's facilities, new or old, he and many on the design team clearly see the potential for new directions in product development. In an industry full of Johnny-come-lately companies whose products have stagnated as a result of runaway growth and financial success, Herman Miller's direction clearly re-establishes this company as an innovative thinker and leader in its field, whose next move may well set yet another industry standard. □

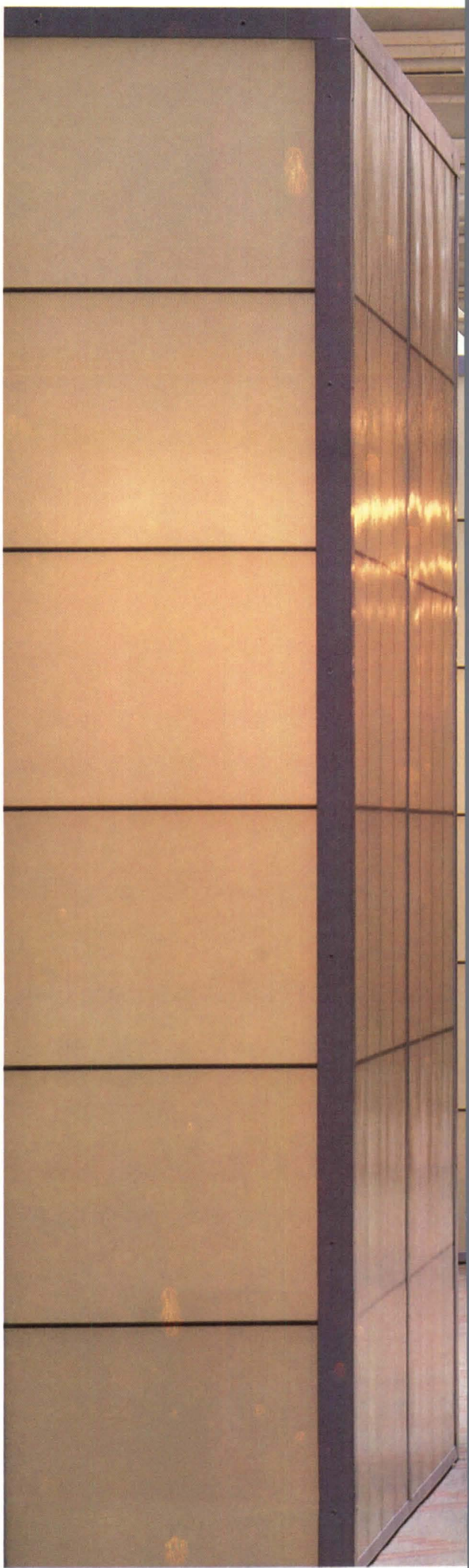
'A Class Act' In an Old Mill

Renovation of the Hasbro Toy Co. headquarters. By Andrea Oppenheimer Dean

In its first incarnation, the building was a sprawling, 19th-century, brick mill in Pawtucket, R.I., one of many that had been abandoned as New England's textile industry decamped in pursuit of cheap Southern labor. For about the last 40 years, the building has been home base to the Hasbro Toy Co., whose rapid ascent to the Fortune 500 coincided with transformation of its headquarters from a junky plywood jungle into a class act, distinguished by a an elegant yet fresh, highly inventive esthetic. As Shirley Blumberg, associate in charge for Barton Myers & Associates, says, "Hasbro didn't want the image of an insurance company." It wanted a visual emblem of its stature, but animated with a sense of play and pleasure.

To this end, Barton Myers hired Sussman/Prejza & Co., of Los Angeles Olympics fame, to select graphics, color, furniture, and "amenities." Deborah Sussman has described her firm's work as "graphic architecture . . . in which you cannot separate the structure from the surfaces and the colors and the objects." Among the most appealing characteristics of the Hasbro conversion is the ease with which the raw-boned old building wears its light and perky new garments together with its hushed, browned pastel colors, freshened up with white trim. Sussman took her palette from surrounding New England towns.

The conversion is configured on the analogy of a town, with a communal 'Main Street,' below, and smaller arteries such as the one at right serving the Research and Development department.



Photographs © Steve Rosenthal

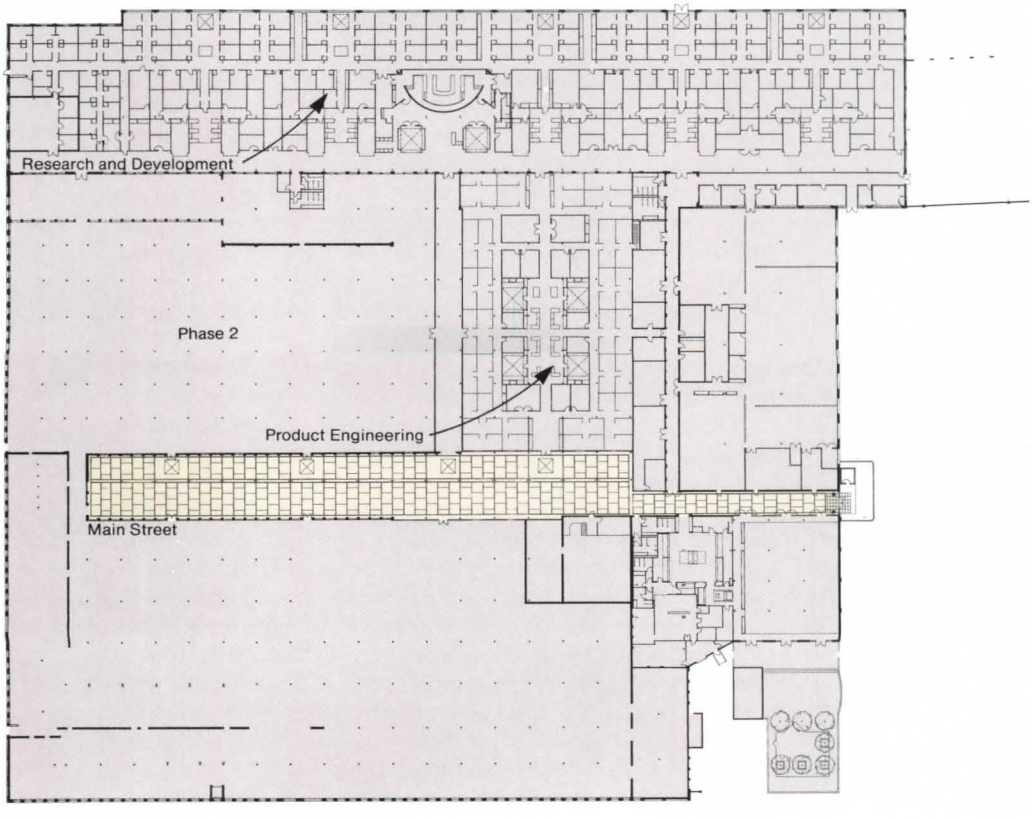
Photographs © Steve Rosenthal

Typical town plans also provided the headquarters' overall organizing element. There is a skylighted "Main Street" and a couple of perpendicular, smaller arteries that feed individual departments. As in a town, the building has a distinct overall character, while each department, like a neighborhood, has its peculiar identity.

When I visited Hasbro, Main Street still looked somewhat vast and vacant, awaiting the kiosks and clock towers, shop, and cafe that Sussman/Prejza designed for it and recently installed. The floor, interestingly, resembles soft stone but is concrete that has been steel-troweled long enough to burn in a black pattern. Its granitelike inlay is, similarly, a man-made conglomerate.

Starting at the rear entrance, the first "street" intersecting Main is a narrow, darkish corridor saved from gloom by a sharp-looking neon sculpture in Prussian blue that follows the corridor in zigzagging stripes. To the right of the corridor is a model shop; to the left, the product engineering department furnished with snazzy new Herman Miller workstations. By contrast the large research and development department—running the length of the building, parallel to Main Street—has built-in offices and workstations. At the center of each pod are secretarial offices with elegant, triangular uplights; these open spaces are flanked by closed offices with gabled roofs, for which meeting rooms serve as bookends. At the center of R&D is a drum-shaped presentation theater. The area between R&D and Main Street comprises Phase 2 of the conversion, now under construction. It is being supervised by Barton Myers' successor firm in Toronto, Kuwabara, Payne, McKenna, Blumberg, with Blumberg as partner in charge.

Facing page, the Research and Development corridor and the interior of one of its offices. Right, Product Engineering department and plan, with Main Street comprising the bricked-in horizontal pathway.



Photographs © Steve Rosenthal

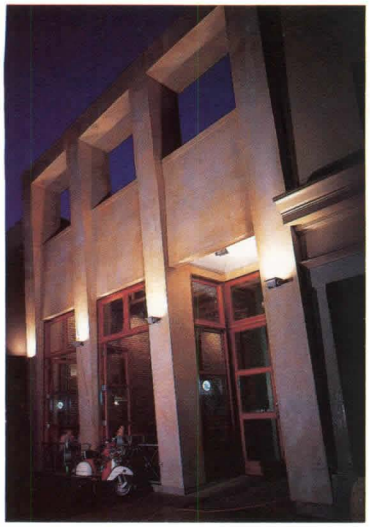
Above, the drum of the theater as seen from the Research and Development department's 'street.' Facing page, the striped, flat back side of the theater. Right, the 'servery.'

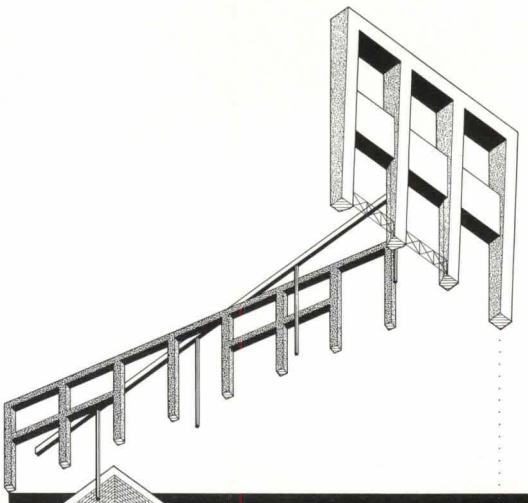
Just inside the entrance are the dining hall and a separate serving area. The dining space is an unarticulated, large, bright room, with abundant natural light and fresh color. Though it is unexceptional it benefits from a landscaped courtyard, designed by artist Richard Fleischner, as well as a smashing mural by Tom Nussbaum portraying life in a mythical world. The mural, best described as sophisticated-primitive, is among several original artworks at Hasbro that were commissioned or selected with discrimination and flair by New York City art consultant Nancy Rosen.

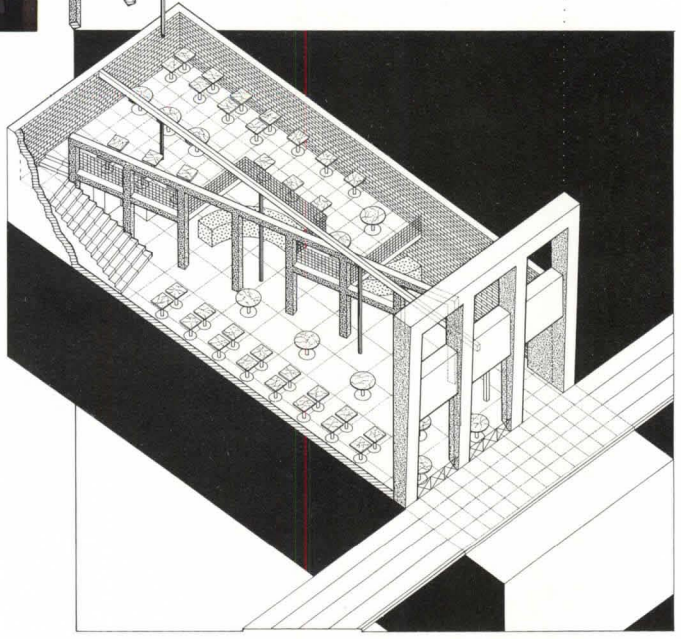
In contrast to the dining hall, the design of the so-called servery, where food is dished up, is one-off. The walls are white tile spattered with rectilinear patterns of bright, mostly primary color. It's what Mondrian might have done with a White Tower diner before a subsequent hand intervened to add, just beneath the ceiling, a teal-colored canopy shape over a broad, rust-colored band—very haute late-1980s.

The effect, overall, of the completed portion of Hasbro's refurbished headquarters is a swanky play of contrasts, where images associated with high-tech and crunchy granola coexist peaceably, with good humor. There are old-timey factory gantries, but they're made up in new and subtle Zolatone colors. Robust brick and masonry walls serve as background for slender, pastel-colored, cast iron columns. There are studio areas of higgledy-piggledy, ordinary drafting tables, but there are also sharp-looking, built-in workstations. And there is the occasional striking, bright accent to offset otherwise muted New England colors.

The designers' real genius was in knowing when to stop. □







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'Clashing Styles and Geometries'

Berkeley restaurant, David Baker. By David Littlejohn

Just a hundred feet from the busiest pedestrian intersection in Berkeley and directly across from the main entrance to the University of California, this frantically busy little coffee house—one of dozens of cheap eating places in the vicinity—makes its appeal through a canny and highly personal juxtaposition of visual messages.

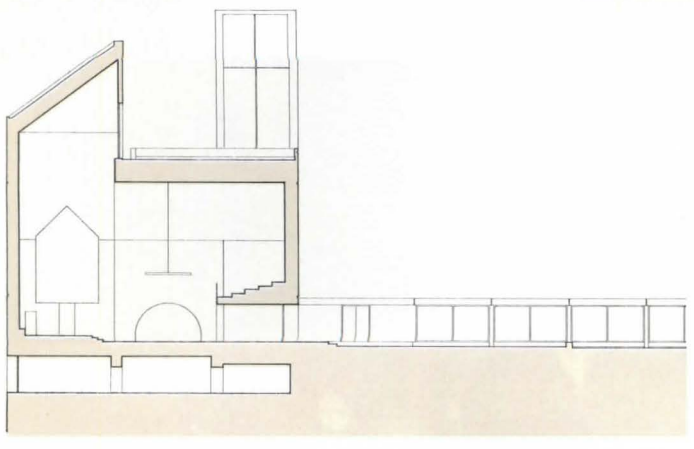
In converting a boring men's clothing store into Cafe Milano, the latest entry in the campus community's surfeit of nosheries, David Baker, AIA, who has converted three other local buildings into pop eating places, retained—even exaggerated—the shabby funkiness of the '60s originals. He ground the floor down to dirty concrete, which he then dirtied and scored to look like a continuation of the sidewalk outside. He stripped the side walls down to raw and bumpy brick and exposed a parade of cheap wood trusses and skylight frames high up under the roof (a gesture found in another of his restaurants as well—see June '86, page 40).

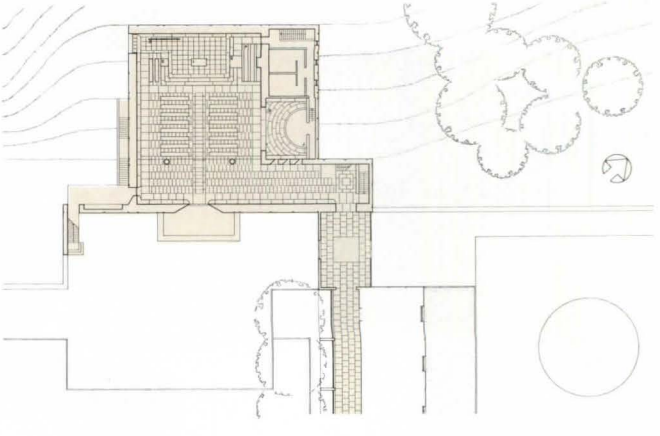
He then inserted his trademark of clashing styles and geometries, in this instance by way of a 60-foot-long internal concrete wall ("a metaphorical building facade") 14 feet high—essentially seven 12x12 concrete columns, capped by a continuous concrete beam. This jarring, defining feature of the space runs from front entrance at the right to rear staircase at the left, at an angle of about 20 degrees to the long axis of the building. (Two original round metal structural columns supporting a roof girder—painted silver—accentuate the crossed axes.) The fixed downstairs furniture follows the orientation of the street and side walls. The mezzanine, fenced by an iron-grid rail, is attached to the invading, off-angled wall. So sippers upstairs pose in a slightly different direction as they stare out the high, handsome front windows across to Sproul Hall. The U shape of the upper level opens up the area in front of the serving counter, further varying the "facade" of this mock-monumental, seven-bay, freestanding wall and the play of light and vertical spaces around it.

On the Bancroft Way facade, three 14-foot-high, mahogany-framed French windows and three open sky-frames above them are separated by mock-monumental pilasters. The facade says nothing about "cafe," although the graffiti already scrawled on its rose-orange plaster (Lautréamont quotes; "This cafe sucks"; etc.)—which Baker insists he anticipated—help define it as Berkeley. But the pompous street front offers fair warning of the architect's grandiose gesture inside.

Above, around, and under the wall, students squeeze into every available folding metal chair, totally at home with both the willed crumminess of the high, well-lighted shell and the clever, theoretical stage set that splits it in two. Baker's designs may not catch his conceit of an "indoor sidewalk cafe," but here, as in his more elegant Cody's Cafe a few blocks away, he seems to be carving out apt settings for a new Berkeley generation. □

Mr. Littlejohn is a professor of journalism at the University of California, Berkeley.





Serenely Simple Interior Painted by Light

Seminary chapel, Edward L. Barnes.
By Allen Freeman

Sweeney Chapel was completed last year, a quarter of a century after Edward Larrabee Barnes, FAIA, conceived it schematically as the last link in the Christian Theological Seminary campus, for which he was planner and architect. The small, modernist sanctuary evokes spirituality through plays of space and light.

Christian Theological Seminary, on the outskirts of Indianapolis, is a graduate school for the Christian Churches (Disciples of Christ) with an enrollment of 320. The school is endowed by the family of J. Irwin Miller, Hon. AIA, who helped put Columbus, Ind., on architectural maps, and this chapel is named for a member of the Irwin-Sweeney-Miller clan who was a pastor of Columbus's Eliel Saarinen-designed First Christian Church. Eero Saarinen, shortly before his death, reportedly recommended Barnes to Miller.

The chapel faces southeast and backs up to a bluff over a small river. Towering behind the rest of the school, it anchors an end of the campus's continuous chain of one- and two-story, cream-colored, precast-clad buildings that lie in an irregular, squared-off S shape. Sheathed in precast to match the rest, the chapel in form is a simple cube with a gable projecting above the mostly flat roof at the rear and an attached, rectilinear bell tower rising to one side. A large Greek cross in relief is the building's sole decoration. Doors centered under the cross open the chapel onto the main campus courtyard, but they are ceremonial and seldom used. Instead, you enter through the bell tower, which is also the point of connection with the rest of the building chain. From the entrance-level alcove within the hollow tower, white-painted metal stairs with open-grille treads wind up along the white interior wall to balcony level and then up to the bells. Cool sunlight filters down from the belfry.

Barnes designed chapel seating in three sections to accommodate small groups without making the room seem empty. Main-floor pews hold 108, balcony pews seat 140, and chairs can be placed under the balcony to bring capacity to about 500, including ledges along two walls. The interior volume from chancel wall to balcony edge is a 50-foot cube augmented by the gable rising 30 additional feet at its peak above the chancel; an unseen, front-facing window lights the high walls. The room's surfaces and accoutrements are simple: white plaster walls, a limestone

Right, Sweeney Chapel from within the seminary's main courtyard. Section at far left includes choir and classroom spaces on lower level. Above, afternoon sun streams in from window on the southwest wall where horizontal pieces in glass grid project patterns of cool color across chancel wall.

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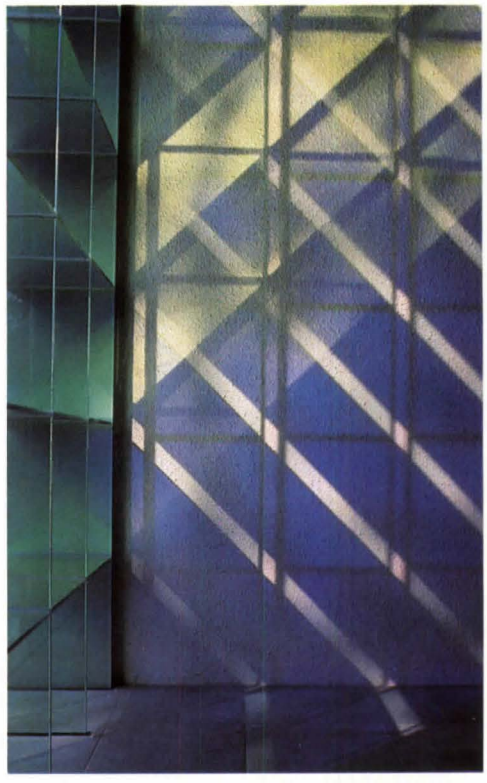

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floor, oak pews, a 27-foot-tall Jerusalem cross of burnished stainless steel, ranks of metal organ pipes rising from an oak pedestal, and two circular steel chandeliers. (Barnes designed the pews, cross, and chandeliers.) Animating the spare sanctuary are curious, changing, crisscrossing streaks of afternoon sunlight.

The afternoon sun paints the streaks, mostly on the rear wall behind the chancel, when it hits glass grids mounted inside two southwest-facing, side windows. Set perpendicular to the window surfaces are vertical fins of clear structural glass and evenly spaced horizontal fins of a special glass. Together these form egg crates of two-foot-square segments about a foot deep. The horizontal fins are made of a so-called dichroic glass that separates the sun's spectrum two ways: pink-yellow light reflects up and blue-green light transmits down. As the sun moves west, the glass inside the tall, slender window beside the chancel produces color patterns that extend clear across the wall behind the cross; the square window in the wall beside the balcony shoots streaks of color across balcony pews. James Carpenter designed the windows; their geometric patterns of cool light seem integral with Barnes's ascetic architecture.

In describing the chapel, Barnes says he hopes "that such an all-white space, in the Barragán-Le Corbusier tradition, will have both clarity and mystery." It does. □

Above left, the skylighted baptistry is located off the sanctuary through a broad arch (also seen at far right of photo at right). Semicircular immersion pool is entered from behind screens flanking tiled wall. Water pours over pool's curved lip. Note unglazed vertical slit windows on wall next to entrance hallway. Above, the dichroic glass projects patterns with right angles when the sun is relatively high in the sky. Right, Barnes's circular chandeliers can be raised from this normal position. Holtkamp organ has 44 ranks; its console faces pipes and choir pews.

Photographs © Steve Rosenthal

Restoring the Remaining Railroad Extravaganzas

Three of the 13 being redone by SOM in the Northeast corridor.
By Allen Freeman

Many of America's most exuberant if self-consciously grand public spaces occur in train stations built from the late 1880s into the 1930s. Conspicuous consumption of materials and space in some speak volumes about their builders' new wealth and confidence in the future of railroads.

No rail corridor was more richly punctuated than the corridor between Boston and Washington, D.C. To stroll through Charles McKim's Pennsylvania Station was to experience Manhattan-scaled Roman baths; to enter Daniel Burnham's Union Station at the foot of Capitol Hill was to penetrate a Beaux-Arts palace. What rail traveler could fail to be impressed? But Penn Station fell to wreckers in the early 1960s, and Union Station was mutilated in a mid-'70s conversion into a so-called National Visitors Center. (A second, more promising conversion into a festival marketplace—what else?—is to be completed this year.)

Strung like jewels between Union Station and Boston's South Station are train buildings now universally valued as landmarks, including the ones we show here. These three, along with 10 others including a Cass Gilbert in New Haven and an H.H. Richardson in New London, have been renovated by Skidmore, Owings & Merrill and associated architects—although several are not quite complete. (DeLeuw, Cather/Parsons managed the $2.19 billion rail improvement program, of which the station rehabs were a part, for the Federal Railroad Administration.) SOM partner Marilyn Taylor, who led the multiple renovations in the Washington office and now heads New York SOM's urban design and planning arm, considers the rehabilitations the project of a lifetime because of their richness, variety, and importance of the architecture.

Newark Pennsylvania Station, along with train palaces in Cincinnati and Los Angeles, was one of the last great stations. Designed in the early '30s by McKim, Mead & White (after all three founders' deaths), it is stylistically an attempted assimilation of art deco into stern classicism—a hulking hub of limestone and granite serving Amtrak and commuter trains, the city subway, and interstate buses.

