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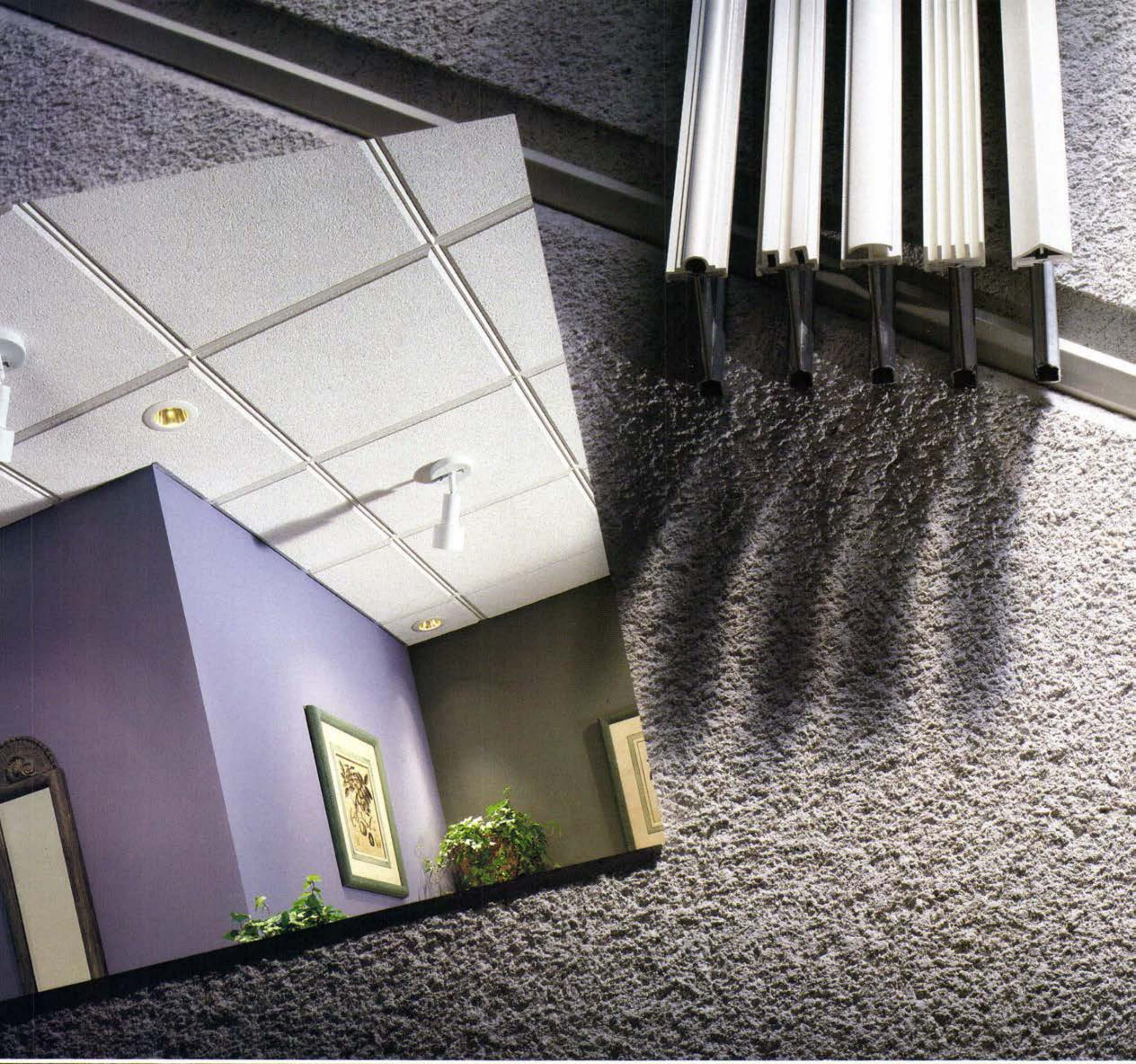

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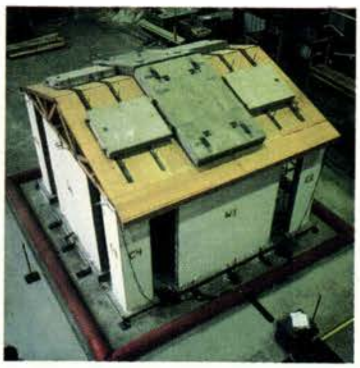
Earthquake Intervention

As proved by the Los Angeles quake, advanced seismic devices and testing methods are needed.



COURTESY EERC

SHAKE TABLE: Model of masonry house tested at UC Berkeley's Earthquake Engineering Research Center. Concrete weights on roof simulate load. Red perimeter marks boundary of table and provides airtight seal for pressurized chamber below.

The earthquake that rocked Los Angeles before dawn on Martin Luther King, Jr., Day proved that innovations in seismic technology are crucial to minimizing damage. Since Los Angeles's last major earthquake 23 years ago, many structures have been built or retrofitted with reinforcement members, connecting joints, and isolation devices that passively absorb vibrations. Nevertheless, the Northridge quake destroyed more than 14,000 dwellings, killed 66 people, and left some 25,000 Angelenos homeless. Estimates of the damage reveal this quake to be the nation's costliest natural disaster, surpassing Hurricane Andrew's $30 million price tag and causing far more destruction than the $7 billion of losses rendered by the San Francisco quake of 1989. Its wreckage proves that buildings must be designed not only with shock-absorbing devices to passively resist an earthquake, but also with more advanced technologies to actively counter the earth's severest forces.

Research into these new, active methods is now under way at several institutions, including the National Center for Earthquake Engineering Research at the State University of New York (SUNY) at Buffalo. Researchers at the center are developing an electrohydraulic "active bracing" system, located in walls and foundations. When a building starts shaking, computer-controlled sensors activate the system's pistons and pumps, which generate forces counter to those of the earthquake. Another electrohydraulic device being studied at SUNY comprises a massive weight, placed atop a building, which moves during an earthquake to counteract seismic vibrations. While these advances have yet to be incorporated in American buildings, many such devices have already been installed in Japanese structures, since Japan's construction industry routinely develops, tests, and implements new seismic devices.

Our construction industry, with help from state and federal governments, must also develop new means of testing seismic strategies. According to many structural engineers, sophisticated computer models are not enough to simulate the damaging effects of earthquakes. More effective is a testing device called a shake table, which can be programmed to physically imitate the vertical and horizontal motions of a quake. Scale models of structures are then attached to the table and tested. According to Nicholas F. Forell of San Francisco-based engineers Forell/Elsesser, "The shaking tests that we've done have been extremely helpful. Computer models are important for design, but even they need the empirical data that comes from the shaking tests." Currently, there are only five such tables in the entire country; the largest, at the University of California at Berkeley (left), measures only 20 by 20 feet. Japan, on the other hand, has built many larger tables, including a 50-by-50-foot model.

The reasons why our country is reluctant to develop, test, and implement new earthquake-resistant devices are complex. The perception is that active seismic technologies are expensive to produce and install, especially within existing buildings. However, engineer Tsu T. Soong of the SUNY Buffalo national earthquake center points out that active systems may not cost more than retrofits. "It's difficult to implement new technologies due to conservatism, liability issues, and insurance," notes Soong. Similarly, shake tables are viewed as esoteric research equipment, rather than as vital testing tools.

But investing in seismic research—and paving the way for implementing new developments—could save both money and lives in the long run. Such action would signal that we have, at the very least, learned a lesson from Los Angeles's disaster, and that the destruction wrought by forces deep within the earth could be lessened in the future.

Deborah K. Dietsch

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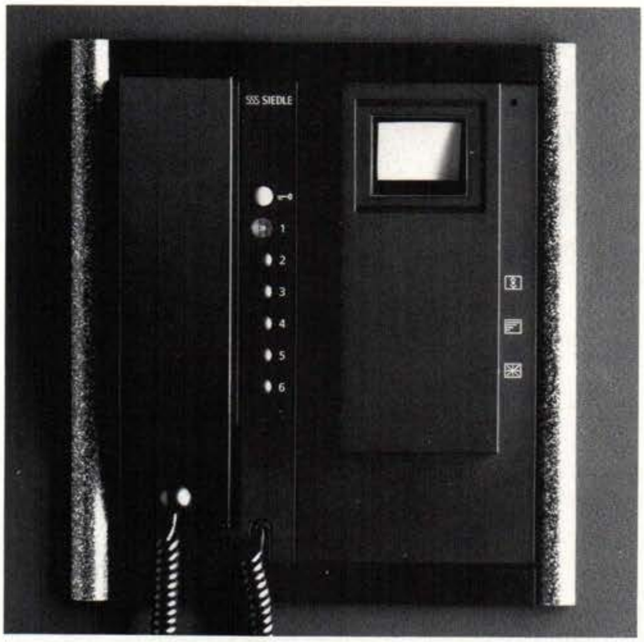

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Bellevue, misrepresented

M. Lindsay Bierman's treatment of the new library in Bellevue, Washington ("Suburban Precedent," December 1993, pages 78-85), while laudatory toward the library, reflects poor research with respect to Bellevue's policies, programs, and projects. The article's title implies that Bellevue is a suburb, but with a population of almost 100,000, Bellevue now holds the rank of fourth largest city in Washington state, and its downtown contains more commercial sites than the downtowns of Spokane and Tacoma combined.

The article mentions a "puzzling array" of codes. The library district selected a site situated between the downtown core and an established neighborhood. Land-use regulations and design guidelines recognized this as an urban site demanding an urban solution, though one tempered by deference to the existing and anticipated contexts.

Bierman's disparaging comments about the "lack of transit," widened streets, and parking are flat out wrong. In fact, there are many bus routes that serve downtown Bellevue. They converge on a transit center which is located a few blocks from the library. The city has also been deemphasizing the use of cars through many programs, including the reduction of parking ratios.

The author beseeches the city to "follow ZGF's lead." In fact, the design of the library is a direct result of actions by the city that were intended to produce precisely such a splendid solution. Too bad the author did not deem the city worthy of any credit in this endeavor.

Mark Hinshaw, AIA
Bellevue, Washington

Author's reply: Regardless of its size, Bellevue not only remains a vast suburb of Seattle, but also has evolved into a textbook example of an edge city. In a place so devoid of human scale, cars will always serve as the primary form of transportation. Too bad Bellevue's city planners did not recognize the ubiquitous flaws of 20th-century urbanism.

Native nod

ARCHITECTURE deserves congratulations for its attention to the subject of Native American architecture in the December 1993 issue ("Discovering Native America," page 15; "Myth and Spirit," pages 48-61; and "Tribal Tribute," pages 70-77). Yet we have a long way to go. Native American architecture must become part of the curriculum at architecture schools, and not just a fashionable concern of the moment used to enhance commission prospects.

Crystal Cai Anderson
New York City

Don't describe, explain

Joseph Giovannini's "Myth and Spirit" is laced with expansive words that I assume are an attempt to impress readers. But employing such overbearing words as "mythopoetic" and "oneiric" does little for my understanding of the work under review. I ask that you treat reviews less like a stage and more like a studio.

R.S. Wilson, AIA
Coeur d'Alene, Idaho

Events

March 12-15
The Association of Collegiate Schools of Architecture annual meeting in Montreal, Canada. Contact: (202) 785-2324.

March 18-20
The Fabric of Neighborhoods, a symposium sponsored by the AIA Historic Resources and the AIA St. Louis Young Architects Forum. Contact: (202) 626-7345.

March 18-20
The First Virginia Design Forum, a symposium on architecture and innovation, in Richmond. Contact: (804) 644-3041.

March 23
Entry deadline for the Urban House design competition, sponsored by the Columbus Neighborhood Design Center. Contact: (614) 274-4141.

March 23-25
WestWeek '94, sponsored by the Pacific Design Center in Los Angeles. Contact: (310) 657-0800.

March 24-25
Second annual Healthcare & Senior Living Design Forum in Minneapolis. Contact: (612) 338-6250.

March 27-31
Cine City: Film and Perceptions of Urban Space 1895-1995, a symposium sponsored by the Getty Center for the History of Art, in Santa Monica. Contact: (310) 458-9811.

April 9-10
International Construction Colloquium, sponsored by Harvard University's Graduate School of Design. Contact: (617) 495-9939.

April 11-14
The Society for the Plastics Industry conference on composites and corrosion in construction applications, in Las Vegas. Contact: (310) 420-8783.

April 22
Entry deadline for the Benedictus Award to recognize outstanding use of laminated glass in architecture. Contact: (202) 785-2324.

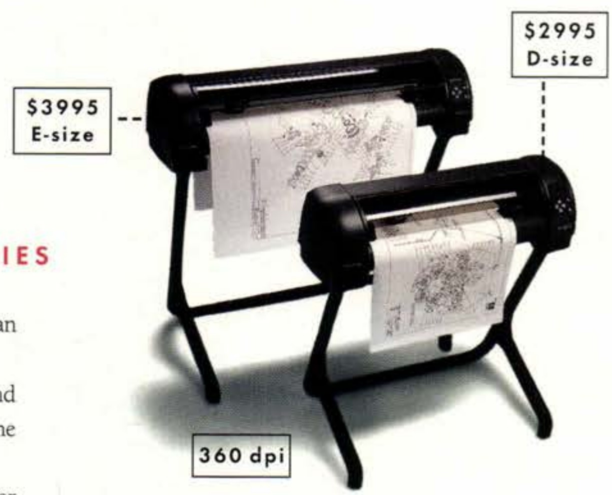
April 23
Architectural Practices symposium, sponsored by Harvard University's GSD. Contact: (617) 495-4315.

April 25-27
Computers and Tall Buildings, a conference sponsored by the Council on Tall Buildings and Urban Habitat, in Manana, Bahrain. Contact: (215) 758-3515.