The 150-foot-long, marble and travertine main waiting room is accented by aluminum vestibules and aluminum inlays on mahogany benches, four huge hanging globes with aluminum silhouettes of zodiac symbols chasing around the equators, and 13 large plaster medallions. The medallions, once polychromed but now stripped of color, depict a romantic, pleasingly naive, slightly dopey survey of transportation that includes the horse, the Mayflower, the stagecoach, the canoe, the motor bus, the steam locomotive, and a twin-engine 1930s airplane climbing through clouds toward a crescent moon.

SOM and joint venture partner Leibowitz/Bodouva & Associates consolidated ticketing, formerly in three locations, to one long wall of the room, cleaned the medallions, and replicated two of the hanging globes that had been removed. Today, after years of hard use, the room seems fresh again, marred somewhat by a central information kiosk, ungainly and rather shabby, that was not removed during renovation and by wooden planters with plastic foliage that have been added since.

Left, sunburst and stars on the aluminum underside of the Newark entrance marquee. Its surface, once deeply pitted, has been restored. Below, the marquee under heroic arched window and stonework bas-relief. Below right, the main waiting room just inside the marquee. Note aluminum vestibule, globes decorated with signs of the zodiac, and tile ceiling with wavy inlays.

Contrasting with Newark's imposing railroad presence is Frank Furness's friendly station in Wilmington. Completed in 1908 toward the end of the Philadelphia architect's career, it is today his last remaining large train station. Furness designed it for commuters to Philadelphia, spreading it under the elevated tracks and popping it up on each side as brick structures with terra-cotta trim. SOM and collaborating architect Moeckel Carbonell Associates removed recent supergraphics from the brickwork and platform windscreens and created a canopy of metal and hammered glass that follows the Front Street facade and wraps around the base of the corner clock tower.

Furness originally positioned a high-ceilinged waiting room next to the northbound track toward Philly, but provided little more than stairs down to the street next to the southbound track. This bias of configuration made the building unsuitable as a full-service station. So the renovation architects cleared out an under-track warren of spaces where they carved out a new main waiting room. All that remains are the original stairs with iron balusters and brass rails and finials and the ceiling of heavy metal trusses and exposed metal decking—now painted cream. The room is functional and bright but neutral in character, appropriately neither counter to the spirit of Furness nor particularly memorable. Meanwhile, Furness's upstairs waiting room, restored to its elegant original state, stands locked up in readyness for adaptation to some new use, perhaps a restaurant.

Furness's Wilmington station was a throwback to the picturesque old style; Baltimore's Pennsylvania Station, completed just three years later in 1911, was a subdued example of the newer Beaux-Arts influence. The original architect was a New Yorker, Kenneth M. Murchison, selected by the Pennsylvania Railroad in a 1909 design competition. For the recent renovation, Nash/Bridges-Hyman Myers associated with SOM.

Baltimore's Penn Station has two very different adjacent public rooms, and they set off one another beautifully. From the trains, you ascend to a T-shaped concourse with large windows and walls of Rockwood glazed ceramic tile—a practical material. This is believed to be the first U.S. station to combine waiting and circulation areas directly over the tracks. It is easy to imagine the days of coal-burning locomotives when workers scrubbed smoke and soot from the green-tiled walls around built-in perimeter oak benches.

Markedly different in character from the concourse's utilitarian tiles are the flanking main hall's rich materials. The hall is a classical room of Sicilian marble dominated by four fat fluted Doric columns that support an encircling balcony. Two massive mahogany benches with ornate brass lamps fill one end of the room opposite the ticketing alcove. The ceiling comprises three shallow, leaded domes of crystalline and pastel stained glass, and Taylor says that perhaps the happiest surprise of the 13-station project emerged when the skylights were disassembled and immersed for cleaning in the lye bath of the Rambusch studio in New York City. It was only then discovered that what was assumed to be dirt on the glass was tan paint and that the room was once, and would be again, enhanced by exquisite filtered daylight. □

Facing page, the Wilmington Station: above, exterior was cleaned of supergraphics, and metal and glass awning was added; below, stairs are original in otherwise new main waiting room positioned under the tracks. This page, Baltimore's Penn Station. Domed skylights are again clear and bright.

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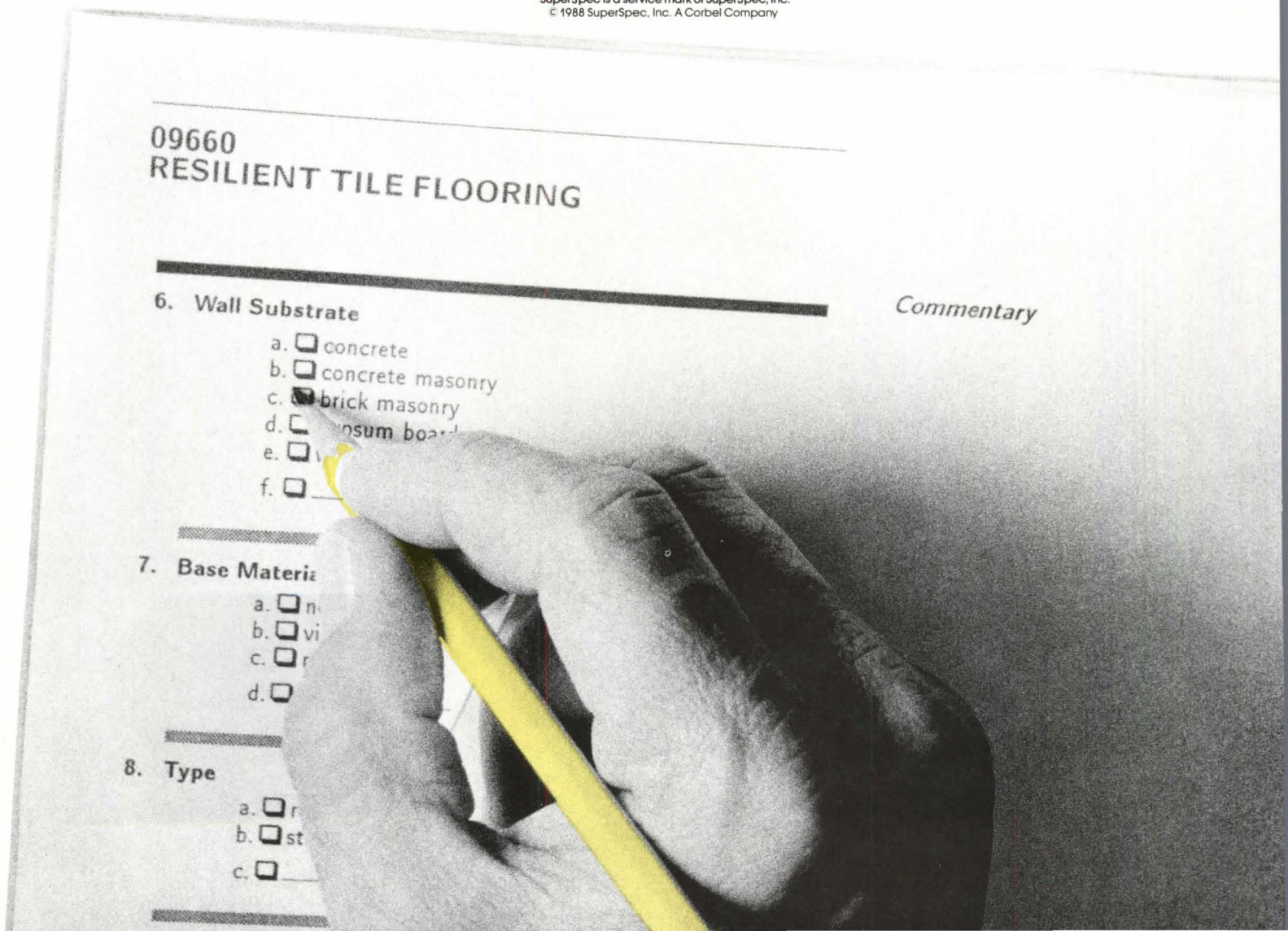

How Galvalume™ sheet gives Countryside Cathedral a little help from above.

Owner: Countryside Cathedral, Clearwater, Fla.
Design/Build Contractor: UNICO, Clearwater, Fla.
Building System Manufacturer: Ceco Building Division, Southern Region, Columbus, Miss.
Steel Material: Bethlehem Galvalume sheet

When the Countryside Cathedral, Clearwater, Florida, put their new house of worship out for construction bids, their concern was for future—as well as present—costs.

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Indoor Pollution Isn't Going Away

It is becoming an increasingly critical legal and design issue. By George Rand

Awareness of the problem of indoor air pollution dates back about a decade to a flurry of complaints from office workers in new, tightly sealed, energy efficient office buildings. These complaints centered on inadequately tempered, stale air that produced widespread symptoms of discomfort and irritation, a pattern that was later dubbed "tight building syndrome." In the ensuing 10 years, designers of the built environment have shown increasing interest in indoor air pollution. Just recently, the American Society of Heating, Refrigerating and Air-conditioning Engineers Inc. (ASHRAE) devoted a conference exclusively to the subject, while AIA held a national training session to alert architects to the scope of the problem. Concern over indoor air supersedes national borders, as demonstrated by the fourth international conference on indoor air quality and climate, conducted this past summer in West Germany.

The borderline between building-related "complaints" and building-related "diseases" is complicated, and failure to clarify the differences between them can be a source of confusion in trying to track down the cause of health problems. There are many sources of "complaints" that may produce discomfort but are not considered as pathological responses to standard medical tests, including response to the undesirable odor and irritating effects of cigarette smoke.

Building-related diseases, on the other hand, comprise infections, such as Legionnaires' disease, and hypersensitivity diseases including pneumonitis, humidifier fever, asthma, and allergic rhinitis (nasal allergy). Building occupants generally date the onset of the symptoms to a move into a new facility, a shift in offices during a renovation, or some other milestone event. The most serious disease is hypersensitivity pneumonitis, a systemic disease that can proceed from cough, shortness of breath, and fatigue to a more serious chronic lung disease. Usually, this illness lasts a short time (24 hours) unless the person remains in contact with the exposure source.

According to Harriet A. Burge of the University of Michigan, about 20 percent of the population have the genetic constitution to produce antibodies in response to exposure to spores, microbial cells, animal dander, and "bug parts" (fungal, bacterial, or arthropod antigens common in the building air supply), resulting in allergic reactions. These allergies may account for some of the symptoms related to the functioning of the airway (including nasal congestion), but they specifically exclude other "sick building" symptoms such as dizziness, nausea, and burning of the eyes or throat.

Professor Rand teaches at the graduate school of architecture and planning at the University of California, Los Angeles.

Clinical symptoms relating to "sick building syndrome" often occur in nonallergic persons and are thought to be due primarily to chemical toxins. Lars Molhave of the Institute of Hygiene in Arhus, Denmark, has been a leader in the study of the neurological and psychological symptoms associated with building-related complaints. In his definition, the symptoms of "sick building syndrome" fall into the following classes: sensory irritation of eyes, nose, or throat, including hoarseness or changed voice; skin irritation or reddening; unpleasant odor or taste; asthma-like symptoms in nonasthmatic persons, such as runny nose or eyes; and "neurotoxic" symptoms including mental fatigue, reduced power of concentration, memory loss, and intoxication.

Scandinavian and Northern European studies of "sick building" symptoms tend to focus on low-level sensory effects associated with chemical toxicity, whereas U.S. studies of health effects are more focused on inflammation of the airways, biological aerosols, and allergic reactions. U.S. investigations seem to favor studies in which clear medical symptoms of a diagnosed illness have been discerned using standard medical tests. Part of the reason may be that in Scandinavian socialist economies the building industry and building research support are coordinated by government agencies, as opposed to a range of trade associations and lobbying groups that provide much of the research funding in the U.S. Also, Scandinavia's cold climate requires people to spend more time inside, so the health effects of low-level toxins pose a greater threat and necessitate more urgent action.

Causes of sick buildings

Some researchers blame the well-intentioned introduction of variable air volume (VAV) systems, first promoted during the late 1960s for their energy-conserving performance and economic operation. In essence, the VAV system provides air movement in occupied spaces by recirculating exhaust air from one zone to another. Using this method, the sizing of the system can be substantially reduced by calculating needed heating and cooling capacity based on the assumption that a small percentage of tempered air is actually exhausted during extremely hot or cold temperatures. Also, the flow of air bypasses unoccupied zones using local temperature sensors connected to VAV boxes. In effect, this creates a demand-initiated "request" for increased airflow into the space only when it is occupied.

Under the best of circumstances, the system still creates many moments of stagnant air in occupied zones within which the flow of air has not yet started. Also, under extremely warm or extremely cold outside temperatures, the system does not have

reserve cooling or heating capacity to temper the percentage of outside air needed to refresh the inside air.

Although it had not been an explicit consideration in the design of VAV systems, it was assumed that adequate airflow volume would be sufficient to ensure general air quality. The problem was exacerbated by introduction of plastic products and complex panelized furniture systems that off-gas a variety of chemical constituents. The HVAC systems additionally were required to exhaust these chemicals to the outdoors. This air-cleaning function was never anticipated as a feature of these systems.

To complicate the problem, most office building products (carpets, freestanding partitions, ceiling tiles) are made up of other elementary building products such as fabrics, backing, chemical coatings, bonding agents, and adhesives. Specifiers of final assemblages do not have data available enabling a choice based on the potential dangers of active chemical contents.

Oddly enough, it is often the case that the only way to discover the active chemical contents of building products is to "bake out" sample panels under controlled conditions in laboratory chambers, measuring emissions and profiling the chemical contents using a gas chromatograph/mass spectrometer. John Girman of the California Department of Health Service's Indoor Air Quality Program reported guardedly positive results from a "bake out" of a recently refurbished office building in San Francisco. Building temperature was raised and maximum flow of outside air was introduced for 24 hours. There was a major increase in the presence of volatile organic compounds in the air during the bake-out procedure, and a 27 percent reduction in VOCs from starting levels a week earlier. However, this is an exceedingly indirect means of producing needed data for what may be a major threat to public health. Both the Environmental Protection Agency and the Department of Energy are supporting tests of common building products, and eventually a catalogue will be available with chemical descriptions and health effects data for the most common building materials.

Because materials off-gassing has until recently been unanticipated and little understood by those regulating HVAC system performance, air-change standards have proved less than effective. Many problem buildings have had HVAC systems leanly designed to provide only five cubic feet per minute (cfm) of fresh air per occupant, in accord with accepted industry standards. Later studies have shown that even under the best conditions the engineering standard of five cfm per person is inadequate for handling the most readily measurable constituents of the problem—diluting particulates due to tobacco smoke. Recently, the industry has agreed to adopt voluntarily a radically increased standard of at least 15 cfm per occupant for normal work areas in new buildings and still a higher level for smoking floors.

HVAC systems aren't just conduits of indoor pollution; they may also be sources if they harbor harmful microorganisms. The relative humidity in the cooling coil section of a heat exchanger and on the duct surfaces immediately downstream from it is almost 100 percent. Because any source of carbon provides nutrients for microbial growth, the dust and debris that adhere to these moist, rarely cleaned surfaces provide ideal sites for fungal amplification. Inadequately maintained parts of HVAC systems are high-risk areas for fungal growth.

In some buildings, drain pans of the main air-handling units and smaller fan-coil or induction units have been found to contain stagnant water with microbial slimes. Sound liners comprised of porous, manufactured insulation in ducts and inside the housing of fan-coil units easily become wet and dirty and act as a niche for the microbial growth. In many instances, regular cleaning of internal components of fan-coil units is difficult and costly. In a large building there may be hundreds of such units, each requiring a half-hour or so to open the housing and expose the drain pans and coils. Often, these systems have not been installed with the expectation of regular maintenance. Air-handling units often are put in without access doors, or access doors are located in inaccessible spaces, such as above ceiling tiles.

Testing procedures

The rapid expansion of health concerns from outdoor air to the indoor environment can be traced in part to the invention of more sensitive, portable testing equipment and the development of new scientific procedures that rely on inexpensive monitors that allow tests of personal exposure to pollutants. Without these aids, it is unlikely that the extent of the problem of indoor pollution could have been documented.

Until recently, the primary watchdog agency called upon to perform health hazard evaluations in work environments was the National Institute of Occupational Safety and Health (NIOSH). At last count, NIOSH had performed 485 investigations of "sick building syndrome" in private offices, libraries, courthouses, post offices, and other nonresidential buildings around the country.

Routine NIOSH investigations follow a standard protocol. First, background information on the worker population is collected to determine how broadly the symptoms are spread; then efforts are made to isolate specific building areas and the group of workers displaying the symptoms. Third, air quality sources are explored through tests of HVAC efficiency and a search of the ventilation systems for potential sources of mold or dirt. Finally, if the scope cannot be narrowed and the symptoms persist, monitoring studies are initiated to measure the source and the presence of a variety of potential contaminants, including VOCs or biological aerosols. In more than half of these cases, the primary source of symptoms is attributed to inadequate design and operation of the ventilation system. Recommendations are made for modifying it—usually increasing the ratio of outside air or the number of air changes per hour. Indoor or outdoor chemical contaminants have been discovered by NIOSH in a relatively small number of cases.

A number of agencies at the federal and state levels, including the Environmental Protection Agency and the Department of Energy, as well as a large number of private and university laboratories, are now involved in indoor air studies. For example, at the latest international conference, James Woods reported results of an independent study performed in 1984 by Honeywell Indoor Air Quality Diagnostics. The study consisted of a stratified random sample of 600 U.S. office workers at all job levels, who were surveyed by telephone in their homes. Respondents were polled about eight indoor factors in their workplaces (lighting, temperature, air quality, workplace size, noise, etc.). About 20 percent (115 of 600) of the workers identified air quality problems as responsible for difficulty in doing their work assignments. Women rated air quality as a productivity problem twice as often as men.

Of course, the effect of air quality on productivity is a very complicated judgment that is correlated with a variety of other factors. For example, the study showed that workers in open offices or areas without windows or those who spend the bulk of their time at computer terminals, as well as those who perceive

their office environment as overcrowded, tend to raise air quality problems more often. This suggests either that the stresses of a poor work setting may interact with the stresses of tainted air or that people working in stressful settings are prone to generalization when identifying their complaints.

Honeywell's preliminary base study has been followed up by scattered base findings for a wide range of building types, sizes, ages, and climate zones, as well as for diverse HVAC system designs. For example, a study by Allan Hedge of Cornell University surveyed 4,373 office workers in 47 buildings ventilated either by natural ventilation (operable windows) or by a variety of airconditioning systems. The results of this study reveal even more extreme negative responses than the Honeywell study. They confirm that naturally ventilated buildings are associated with the smallest number of reported symptoms, while the greatest number of symptoms are found in airconditioned buildings with water-based units (compared with all air systems).

In a recent ASHRAE conference, P.R. Morey of Clayton Environmental Consultants in Edison, N.J., reported results of a study of 21 buildings in which one or more people had reported developing a building-related illness. In 18 of the 21 buildings studied, there was evidence that the HVAC systems were functioning as reservoirs or amplification sites for microorganisms.

Legal ramifications

Legal remedies to indoor air complaints are being pursued in a variety of cases in which people claim to have been injured by poorly designed or operated buildings. The arguments stem from two basic theories. The negligence theory suggests that a building owner, the architect, the building contractors, and even manufacturers or individual building products can be judged to be negligent if they failed to fulfill a duty to protect a building occupant from injuries or illnesses that could have, and should have, been foreseen. Under this doctrine, architects, et al., may have an obligation to inform building occupants of known health risks. The alternative theory is strict liability, which relates to latent defects in the design of a building when it is viewed as a product. The question is whether it was designed with features that minimize the risk of injury.

Laurence Kirsch, an attorney with the firm Cadwalader, Wickersham & Taft and editor of the "Indoor Pollution Law Report," sees indoor pollution cases emerging as "the most important area of environmental law in the 1990s." In past years, workman's compensation remedies were sought by people who claimed they had been "injured" or suffered health loss as a result of a building-related problem. The door has now been opened to more direct civil litigation against employer, architect, or any other party involved in creating an environmental condition that is thought to be the cause of injury.

While many legal issues remain to be fleshed out in future proceedings, it appears that some professional knowledge of the risks of pollution are considered standards of the trade and that the architect is wise to inform others of the risks.

For example, it is commonplace for a company to move workers into half of an office floor while tenant improvements on the other half are being completed, exposing employees to the intense chemical off-gassings of freshly applied carpet glue in a closed environment that has not yet been "air balanced" or inspected. One lawyer suggested this is tantamount to allowing employees to move in on the lower floors of a high-rise building while the upper floors are still being constructed. In our litigious society, it is risky business.

Nor can anyone take comfort in the ambiguities of research findings regarding "sick building syndrome." In the end, it may not be necessary to scientifically prove building problems actually caused an illness to render a substantial judgment against an architect or an employer.

Take, for example, the case of a counterclaim in a landlord-tenant dispute between a bank and its landlord in Broward County, Fla. Following the bank's move-in at the new building, employees suffered a variety of health impairments attributed to the building, including itching, burning eyes, nausea, chest pains, numbness, headaches, fatigue, skin and throat irritation, diarrhea, and feelings of disorientation. The bank claims the landlord failed to maintain both the airconditioning system and the exterior of the premises. This forced the bank to vacate the building and break the lease agreement with the landlord, for which the bank now is being sued. In this case, there is no need to prove scientifically the connection between the symptoms and the physical operation of the building. The question is whether it was reasonable for the employer to assume that the building was responsible for the pattern of illness, based on available data. Had the bank failed to act based on the data, it would have been derelict in its duty and could have been liable.

In a similar case, a sick building in Alaska is the subject of an indoor-air lawsuit involving four state employees who became ill; some were forced to leave their jobs and to terminate otherwise successful careers as a result. In 1980, several state department of labor agencies moved into a new, preleased building constructed by a private developer to suit their specific requirements. The three-story building was sited next to a large deposit of peat. Over the next five years, employees complained about a variety of health symptoms, including sinus, headache, respiratory, and pulmonary problems. The symptoms seemed to start when employees entered the building and disappeared a few hours after they departed for home. To gain relief at work, one employee is alleged to have used a respirator.

By 1985, worker complaints prompted the department of labor to investigate multiple sources of concern, including the allegation that the entire first floor had a "locker room odor" due to urine-soaked carpets from leaking toilets. As part of the study, an extensive health survey was commissioned of all employees in the facility, while a comparison survey was undertaken in another government agency in a different building of similar size. Eleven department of labor employees were found to have symptoms so severe that they were temporarily relocated to other job sites. The building was finally evacuated in 1986 when one employee collapsed at his desk.

The next year, the building owner and contractor redesigned and cleaned the HVAC system (allegedly a source of biological aerosols), replaced the flooring, and decontaminated the building. The department of labor returned to the building in late 1986, but the health of the plaintiffs in the case continued to deteriorate and resulted in one of the current lawsuits being waged against the architects and other professionals involved in the building design, the contractor, and the owner.

At least one other similar case has been settled out of court for a substantial sum. In California, a brilliant computer scientist suffered severe neurotoxic frontal lobe damage that measurably reduced his IQ and virtually eliminated his capacity to work. It is suspected that the source of the toxicity may have been chemicals off-gassing from carpet glue, because one of the

glue's chemical components has been shown to produce neurotoxic effects similar to the victim's behavioral symptoms. It is possible for this degree of damage to occur from relatively low-level doses of a chemical compound because the exposure went on for a full six months before the victim collapsed into a coma at home. This time period involved two buildings: an existing building was remodeled while the employees were still in it; employees were also moved to a new building while construction was under way. Despite the fact that the victim showed symptoms of erratic behavior that appeared at unpredictable times, the symptoms were not immediately connected with one another, nor were they associated with the work environment until after serious cumulative deterioration had already occurred.

Los Angeles attorney Larry Clough, who represented the plaintiff, suggests that the problem may have been increased by the fact that this was a high-tech defense industry operation, requiring perimeter security and an internal division of spaces into a series of separate zones with varying levels of security. The building employed a closed HVAC system with an inadequate number of VAV boxes so that temperature and airflow could not be properly regulated, therefore aggravating the problems caused by off-gassing of chemical compounds.

The buildup of pollutants was most noticeable at the end of the work day. Many employees resorted to taking periodic walks outside. Some brought in fans in a futile effort to increase their comfort level by blowing the tainted air around. Clough suggests that architects should acknowledge the potential risks to occupants in this kind of closed environment, particularly during construction, and further, that they have an obligation to inform their clients of the risks. In the end, there may be additional expenses incurred in order to ensure occupant health and safety, including delaying occupancy until construction is completed. "Bake-out" procedures may be needed to accelerate the depletion of toxic chemicals.