May 4-6
1994 LightFair International, a conference in New York City, sponsored by the Illuminating Engineering Society and the International Association of Lighting Designers. Contact: (404) 220-2217.

May 13-16
AIA annual convention at the Los Angeles Convention Center. Contact: (202) 626-7395.

May 25
Construction Specifications Institute's conference in Pasadena. Contact: (213) 651-3820.



News

Accent on Architecture Sends Social Message

On February 1, nearly 700 architects packed the National Building Museum in Washington, D.C., to celebrate the fifth annual Accent on Architecture. The black-tie gala honored the AIA's highest design awards for 1994: a collection of 22 projects that encompasses a broad range of uses. For the first time, the AIA combined the Honor Awards for Architecture with those for Urban Design, encouraging the difficult and necessary collaboration between the profession and the public in the rebuilding of our cities.

Although PBS talk-show personality Charlie Rose was the master of ceremonies, Secretary of Housing and Urban Development Henry Cisneros set the tone of the event as the keynote speaker. "Right now in neighborhoods near where we sit," Cisneros declared, "there are drug dealers terrorizing residents of low-income housing; rats, roaches, and lead-based paint jeopardizing children's health; and people crying out for help. Architects have the gifts of conceptual understanding, vision, and talent to make a huge difference in solving these problems."

Cisneros' imperative was echoed in Winston Churchill's chilling observation that "we shape our buildings; thereafter, they shape us," which became the evening's refrain. The affirmative nods in the audience reveal a profession struggling to reverse the destructive effects of postwar public housing. "We are still living with the problems of urban renewal," Cisneros affirmed. "But mistakes can be corrected and lessons learned." Indeed, four of the evening's award winners demonstrate alternative forms of low-income housing, from the Charlestown Navy Yard Rowhouses by William Rawn Associates to the Simone Hotel by Koning Eizenberg Architecture.

The highlight of the evening was the acceptance speech by Norman Foster, who was presented with the AIA Gold Medal by NEA Chair Jane Alexander. Foster not only invoked Churchill, but more surprisingly, Jane Jacobs. Foster's expensive, custom designs are not usually associated with Clinton-era social consciousness, but as the British architect reminded the audience: "Design is not a fashionable 'ism.' It is about people and borne out of the needs of people."—*M. L. Bierman*

ROSE: Talk-show host likes architects.

FOSTER: Gold Medal from Alexander.

CHAPIN: New AIA President.

CISNEROS: Architects make a difference.

TERRY ASHE PHOTOS

BUILDING MUSEUM: Dinner honors national architecture and urban design awards.

EARTHQUAKE DAMAGE: Fallen masonry.


COURTESY HISTORIC RESOURCES GROUP

COLLAPSED PORCHES: Historic 1920s wood-framed bungalows severely damaged.


AIA SURVEY: Tanzmann and Chapin.


LEADERS: Chapin, Mayor Richard Riordan, Tanzmann, Chester Widom.

L.A. Earthquake Raises Code Questions

The January Los Angeles-area earthquake proved that those buildings equipped with seismic technology are capable of preventing loss of life and that architects play a vital role in a community affected by natural disaster. As Virginia Tanzmann, president of AIA Los Angeles, notes, "The good news is that the majority of the buildings performed marvelously and that architects responded immediately to assess the structures that were damaged."

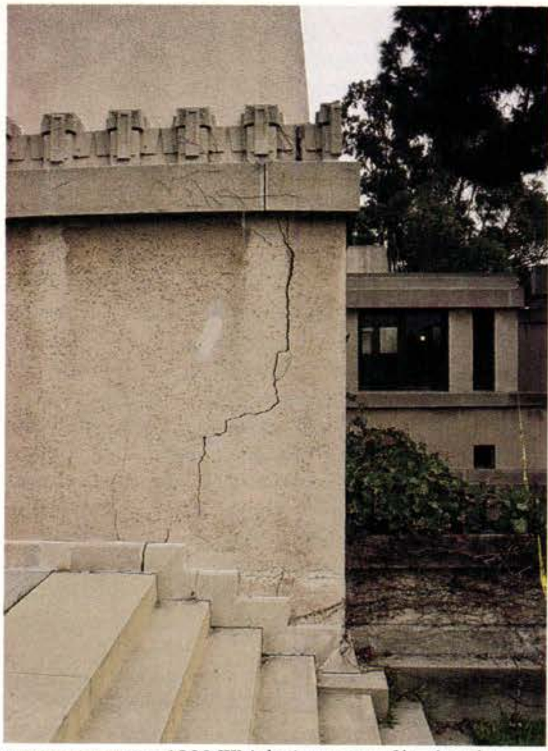
According to Tanzmann, hundreds of architects from across the state volunteered to assist the California Office of Emergency Services survey and investigate damaged buildings and recommend courses of action. Architects also volunteered to work at some of the 16 FEMA centers.

Tanzmann reports that the Historic Resources Committee of AIA Los Angeles immediately formed teams to conduct a windshield survey of designated landmarks and older buildings. Among the damaged structures are such Los Angeles landmarks as Frank Lloyd Wright's Hollyhock House as well as his Freeman House, and a vintage 1953 McDonald's restaurant in Downey —the last of the chain's original "golden arches." The one-page building survey is intended to help the state evaluate whether requests for permits to demolish historic structures are legitimate.

To prevent unnecessary demolition, the Historic Resources Committee assembled technology assistance teams and created a general plan for owners of landmarks. "The teams are making recommendations on how to repair buildings and deal with historic building codes, as well as providing lists of designers and contractors who might be able to assist with problems," explains chairman Gordon Olschlager. "They are not providing design solutions."

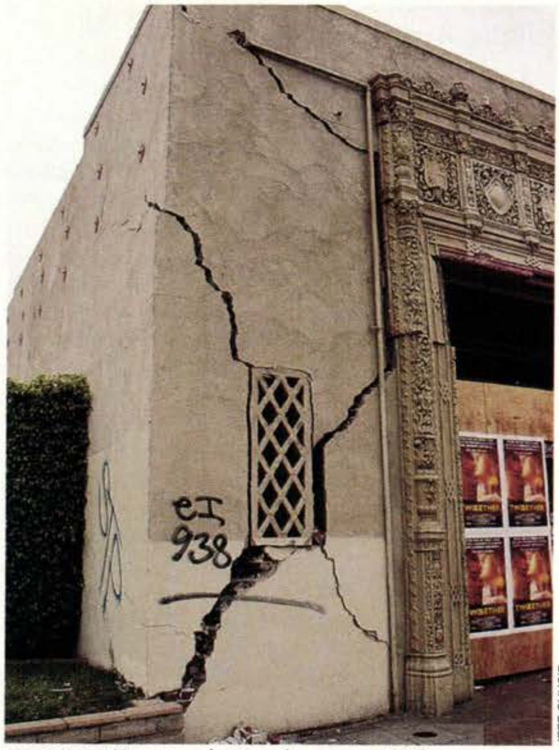
The committee is also acting as a clearing house for information gathered from other California localities that have previously dealt with the aftermath of an earthquake. "We are spreading information from places like Humboldt County and Ferndale, California, which have shown that repair is often a quicker way to make an historic property habitable than demolishing the structure and rebuilding," explains Olschlager.

Buildings that meet the 1976 Uniform Building Code, which included updated requirements to prevent the type of damage incurred during the 1971 San Fernando earthquake, fared well during the recent quake.



JEFF CHUSID

HOLLYHOCK HOUSE: 1920 Wright in survey of landmarks.



JEFF CHUSID

HOLLYWOOD: Teams evaluating damage to 1924 structure.

JEFF CHUSID

FREEMAN HOUSE: 1925 Wright.

REUTERS/BETTMAN

GOLDEN ARCHES: Last original McDonald's in Downey may be demolished.

As Rudolph DeChellis, of O'Leary Terasawa Partners, explains, "The buildings we designed since the code updates did not suffer any damage."

Similarly, a series of code upgrades related to unreinforced masonry buildings appeared to have worked well. The Division 88 ordinance of L.A.'s building code requires the steel bracing of unreinforced masonry buildings. It was enacted in 1981 and upgraded in 1983 and 1986. An estimated 85 percent of the unreinforced masonry buildings in Los Angeles have been upgraded to meet these requirements. Structural engineer John Karriotis asserts, "Most unreinforced masonry buildings that were properly upgraded did not suffer life-threatening damage; most of the damage I saw resulted from code violations."

Bill Delvac, of the Historic Resources Group, reports that such historic Hollywood theaters as the Egyptian Theater and Grauman's Chinese Theater suffered cosmetic damage. One type of damage that occurred at the Egyptian Theater and other early 20th-century buildings was the "explosion" of hollow clay tile. Often used as an infill material between structural members, clay tiles can crack and fly off when they flex during an earthquake. If the L.A. earthquake had occurred during daytime hours, injuries might have been inflicted by the falling tiles.

Masonry chimneys and fence walls collapsed with enough regularity to make officials consider changes to existing codes. Permits for the repair of masonry chimneys are being denied temporarily, and such chimneys may be outlawed in the future. There is also speculation that masonry garden walls taller than 3 feet may require building department approval in the future; currently, only masonry fence walls taller than 5 feet require such approval.

Another ordinance under consideration is requiring steel ties to be placed between wood-framed structures and their foundation, since many wood-framed buildings "walked" off their foundation during the recent earthquake. However, most buildings that were tied to their foundation did not suffer this type of damage. Many Craftsman-style houses resting on concrete cripple walls reportedly toppled over, although this type of damage was also predictable and easily avoidable.

While this earthquake was clearly a tragic event, it showed that proper design can save lives and property. Authorities must continue to enact legislation that mandates building safety and the protection of human life.—*Michael Bordenaro*

Details

The University of Maryland has selected **Moore Ruble Yudell** as the winner of a competition to design an \$80 million performing arts center. The AIA's 1993 Gold Medalist **Kevin Roche** has been elected President of the American Academy of Arts and Letters. Roche will succeed current President **Jack Levine**. In Seattle, **Loschky Marquardt & Nesholm** has been commissioned to design the city's new symphony hall. Seattle University has selected four finalists in a competition to design a new campus chapel: **Steven Holl**, **Moshe Safdie**, **Dagit Saylor Architects**, and **Bohlin Cywinski Jackson** and **James Cutler Architects**. Seattle's **Carlson/Ferrin Architects** has reorganized as **Donald Carlson and Associates Architects**, following the retirement of partner **Alan Ferrin**. The firm is designing a new headquarters and practice court for the Seattle Sonics. Harvard University's GSD has established a postprofessional program for a master's degree in urban planning. In association with **NBBJ**, **Robert A. M. Stern Architect** is designing a new hospital for the Walt Disney Company in Celebration, Florida. **Cambridge Seven Associates** has been selected to design an aquarium for the 1998 Lisbon Expo in Portugal. **Cesar Pelli & Associates** is designing the headquarters of the Zurich-based insurance company MAB in The Hague, Netherlands. University of Wisconsin–Milwaukee professor **Douglas Ryhn** will receive the Distinguished Professor Award from the Association of Collegiate Schools of Architecture. **Michael Fieldman and Partners** is designing three new public school projects in New York City. **The Hillier Group** of Princeton is designing a master plan for the 50-acre west campus of Pennsylvania State University and a library at Bellarmine College in Kentucky. The firm is also opening offices in Hanoi and Ho Chi Minh City, Vietnam. **Hellmuth, Obata & Kassabaum** was chosen to design a new international air terminal in Fukuoka, Japan. Architect **Wes Jones**, former partner of **Holt Hinshaw Pfau Jones**, has established his own San Francisco-based firm, **Jones, Partners: Architecture**. The San Francisco-based practice of **Kaplan/McLaughlin/Diaz** was selected over **John Portman**, **John M.Y. Lee & Partners**, and **Kohn Pedersen Fox** to design the new Shanghai International Center in China.

News

Jefferson Medal Honors Public Architecture


MICHAEL GEISSING

HONOREES: Dattner, Brodie, Riley.

A mayor, a New York City architect, and an architect-planner who has long worked in the public sector were presented with this year's Thomas Jefferson Award for Public Architecture, presented by the AIA on February 1 in Washington, D.C. Joseph P. Riley, Jr., mayor of Charleston, South Carolina; Richard Dattner, principal of Richard Dattner Architect; and M.J. "Jay" Brodie of RTKL Associates were selected by a jury headed by John Belle of Beyer Blinder Belle.

Mayor of Charleston since 1975, Joseph Riley has become a national symbol of progress and preservation. Stating that "good architecture is not elitist," Riley has sponsored extensive commercial development in Charleston, including the revitalization of the city's waterfront, as well as several public housing projects. He contends there is a lack of appreciation for architecture among elected officials. Finding most mayors unaware of the problems and opportunities of urban design, Riley co-founded the Mayor's Institute for City Design with the National Endowment for the Arts in 1986. With mayors and designers discussing ideas together, these conferences have initiated informed exchanges in over 200 cities across the nation.

In accepting his award, Riley implored those in control never to underestimate the impact of beauty —or lack of—on the human spirit. He challenged designers and public officials to "create a public realm worthy of our country."

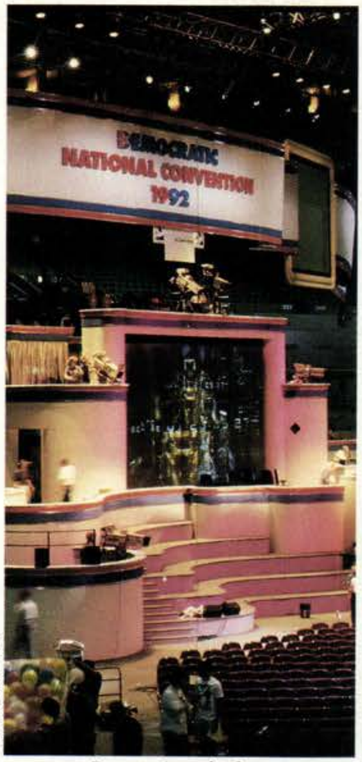
The only private-sector architect who was awarded the Thomas Jefferson Medal this year, Richard Dattner has long been involved in designing public buildings. Since opening his firm in 1964, Dattner has designed numerous schools, public works facilities, libraries, public housing, and healthcare facilities in a successful career affirmed by more than 60 design awards. One highly visible example of his work is the stage for the 1992 Democratic National Convention, which featured a stepped platform, resulting in a less distinct separation of speaker and audience.