Hiring of an industrial hygienist and/or ventilation engineer may be necessary to monitor the environment on a regular basis. Some firms are offering services to building owners or operators in advance of any problems. ACVA Atlantic operates out of Washington, D.C., and has contracts for preventive maintenance and monitoring of buildings throughout the country. Gray Robertson, president and founder, is an English-born chemist who seems to have seized the opportunity to do for health issues in commercial buildings what termite inspectors have done with transfer of title of private residences. Robertson and his team of 12 inspectors work on a contract basis to assess buildings to determine whether there are existing or potential health problems that should be known to a lessee of space or to a purchaser of a building before consumating a financial agreement.

The initial inspection includes assessment of outdoor air (bacteria, dust, fungi), a check of indoor air by measuring CO_2 level and quantifying size of particulates in sample sites, efficiency checks of the ventilation system, and a fiber-optic visual scan for microbial growth in building ducts and ceiling plenums. If evidence is found of poor functioning, additional studies are undertaken. What is most interesting about the ACVA Atlantic approach is its ongoing monitoring program in which testers return to buildings every six months for a checkup. In addition, ACVA performs regular duct cleaning and maintenance services that would otherwise be burdensome to building engineers. As part of this extended service, ACVA offers cost-saving advice to operators based on state of the art techniques in filtration and HVAC operation.

Were this type of monitoring required by lenders, it would force owners to bring buildings up to a certain standard of health and safety before a loan could be funded. It offers insurance against liability for future health problems.

A variety of other firms offer similar services. TRC Environmental Consultants is a nationally recognized research and development organization that has performed government-financed investigations of sick buildings since the late 1960s. Radian Corp. in Sacramento performs 50 investigations per year of problem buildings, all of them for private firms.

Despite the fact that the airconditioning engineering field is in turmoil, architects need to take an active position in setting policies for deciding building performance characteristics related to the healthfulness of the indoor environment. For example, ASHRAE Standard 62-1981 is still in effect as an industry standard and calls for minimal provision of fresh air at five cfm per occupant. This standard is feasible only in the middle of the Rocky Mountains, with the cleanest air available both inside and outside the building, no chemical off-gassing, and with the assumption of perfect ventilation effectiveness. In practical terms, the architect must assume the need for a minimum of 15 cfm per occupant (ASHRAE Standard 62-1981R), and even higher levels under conditions of less than perfect ventilation effectiveness (for example, where there are barriers in a space that prevent the flow of air, or supply and room air are mixed.)

The architect should make sure that the mechanical design engineer is as aware of air quality as air quantity. For example, the engineer should ensure that exhausted air is not entrained back to the intake system. Too often, the supply air surface is located near loading docks, kitchens, laboratories, or bathroom exhausts. And in a recently built public building in California, it was discovered that the supply air grate was actually inside the building.

The designer should also consider providing local exhaust systems near areas in which major office machines are likely to be installed, as well as using negative pressure devices (such as revolving doors) to prevent contamination from one area, say, a smoking zone, from permeating other areas. In one instance, a smoking room had an open door to a balcony, and just outside the door the air intake for a large secretarial pool was located, entraining the sidestream smoke into that environment.

Close supervision is necessary for installation of HVAC systems to ensure proper location of access doors for equipment maintenance and cleaning.

Finally, it is critical to maintain complete records of design choices and their history. In many buildings, problems are generated because the original notion behind a design has long been forgotten and the occupancy of the building has changed radically.

Last year, a bill was introduced in Congress to amend the Clean Air Act to include authorization for a national effort to reduce the threat to health due to indoor contaminants. It was opposed by the Administration, and a new, scaled-down version is still pending. As the field of indoor air research continues to emerge, it begins to suggest positive opportunities for designers to distinguish themselves based on sensitivity to environmental health issues and the ability to create "gourmet" environments that feel refreshed and induce a positive sense of well-being and vitality. This is so much in keeping with the new ethos of American culture and its commitment to fitness and health that one wonders why no great designers have taken up the banner of Frank Lloyd Wright, Richard Neutra, and other architects sensitive to health issues. □

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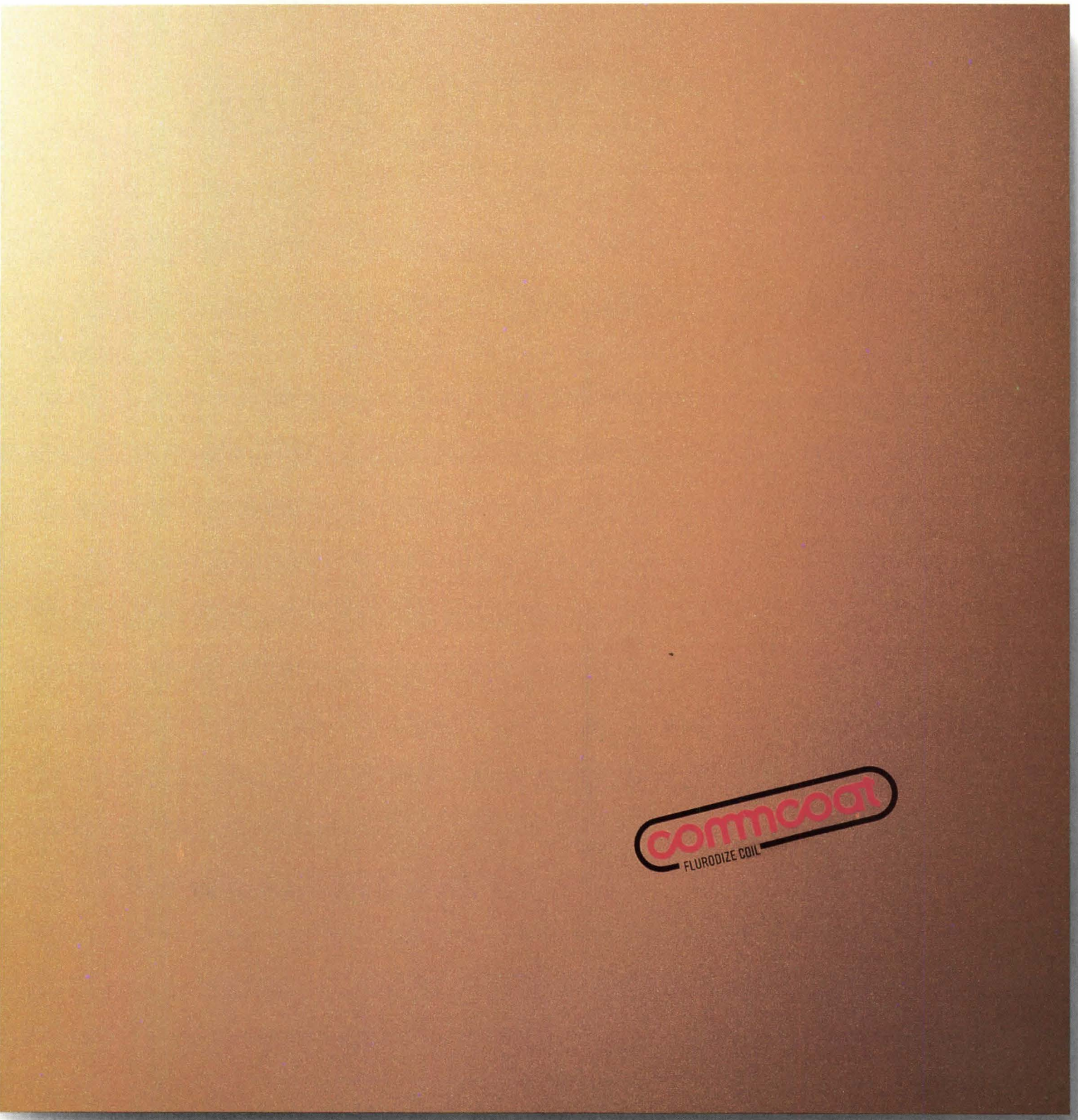

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COMMONWEALTH ALUMINUM

Simulation of Lighting Designs

A new sophistication has been introduced by the microcomputer.
By David Lord

Until a few years ago, lighting values were calculated by hand. Computer analysis consisted of a mainframe computer generating tables of numbers that represented illumination values. The primary tool for lighting simulation was the cardboard model. Viewing a lighting concept on the microcomputer was just a dream. In the days of manual calculation and mainframe computer programs, alternate lighting designs seldom were investigated unless requested by the client. Thorough analysis and simulation of lighting designs was reserved for a few large and exclusive projects. Today, as lighting designs are being improved to meet energy regulations and construction budgets, the need has grown for easy methods of analysis and simulation. At the same time, the microcomputer has become a standard multipurpose tool in the architect's office. Microcomputers also are revolutionizing the way architects visualize and design lighted spaces and shapes.

Many of the lighting calculations once done on the mainframe now can be performed on a small calculator. The HLC-1 handheld lighting calculator recently marketed by Halo Lighting helps the designer prepare quick luminaire layouts by determining the number of fixtures needed and the spacing and area of illumination. However, the HLC-1 provides only numbers. A microcomputer is required for graphical answers to lighting questions.

In addition to performing sophisticated lighting analyses with graphic layouts of luminaires and contour plots of illumination values, the microcomputer also offers the architect a view of what Le Corbusier called "the masterly, correct, and magnificent play of masses brought together in light." Images on display screens or on dot matrix printouts give a rough idea of how interiors will appear under different lighting conditions. Microcomputer-generated video images give full-color perspective renderings of simulated lighting conditions.

Cardboard models traditionally have been used by architects to study the behavior of forms in light. These physical models will continue to play a role in lighting design, and they still are widely used to validate the results of lighting studies on the computer. However, the computer can help to reduce the number of design alternatives to be studied with a model. Although not yet as realistic as a photograph of a well-built physical model, a rendering by a desktop computer of a simple daylighting and electric lighting design is generated in far less time than it takes to construct a model and take a photograph. Furthermore, experimentation and testing of many different design ideas is done quickly and efficiently on the computer.

Any computer model of lighting requires basic information about the source of light and the space being designed. The software available is generally for either electric lighting design or daylighting design; a few packages attempt to integrate the two. For electric lighting design, information about the direction and intensity of the light source (photometric data) is provided on floppy disks by most manufacturers of lighting equipment. These data disks can be used with most lighting programs, saving the user the tedious job of entering numbers on the keyboard. For daylighting design, the photometric data for the sun, a point source for which intensity and position are predictable, is calculated within the program. All that remains is for the designer to provide information about the space, including size, shape, orientation, and reflectivity. Some programs utilize design information from CADD drawings.

Most of the microcomputer software for lighting analysis is written for the IBM PC family, although this too is changing. The user who is already familiar with the notorious IBM Disk Operating System (DOS) will find it easier to begin using lighting analysis programs. The standard Macintosh user interface of mouse-operated, pull-down menus makes it a more friendly environment for learning new programs. Of course, a well founded knowledge of lighting principles and terminology is essential in order to input correct values and interpret the results.

Available software

Lighting software is either proprietary or in the public domain. Purchased proprietary software comes with full support and technical assistance. Frequent upgrades at a nominal additional charge further enhance an investment in these commercial packages. Some manufacturers of lighting equipment offer complimentary copies of their own proprietary software, which is usually capable of simple lighting calculations and layouts. For the adventurous designer, public-domain software is available, but with little help beyond brief instructions.

At California Polytechnic State University in San Luis Obispo, fourth-year architecture students receive three sets of software for the IBM PC. Within a few hours, each student becomes proficient on Aesop and Sunpatch, two programs that give basic information on solar position, solar shading design, and the sunlighting potential of windows (see page 108). The student then investigates design alternatives on Solar-5, a thermal energy design tool. At the end of the course, the students keep the computer programs, which are useful for optimizing subsequent designs.

There is a wide choice of other lighting programs. Daylit, a two-disk, public-domain program from Southern California Edison, is used to explore the integration of daylighting and electric lighting. With Daylit, it is possible to predict combined illumination levels from skylights, windows with light shelves, and dimmable electric lighting. A curve of illumination values throughout the room appears on the screen, with a graph of monthly and annual operating costs for each lighting alternative.

Mr. Lord is a professor of architecture at California Polytechnic State University, San Luis Obispo.

The operation of Daylit, which has a user interface similar to Solar-5, requires only a few hours to master.

Microlite, a quirky public-domain program, plots daylighting illumination in rooms with simple configurations. For more complicated geometries, Daylite 2.0 from Solarsoft is a professional-quality program. Daylite 2.0 is available for both the IBM PC and the Macintosh.

Simple area lighting designs can be tackled with one of the programs distributed by lighting manufacturers. Emcolite and the Globe lighting program are good examples of this type of software.

Point-source illumination of outdoor electric lighting layouts is designed with the help of Lumen-Point, from Lighting Technologies, or Cala, a program from Holophane. For example, either program can assist in the design of outdoor lighting for a tennis court. The designer can try different locations and orientations of light fixtures and see the resultant vertical illumination (on a tennis ball) at the net. Lumen-Point is the more expensive of the two but is also more capable, executes faster, shows shadowing of objects, and has perspective graphics and color-rendering capability.

For the advanced student or the professional, Lumen-Micro from Lighting Technologies is a high-quality, comprehensive interior lighting analysis program that presents accurate three-dimensional graphic images of electric lighting alternatives. Used in conjunction with an AT&T Targa 16 video card, Lumen-Micro superimposes alternative lighting designs in full color on captured video images of real or scale-model spaces.

Programs such as Lumen-Point, Cala and Lumen-Micro require the use of a specific light source with manufacturer's photometric data. However, a new Finite Element Luminaire Design (Field) program from Lighting Technologies allows the lighting designer to create a light source that does not yet exist, to evaluate its performance, and to light simulated spaces with it.

CADD software with perspective-rendering and solid-modeling capabilities is emerging as an aid to visualizing the play of light on architectural forms. At Cal Poly, we use DynaPerspective and AutoShade on the IBM PS/2 and the IBM AT. Both programs allow the designer to move a light source in relation to building surfaces. However, the resultant shading only hints at realism. Another IBM solid-modeling program, Solid Vision, shows hard-edged shadows cast by architectural shapes on surrounding horizontal and vertical surfaces.

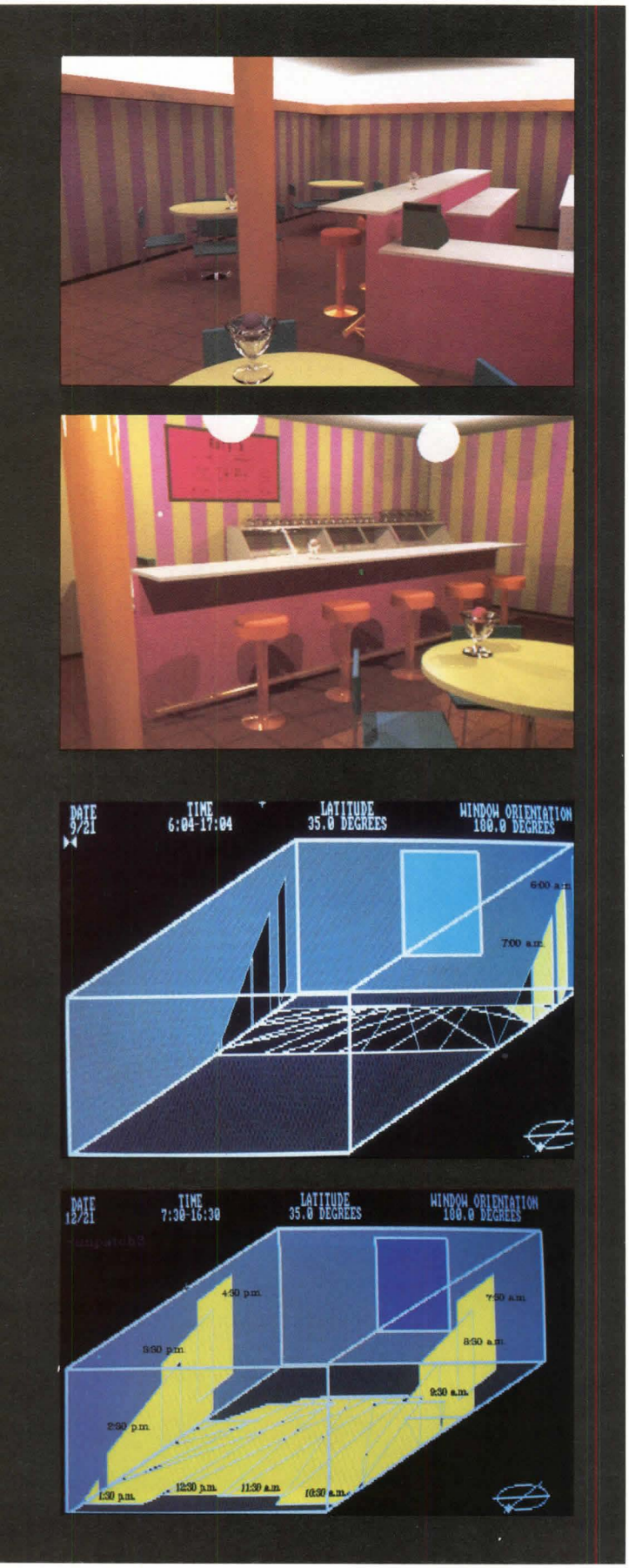
A new technique for analyzing existing lighting designs or scale models of designs is being perfected by Mojtaba Navvab and colleagues at the University of Michigan department of architecture. Using captured video scenes and computer analysis, relative brightness in the visual field for any lighting arrangement and viewing position can be compared and evaluated.

It must be emphasized that experience and professional judgment are required for any of these computer techniques. Architects who do not have time to become familiar with specialized lighting design programs may prefer to work with a lighting consultant. It is also important to remember that the greatest drawback to lighting design software is the time investment required for proficiency. This time commitment is usually worth more than the cost of the hardware and software combined.

Photos at right show three different lighting configurations for a corridor. They are screen displays generated by Lumen-Micro software on an IBM PC.

Lighting Technologies

Greg Ward, Lighting Systems Research Group, Lawrence Berkeley Laboratory



Future directions

The best computerized lighting simulations make use of ray tracing and radiosity calculations, which require the computing power of graphics workstations. Ray tracing programs excel in calculating the effect of specular light reflections from shiny surfaces in a space. Radiosity calculations model diffuse light reflections from matte-finish colored surfaces and the emission, scattering, and absorption of light transmitted through glass and the atmosphere. Ray tracing software for lighting simulation has been developed at Lawrence Berkeley Laboratories in California. Integration of ray tracing lighting simulation capabilities with CADD software is being developed by Skidmore, Owings & Merrill in partnership with IBM. This activity eventually will lead to wider availability of the software.

Software using both ray tracing and radiosity techniques has been written at Cornell's laboratory of computer graphics. The views of interiors simulated on graphics workstations are almost indistinguishable from photographs. One stunning simulation shows the effect of polishing a marble floor in a 17th-century painting by Vermeer. This opens up the exciting possibility of seeing spaces that existed in history as well as spaces for the future. Software based on the work at Cornell runs on a Hewlett Packard graphics workstation; together they sell for less than $100,000. Because of computational requirements at this early stage, the software is not often used in design. However, as advances are made, this type of software eventually will run on a desktop computer. According to one authority, in the early 1990s the power of the original Cray 1 supercomputer (circa 1976) will be available in a microcomputer for about $10,000.

Although the IBM PC continues to be the principal platform for lighting software, many architects prefer the Macintosh because of its visual appeal and ease of use. The Mac II in particular has the computational power and graphics interface that will provide incentive for lighting software developers in the future.

CD ROM, or compact-disk, read-only memory, is quietly emerging as an inexpensive way to read catalogues of information. Architects will see the day when alternative lighting design solutions will be proposed and simulated by expert-system CADD software through access to catalogues of products stored digitally on CD ROM. Research in this direction is taking place at Cal Poly and elsewhere. Ironically, the hardware to accomplish this already exists; a principal barrier to the development of software is the lack of standardization of information format.

More stable standards in both hardware and software in coming years will facilitate the interfacing of computers and the exchange of information from one computer to another and from one program to another. Only then will designers be able to push existing hardware to its full potential. Even more important, the designer will spend less time learning to use computer software and more time designing. We should not forget that, although computers have contributed to progress in architecture, the designer still makes the most significant contribution. □

Left, the top two photos illustrate ray-tracing simulations of an ice cream shop, performed on a Sun workstation. The interior with globe fixtures took about 16 hours to generate, and the interior with indirect cove lighting took about 30 hours. The bottom two photos are screen displays of Sunpatch in which beam sunlighting through a south-oriented window is shown for various times of day.

Achieving Energy Efficient Lighting

A review of design techniques. By Alex Wilson

Lighting accounts for 60 to 65 percent of the electricity used in most commercial buildings (including the cooling load contributed by lights). Energy-conserving technologies and designs can reduce lighting costs by more than 50 percent. Clearly, there exists considerable incentive for building owners to incorporate energy efficient lighting.

Until recently, most architects were frustrated by the limited availability of suitable fixtures for energy efficient lamps, the light quality offered by these lamps, and their general lighting esthetics. But that is quickly changing. The last several years have seen dramatic improvements in the entire field of energy efficient lighting. While a few years ago energy efficient systems were at best considered acceptable alternatives to conventional lighting, applicable only in situations where cost was a very high priority, today these systems often surpass their conventional counterparts from a design standpoint, even as they produce dramatic energy savings. Energy efficient lighting today is truly a case where you can have your cake and eat it too.

The following brief overview of energy efficient lighting will help architects specify systems that satisfy operational requirements and lower operating costs for the building owner.

Incandescent lamps

Regardless of energy efficiency, incandescent lamps still provide the highest-quality light, so lighting designers will want to stick with them for many applications for the foreseeable future, especially in retail spaces where color rendition is so important. While these lamps are at the bottom of the stack in terms of efficacy, there are some new designs with improved efficacy. (Efficacy is a measure of lighting efficiency, given in lumens of light produced per watt of electricity used.) Better filaments and higher concentrations of argon or krypton gas, for example, improve efficacy somewhat. In PAR lamps, better lens design and better reflectors account for efficiency improvements.

Tungsten halogen, sealed capsule incandescent lamps provide higher efficacy and better light-focusing characteristics than standard incandescent lamps, and they have considerably longer lifetimes (though at a premium price). Tungsten halogen lamps are most common in the higher wattages, from 200 to 1,000 watts, though several manufacturers offer lower-wattage lamps, such as Sylvania's Capsylite™ lamps.

With A-type lamps (standard light bulbs), Sylvania's 42-, 52-, and 72-watt Capsylite™ lamps are marketed as replacements for standard or long-life 60-, 75-, and 100-watt A lamps, respectively. In Sylvania's PAR series, 45-, 90-, and 150-watt Capsylite™ lamps are marketed as replacements for 75-, 150-, and 250-watt standard PAR lamps, respectively.

A few tungsten halogen incandescent lamps achieve significantly higher efficacy with the use of a selective coating on the bulb wall. This coating transmits the visible light but reflects the longer-wavelength infrared radiation. The filament absorbs the reflected infrared light and incandesces at a higher temperature, thus converting more energy into visible light—about 40 percent more. These infrared coatings are available now only on relatively high-wattage tungsten halogen lamps (GE has 350- and 900-watt models, for example). The higher efficacy and longer lifetime produce a good return on the investment in these lamps

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as compared with that of standard incandescent lamps.

Coated incandescent lamp technology may make its way into lower-wattage lamps. Recently, a 65-watt coated incandescent lamp was announced that would have given a light output equivalent to a standard 100-watt lamp, but the manufacturer has suspended work on the product for the time being.

While the improvements are impressive, even the higher-efficiency tungsten halogen lamps are much less efficient than other lamp technologies for their primary application, which is outside lighting. Whenever possible, they should be limited to areas where good color rendition is an absolute necessity, such as illumination of outdoor signs.

Low-voltage quartz halogen incandescent lamps, for track lighting and high-intensity desk lamps, have become more popular over the past several years. Because of their somewhat higher efficacy and more precise focusing and light delivery, these low-voltage, high-intensity lamps can replace higher-wattage conventional lamps.

By delivering light exactly where it is needed, they also may allow reduction of ambient light levels. Low-voltage lamps require compatible transformers to convert the line voltage to the proper level, so the cost of such systems is high.

Fluorescent lamps

Of the major lighting technologies—incandescent, standard fluorescent, compact fluorescent, and high-intensity-discharge (HID)—fluorescent lighting accounts for more than three-quarters of the illumination in commercial buildings. Four-foot F-40 lamps provide about 70 percent of this fluorescent lighting, with most of the rest coming from eight-foot F-96 lamps. Techniques to reduce energy consumption from fluorescent fixtures fall into four categories: lamps, ballasts, reflectors, and controls.

Energy savings can be accomplished by removing lamps, reducing their output through special power reducers, and using lower-wattage and/or higher-efficacy lamps.

Where existing light levels are high and cost is a big consideration in retrofit measures, it may be possible simply to remove some of the lamps and replace them with "dummy tubes," which complete the electrical circuit but consume no electricity. Such an approach may work in a warehouse or other little-used space, but the resulting "missing tooth" effect is not acceptable in most commercial spaces. Often a better method of lamp removal is to rewire the fixtures so that a single, centered lamp can replace two side-by-side lamps. Specialized reflectors are available that distribute light from the single lamp so that it appears to come from two lamps.

Specialty lamps and devices can provide the same energy savings as lamp removal yet with a more even light output. For instance, when a Sylvania Thriftmate™ lamp is substituted for one of the standard tubes in a two-lamp fixture, it reduces and balances the light output from both lamps. There are two versions of this lamp: one providing 33 percent reduction, the other 50 percent reduction. The latter has the same net effect as a dummy tube or lamp removal but with uniform light output from two lamps.

Devices called "power reducers," such as the No-Watt™ product line manufactured by Remtec Systems of Duarte, Calif., accomplish the same effect as Thriftmate™ lamps. They are installed either in line with the ballast in a fixture or between the lamp and the socket, depending on the product.

Replacing standard F-40 lamps with energy-saver lamps of 34, 32, or 28 watts is a simple way to reduce energy consumption, although it will reduce lighting levels as well. Most energy-saver lamps have somewhat higher efficacy than standard F-40s, but they still produce less light. In retrofit situations where it is possible to reduce light levels, relamping with lower-wattage lamps often makes sense. By combining lower-wattage lamps with better reflectors, illumination levels can be maintained or even increased while electricity consumption is reduced. All the major lamp manufacturers offer energy-saver 48-inch lamps under such trade names as Watt Miser, Econ-o-wat, and Super Saver. In conventional fixtures, 34- and 32-watt lamps can generally be used, while lamps of lower wattage require specialized ballasts. Similar replacements for eight-foot F-96 lamps are available.

In new construction, or in retrofit situations where higher light levels must be maintained, it often makes sense to stick with higher-wattage (40-watt) lamps but use lamps with higher efficacy. Trichromatic phosphor lamps, a relatively new type of fluorescent lamp available from all the major lamp manufacturers, produce 10 to 15 percent more light than standard F-40s. They also provide a higher CRI (the color rendering index is a measure of how well a light source renders color compared with a reference light source, usually sunlight) than standard cool white lamps, and they are available in various color temperatures (the color temperature, given in °K, describes how "warm" or "cool" the light source feels).

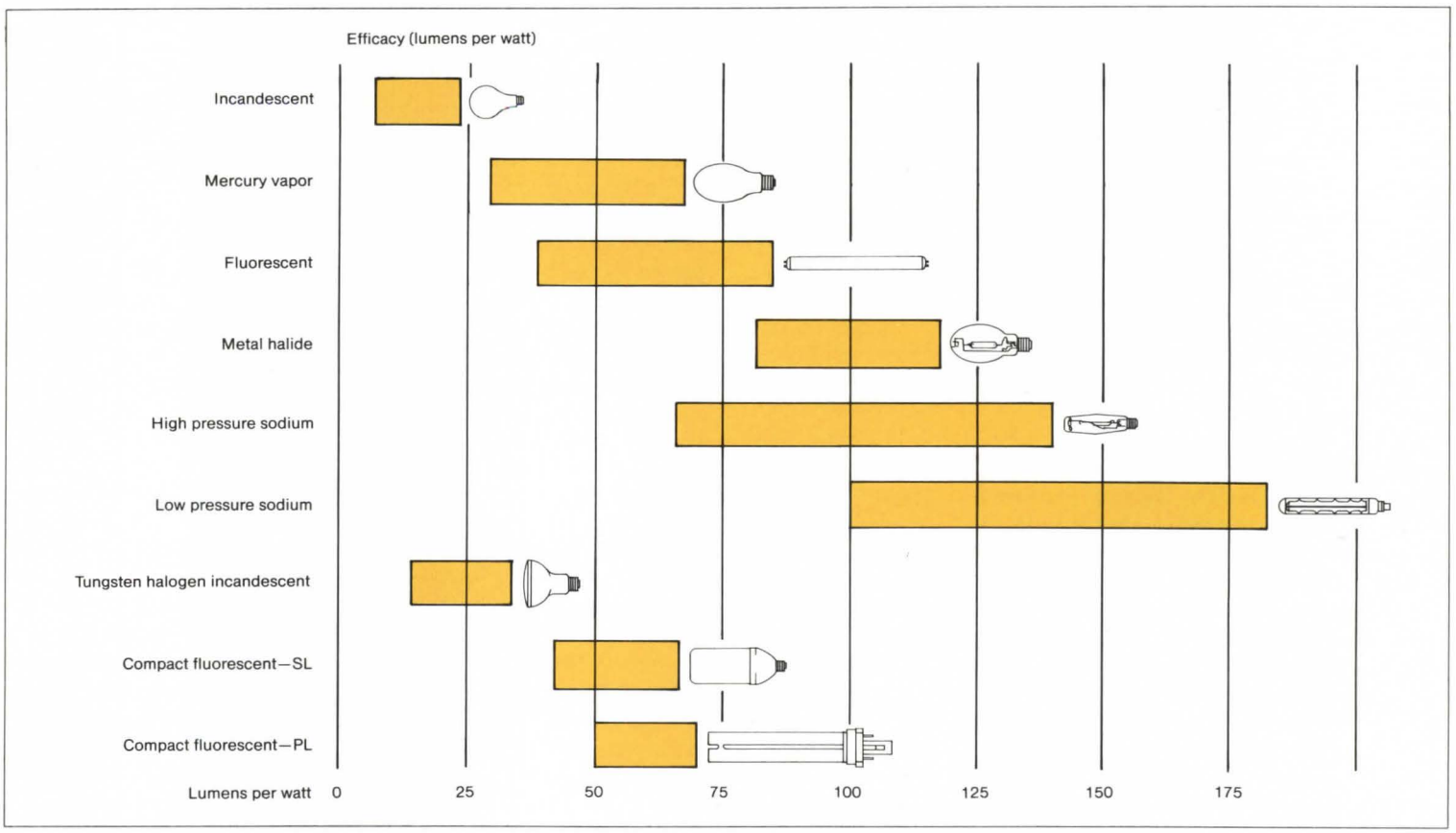
Higher efficacy with other fluorescent lamps can be achieved by going to smaller-diameter lamps (T-10 or T-8 rather than T-12), by using different gas mixtures, or by adding reflective coatings to the top inner surface of the tubes. Making use of higher-efficacy lamps, especially with more efficient ballasts and better reflectors, may allow designers to specify fewer fixtures yet still provide the desired light levels.

The dramatic changes in lamp technology over the past several years have made the decision-making process for architects much more complex. It is no longer simply a question of cool white versus warm white lamps. We now need to look at a range of properties: efficacy, color temperature, CRI, and cost. It is difficult to keep up to date on all the new lamps available, so it pays to spend some time with manufacturers' representatives or lighting designers before choosing your lamps.

Ballasts, an integral component of all fluorescent fixtures, adjust voltage, current, and wave form conditions to start and operate the lamps. Standard ballasts for fluorescent lamps are electromagnetic, using a ferromagnetic core and aluminum wire coil. A standard ballast, operating two F-40 fluorescent lamps, will consume about 16 watts. Thus, even though efficacy of your lamps might be 75 or 80 lumens per watt, efficacy of the system, including ballast, will be considerably lower.

Most people assume that "energy-saver" electromagnetic ballasts are a recent phenomenon. Actually, they represent a return to former, higher-quality standards of ballast manufacturing, using better core materials and copper, rather than aluminum, for wire. Energy-saving ballasts now are required by code in several states, including New York, Massachusetts, and California, to reduce energy consumption; other states are considering such codes. An energy-saving electromagnetic ballast will consume approximately six to eight watts. Using these ballasts in place of standard ballasts will improve the overall system efficacy by about 10 percent.

Electronic or solid-state ballasts are relatively new but have been gaining acceptance over the past few years. Rather than



operating at 120 cycles per second as do standard ballasts, electronic ballasts operate at 50,000 to 80,000 cycles per second. An electronic ballast will consume only about four watts in operating two F-40 fluorescent lamps, roughly a quarter of the energy required to operate standard ballasts. Plus, electronic ballasts boost the lamp efficacy 10 to 15 percent by operating at a high frequency. Combined, these savings amount to a 20 to 35 percent efficacy gain for the system.

In addition to the obvious benefits of lower energy consumption, electronic ballasts offer other important benefits. They generate much less heat and so have a smaller impact on cooling loads (lighting accounts for 40 to 60 percent of the cooling load in most commercial buildings). They eliminate or greatly reduce the hum and flicker common with standard ballasts. They are much lighter than standard ballasts. And some are easily switchable and/or dimmable.

The level of control offered by some electronic ballasts is a particularly exciting feature. Switchable electronic ballasts manufactured by Triad-Utrad, for example, allow the user to flip a switch to reduce light output (and electricity consumption) by 50 percent. Some other electronic ballasts may be tuned individually with a screwdriver to provide task-specific illumination levels.

Still others are fully dimmable and, unlike standard (nonelectronic) dimming ballasts, do not require an efficiency premium paid for the dimming feature. Dimming electronic ballasts are just as efficient as nondimming ones. Furthermore, their efficiency does not drop appreciably through the dimming cycle, as it does with standard dimming ballasts. Because of this, installation of dimming electronic ballasts can be justified by energy savings; the design features are a bonus.

From a design standpoint, dimmable electronic ballasts provide tremendous design flexibility, heretofore unknown to most architects. XO Industries of Mountain View, Calif., the premier manufacturer of dimmable electronic ballasts, offers three options for dimming ballasts: fixed dimming, a device wired in line with the ballast to provide a set output of 85 percent, 70 percent, 50 percent, or 35 percent; manual dimming, with the ability to dim banks of up to 100 ballasts over the range of 100 percent to 35 percent via a wall-mounted dimmer switch; and automatic dimming, using photocell controls to sense ambient light levels and/or programmed timer controls.

Standard fluorescent fixtures are white enameled steel. When new, they have a reflectivity of 60 to 70 percent, which drops considerably with aging. According to a lighting study by Competitek of Snowmass, Colo., it is common for half of the light emitted by fluorescent lamps never to reach its destination. Reflectors that increase the light output from fixtures are an important means of increasing the overall lighting efficacy. The best silver imaging specular reflectors have a reflectivity of about 95 percent, with a lower loss in reflectivity over time than standard white reflectors.

Reflectors can be used effectively in both new construction and retrofit situations. There are many types of reflectors on the market, with various reflective surfaces and various shapes. Some reflectors are specifically designed for four-lamp fixtures where two of the four lamps have been removed and the remaining lamps centered. The reflector makes the two lamps appear to be four, and the higher reflectivity means that the total illumination level will drop only slightly.

The lighting designer should carefully match the type of reflector chosen with the light distribution needs of the building. Usually the light distribution of a fluorescent fixture with an imaging specular reflector will be quite different from that of a standard fixture.

Compact fluorescent lamps

Compact fluorescent lamps, first introduced in this country in the early 1980s, are an excellent alternative to incandescent lamps in many applications. Twin-tube or quad-tube compact fluorescent lamps offer approximately four times the efficacy of standard incandescent lamps and last 10 times as long.

In some units, the ballast is built right into the lamp, which screws into a standard Edison socket. These are called "integral compact fluorescent," or SL, lamps. In other units, the ballast screws into the Edison socket and the lamp plugs into the ballast, allowing replacement of just the lamp, rather than both lamp and ballast, when the lamp fails. These are termed "modular compact fluorescent," or PL, lamps. With PL lamps, ballasts generally are specific to the lamp type.

Compact fluorescent lamps, with their integral ballasts, will not fit into all incandescent fixtures because of both their dimensions and their light focal point. Fixtures are quickly becoming available, however, that will allow lighting designers to take full advantage of these lamps in many situations where they now specify incandescents. Among the new products are modular reflector assemblies that allow compact fluorescent lamps to replace incandescent PAR lamps, providing relatively good spotlight or floodlight performance.

Most compact fluorescents now on the market are not dimmable, but that is changing. PL-type compact fluorescents in GE's Biax family, first introduced in 1985, have four-pin bases and external starters, enabling them to be used in dimming circuits. GTE is pursuing a four-pin base design with ballast circuitry that eliminates the need for a starter, making it fully dimmable. Osram showed a compact fluorescent lamp at the 1987 Lighting World International trade show that could be tuned from 100 percent down to 10 percent, making it fully applicable to hotel lobbies, conference rooms, and bars, which otherwise are limited to incandescent lighting.

In specifying compact fluorescents rather than incandescents, the lighting designer must make sure to get lamps with the necessary properties. Because of the trichromatic phosphors, color rendition tends to be quite good with compact fluorescents (CRI of 80 to 85, typically), but it still will not equal that of incandescent lamps. Compact fluorescents, especially the SL types, are most common in low-wattage sizes, equivalent only up to 60- to 75-watt incandescents, although that too is changing as higher-wattage compact fluorescents become available. Also, because compact fluorescents do not provide as exact "point-source" light as incandescents, they may not work well in fixtures that rely on precise light focusing, even if they physically fit.

High-intensity-discharge (HID) lamps

HID lamps, as a group, are the most efficient lamps available. These include metal halide, high-pressure sodium, mercury vapor, and low-pressure sodium. All HID lamps require ballasts to operate, and the ballasts are usually specific to just one type and size of HID lamp.

HID lamps are used primarily for outdoor and security lighting. Other applications are limited by the poor color rendition of HID lamps—*driving your car* under HID lighting is fine, but you wouldn't want your office illuminated by it. Recent improvements in the quality and consistency of HID lamps, however—especially high-pressure sodium and metal halide—have resulted in increased use indoors in appropriate applications. Lamp manufacturers agree that the next several years will see continued rapid advancement in indoor use of HID lighting.

Metal halide lamps are the best bet among HID lamps for incandescent replacements inside buildings. Lower-wattage metal halide lamps with color temperatures closer to incandescents are increasingly available. Some color-corrected metal halide lamps now have CRIs above 80—well into the range of fluorescent lamps, with considerably higher efficacy (see table). For example, Osram's HQI-T line of metal halide lamps, introduced in 1987, available in 35-, 70-, and 150-watt sizes with a color temperature of 3,000°K and CRI of 81. These lamps may replace 150-, 300-, and 500-watt incandescents, respectively.

Until recently, most architects and lighting designers kept away from metal halide (and all other HID lamps) for indoor use because individual lamps tended to degrade differently. While a bank of lamps may have started out uniform, as they aged their colors changed individually. Metal halide lamps still degrade, but the newer products degrade in a consistent and predictable way. At the same time, their efficacies have increased and lower-wattage lamps have become available.

Metal halide is followed by high-pressure sodium in suitability for incandescent replacement inside buildings. The Ceramalux™ White 35-watt, high-pressure sodium lamps from Phillips, for example, are designed for incandescent replacement, and their good color rendition makes them suitable for many interior applications. The color quality of high-pressure sodium lamps is usually not as good as that of metal halide, and their efficacy range is broader, with the higher-CRI lamps generally having lower efficacy. Some high-pressure sodium lamps, in fact, have lower efficacy than the newer high-efficacy fluorescents.

Some mercury vapor lamps offer better color characteristics than high-pressure sodium, but their efficacy is lower—in fact, often lower than fluorescents. With the better performance and economics of other HID lamps, mercury vapor lamps are finding fewer practical applications.

Low-pressure sodium lamps produce the most lumens per watt of any HID—indeed, of any lighting technology—but their light quality is the poorest. While they are occasionally used as base-load light in large industrial spaces, their primary applications are outdoors where light quality is not important and in security lighting indoors.

Controls also can produce savings

Just as improved lamps and ballasts save energy by reducing the electrical consumption of fixtures, control systems can save energy by reducing the time those fixtures are on or by reducing their intensity.

Adding new switches and breaking large lighting circuits into smaller circuits can allow more lights to be turned off more of the time. It is interesting to note that many people still have the notion that turning fluorescent lights off and on somehow uses more energy than leaving them on all the time. Reducing the on-off cycles will increase lamp life somewhat, but it will not save energy unless the lamps are off for less than a minute or two. Turning lights off when you leave the room or work space makes economic sense, so providing enough switches to do so is advisable.

Timer switches are an effective lighting control strategy for closets, storerooms, and other spaces occupied for short peri-

This six-inch round fixture diffuses light with a proprietary lens system, and the resulting indirect light turns the ceiling into a reflector, creating even light levels and a low glare.

ods. Electronic timers are now available that are much quieter than the older rotary types. Time clocks control entire lighting circuits, turning fixtures on and off according to a preset schedule, usually with manual override. This is an effective strategy in many commercial buildings. Programmable time clocks and integrated energy management systems provide an even higher degree of centralized control. Occupancy sensors can tell when there are people in a room and, therefore, when light is required. Of the several different kinds of occupancy-sensing switches, those sensing motion and heat are the most widely used.

Dimmer or tuning controls can offer significant potential for savings, as described above. Dimmers for incandescent lamps are important also. Standard dimmers for incandescent lamps consume energy (electrical consumption decreases more slowly than light output through the dimming cycle), but electronic dimmers for incandescent lamps are much more efficient over the dimming curve. Electronic dimming ballasts for fluorescent fixtures have greatly increased the potential for energy savings in most commercial buildings. Dimming controls for compact fluorescents are just now coming onto the market. As the market becomes more aware of dimmable electronic ballasts, we can expect to see much greater application of them.

Dimmer controls can be interfaced with other controls—occupancy sensors, photocells, and time clocks—although such a level of integrated control is still uncommon.

Photocell controls, either for dimming or turning fixtures on and off, offer tremendous potential for savings in buildings with a substantial daylighting component. Electronic ballasts manufactured by XO Industries are designed for easy control by a photocell. A single photocell can control up to 100 XO ballasts, either by turning a circuit on and off or by dimming to a preset light level. Photocell controls make sense only in strongly daylighted spaces. The first 10 to 15 feet in from a window is a good place for such control in many commercial buildings. By rewiring a room or floor so that fixtures along a wall are on a separate circuit controlled with a photocell sensor, considerable energy savings can be achieved. In buildings with specialized daylighting strategies, the potential will be far greater.

Programmable controls and integrated energy management systems, often combined with other control techniques such as photocells, dimmer circuits, and time clocks, can provide the highest level of lighting control in a building. For optimal levels of control and energy savings, the lighting designer should specify wiring that will adapt to the particular building needs. Controls function with a number of transmission systems: hard wiring; lower-gauge; low-current control wiring; and power line wiring (sending signals through electrical lines in the building).

Putting the light where it is needed saves a great deal of energy in most commercial buildings. It also presents a challenge to lighting designers: to succeed, the system must be adaptable to changing needs and altered room layouts.

All lighting technologies and control systems can play a part in task lighting. Even HID lamps with their lower quality of light often can be used for base-level illumination in large buildings, while higher-quality light is directed only to the work areas. Track lighting is one popular way to put light where it is needed. Reflectors, diffusers, and louvers for fluorescent fixtures also can play an important role by directing light where it is needed and putting it into a form most beneficial for the particular application. Computer workstations, for example, often will benefit from light channeled directly down by louvers.

Energy-efficient lighting has come a long way in a short time. From an early emphasis only on saving energy, energy-conserving technologies and techniques have come to focus much more on design, flexibility, convenience, and esthetics. Technological improvements have kept pace with designers' requirements, and that trend appears to be continuing. But all this has meant a much greater load on the designer. It is difficult, especially for a general architect, to keep up with all the advances and to know all the evergy-saving options available to clients.

As the field becomes more specialized, most architects will be able to keep abreast of general developments only and will need to rely more on specialized lighting designers. From the client's perspective, the extra cost of hiring a specialized lighting designer who knows energy-saving technologies and designs is a good investment. □

The author gratefully acknowledges the contributions of Fred Davis in preparing this article. Mr. Davis is president of the Fred Davis Corp. in Charlestown, Mass., a firm specializing in energy-conserving lighting retrofits in commercial buildings. Acknowledgment is also due to Competitek of Snowmass, Colo., for information on lighting systems and statistics on energy savings. Competitek produces an annual State of the Art Monograph on Lighting, which includes extensive technical information on energy-conserving technologies in the lighting industry.

Comparative Analysis of Alternative Energy Efficient Lighting Systems

By Steven P. Kimsey, AIA, with Perry Jarrell and Andrew Beldecos

With every nuance of increased efficiency and comfort becoming critical to office-building clients—and to those clients' design-team selection criteria—there is little wonder that specification of lighting systems is getting so much attention. Gone by the wayside is quantity of light as the primary performance criterion. Color, warmth, glare, and life-cycle cost also govern selection, and, as can be seen from even a cursory study of available lighting hardware, every lighting system is weighted differently with respect to these factors.

This article examines current trends in energy efficient office lighting with respect to visual quality and comfort and operating-cost control. The factors and costs presented in the evaluation were chosen to reflect the lighting systems most prevalent in office buildings today. Standard office layouts, based on the authors' practice experience and manufacturers' performance data, were used in the calculations. The authors followed standard IES and ASHRAE procedures and used a spread sheet microcomputer program to obtain the results. The factors and costs most likely will vary by project and by location. Therefore, evaluation can only highlight and emphasize the potential differences in quality and operating costs among popular lighting systems. It is up to the designer to encourage qualitative and operating-cost comparisons for a particular project.

Open office lighting

The office lighting alternatives summarized in Figure 2 were compared based on the illuminance levels and design assumptions in Figure 1. The costs in Figure 2 summarize estimated annual net heating and cooling costs due to lighting, direct lighting usage costs, and fixture lamp replacement costs for the selected lighting alternatives. The results are prorated for 25,000 square feet (a small office building) and 100,000 square feet (a large office building) to provide representative operating-cost savings. The alternatives, which include energy-saving lamps and ballasts, small-cell and large-cell parabolic louvered fixtures, two-by-two fluorescent, and direct and indirect task lighting schemes, reflect standard and energy efficient lighting systems typically used in practice today. However, the comparative schemes, both for work spaces and for circulation areas, indicate a wide range of potential operating costs.

Energy-saving lamps and ballasts. Under similar space conditions and color requirements, energy-saving lamps and ballasts provide 90 to 95 percent of the illuminance levels of standard lamps and ballasts and require only 80 to 90 percent of the electrical power, potentially saving operating costs of approximately $3,000 per year for a small office building and $11,000 per year for a large one. Depending on local electric costs, simple payback periods ranging from less than one year to two years typically can be achieved with energy-saving lamps and ballasts. For example, a 1.1-year simple payback was the result using eight cents per kwh; both electric kilowatt hour and electric kilowatt demand savings must be factored into the equation. In this case, the designer also must consider whether 90 to 95 percent of the illuminance levels achieved with standard lamps is acceptable. If not, illuminance levels equal to standard lamps can be achieved by specifying ceiling or walls and partitions with higher light reflectances.

Energy-saving electronic ballasts and compatible lamps can achieve significant additional savings with slightly longer payback periods. However, widespread use and availability of electronic ballasts is recent, and debate continues over the electromagnetic interference (EMI) of these ballasts.

Small-cell parabolic louvered fixtures. Greater use of computer display terminals and the consequent desire to minimize localized glare has led to the popularization of the small-cell parabolic louvered fixture. This typically is a standard fluorescent fixture with a ½x½-inch to 1½x1½-inch, egg-crate-type parabolic louver. It virtually eliminates glare but is inefficient in terms of electric power requirements. Realistically, the small-cell fix-

Design Assumptions

	General	Task
Open office lighting		
Direct general lighting	65-75	NA
Direct task/ambient lighting	40-50	75
Indirect task/ambient lighting	30-40	75
Circulation lighting		
Downlighting	10-20	

Lighting design and evaluation assumptions
(Southeast United States)

1. 3,600 per year of lighting
2. Room cavity ratio = 1.0

	Ceiling	Wall	Floor
3. Standard design reflectance	70%	50%	20%
4. Energy efficient reflectance	80%	50%	20%

5. Net heating and cooling cost = lighting cooling energy cost—lighting heating benefit
6. Cooling = 1,800 hour/year. Large building = 1.0 kw/ton, small building = 1.4 kw/ton
7. Heating = 900 hour/year; ¼ building or perimeter is electric heating
8. Energy cost = $.08 kwh

Figure 1

Mr. Kimsey is an architect associate with Heery Energy Consultants Inc., and Mr. Jarrell is a project designer with Heery Architects & Engineers Inc. Mr. Beldecos heads Andrew J. Beldecos Lighting Design. All three firms are in Atlanta.