In accepting his award, Dattner pointed out Jeffersonian attributes worthy of emulating: inclusiveness and accessibility; contextuality; economy of means; architecture which educates; and civility.

Jefferson Award winner Jay Brodie practiced in the public sector for 32 years before joining RTKL last June. Working at Baltimore's Urban Renewal and Housing Agency and the Department of Housing and Community Development, Brodie played an integral role in Baltimore's recent revitalization, including the Charles Center and Inner Harbor. In 1984, Brodie was named Executive Director of the Pennsylvania Avenue Development Corporation (PADC), established to revitalize the area between the White House and the Capitol. During his nine-year tenure with PADC, Brodie managed several projects, resulting in a stretch of award-winning developments, such as the renovation and addition to the Willard Hotel and the new Canadian Embassy designed by Arthur Erickson. Brodie also kept the Federal Triangle project on schedule during his term—a large-scale development replete with complex congressional approvals, design competitions, and bid documents.

At the ceremony, Brodie stated that public architecture is the inspiration of future generations. He suggested that the profession educate students about public-sector careers and "work to expand the presence of architects in public service."

This year's winners mark the third year of the Jefferson Award. The 1993 recipient was U.S. Representative Jack Brooks of Texas. In 1992, James Ingo Freed, Pei Cobb Freed & Partners; U.S. Senator Daniel Patrick Moynihan of New York; and Architect of the Capitol George M. White were selected as the award's inaugural recipients.—*Ann C. Sullivan*



RICHARD DATTNER

DATTNER: Convention platform.


PETER AARON / ESTO

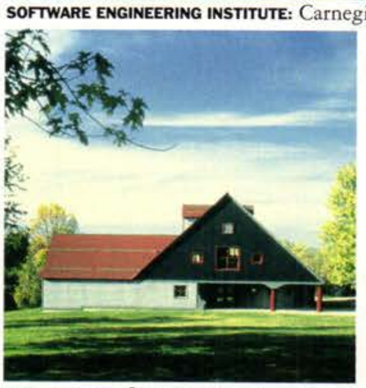
BRODIE: Market Square (left) introduces housing to Pennsylvania Avenue.

RILEY: Schmitt & Associates' Charleston cottages for the homeless.

News

CAMP LOUISE: Scout camp, 1972.

SOFTWARE ENGINEERING INSTITUTE: Carnegie Mellon University, Pittsburgh, 1987.



SHELLY RIDGE: Scout camp, 1983.

SHELLY RIDGE: Solar wall.

AIA Announces 1994 Firm Award Winner

Joining the ranks of such celebrated firms as Venturi, Scott Brown Associates; I. M. Pei & Partners; and most recently, Cambridge Seven Associates, Bohlin Cywinski Jackson will receive this year's AIA Architecture Firm Award at the AIA convention in May. The award is presented annually to a firm that has "consistently produced distinguished architecture for a period of at least 10 years," according to the AIA. Explains Principal Peter Bohlin, "This award celebrates our clients, friends, and colleagues, whose support and encouragement have made possible the rich variety of projects we've worked on over the years."

Since its 1965 founding in Wilkes-Barre, Pennsylvania, by Bohlin and former partner Richard Powell, Bohlin Cywinski Jackson has won over 100 national, state, and regional awards and has expanded its practice to offices in Pittsburgh, Philadelphia, and Seattle. Although the 52-person firm is not associated with a single architectural style, its designs blend technological sophistication with a sensitive response to the particulars of place. According to architect and educator Mack Scogin, "The strength of the firm's work consistently resides in the toughness and critically considered aspects of the site, plan, and section, always modern in attitude."

"We've always believed that exceptional architecture should spring from the particular circumstances of each situation," explains Bohlin. "After 28 years of pursuing this very simple idea, it is a great pleasure to see its strength affirmed by this award."—*Raul A. Barreneche*

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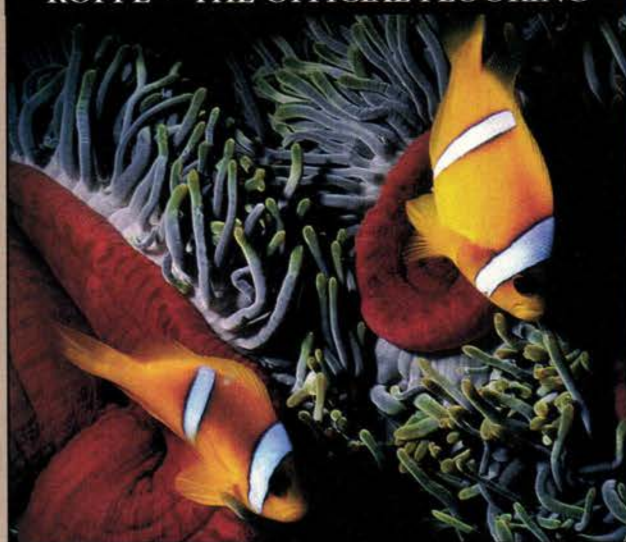

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McCLURE: Topaz Medallion winner.

MCCLURE COLL

DANIEL CENTER: Clemson's urban studies program in Genoa, Italy.

McClure Awarded Topaz Medallion

The AIA and Association of Collegiate Schools of Architecture (ACSA) have selected Harlan Ewart McClure as this year's winner of the Topaz Medallion for Excellence in Architectural Education, to be presented at the ACSA annual awards banquet in Montreal on March 14. As a member of Clemson University's faculty since in 1958, McClure served as Dean of its architecture school for 27 years, overseeing the transition from a small department of architectural engineering into today's nationally recognized college of architecture. During his 36 years at Clemson, McClure successfully balanced part-time professional practice with teaching graduate and undergraduate design studios. A generation of students has benefited from his instruction, including two former AIA presidents, R. Randall Vosbeck and Ted Pappas; 48 Fellows of the AIA; as well as 10 Fulbright scholars.