Comparison of operating costs for open office lighting

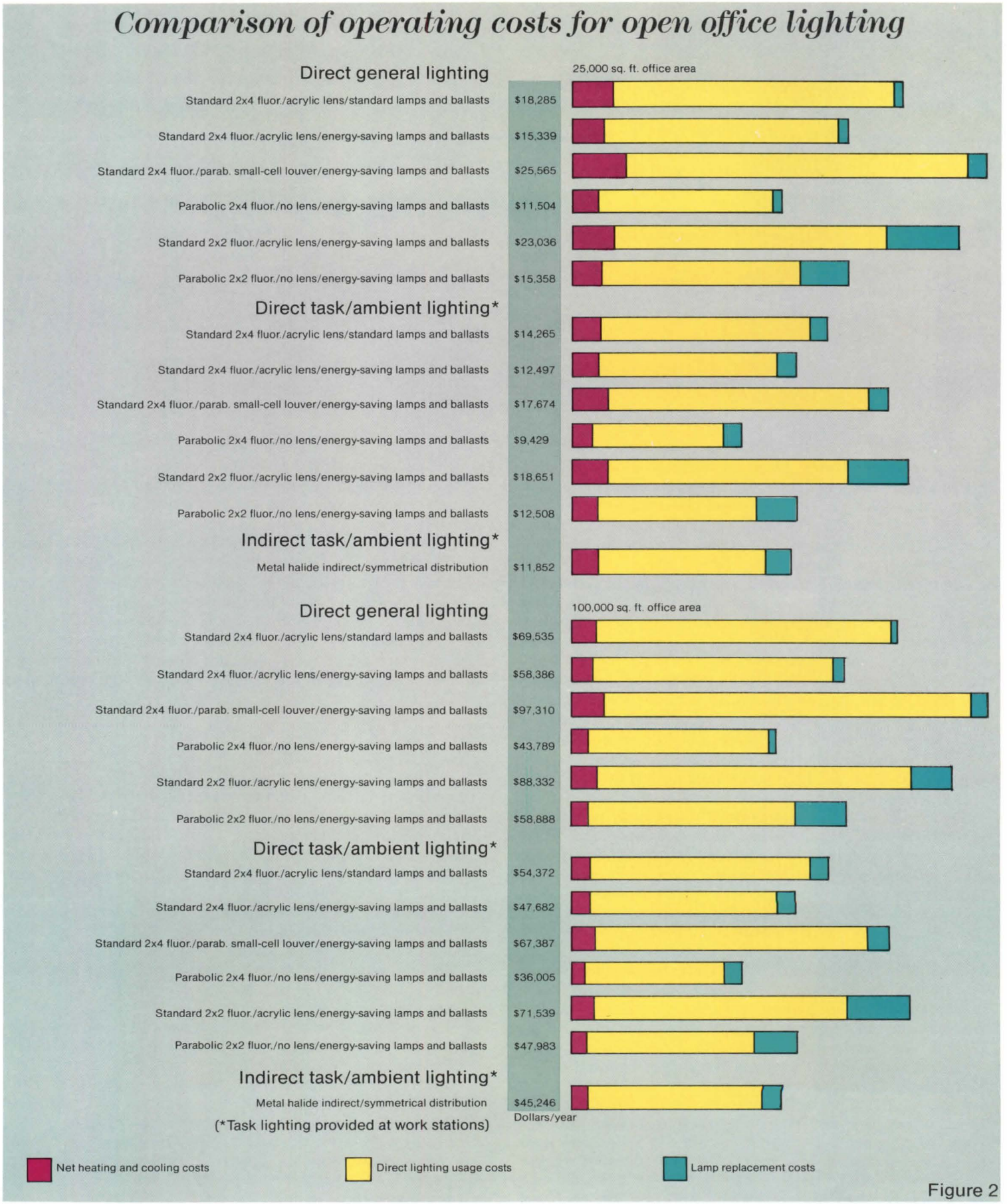


Figure 2

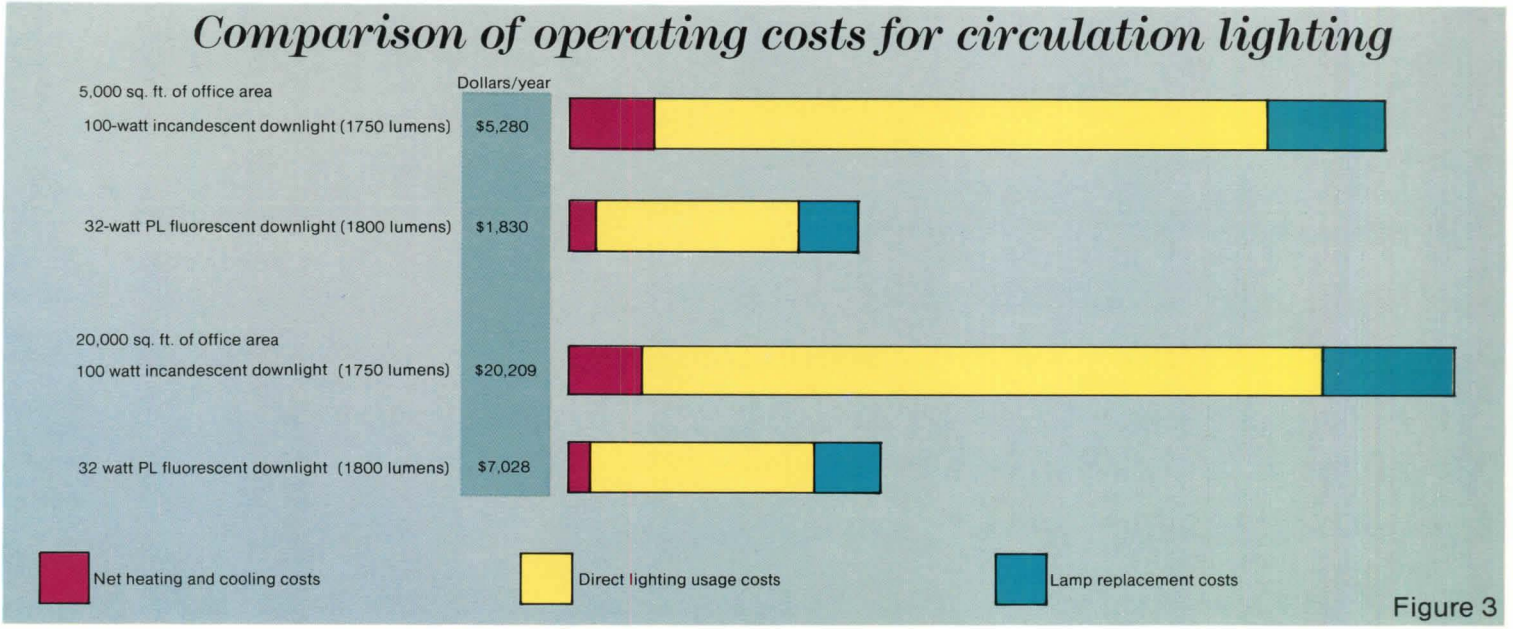


Figure 3

ture should not be used throughout an office area, but an appropriate number of fixtures can be very effective if carefully placed in a particular building design. Other, more efficient fixtures with moderate to good glare control should be employed in all areas where general or moderate automated office tasks are performed and in supporting areas such as corridors, storage areas, break areas, and conference rooms.

Large-cell parabolic louvered fixtures. Parabolic fixtures of 12, 18, and 24 cells with energy efficient lamps and ballasts are popular. These true large-cell louvered parabolic fixtures have coefficients of utilization (CUs, or effective light efficiencies) of 75 to 85 percent, compared with 60 to 70 percent for standard acrylic-lens fixtures and less than 50 percent for small-cell louvered fixtures. Because large-cell parabolic louvers are open to air circulation, dirt accumulation is significantly reduced, yielding a better maintenance factor and a higher maintained light output. The visual comfort probability factors (VCPs, which indicate glare control) are 40 to 60 for standard, 99 for small-cell parabolics, and 75 to 87 for large-cell parabolics. The higher number indicates better glare control. All around, the large-cell parabolic fixtures provide lower operating cost, excellent glare control, and a high level of visual comfort. Application of these fixtures has increased rapidly in recent years, and purchase costs now run 20 to 30 percent higher than standard features with energy-saving lamps and ballasts. Simple paybacks of one to two years typically are achieved, with significant operating-cost savings in the long run.

Two-by-two fluorescent fixtures. These fixtures are popular because they allow symmetry in interior ceiling layout and design. However, a significant penalty in operating costs is paid over the life of the building because these fixtures are inherently less efficient than two-by-four-foot fixtures. Their CUs typically are 10 to 15 percent lower than their two-by-four counterparts, and their unusual U-shaped lamps provide less light than four-foot fixtures. Additionally, the U-shaped fluorescent lamps are stocked less commonly by venders, have significantly shorter rated lamp lives (12,000 hours *versus* 20,000 hours for four-foot lamps), and typically cost three to four times more than four-foot lamps.

Direct-task ambient lighting. This light design approach reduces the general or ambient overhead lighting requirements by providing localized task fixtures at workstations. The result is reduced overhead glare potential and significantly reduced overall operating costs for lighting. Shelf-mounted task fixtures using efficient miniature fluorescent lamps and/or PL-type fluorescent lamps typically are used.

Indirect-task ambient lighting. This approach is similar to direct-task/ambient lighting except that it uses high-intensity-discharge (HID), metal halide, indirect ambient lighting reflected off the ceiling. Because of the diffuse nature and better quality of the indirect lighting, ambient illuminance levels can be reduced even further. However, the potential operating-cost savings of this approach depends on both the openness of the space and on high reflectances of the ceiling, walls, and furnishings in the office area.

Circulation lighting

The circulation lighting alternatives summarized in Figure 3 also were compared on the basis of the illuminance levels and the applicable design assumptions in Figure 1. The costs in Figure 3 summarize estimated annual net heating and cooling costs due to lighting, direct lighting usage costs, and fixture lamp replacement costs for the selected lighting alternatives. The results are prorated for 5,000 square feet (circulation for a small office) and 20,000 square feet (circulation for a large office) to provide representative operating-cost savings. The comparison indicates a significant savings opportunity in the use of PL-type fluorescent downlighting in lieu of incandescent downlighting, where appropriate.

PL-type fluorescent downlighting represents a major technical advancement as an interior lighting alternative to the inherent inefficiency and short lamp life of incandescent lighting. Two 13-watt PL lamps (16 watts each, including the ballasts) provide 1,800 lumens compared with 1,750 lumens for a 100-watt incandescent lamp. Additionally, the rated life of the PL lamp is 10,000 hours; the incandescent lamp's is 750 hours. Incandescent lamps also are sensitive to electric power surges that reduce their short lives even further, while the ballast in a PL lamp insulates it from power surges. More importantly, the PL lamp provides a color

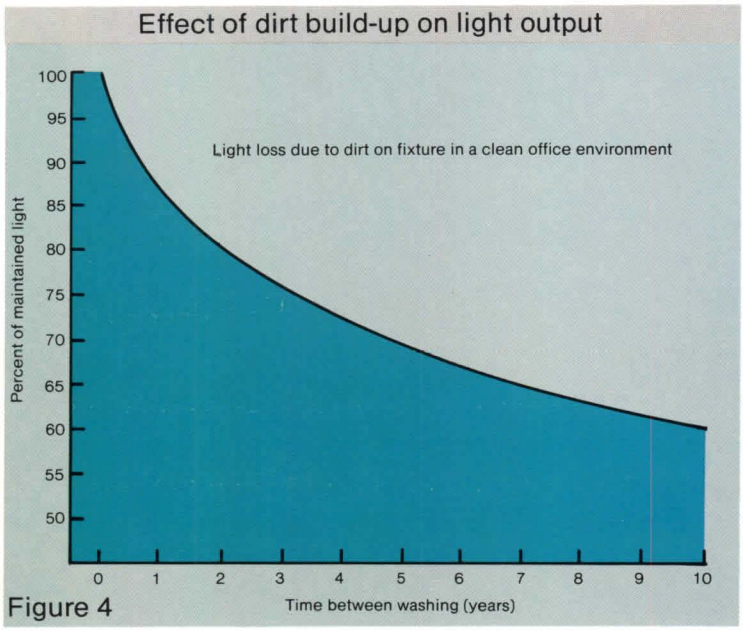


Figure 4

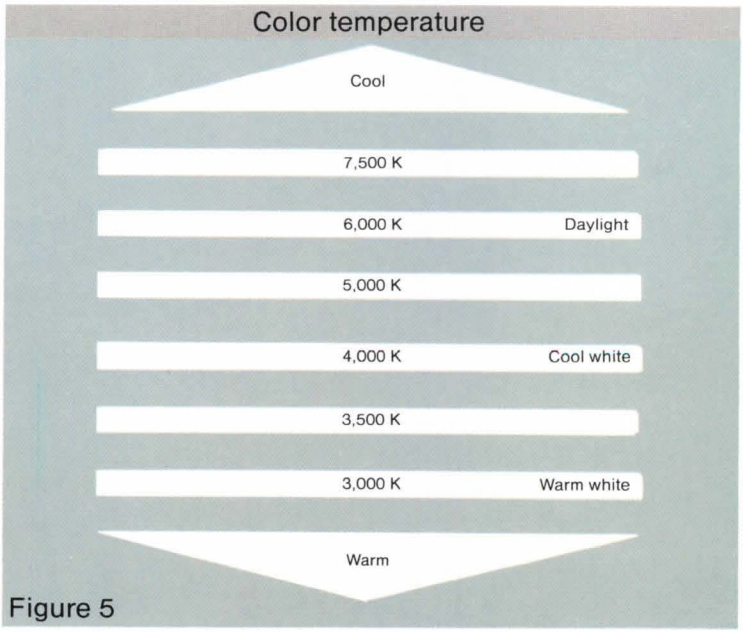


Figure 5

quality similar to the incandescent lamp and not achieved economically in earlier fluorescent lamps. The tight light beam spread of the incandescent spotlight is the only factor not fully achieved in the new PL lamp type.

Where incandescent spot/ambient lighting is still desirable, low voltage/low wattage tungsten halogen lamps are now available to meet this need.

Lighting design factors

Lighting system operating-cost comparisons should take into account both the purchase costs and the operating costs over the life of the building. Net heating and cooling costs due to lighting, direct lighting usage costs, and fixture lamp availability and replacement costs should all be evaluated. Electric cost calculations should take into consideration electric kilowatt hour usage costs, and electric kilowatt demand costs, including any summer/winter demand ratcheting.

For a typical office building, lighting can represent 30 to 50 percent of annual energy-related operating costs. In addition, interior heat produced from lighting significantly increases building cooling capacity requirements (a first cost) and cooling operating costs. Lighting provides some heating benefit, however, in new buildings with insulated windows and wall systems; most of the heating needs occur during unoccupied, minimum-lighting periods. The building mechanical system designer should take into consideration reduced cooling capacity requirements.

According to studies by the Illuminating Engineering Society, the frequency of cleaning fluorescent fixtures can also have a profound effect on the performance of the lighting system. Lighting systems seldom are cleaned on a regular basis, yet routine cleaning can be one of the most effective means of reducing lighting costs. As indicated in the *IES Handbook* (1984), light output can be reduced as much as 35 percent due to dirt buildup in an unmaintained system, even in a clean office environment. Figure 4 illustrates the effects of dirt buildup on the percentage of light output over time.

Simple washing of the fixtures will restore the output loss, unless the fixture surfaces have deteriorated because of lack of cleaning. The proper method of fixture cleaning is to have the fixtures, lamps, and lenses thoroughly cleaned and allowed to air dry. The fixture components should not be toweled dry because they then may develop a dirt-attracting electrostatic charge.

Within practical limits, high-quality lighting can help offset lighting levels that are slightly below recommended criteria without a significant reduction in visibility and performance. However, no increased quantity of light can entirely compensate for poor-quality lighting. In fact, increasing the light level from a poor-quality lighting system may increase the detrimental aspects of the system. It is somewhat of a paradox that much of the industry places great emphasis on quantity while it appears that quality is the more significant factor. Both, however, need to be addressed in any design.

Efficient lighting components and systems are available to control visual comfort and energy costs. However, even an efficient lighting system will waste energy whenever it is used unnecessarily or provides more light than needed. Many types of lighting fixture controls are available today that provide good lighting management for visual comfort and energy-cost control. The types of fixture controls range from simple manual switches to fully automated devices (see page 112). The particular control system should be selected based on the degree of control and energy savings desired. However, with any lighting system a planned control pattern will yield the greatest success. Full automation of an energy management system yields maximum control and energy savings.

Careful evaluation of lighting fixture and lamp alternatives available in general office design today can provide significant visual quality and operating-cost benefits over the life of a building. Overall lighting operating-cost savings of $9,000 per year for small buildings and $34,000 per year for large buildings are achievable by employing high-quality, energy efficient lighting systems versus standard lighting systems and/or systems selected for symmetry only. As is evident, high visual quality and comfort and lower lighting operating costs are compatible. □

This article was completed and reviewed under the auspices of the Cooperative Committee on Energy: the Georgia Association AIA and the Georgia Power Co.

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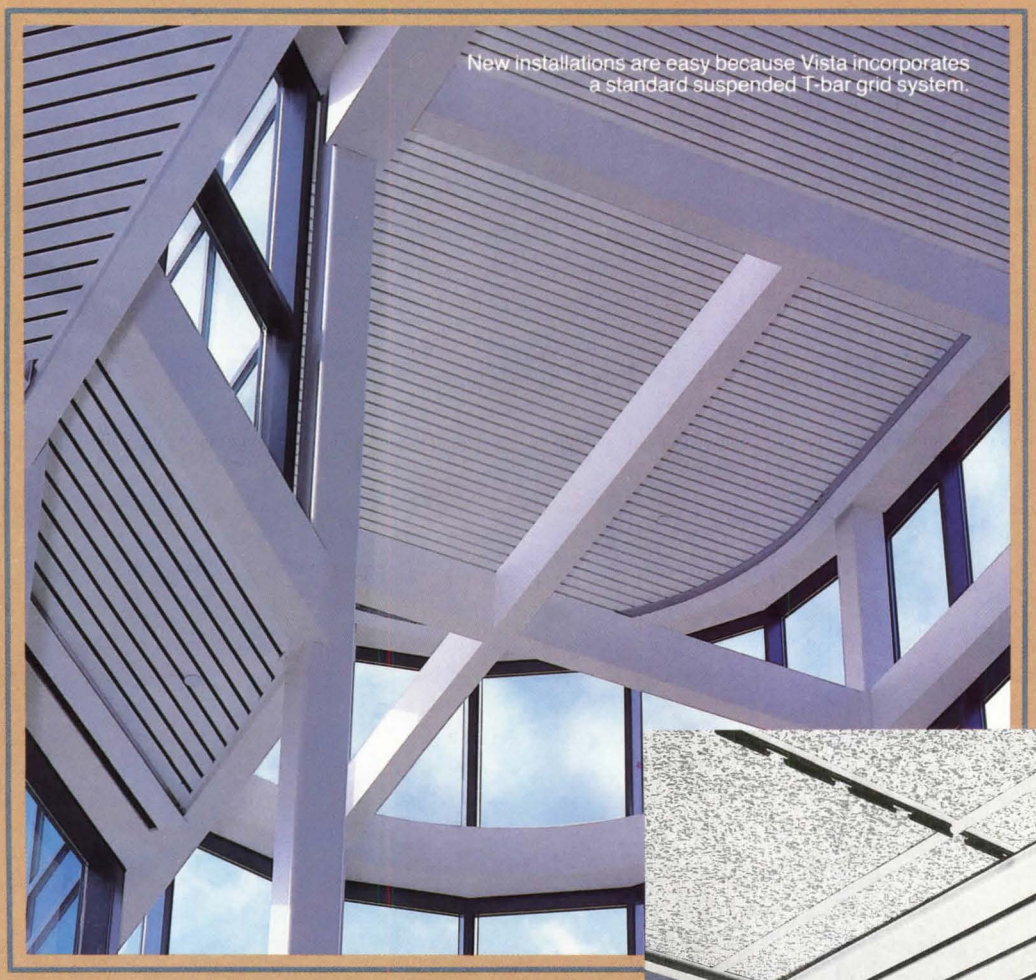

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Open Office Systems Gain Flexibility

Mainly through innovations in partitions and wiring. By Stevens Anderson

Twenty-five years after their introduction to the U.S. market, open office systems are the norm in this country's corporate and municipal environments. The best explanation for this is the efficiency and flexibility of space inherent with open offices. Even as open office plans fall from favor in other countries, in the U.S. market innovative new partition and wiring systems are increasing flexibility and presaging a continuing growth in open office design.

Established in post-World War II Europe as part of the rebuilding campaigns, open office planning promised to democratize the workplace by lessening the differences between top management and clerical workers and to improve communication between levels of workers by eliminating the individual office walls, thereby increasing overall productivity. In 1964 R.E. Planas of the German Quickborner Team brought the open office concept to the United States, and its economic advantages quickly gained it support. Open plan offices could hold more people per square foot than conventional private offices, a fact that could not be overlooked given the increasing cost of commercial real estate. Also, open office mechanical systems, designed to service one large space, could reduce energy costs by up to 20 percent, an appealing factor in the energy-conscious 1970s.

Although open office system furniture, including partitions, is initially more expensive than conventional office furniture, this cost is counterbalanced by life-cycle savings. The building user realizes tax savings through depreciation of the system furniture while the flexibility for future reconfiguration inherent in an open office system can save money for the large corporation constructing its own office building. According to Roseanne Beattie, AIA, a director of DBI, a Washington, D.C., architecture/interiors firm that has planned and designed 20,000,000 square feet of office space over the past 14 years, the overlying reason that corporate clients accept the initial expense is the reduced work interruption for reconfiguring system furniture and partitions as opposed to conventional drywall.

In a cost breakdown comparing a six-by-eight-foot drywall office build-out with a similarly sized system furniture cubicle in the Washington area, Beattie estimates a difference of $30 per square foot. The system furniture costs roughly $83 per square foot for a low-range model at $4,000, and the total cost of a build-out office is about $55 per square foot. This includes the local building work letter allowance for office build-out at $15 per square foot and the cost of conventional office furniture at $6,000. The work letter allowance is a cost added to the building's given price per square foot to cover upgraded finishes, millwork, or in this case added drywall construction.