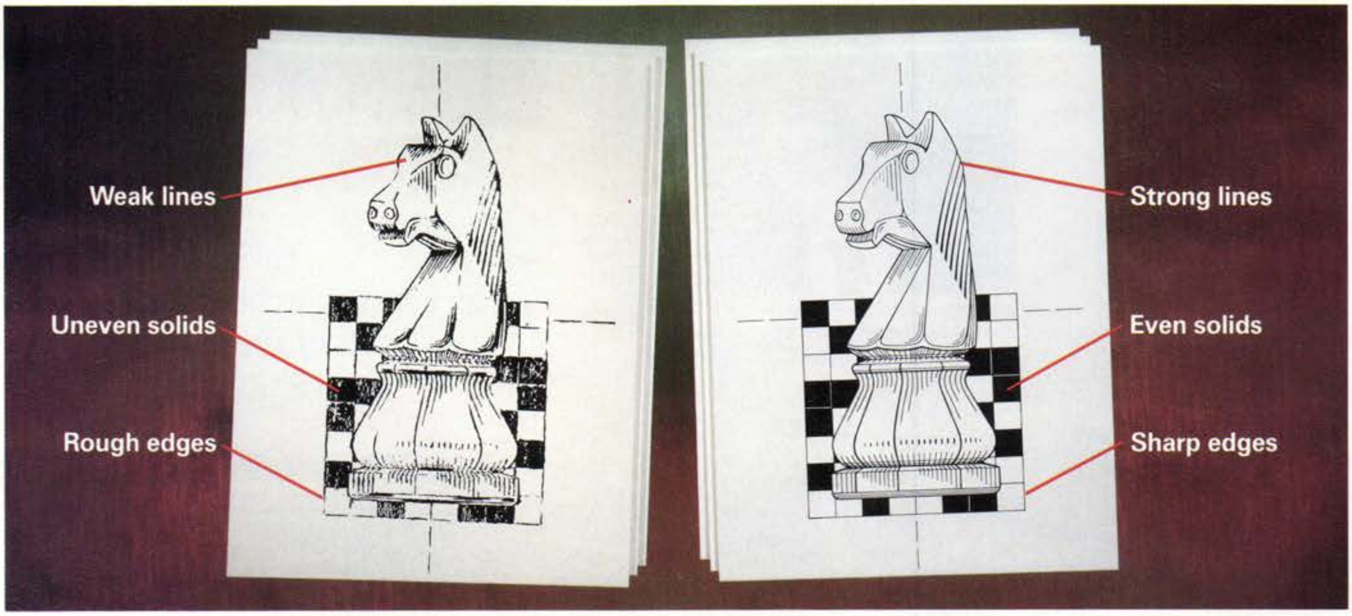
McClure received a bachelor of architecture from George Washington University and a master of architecture from Massachusetts Institute of Technology (MIT). Following World War II, he taught at the University of Minnesota and was a Fulbright visiting professor at the Architectural Association in London from 1952 to 1953. McClure served as ACSA President 1960-61, National Architectural Accrediting Board President 1969-70, and Tau Sigma Delta President 1970-87.

Committed to broadening the horizons of students from rural areas, McClure helped initiate two unique programs: the Clemson Architectural Foundation, designed to bring contemporary architects and artists from around the world to the South Carolina campus; and the Charles E. Daniel Center for Building Research and Urban Studies in Genoa, Italy, a graduate program celebrating its 20th anniversary this year. Available to design students, the program operates in a villa owned by the university and hosts both Clemson and Italian faculty.

Semiretired at 77 years old, McClure teaches one class each semester, primarily because he enjoys the contact with students. "It allows me to explore some of the new ramifications of the field, enabling me to continue thinking ahead rather than backward," he explains.

After four decades of teaching, McClure continues to shape Clemson's curriculum and to draw from it as well, keeping stride with the architecture school he helped develop. "The current challenges to architectural education are great, and opportunities abound," McClure asserts. "It is a pleasure to be a part of that environment."—*A.C.S.*

The decisive move to copy quality.



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NEW SCHOOL: Tigerman and Maddox.

New Architecture School Launched in Chicago

A year after he was forced to resign as director of the architecture program at the University of Illinois-Chicago, Stanley Tigerman is starting a school of his own in collaboration with Chicago interior designer Eva Maddox. In September, Tigerman and Maddox plan to open a think tank in which students from a variety of disciplines will research and develop socially conscious products and projects, such as shelters for the homeless. Called Archeworks, the nonprofit institution promises to break down barriers between the worlds of theory and practice, and architecture and other design disciplines. Yet it remains to be seen whether Tigerman's and Maddox's vision, at once gritty and grand, can be translated into reality.

Archeworks harkens back to the social idealism of the Bauhaus and its Chicago descendant, the Institute of Design. Founded in 1937 by Laszlo Moholy-Nagy as the New Bauhaus, the institute merged with the Illinois Institute of Technology in 1949 and now focuses on new theories of design with projects commissioned by corporate clients. Similarly, Tigerman and Maddox hope to link Archeworks with industry.

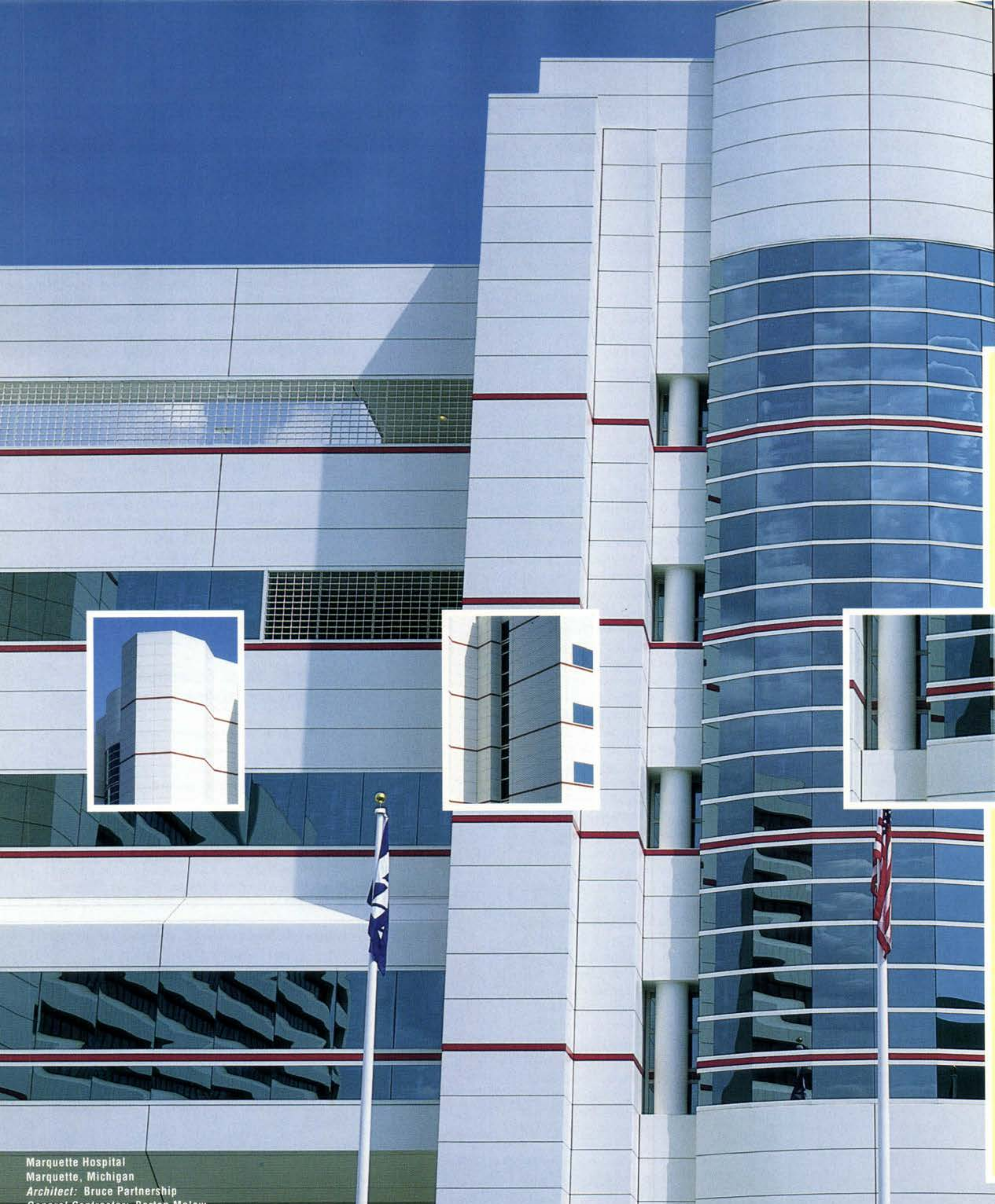
The core of the Archeworks experience will be a research and development team of 12 students, which will comprise undergraduates on junior-year-abroad programs; graduates of architecture, design, and engineering programs; as well as those seeking the equivalent of a one-year, postprofessional degree. Tigerman also hopes the school will disseminate a new type of design theory derived from real human needs instead of precious philosophizing. The school's funding is expected to come from the $7,000 annual tuition, as well as from donations and foundation grants.

Will Archeworks be worth it? Or will it be the cause du jour classroom of the 1990s, a repeat of the failed advocacy architecture experiments of the 1960s? Tigerman is heartened by an enthusiastic response to an Archeworks prototype he taught last fall at the Yale School of Architecture and by the application requests already received. Archeworks will have "an ethical and moral underpinning" missing from conventional architectural schools, Tigerman maintains. Chicago colleagues such as Thomas Beeby, agree. "I think it's a brilliant idea," Beeby remarks. "It actually brings together the ideas that you found in the Bauhaus."

Still-to-be-addressed gaps could prevent Archeworks from fulfilling that mission. The school's catalog is laced with architectural jargon that may put off prospective students. More substantively, the faculty does not yet include any of the industrial designers who are supposed to lend Archeworks its Midwestern, hands-on identity. Without them, Archeworks is likely to resemble any other design compound—long on theory and short on practice.

Finally, there is the question of Tigerman's long-term commitment—serious business for an architect who has jumped from style to style over five decades. Tigerman contends there has long been a socially conscious strain in his career, evident in such projects as the Illinois Regional Library for the Blind and the Physically Handicapped (1975-1978). "He's always had a gut reaction against the idea of architecture as an elitist thing," states Beeby. "If he can actually do it, it would be wonderful."—*Blair Kamin*

Blair Kamin is the architecture critic of The Chicago Tribune.



Marquette Hospital
Marquette, Michigan
Architect: Bruce Partnership
General Contractor: Barton Malow

A suburban high school responds to site geometries.

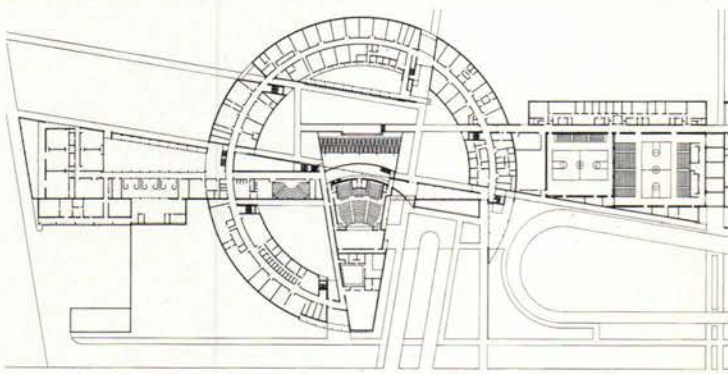
The Woodlands High School
The Woodlands, Texas
Perkins & Will, Architects

Perkins & Will's design for a new public high school on 70 wooded acres north of Houston mediates between a true north-south axis and the street grid of the surrounding community. Public spaces, including a library, gymnasium, and performing arts center, will be oriented to the orthogonal neighborhood grid, while athletic buildings and playing fields will be aligned north-south to allow for proper solar orientation. Dominating the overlapping geometries is a three-story circular classroom building enclosing a courtyard and open-air amphitheater.

The steel-framed structure will be clad in brick with aluminum fasciae and cornices, and clear and gray-tinted glass. Colonnades and deep overhangs will help protect against the harsh Texas sun. Construction of the $27 million project is slated for completion in mid-1995.—*R.A.B.*


JAMES STEINKAMP

MODEL: Classroom structure encircles performing arts building and library.



PLAN: School includes cafeteria (left), theater (center), and gym (right).

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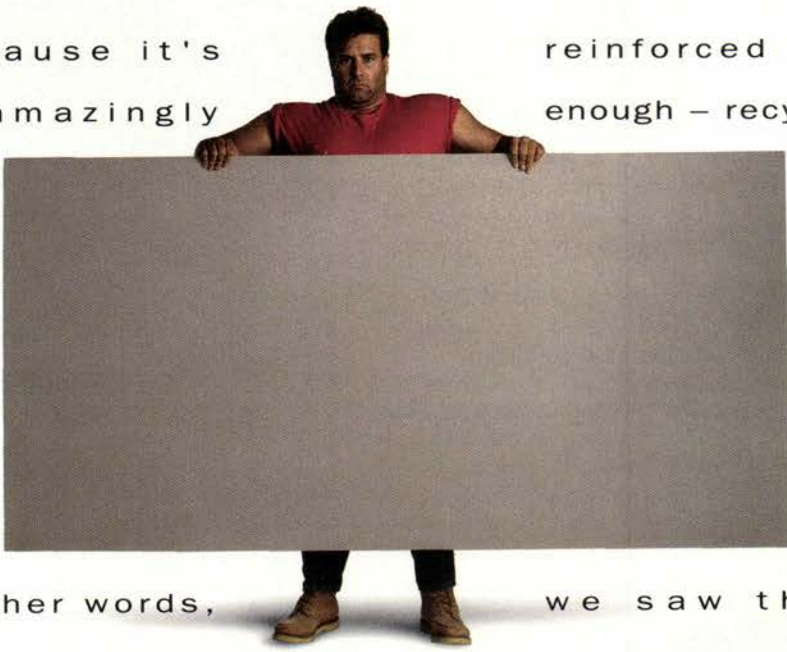

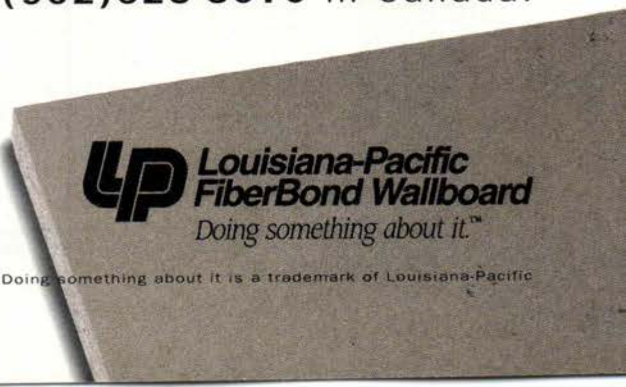

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Lewis & Clark College Additions
Portland, Oregon
GHA Architects

A trio of buildings updates a college's Beaux-Arts setting.