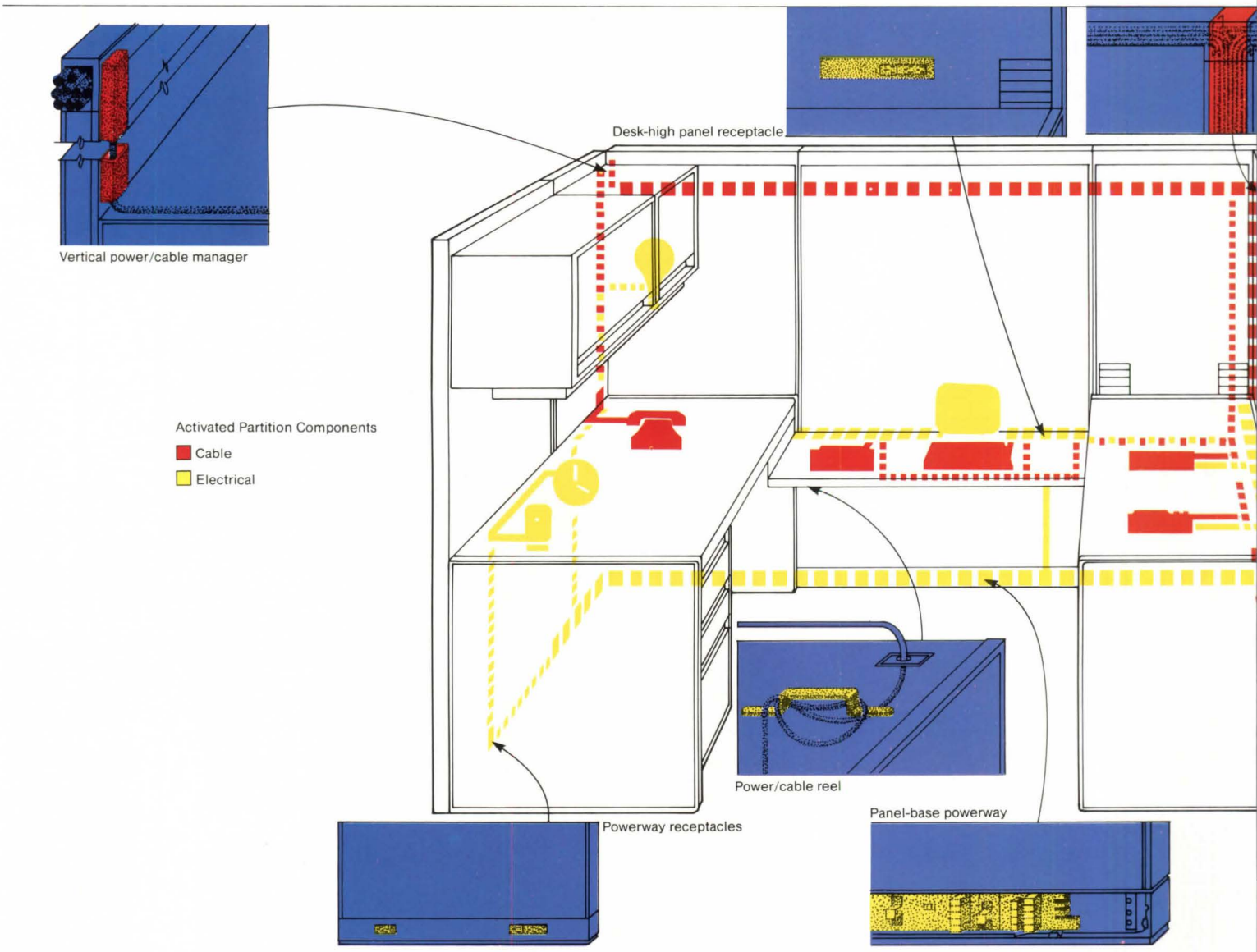
Mr. Anderson is an architectural historian and writer living in Washington, D.C.

In contrast to American enthusiasm for open office partitions and planning, many European firms are abandoning the open office system, despite its proven flexibility and long-term economic advantages. Concern about the psychological stress on people working in such an environment has given rise to opposition. In one instance, Scandinavian labor unions have expressed their concern about workers' well-being. European developers are finding it more difficult to lease open plan office buildings and consequently are turning to alternative designs or conventional office layouts. Japan, on the other hand, has taken the open office plan and has established a derivative known as the "free address" system, in which workers move nonterritorially between various workstations according to job function; only secretaries have permanent workstations.

U.S. firms, however, have developed a uniquely hierarchical open office system. According to a recent survey by the Business and Institutional Furniture Manufacturers Association, 43 percent of American offices now use open plan system furniture. Beyond economic issues, the American use of the open office plan is possibly an indicator of business community philosophy. Top managers rarely work in an open office. According to Jacquie Felegie, senior designer at DBI, partitions for clerical staff average 42 inches tall—high enough to conceal desk clutter but low enough for workers to be observed at all times. Middle managers have partitions averaging 54 inches, sufficient for visual privacy when a manager is sitting but still low enough to allow the manager to observe clerical staff while standing. Many middle managers receive increased square footage—typically a 10x14-foot space—as a trade-off for the loss of private offices. Still, for middle managers, getting an office with a closing door is strong incentive to advance.

There is evidence that the desire for enclosed offices is raising the level of partition heights used in open office planning. The trend is toward 65-inch-tall partitions, which allow visual privacy whether the worker is standing or sitting. Felegie estimates that up to 80 percent of DBI's open plan partitions now are 65 inches, a compromise that increases privacy but still allows existing mechanical systems designed for the open plan to function without costly alterations.

Most workers are familiar with the prototypical open office. A maze of workstations surrounded by private offices reserved for management and adorned with full-height partitions makes its statement all too obviously: if you produce in the "bull pen" your prize will be a work space with controlled access and maybe a window. The issue of productivity, if it can be linked to the open office plan, may in fact be a result of the derivative American system. It is an ironic twist that open offices make the general work environment so unpleasant that the desire to escape that environment actually results in better productivity.



Wired for productivity

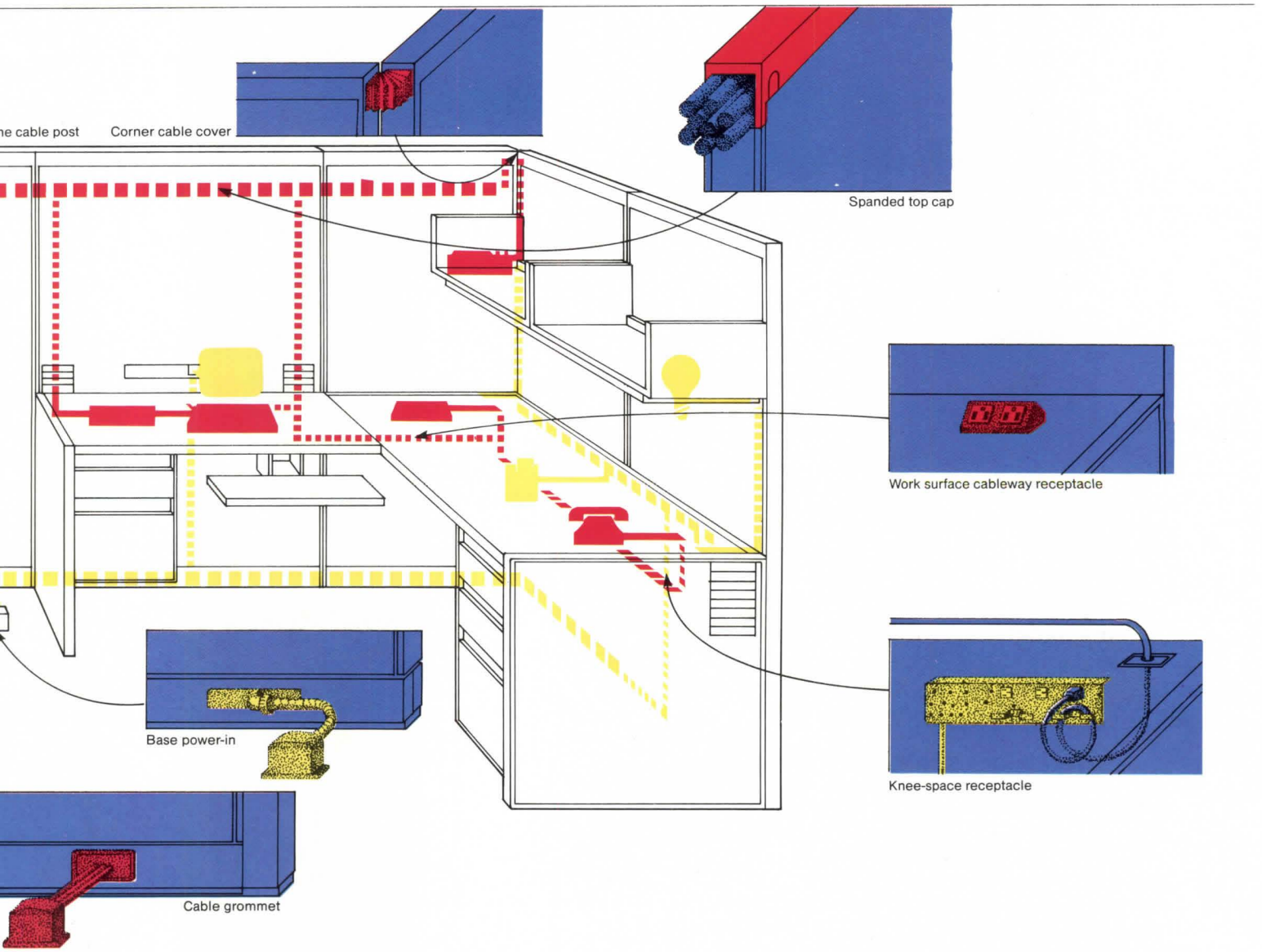
The ever-increasing automation of the work space brings in yet another consideration—how best to activate an open plan in a way that allows maximum flexibility and provides optimum service. Activating is the process of bringing electricity and telecommunications links to each workstation. Partition systems are available that serve as conduit between the building's power distribution and the individual workstations.

According to Steelcase Inc., one of the largest manufacturers of systems furniture, a designer must consider four main functions in the design of any open office plan using activated partitions. First, know where the best locations will be to join the furniture distribution system with the building distribution system that provides electrical and data/telecommunications services to the workstations. Second, understand the most appropriate distribution system for routing wires and cables through the partitions and/or furniture, between the building's power distribution system and the equipment. Third, consider the storage requirements for excess lengths of cable and wire. Fourth, provide adequate outlets in the workstations for plugging in electrical equipment and adequate cables for telecommunications equipment.

The initial high cost of activated partitions (about 25 percent higher than nonactivated partitions) usually can be justified in the retrofitting of older buildings, where insertion of cables to service an open office with numerous computers may cost $100 per foot of cable, with a total cost many times that of an activated-partition system. The complex wiring required to accommodate the various electronic needs of a workstation now can be systematized within the partition and can be plugged into or out of the building's distribution system when the office is reconfigured. Another advantage of activated partitions is that future reconfiguration does not require construction documents or building permits. According to Sharon Mount, vice president of Heery Facilities Management Group in Atlanta, the increased role of the computer, with its complex cable requirements, has resulted in clients no longer questioning the feasibility of activated partitions.

To determine whether activated partitions will best serve the functions of an office, a designer needs to know both the frequency of reconfiguration and the kind of power distribution system being employed. Office wiring and cabling has changed as partitions have replaced the walls that traditionally concealed distribution systems. Ceilings and floors now provide most building's horizontal distribution.

Typically, a power pole brings cabling down from a ceiling plenum area. This system has its pluses and minuses. Ceiling power distribution systems are low in initial cost but more expensive in later reconfigurations. The plenum area created by sus-



pended ceilings provides ready space for concealing cables, but fire codes limit their use. Because air systems are commonly placed above hung ceilings, it is risky to run through the same space certain types of cable insulation that are known to produce poisonous gas during a fire. The more expensive low-smoke cable that is therefore required by code may offset the cost savings of ceiling plenum wiring.

Power poles attached to ceiling distribution systems are considered by some to be esthetically unpleasing, but their number can be reduced when they are combined with activated partitions. They also tend to be an expensive means of vertical distribution.

It is primarily the construction cost of power poles that led to the distribution of cables upward through the concrete floor by the poke-through system, one of the four main underfloor systems that are supplanting ceiling plenum systems. The other three are the raised-floor (or "computer-floor") system, the underfloor duct system, and the flat cable system.

It was not until the boom in speculative office buildings during the 1970s that the poke-through system became prevalent. It is the most static of the four systems in terms of reconfiguration, but it is also the least expensive initially. In the poke-through system, access to power is fixed at given monument or tombstone fittings raised above the floor level. The cable runs beneath the concrete floor into a service fitting on the underside of the slab. The system requires drilling through the concrete floor to alter the existing layout, a fact that has led many to call it the "Swiss cheese" method. Its advocates did not anticipate the growing cable requirements of today's office spaces and the fire codes that would limit the number of poke-through fittings used in one space. It is this system that has benefited most from activated partitions and the flat cable system, providing power to an open office design without further structural weakening of the floor.

Buildings constructed before the 1970s commonly used the underfloor duct system, which allows for relatively easy spatial reconfiguration. A raceway embedded in the concrete slab flooring uses branch ducts to provide power at regular intervals at floor level through preset fittings or outlet housings known as presets. The presets usually are flush with the floor surface. This system is good when there is a high cable density and where flexibility is required with minimal access to the cables.

The most flexible system is the combination of carpet tile, flat cable, and activated-system furniture. This component integration reduces the potential disruption for later reconfiguration of the workstations. The building's power distribution system is concealed in the wall but hooks into a junction box just above baseboard level. Power then is transferred into flat cables (including data/telecommunications cables and electrical cables) that run behind the baseboard and beneath the carpet on the surface of the slab. A primary run will branch off into secondary

runs to specific workstation clusters or will connect with activated partitions that function as secondary runs in combination with the flat cable primary run. Future changes in the workstations require lifting up specific carpet tiles and altering or tapping into an existing run. One of the biggest advantages of this system is minimal visual interruption of an area, since wires and cables are concealed beneath the carpet surface and connect with the furniture. This system has a short installation time, requires no drilling, and eliminates the slab height increase needed with floor ducts. Technology is limited, however, in the ability to devise a truly flat cable, and several designers have expressed disappointment in the resulting uneven feel of the carpet surface.

The raised-floor system, best used in new construction, is a false floor mounted on steel pedestals with removable panel sections built over the real floor of a given space, creating a plenum between the floors. This is the most expensive alternative, often costing between $10 and $12 per square foot for the floor alone, but it allows more flexibility over a longer period of time. However, in an attempt to be competitive, manufacturers of this system have brought the cost down to as low as $7 per square foot. Raised floors may not be feasible in areas with height restrictions, where the additional six to eight inches of floor-to-ceiling height may necessitate the sacrifice of additional floors. This system is the least expensive to alter, but it must incorporate floor tiles instead of carpet to permit easy access to the cable.

Other considerations for partition design

If an open office plan is to be used with partitions and other system furniture, it is crucial that the architect understand the multifaceted ramifications of the system on the building, as well as those of the building on the system.

Structural interface. Placement of interior columns and structural bay dimensions will have a major impact on the success or failure of an open plan. The insertion of partitions will work only in conjunction with the existing structural components. For instance, the exact measurements of panels and their anticipated creep must be taken into account when workstations are placed between structural elements. Creep, caused by movement of the panel connectors, can be as much as a quarter-inch when several panels are joined. Some, but not all, partition manufacturers publish creep measurements.

Flexibility. The key to successful open plan system furniture is the amount of flexibility required. For example, Blue Cross/Blue Shield of Washington, D.C., a client of DBI, employs six full-time designers, who have been working for the past six years only on reconfiguration of the company's downtown office. The regular staff turnover in this case is considered appropriate to support corporate changes reflecting service changes. Today, a trend is beginning toward universal layouts that will meet all needs at any given time, with the emphasis on moving staff rather than the office system to the appropriate spaces. It remains unclear, however, whether the American work force will accept this Japanese-style, communal work environment without territorial boundaries.

Electrical capacity. To plan the correct electrical capacity, as well as the type and quantity of cables required, it is important to know what equipment is to be used in every workstation. According to a study by Steelcase Inc., it is important to know the cable type, size, and quantity for each piece of equipment; how much bending each cable can tolerate (its minimum bend radius); where the equipment will be located within each workstation; how much cable storage space will be required in each workstation; which workstations will be combined in each cluster, which determines the cable distribution capacity needed for each cluster and is a function of the number or density of the equipment used within the cluster (telephones, calculators, task lights, personal computers, printers, etc.); and where the building interface points are located—usually one connection per cluster is provided to link the building's electrical distribution system with that of the partitions.

Airflow and lighting. Though there is a trend toward floor-to-ceiling partitions, there is some resistance to their use in existing open office plans, in which, in most cases, airflow and lighting have been designed to work in a single open space that depends on an open upper space. Full-height partitions may prevent free airflow and interrupt even distribution of ambient lighting from the fluorescent fixtures found in most office ceilings. One solution is ambient tungsten-halogen or mercury-vapor lighting, which provides an esthetic though expensive replacement for the ceiling fluorescents while producing less reflective glare in a computer-screen-oriented office. This can be accomplished either with lighting that is concealed in the system furniture and points up to the ceiling for reflection back to the work surface, or by pedestal lighting that projects light upward and outward to reflect off either walls or ceilings. Task lighting incorporated into the system furniture also offers a valuable source of additional light to provide the acceptable 60 to 80 footcandles on the work surface; but this is possible only with higher partitions that include hung filing cabinets, which allow for a hidden connection high enough above the lighted surface.

Acoustics. Ten years ago, built-in "white noise" was a popular answer to overall office noise. But today, after seven years of working with DBI, Beattie says that none of her clients as yet has required white noise. In fact, sound transmission has not been an issue for her clients, except for the open office area of a dog kennel that required additional insulation of the walls to prevent the sound of howling canines from entering the space.

The general consensus is that the American worker is able to tolerate an average of 35 to 40 decibels in an open office without negative repercussions. For partitions themselves, there are four basic acoustic classifications. The least acoustically effective have hard surfaces—steel, wood, glass, or plastic; middle-level panels are particleboard wrapped in fabric; better acoustic panels consist of particleboard wrapped in fabric with acoustic insulation between; and the most effective are composed of a cardboard honeycomb system wrapped in fabric that works on the same principle as a double wall, creating an air space to reduce sound transmission. Additionally, sound-absorbent ceiling tiles and carpeting can improve an office's acoustics overall. One solution to the lack of privacy for speaking is adjacent conference rooms and meeting areas; in the 1980s conference space has increased from one conference room per 100 employees to one for every 30 to 50 employees.

Maintenance. Another trend—cleaning and maintaining older panels rather than replacing them—is believed to be related to the recent economic uncertainties. Businesses are less willing to open the purse to replace system furniture when replacement or cleaning of the partitions' fabric is economically feasible. Until recently, replacement of fabric could be as expensive as total system replacement, but recently manufacturers have been offering cost-effective replacement programs for their products in the field. □

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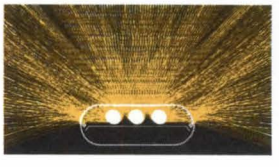

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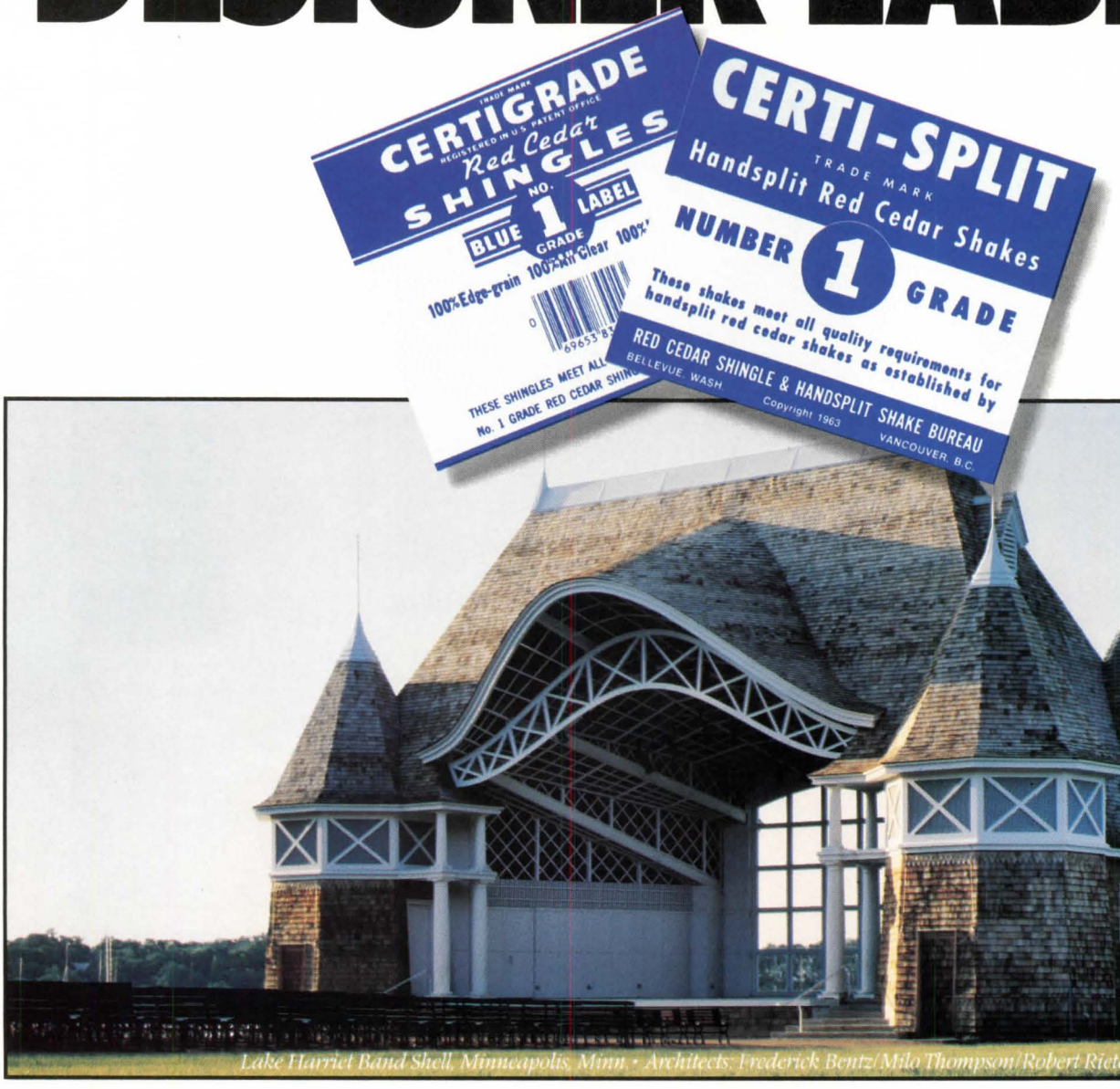

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Inspecting Cast-in-Place Concrete

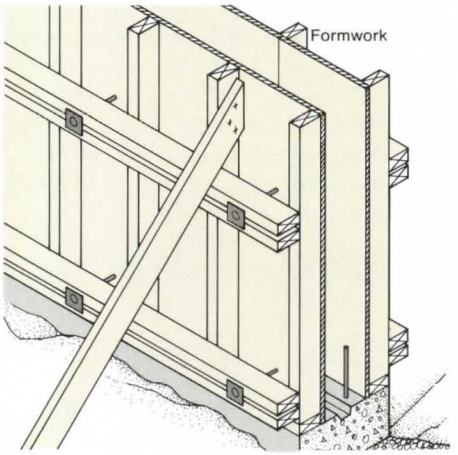
The contractor called me late in the afternoon and insisted on an immediate inspection of the reinforcing in the "footers." He wanted to pour the concrete first thing the next morning. As I was leaving, my boss demanded that I be on the site the next morning when the first concrete truck arrived. So at zero-dark-thirty the next morning, I stood watching concrete pour into the footing trenches and over the rebar, wondering why contractors got up so early. Later that day my boss explained that rumor had it that this particular contractor was known for requesting reinforcing inspections late in the afternoon and then, once he had approval, removing the rebar and pouring the concrete early the next morning before anyone was up and about. This little maneuver allowed him to reuse the rebar on his next job.

Thanks to this and other incidents, I learned the wisdom of breaking cast-in-place concrete inspection into its component parts: formwork, reinforcing, and the concrete itself. Although this approach means spending more time on the job site inspecting each component in turn, it pays off in the long run with fewer mistakes and a better quality product.

Formwork often is more expensive than the concrete itself and consequently often is designed for reuse. The architect should keep this in mind during the building design process. Consistent structural elements that allow the reuse of formwork can save money and construction time (see Sept. 1987, page 125).

When inspecting formwork, the architect usually is concerned with the finish. Begin the inspection by looking at the quality of the forms. Are they in a good state of repair, or have they been used one too many times? You need to see the inside surface of the forms in order to be assured you will get a smooth, well-finished concrete surface. For some walls and columns, you may have to be on the site when the crew is erecting the forms in order to inspect the surfaces. Even if the formwork is intended only as structural substrate, the quality of the concrete surface will affect the surface put over it.

Check the horizontal and vertical joints between forms—they should be tight and not allow any leakage to avoid honeycombing. Small cracks between the forms also can result in ridges or fins on the surface. When these ridges are cut off,



they leave a rough surface or exposed aggregate.

Continue the inspection by checking the formwork dimensions and configuration with a tape measure. It is not unknown for a contractor to shave an inch here or there, which can add up in a large pour. Also, ascertain that chamfer strips have not been overlooked. If they are left out, sharp edges must be broken off and aggregate exposed. Finally, check against the plans the location of construction joints, sleeves, embedded pipes, and cast-in-place steel plates.

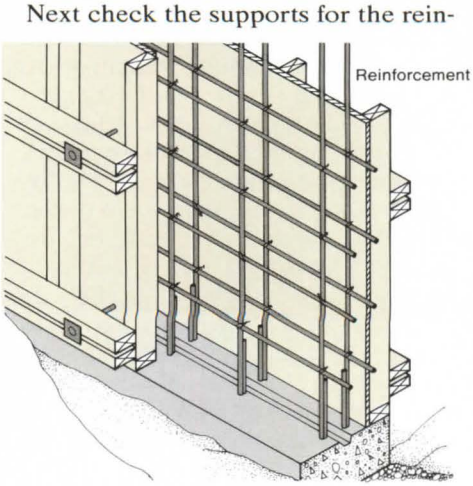
The formwork should have removable panels at the bottom to allow it to be cleaned out. Before the pour, check to make sure that the crews have not left trash in the forms. If not removed, trash can cause blowouts (circular soft spots and protrusions in the concrete surface as a result of organic material left in the formwork) or aggregate popouts (nonorganic material that absorbs water from the concrete, causing a popout when the water freezes). Also, don't neglect the forms during the pour. Dry wood forms can pull water out of the concrete, changing the water-cement ratio. If the forms are wetted before the pour, concrete that isn't going to be vibrated is less likely to honeycomb. Metal forms should be oiled but not to excess.

While the pour is in progress, constantly check the formwork, its fastenings, and the shoring for movement. Inadequate shoring or shoring that isn't plumb can cause excessive lateral loading. The optimum pouring procedure is to place the concrete in the formwork directly from the mix truck. The concrete shouldn't be overhandled, and heavy traffic around the formwork should be avoided, to prevent formwork settlement due to vibration. Settlement can also be caused by water seepage at the base of the forms.

Movement of the formwork after the pour and prior to final set can result in internal cracks. This problem makes itself known on the surface in the form of spalling. The spalling is a result of corrosion and expansion of the reinforcing in contact with internal water in the crack. Deflection in formwork for beams and girders before the concrete has thoroughly set can result in a separation plane of hardened concrete just below the reinforcing and the concrete above. A slight camber built into the formwork will help avoid a separation plane. Stripping the formwork shouldn't be done before the concrete is up to strength. This also applies to the removal of the supports, particularly under structural sections.

Reinforcing often is stored on the job site by size or by erection and pouring sequence, and the specifications should require the contractor to provide a clean, dry area for storage where the reinforcing is up on skids off the ground. When reinforcing is delivered to the job site immediately before it is placed, inspection is more difficult. The inspector should look for cracked or bent bars as well as excessive rust, scale, dirt, or oil. Rust and scale that are tight aren't considered a problem by some inspectors, who in fact believe that the rust improves the bond between the concrete and the reinforcing bar. The problem is where to draw the line—what you want is a good bond between the concrete and the steel, not the concrete and the rust.

Next check the supports for the rein-



forcing. Over the years I've seen pieces of concrete block, brick, stone, 2x4 scraps, and even empty beer cans used to hold the reinforcing off the ground. Some specifications even allow the use of certain scrap material. However, concrete doesn't always adhere evenly to these pieces and can leave cracks into which water can seep. The water then reaches the reinforcing and eventually causes it to corrode. Using scrap material can result in uneven concrete coverage of the reinforcing, further risking contact with water. When the reinforcing corrodes, it causes spalling and cracking of the concrete, eventually leading to exposure of the reinforcing. Therefore, for footings, slabs, joists, and beams, chairs are the best solution for reinforcing support because they guarantee a consistent depth of concrete coverage.

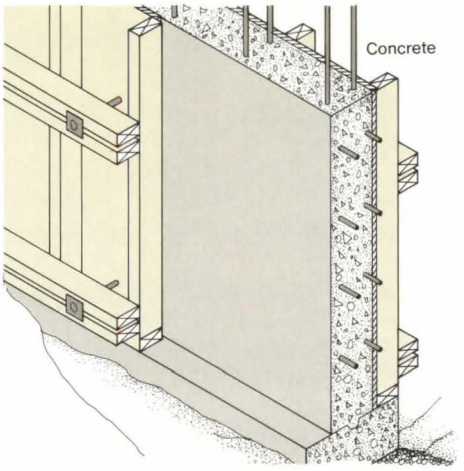
To prevent shrinkage tension in slabs, which is often concentrated at the corners, check that the reinforcing bars are placed at the corners near the top of the slab at right angles to the anticipated crack lines. Only under special circumstances should reinforcing be welded together, because welding can notch the bars and thereby weaken them.

During the inspection make sure any dowels between separate sections of slab are properly placed, aligned, and lubricated. The lubrication helps ensure movement and prevent transverse cracking. The misalignment, misplacement, or lack of proper lubrication can result in transverse cracks that appear across the slab, usually within two feet of the joint.

After the column reinforcing is in place and the formwork set around it, the reinforcing should be tied to the formwork. If the ties aren't in place the concrete can displace the reinforcing, resulting in uneven coverage. Measure the bar spacing, splicing, and size, and make sure these conform to the structural drawings and specifications. When checking columns note the number of reinforcing bars, their size, spacing, the manner in which they are spliced into the structure below, and whether they are tied to the formwork. When inspecting column and wall reinforcing, take along a tape measure in order to check the distance of reinforcement from the formwork.

Concrete must be handled carefully during the pour so the cement, water, and aggregate don't separate. The fewer steps from truck to placement, the better. Separation of aggregate can occur when it is dropped from heights over four feet or through reinforcing bars.

Though architects generally hire a testing lab rather than take concrete samples themselves, they should be aware of good and bad sampling practice. The ASTM *Manual of Concrete Testing* specifies sampling and testing methods that should be part of the specifications, and these specifications should be followed strictly in the field. If 25 strokes with a ⅝-inch tamping rod are specified, the test should not be 24 strokes with a reinforcing rod or a stick of wood.

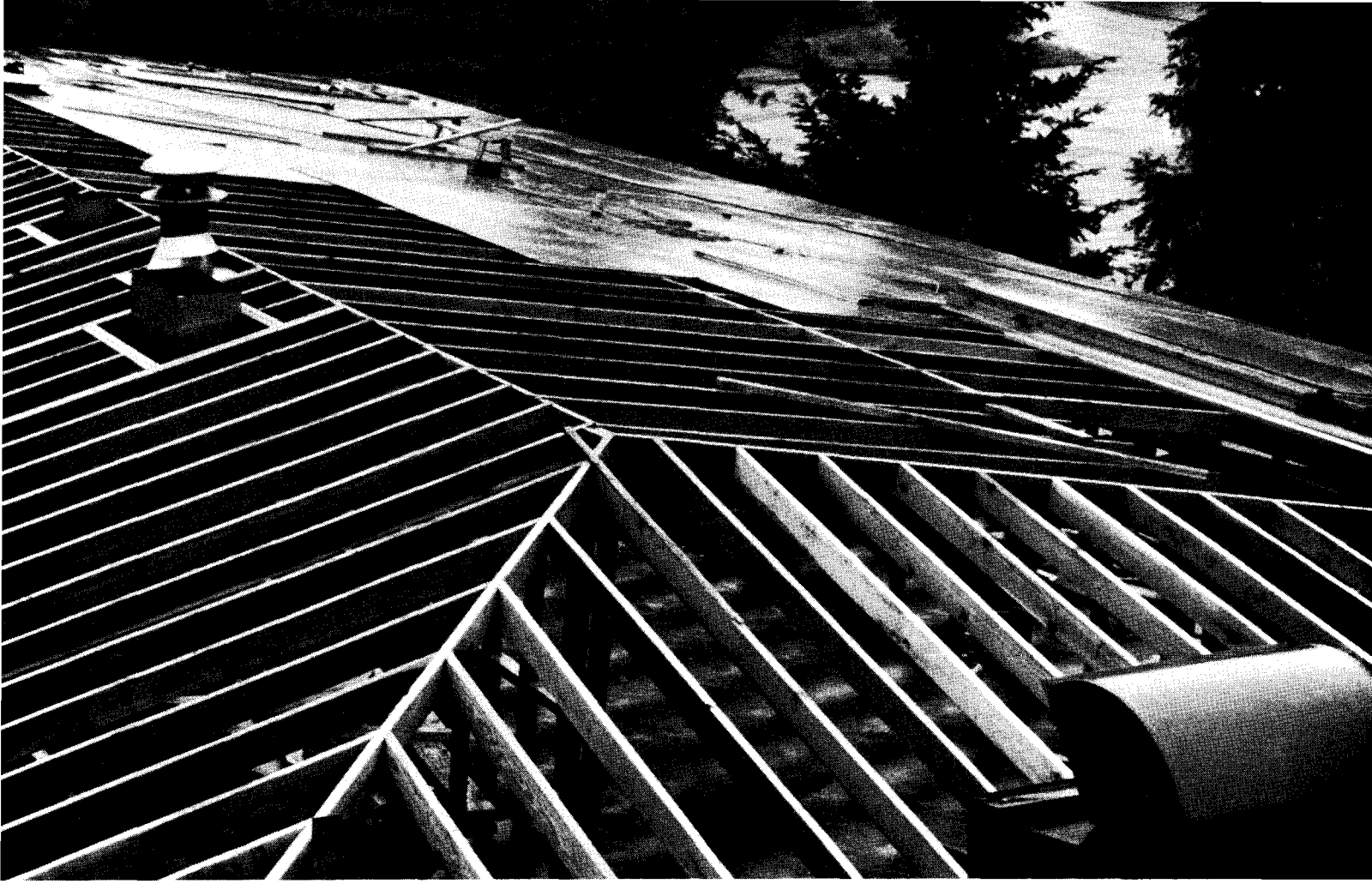


Samples for testing should be taken from the middle of a batch, directly from the truck discharge. The containers must pass through the entire cross section of the stream at regular intervals. Samples normally shouldn't be taken from the forms because some separation and bleeding already may have occurred. Strength-test specimens should not be moved for at least 12 hours, whereas slump tests should be carried out promptly because a delay of even 10 minutes can affect the test results, particularly in hot, windy weather.

Once the concrete is poured and set, there isn't much that can be done to remedy mistakes. But once the formwork is off, an inspection can show many lessons that can be applied to the next job. Some things to look for:

- Layers of hardened concrete that have separated. These are called cold joints and often are caused by delayed or badly handled pours, which prevent cohesion between lifts of concrete.
- Large or many-surfaced air pockets, which can result from a concrete mix being oversanded, lifts that were too deep or not properly consolidated, or too much oil used on the formwork.
- Sand streaking, carried by water seeping from the formwork. Also, excess water in the mix can bleed at the surface and prevent solid compaction of concrete against the formwork, resulting in a rough, sandy surface.
- A sandy slab surface, referred to as slab dusting and scaling. This may be the result of inadequate or delayed curing moisture that allows the surface to harden before the slab gains full strength. Slab dusting and scaling also can result from organic material in the aggregate or sand coming to the surface during curing and finishing.
- Surface checking. These short, intermittent cracks of about an inch in depth can result from excess water in the mix. Excess water also can cause thin, multiple cracks running parallel to the edge of the slab and can carry fines to the surface that cause weak spots in the slab or in between lifts.
- Curls in cantilevered slabs. This problem happens when the exposed top of the slab dries and shrinks faster than the bottom, causing the slab to curl. The curling is accompanied by spalling and cracking of the slab. To prevent curling, the top of the cantilever slab should be covered.
- Long, random, deep, isolated cracks. These usually are the result of too few or incorrectly spaced control joints and may be structurally dangerous.
- Cracks in the slab directly over a monolithic column, beam, or wall. This potentially dangerous cracking comes about because of different shrinkage rates caused by the difference in thickness between the slab and the vertical member. To prevent this, there should be a few hours' delay between pouring the structural member and pouring the slab.
- Deep line cracks, sometimes resembling crows' feet. This type of crack may result if the surface of the slab dries and shrinks faster than the interior of the slab, a condition that is often caused by either a sudden drop in humidity or a rise in wind, both of which increase the evaporation rate. To prevent this form of cracking, the contractor must cover the slab, wet the formwork, or apply a curing compound.
- Star cracks and crisscross cracks in a slab on grade, often accompanied by humps or swelling, indicating the presence of sulphates in the soil. A vapor barrier prevents subsurface water from bringing sulphates in contact with the cement, causing these expansive reactions.
- Small, rectangular, web cracking, sometimes called map cracking, coupled with a crumbly surface. These often are a sign of chemical reaction between the aggregate and the alkalis in the cement.

—Timothy B. McDonald



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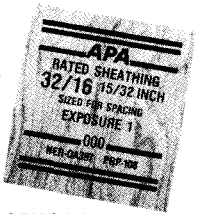

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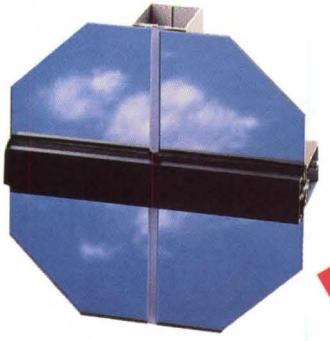
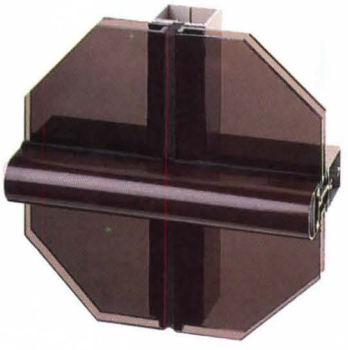


¼" Vertical Butt Glazing
2¼" Mullion 1¾" Horizontal
Exterior Glazed
Black Exterior
Beige Interior

VISTAWALL
GLAZING SYSTEMS

1" Glazing
Radius Face Caps
1¾" Mullion 1¾" Head & Sill
Exterior Glazed
Fashion Gray Exterior/Beige Interior



1" Vertical Butt Glazing
Radius Horizontal Face Cap
2¼" Mullion 1¾" Horizontal
Exterior Glazed
Mineral Brown Exterior/Beige Interior

1" Glazing
2¼" Mullion 2¼" Head & Sill
Interior Glazed
Hartford Green Horizontal Exterior Caps
Bone White Vertical Exterior Caps
Beige Interior

Circle 104 on information card

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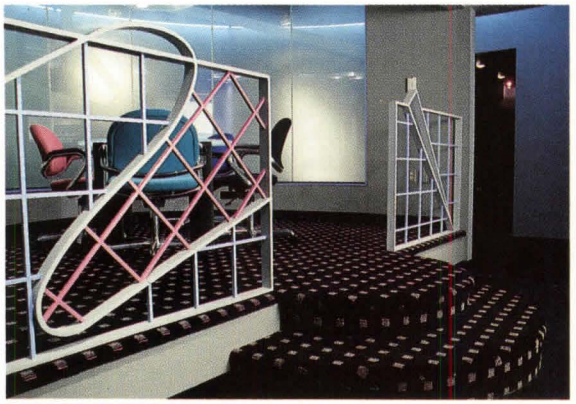
PHOTOS: RICHARD HACKETT

GRAND PRIZE. Design Team: Phyllis Martin-Vegue, Lamberto Moris and Cindy Kupka of Simon Martin-Vegue Winkelstein Moris, San Francisco. Client Site: Packard Foundation. Carpet Mill: Patrick. Styles: Tradition, Heritage. Contract Dealer: Conklin Brothers.



OUTSTANDING ACHIEVEMENT, PUBLIC SPACES CATEGORY. Design Team: Jane Garland Lucas, Janice Fanya Lewbin, and Edwin J. Steel of JGL Interiors in association with Stahl Associates, Boston. Client Site: Boyd Corporation's Advantage Showroom. Carpet Mill: Harbinger. Styles: Confetti, Classic Square, Fifth Avenue.

OUTSTANDING ACHIEVEMENT, HEALTH CARE CATEGORY. Design Team: Raymond F Stainback, Jack Plaxco, and Paula Stafford-Cloutier of Thompson, Ventulett, Stainback and Associates, Inc., Atlanta. Client Site: Ronald McDonald House at Emory University. Carpet Mill: Designweave. Style: Marquis. Contract Dealer: Carnes Brothers.

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- NO LOST FLOOR SPACE.
- NO NOISE.

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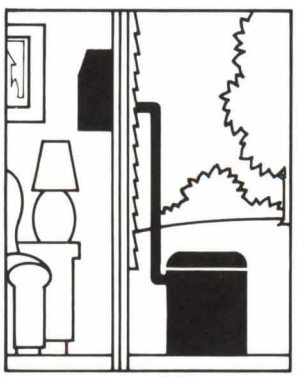

Remote control is another unique feature that helps provide greater comfort and energy savings. And, homeowners have the option of choosing a cooling unit, or one that cools *and* heats utilizing an energy-conserving heat pump.

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Circle 110 on information card

PRODUCTS

New Offerings in Open Office Outfitting

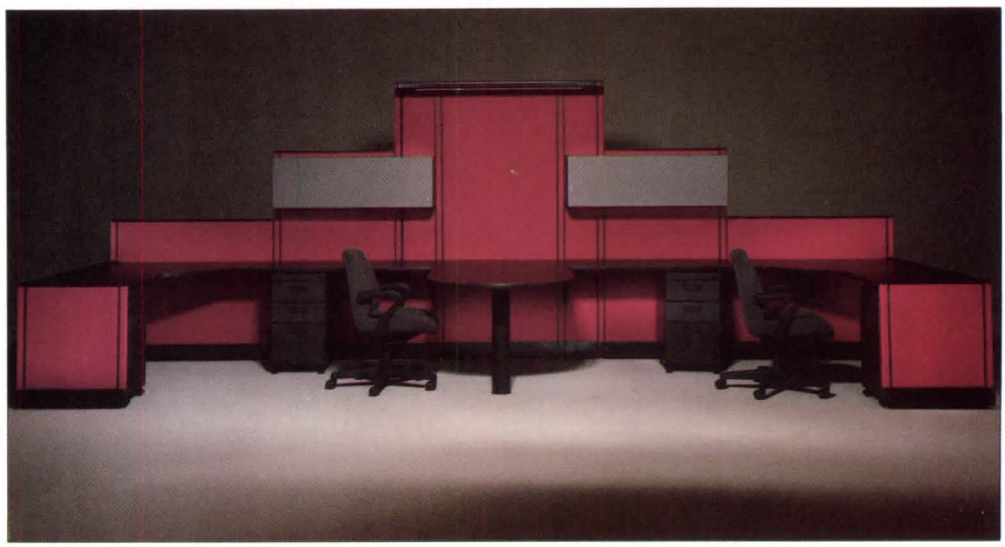
Wall Partitions

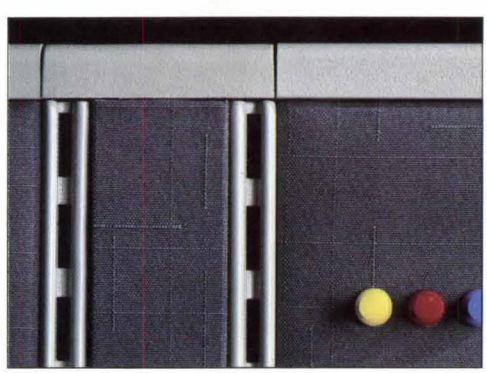
Westinghouse Furniture Systems' Wes-Group Ultra Panel (shown at right and below) has a high-strength, high-density composite core with foam-laminated fabric applied to the outside of the panel to help provide firm alignment. The soft panels also provide a good tackboard surface. They have a Class A fire rating, and the core reputedly helps extinguish flames and reduces smoke development. The panels have an acoustical rating of NRC .80 and an STC value of 24. They are designed not to bulge or sag, and carry a lifetime warranty.

Steelcase offers new design options to its Movable Walls systems furniture, which features softened, curved work surfaces and increased support to office automation. Many styles of wall detailing in different fabrics and trims are available, with optional wood top caps and fabric-covered end trims offered.

Freestanding or panel-supported modular components allow increased flexibility and design alternatives, and lateral files of three, four, and five drawers coordinate with adjustable panel heights. A U-shaped workstation configuration allows work areas to be easily accessible, while recessed cantilever supports provide a barrier-free "activity arc." Power and data/telecommunications cables are accessible but out of sight, stored in powerways, cableways, or recessed panel bases, or plugged into receptacles mounted in the work surface. An optional panel-mounted receptacle provides electrical access at variable heights, while an optional five-way articulated keyboard shelf adjusts to keyboard size and locks into place, sliding away when not in use. All electrical components are UL listed.

Wilson Partitions' Demountable Partition System is a floor-to-ceiling system designed to install easily over carpeting or flooring materials so that later relocation will not require carpet laying or patching. The system uses anodized or aluminum trim and prefinished gypsum wall panels. The basic wall is fabricated using ⅝-inch gypsum face panels prefinished with vinyl or other wall covering. These panels are attached to 2½-inch steel H-studs with metal clips that permit later removal of individual panels should the need arise for additional plumbing or electrical work. Finishing trim, door frames, glazing, and other components are prefinished aluminum extrusions. The system is available in three profiles: Projected, with a rectangular form extending out from the wall surface; Flat; and Radius Profile, which uses extrusions with a rounded exterior form. Optional panel connectors are designed to support storage components and work surfaces.





Wilson Partition's 1300 Series low-profile fixed and demountable wall systems use wall panels of ⅝-inch gypsum wallboard. Walls can be painted or covered. The 1300 Series is noncombustible and meets Class A fire rating requirements. System components provide for sound and light seals at ceiling and floor joints, doors, and glazing. Modular, wall-hanging furniture can be affixed with mounting strips inserted at panel joints. The 1300 Series uses an extruded aluminum trim with heavier than average wall thickness for increased durability, and features a ⅛-inch-high, flat projection.

USG Interiors' Ultrawall movable partitions consist of four basic parts: a ¾-inch-thick gypsum panel, ceiling runners, floor runners, and spline stud. The 2x8-foot gypsum panels are covered with either vinyl or fabric. The flush-mounted panels have no visible fasteners, and adaptable furniture supports accommodate most standard hang-on furniture up to 72 inches wide as well as accessories such as shelf brackets and paper flow organizers. Ample chase areas channel power, communications, data processing, and other services within the partitions. Ultrawall has a one-hour fire rating and a sound rating of 42 STC.

The Perimeters freestanding wall system, also from USG Interiors, consists of panel modules with attached slotted standards in a variety of widths. Pilaster modules are available in 90- and 135-degree, U- and T-shaped configurations. All system components come 30 to 120 inches high. The system is held together by cam-lock connectors mortised into the side of each panel for standard alignment. Each panel can be removed and replaced with the turn of a bolt and without disturbing adjoining panels or pilasters. Three cam-lock connectors are used on each side of an eight-foot panel. Panels are recessed, painted in a matte finish, and covered by PVC extrusions that match or contrast with the adjoining face panel. When the back side of a Perimeters setup is exposed, the same decorative surface materials used on the face of the system can be applied to the back of each panel and pilaster. Matching vinyl caps can be ordered to cover the metal standards for a finished

continued on page 134

Products *is written by Amy Gray Light.*

Products *from page 133*

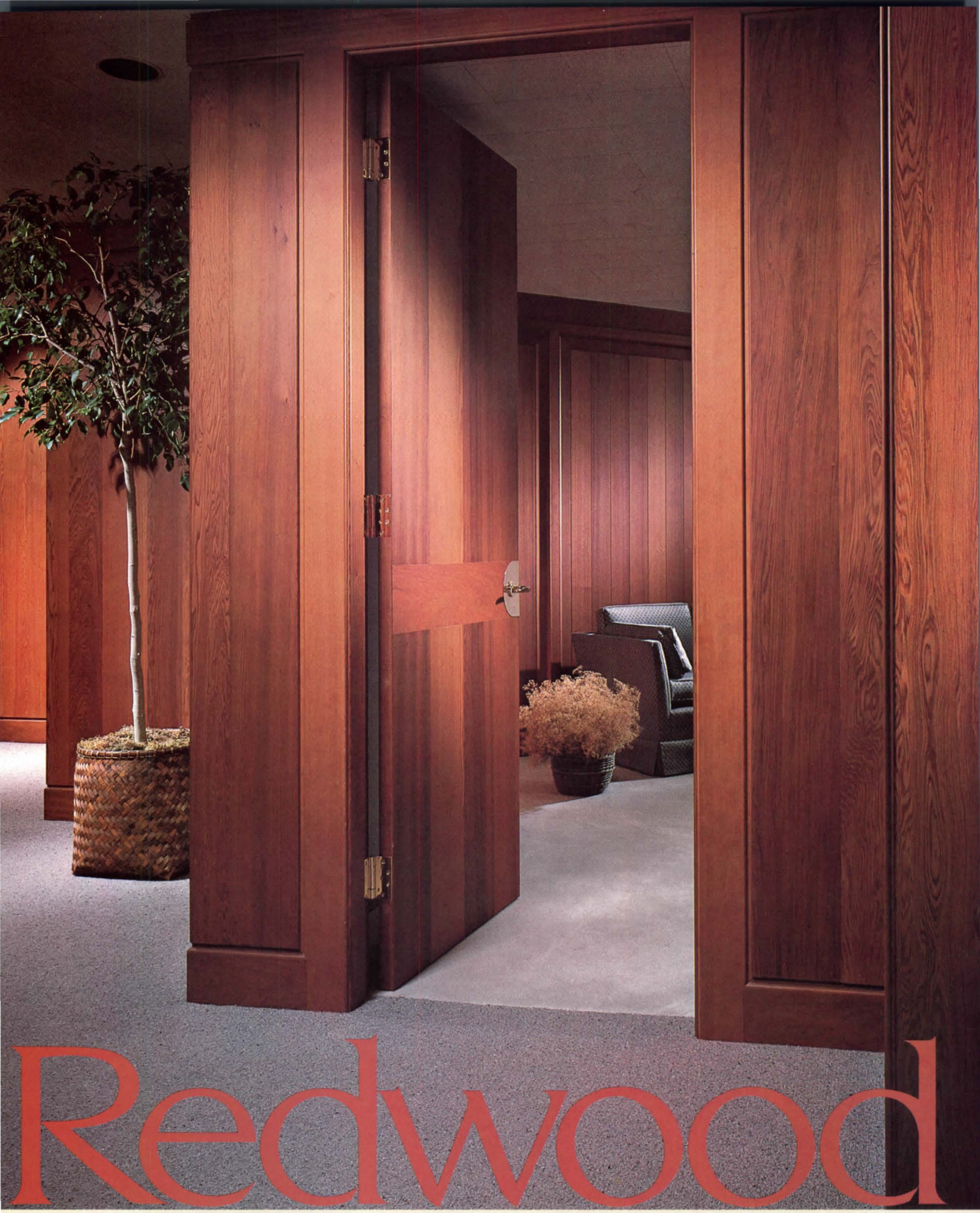
appearance. Shelving, a cornice system, and hardware such as brackets and handrails can also be ordered.

Panel Concepts, L.P., has expanded its System 2 Plus line (above) of panel-mounted straight and corner work surfaces to feature nine new straight work surface sizes, including 24, 30, and 66 inches wide and 20, 24, and 30 inches deep. New 42-inch corner work surfaces interface with surfaces 24 and 30 inches deep. A 42-inch computer support corner has a 10x23-inch keyboard platform set at typing height. All work surfaces are 1¼ inches thick and are laminated in seven finishes. The forward edge of each surface is rounded, and the back and sides are flat and self-edged to a fit flush with adjoining surfaces.

Panel Concepts' Slotted Rail Insert (SRS) option consists of an additional pair of slotted upright rails built into an intermediate position along a panel's width. This slotting enables one wide panel to provide the same furniture support capabilities as two smaller panels. Slotting is provided on both sides of each panel so back-to-back workstations can be set up. The SRS rails may be ordered at any position along a panel's width to allow flexibility with the manufacturer's modular furniture components. The SRS options are available on the manufacturer's System 2.0, Impac-6, and Impac-8 office panel systems.

Movable partitions in Trendway's "T" Series have seven basic parts: a steel crown or ceiling channel, a metal floor plate, fabric-covered or laminated Videne panels, steel connectors that attach the partitions together, a finished strip or pilaster between partitions, a snap-on vinyl base, and doors. The partitions integrate with Trendway's SMS open-plan panels and components. Horizontal and vertical electrical and communications wiring is run through raceways and in the spaces where one panel connects to the other. Electrical outlets, light switches, thermostats, and other controls are positioned on vertical pilasters located between panels. Color-coordinated vinyl base covers slide over a lip on the metal floor plate. The floor plates are attached to the carpet surface with foam tape strips so partitions and floor plates can be relocated without damaging the carpet. Partitions can be removed without disturbing adjacent partitions. Double-slotted mounting rails are screwed into partition side rails at panel connections. Vinyl pilasters that provide access to the mounting rails are installed to per-

continued on page 137



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Products *from page 134*

mit flush-mounting of work surfaces and storage components. The partitions are shipped fully assembled.

Gold Bond Building Products introduces the Designer's Touch Wall Panels for its GB-350 Movable Wall System floor-to-ceiling systems. The series comprises four panels, including two types of acoustical panels. When installed with 2½-inch glass fiber insulation, the system achieves an NRC rating of .90 on one side and .40 on the other. All panels are ⅝ inch thick and come in 10 colors. Standard width is 48 inches with height options of eight, nine, and 10 feet. Custom widths of 24 and 30 inches also are available.

Two additional panel options in the series are Rugged Touch and Popular Touch. Rugged Touch is a steel-faced gypsum wallboard panel laminated in the same 10 fabric options. Popular Touch is a fabric-laminated gypsum wallboard panel suggested for areas where special acoustical or high-durability performance isn't required. This panel is also available in 10 colors. The Quiet Touch Panel has an NRC rating of .85. The honeycomb core enables the panel to be used as a tackboard. The Sound Touch Panel is a glass fiber/gypsum wallboard composite with a woven, fabric-laminated surface. Its NRC rating is .40 and its STC rating is 35 when it is installed in a GB-350 partition; the STC rating is 41 with insulation in the cavity.

Conwed Designscape introduces its Group 100 Furniture System, a line of workstation components and partitions featuring the Valu-Screen partition that uses a common-post connecting system for easy installation and reconfiguration. Workstation components include an overhead storage cabinet, open bookshelf, work surfaces, pedestal, keyboard tray, center drawer, and task light. A reception station is available in several configurations.

The Silhouette movable wall system from Virginia Metal Industries features 20-gauge steel construction with welded stiffeners. The system requires no fastening holes, so it can be easily moved. Carpet grippers snap on to continuous floor channels to hold the walls in place without marring the floor or carpet. A ceiling channel secures to an exposed grid system, and the walls lock into the channel. Wiring is run through electrical raceways at both the top and bottom of the panel system. Silhouette is offered in a range of colors, finishes, fabric coverings, real wood and glass combinations, and customized dimensions. A brochure contains detailed information.

New modular partition systems from Porta-King come five to nine feet high and two to four feet wide. The partitions pivot and lock together without mechanical fasteners or tools. By means of panel accepters, partitions can be attached to existing walls. Varying degrees of insulation are available in the 1¾- and three-inch-thick partitions to minimize noise levels. Preglazed windows made of tempered, tinted, or wire glass may be installed. Prehung doors, both hollow and solid, also are available. The partitions may be manufactured with raceways that pivot and lock together for wiring, telephone lines, duplex outlets, and light switches. More than 100 color choices and three types of wall coverings are available, and the partitions can be ordered with standard anodized aluminum frames or bronze-painted extrusions. Frame caps and corners also are available.

Westinghouse Furniture System
Circle 401 on information card
Steelcase Inc.
Circle 402 on information card
Wilson Partitions
Circle 403 on information card
USG Interiors Inc.
Circle 404 on information card
Panel Concepts, L.P.
Circle 405 on information card
Trendway
Circle 406 on information card
Gold Bond Building Products
Circle 407 on information card
Conwed Designscape
Circle 408 on information card
Virginia Metal Industries
Circle 409 on information card
Porta-King Building Systems
Circle 410 on information card

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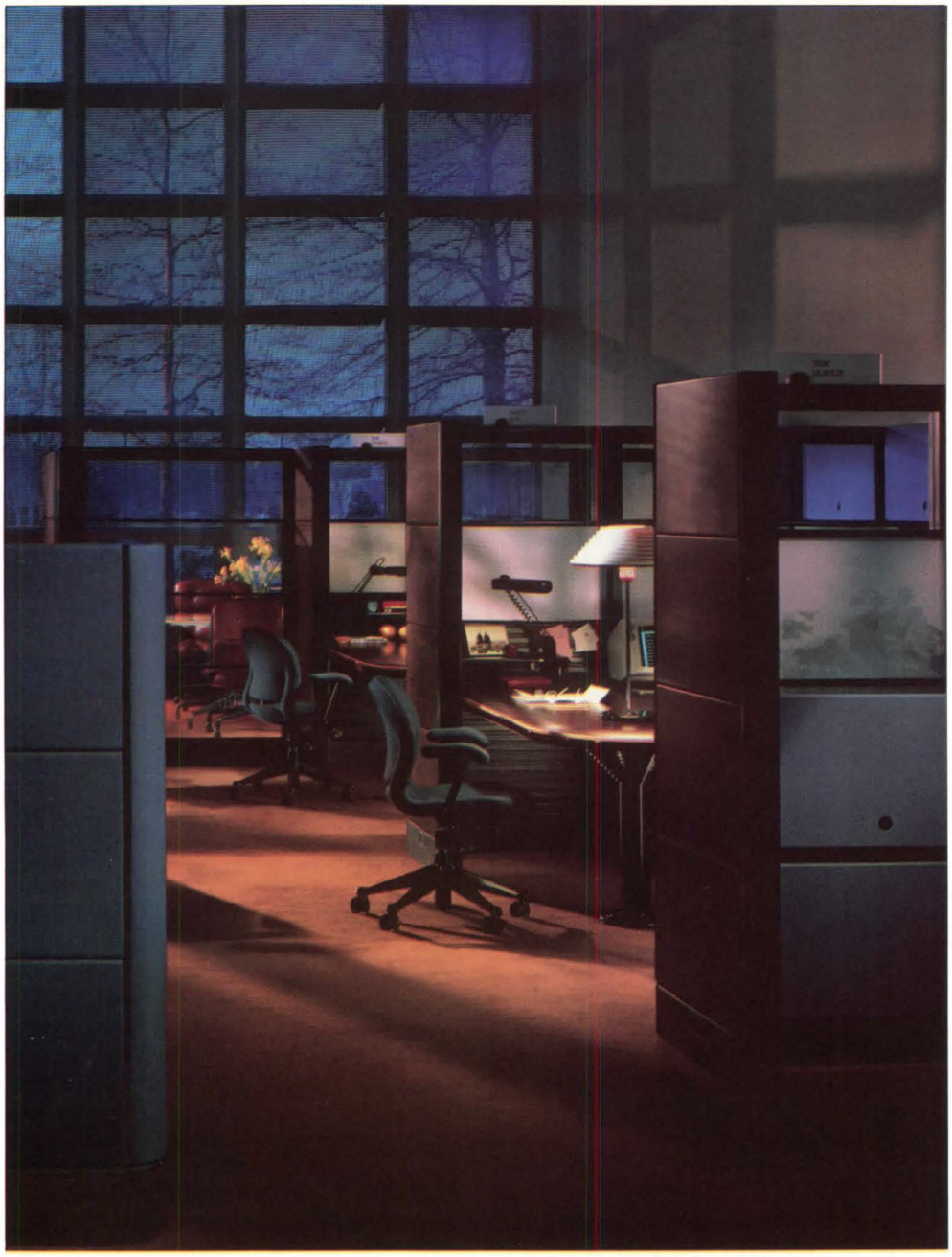
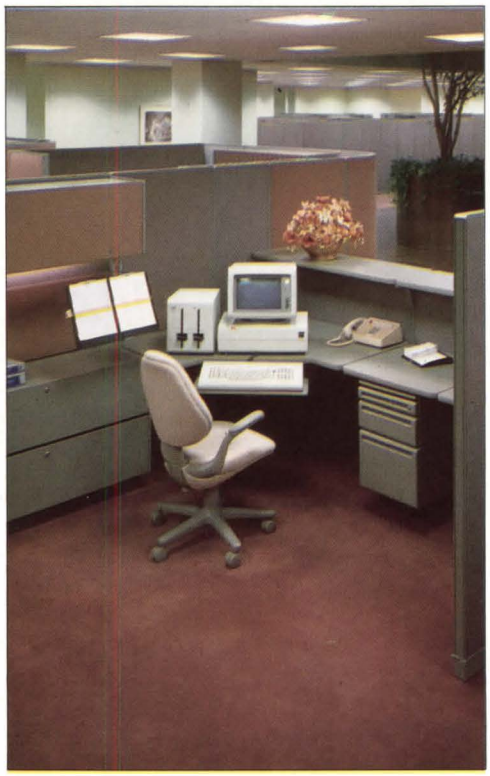


Space-Saving Workstations

Herman Miller's Ethospace Interiors full- and partial-height walls and components (above) feature sturdy space frames designed to be clad with combinations of surface tiles that come in a wide variety of colors and materials. Clear and translucent window tiles let in light, rail tiles support work-organizing tools, and acoustical tiles absorb sound. Organizing tools that users arrange to suit their individual working styles include trays, shelves, tackboards, mobile file cabinets, and a personal light.

Haworth Inc.'s full line of open office furniture known as Unigroup (right) includes the ES Electronic Support furniture, TriCircuit ERA-1 powered panels, and a line of ergonomically designed seating called SystemSeating. ES Electronic Support furniture components include 180-degree straight surfaces; 90-degree and 120-degree corner surfaces; freestanding and mobile task tables; printer tables; and a carousel that rotates 355 degrees in either direction. An adjustable key pad attaches to any panel-mounted and freestanding work surface in the Haworth line. It mounts under standard work surfaces 20 inches or deeper and stores beneath the work surface when not in use. TriCircuit ERA-1 powered panels have three separate 20-amp electrical circuits integrated with a compartmentalized base raceway, giving the user control over circuit allocation or dedication by means of a unique receptacle. More than one circuit can be dedicated to a particular use, extending the number of workstations or receptacles that can be serviced by a single three-circuit power feed, and simultaneous power can be provided for convenience outlets, special equipment, and lighting. SystemSeating office chairs are scaled to be compact and save space. A five-star base provides stability, and dual-wheel casters add mobility on hard surfaces or carpeted floors.



Biotec cluster-core workstations from Biotec Systems come in four basic configurations, three partition heights, and various keyboard and VDT area adjustments. Workstations also feature task lighting and cable management and airflow systems. A wraparound shelf surrounds the top portion of the panel system, and the dividers for the shelves are adjustable.

Allsteel's freestanding Syntrax System workstation can stand alone or interface with an Allsteel System. A trough allows two- or three-circuit electrical distribution, which holds and conceals wiring and channeling through linking tops. An integral track enables the user to move a CRT monitor along the length of the work surface, bringing it close during use, swiveling it, or storing it out of the way. The processing unit with a disk drive for a personal computer can be stored beneath the work surface. A swiveling, adjustable articulating keyboard arm pulls out from under the work surface, where it can be stored. An accessory console runs the length of the work surface, and channels built into the console accommodate a variety of accessories. Telephones, papers, reference materials, and lights can be raised, lowered, or moved to the left or right.

Stow & Davis, a division of Steelcase, has a detailed brochure explaining its Elective Elements workstation system. The Elective Elements Planning Guide gives an overview of the system and details on each of the elements and how to use them. The brochure shows several workstation configuration possibilities and contains specific information on how to set up effective electrical power and communications cabling and lighting for the office layouts.

The Delta-Series line of furniture for the automated office by Data-Mate features a connector that allows the user to network work surfaces at 45-degree angles. Placing a typical 60x30-inch workstation beside the freestanding 45-degree connector allows work surfaces to be easily reconfigured. The linear configuration is constructed of steel, provides bilevel cable management, and can be fully powered. Privacy panels come in two heights.

continued on page 140

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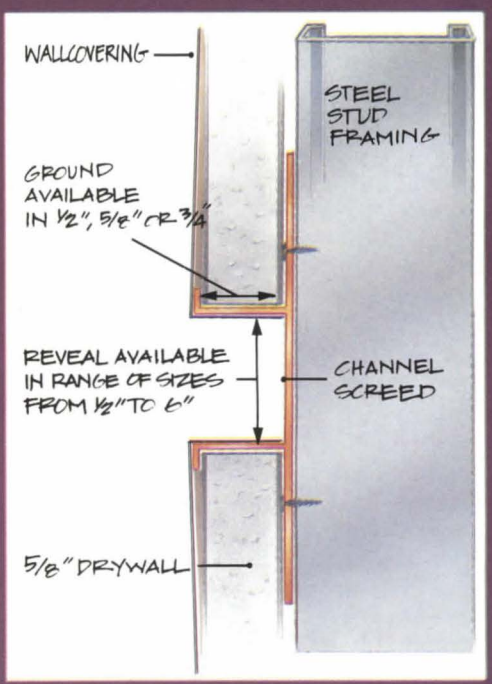

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Products *from page 138*

The Action Office Encore furniture system by Herman Miller features work surfaces with thicknesses increased to 1¼ inch and continuous, wrapped edges; and monolithic work surfaces up to 96 inches long with seamless tops. In addition, recut mahogany, dark mahogany, inntertone, and ash veneers now can be specified on all surfaces. Action Office Encore peninsulas are 30 and 36 inches deep and 48, 60, and 72 inches long and connect to other work surfaces or directly to work panels. There are two laminate and five veneer finishes to choose from, and either round or square ends. The same finishes are offered on the new transaction surfaces. Transaction surfaces rounded at one end can butt against each other, and the double-round transaction surfaces fit panel runs of 48 and 72 inches.

Interiors Specialists introduces the Function 2000 workstation in a variety of options from a cluster of two to one of six. Communications and data cables and wires are located in a central core. The wires are routed through molded grommets to a horizontal wire manager below the work surface. Modular phone jacks are available in the utility strip. Air is managed through a system of fans, filters, and louvered diffusers that collect warm air from computers, lighting, and other heat sources and distribute clean, regulated warm air to the floor or exhaust it to the ceiling. Lighting options include ambient and task lighting located in the core above cabinets or under shelves or cabinets.

The Kaleidoscope 360 System from Dennison Monarch Systems (below) is a patented design of posts and interlocks that click together for tool-free assembly. The system's foundation is a center stem that serves as an axis for up to six individual workstations. The concave design provides additional surface area for workers, with visual and acoustical privacy minus that boxed-in feeling. A power pole feeds power and communications lines into the stem and routes them via a built-in electrical raceway. The Kaleidoscope 360 is available in six, half-six, five, four, half-four, quarter-four, and three pod clusters. Each can be configured in a combination of radial and linear formats. Work surfaces, pedestals, and overhead storage units are available.

Allsteel Inc.
Circle 411 on information card
Stow & Davis, division of Steelcase Inc.
Circle 412 on information card
Herman Miller
Circle 413 on information card
Haworth Inc.
Circle 414 on information card
Data-Mate Inc.
Circle 415 on information card
Interiors Specialists
Circle 416 on information card
Dennison Monarch Systems Inc.
Circle 417 on information card
Biotec Systems Inc.
Circle 418 on information card

Flexible, Versatile Screen

Vogel-Peterson's VistaScreen office panels are 60x60 or 60x72 inches and come in seven colors. Detachable stabilizer bases position screens upright or lengthwise. The black bases are easily transportable.

Vogel-Peterson
Circle 419 on information card

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Chiat/Day Hampton Drive (temporary offices), Venice, Calif. (page 68). *Architect: Frank O. Gehry & Associates, Venice, Calif.* Principal in charge: Frank Gehry, FAIA. Project manager: Bob Hale. Design team: Frank Gehry, FAIA, Tom Buresh, Rene Ilustre, Adolph Ortega, A. Carol Stockard. Electrical engineer: G.W. Electrical Engineers. Mechanical engineer: Western Allied Corp. Structural engineer: Kurily & Szymanski. General contractor: J.A. Stewart Construction. Interior design: Ann Grenwald.

Herman Miller "Building B" Administrative Offices, Zeeland, Mich. (page 72). *Architect: Meyer, Scherer & Rockcastle Ltd., Minneapolis.* Principal in charge: Thomas Meyer, AIA. Herman Miller facilities management: Doug Zimmerman (director), George Cary, AIA (regional manager), Patsy Jackson (project manager), Gord Nagelkirk (construction manager). Design team (MS&R): Lynn Barnhouse, Victoria Gibbs, Rich Laffin, Thomas Meyer, AIA, Garth Rockcastle, AIA, Jeffrey Scherer, AIA. Design team (Herman Miller): Rick Edwards (project designer), Jeff Meyer (associate designer), John Kriekaard (designer). Mechanical, electrical, and plumbing engineer: Bakke Kopp Ballou & McFarlin Inc. Electrical contractor: Circuit Electric, Jerry L. Taylor. Mechanical contractor: Spartan mechanical Services Inc., Sid Holwerda. Lighting consultants: Mitchell B. Kohn, Duane Schuler, D.H. Schuler Associates. Acoustic consultant: Steven Kvernstoen, Acoustic Predictions Ltd. Graphics consultant: James E. Johnson, Johnson Plus Johnson. General contractor: Owen-Ames-Kimball.

Hasbro Corporate Headquarters, Pawtucket, R.I. (page 78). *Architect: Barton Myers Associates, Toronto, Ontario.* Principal in charge: Barton Myers, AIA, FRAIC. Associate in charge: Shirley Blumberg. Design team: Barton Myers, AIA, FRAIC, Shirley Blumberg, Cal Smith, Michael Tayor, Chris Couse, Jerry Bowes, Howard Sutcliffe, David Pontarini, Karen Cvornyek, Beverly Horii. Mechanical and electrical engineer: The ECE Group. Structural engineer: M.S. Yolles & Partners. Color and graphics consultant: Sussman Prejza & Co. Lighting consultant: Theo Kondos Associates. Food Services consultant: Cini-Little International. Fine arts adviser: Nancy Rosen, Fine Arts Planning Group. Construction manager: Dimeo Construction Co. Client: Hasbro Inc. □

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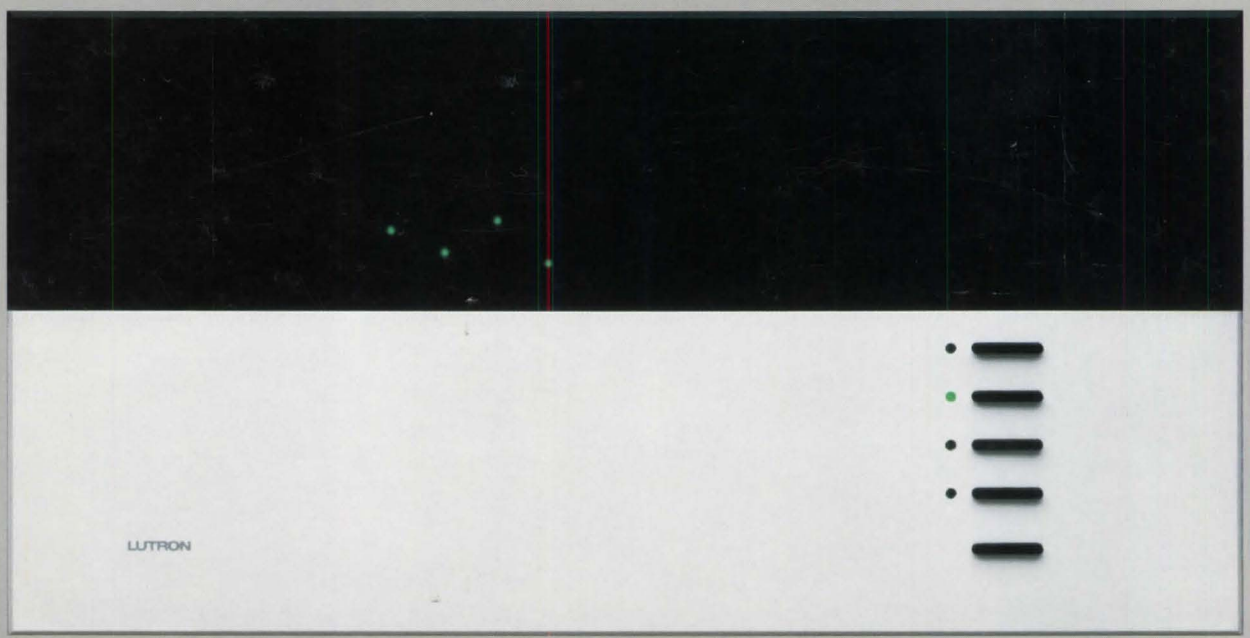

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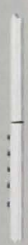

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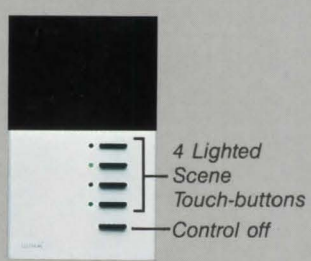

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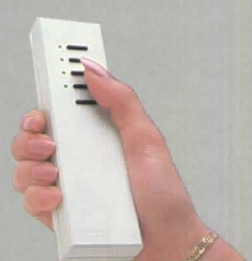

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