After considering schemes by Stanley Saitowitz, Moore Ruble Yudell, and Zimmer Gunsul Frasca in a 1993 competition, Lewis & Clark College in Portland selected the local firm GHA Architects to design its new academic facilities. GHA's scheme complements the school's original 1927 structures, part of a Herman Brookman-designed estate that combines formal gardens with vistas of the Cascade Mountains.

The new facilities will comprise a library addition and renovation, as well as a new humanities building and a visual arts center. The brick-clad buildings will be organized around a circular plaza, providing a connection to the campus gardens.

Steel balconies and copper ridge caps will recall the existing campus buildings. Construction of the $21 million project is scheduled for completion by mid-1996.—*R.A.B.*

SITE PLAN: Three GHA-designed buildings border formal gardens.

SITE PERSPECTIVE: Brick-clad, gabled volumes recall existing campus vernacular.


FRANCIS J. PLYM,
ARCHITECT.
KANSAS CITY, MO.
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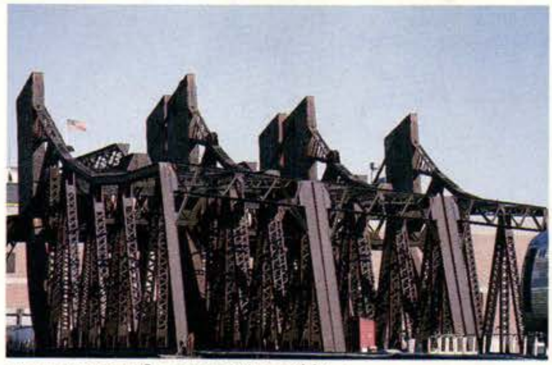
Revamping the Central Artery calls for demolishing a transportation landmark.



STEEL TRUSSES: Support active rail lines.

LIFTING MECHANISMS: 1898 innovation.

PETER VANDERWARKER PHOTOS

OLD COLONY BRIDGE: Counterweights and rocker arms (right) raise bridge span (left) over channel.

Save a Boston Bridge

Boston's $6 billion Central Artery project is accomplishing a goal that architects and planners dream about: removing an ugly elevated highway from the heart of a great, historic city. However, lack of vision and financial support may rob Bostonians of a chance to preserve a beautiful, turn-of-the-century railroad bridge.

The Old Colony Bridge, which sits at the end of the Massachusetts Turnpike near South Station, symbolizes an era when people and freight moved through Boston by train and boat. Although it has not been used as a drawbridge since 1950, the span still carries passenger trains across a shipping channel, and its powerful form serves as both a local landmark and a compelling work of art. The bridge is constructed of three spans that carry rail lines across the narrow Fort Point Channel, where a conventional swing bridge would not have room to open. The unique counterweighted lift bridge, the oldest of its kind in the country, was built in 1898 by the Schertzer Rolling Lift Bridge Company of Chicago.

Sadly, plans for the interchange that will connect the Massachusetts Turnpike to the new harbor tunnel call for the demolition of the Old Colony Bridge. Although the Massachusetts Highway Department would like to see the bridge saved and has advertised publicly for proposals, no plans have been made.

The optimal solution to this dilemma would be to keep the bridge, reinforce the foundation, and then stabilize the structure so that it can continue to carry rail traffic. Some funding may be available through the National Historic Bridge Act, as well as through the enhancement provisions of the Intermodal Surface Transportation Efficiency Act of 1991. Currently, a local preservation group called the Rolling Bridge Initiative, started by designer Michael Tyrrell, is aiming to preserve the bridge with new sources of funding, such as corporate donations.

The Old Colony Bridge has a rich history. Walking through the massive, offset counterweights on foot and seeing the city framed beyond is a powerful visual experience. The bridge is a symbol of our transportation heritage, an inspiration for artists, and a memorable landmark. To destroy the bridge now would be a regrettable loss for Boston and its people.—*Peter Vanderwarker*

Peter Vanderwarker, Hon. AIA, is a Boston-based photographer who is documenting the Central Artery Project.

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Houston's Zoning Battle

A city ordinance must be developed to harness sprawl while nurturing urban life.

BOTTOM: Downtown Houston skyline reveals effects of 1980s building boom.

Third time's the charm, unless the issue is zoning for Houston. In November 1993, voters rejected comprehensive zoning for the third time in the last 45 years. The margin was slimmer than before—52 percent to 48 percent—but the situation remains the same. Houston is still the only unzoned major city in America, the unchallenged capital of cowboy capitalism where residents believe that sprawl is okay and that nothing bad ever happens from growth. "It's our special advantage over all cities," boasts anti-zoning activist Barry Klein. "We're the only free city in the country."

That's a classic example of Houston thinking. No zoning means no controls, and no controls means more business. It's a specious argument that ignores the dramatic economic success of zoned cities—neighboring Dallas among them—and also glosses over Houston's own urban problems.

During the 1970s and early 1980s, Houston grew by 10,000 residents a month, 48 percent in a single decade. Skyscrapers and shopping centers popped up like mushrooms after a rain, along with fight-a-night bars next to townhouses and sex shops around the corner from schools. The appeal of exotic diversity waned as the spaces in between these enclaves grew bleaker.

By the mid-1980s, many residents recognized that Houston needed some form of land-use control. The question was which one. The city passed dozens of special ordinances regulating everything from shrubs to sex shops. But they weren't enough. Neither were deed restrictions, the principal tools for land-use control. Only half of Houston's neighborhoods have them, and only the wealthiest could afford to enforce them.

So zoning became the strategy of choice, and "protecting neighborhoods" the rationale for the recent zoning campaign. Unfortunately, the neighborhood groups never developed broad support for their cause, leaving themselves vulnerable to charges of elitism, racism, and economic imperialism. A leaflet distributed by Barry Klein's Houston Property Rights Association, for example, claimed that zoning would encourage harassment of African-Americans "when driving through zoned white neighborhoods" and "would make apartments illegal so poor people can't find places to live."

Instead of attacking these bogus claims, the neighborhood groups repeated the litany of their own problems, talking abstractly about the rosy future of Houston with zoning. This didn't sit well with African-Americans and other minorities, who wanted to use their property as an economic investment in a variety of ways. To them zoning looked like a way of legitimizing the status quo, and they voted overwhelmingly against it. "We did

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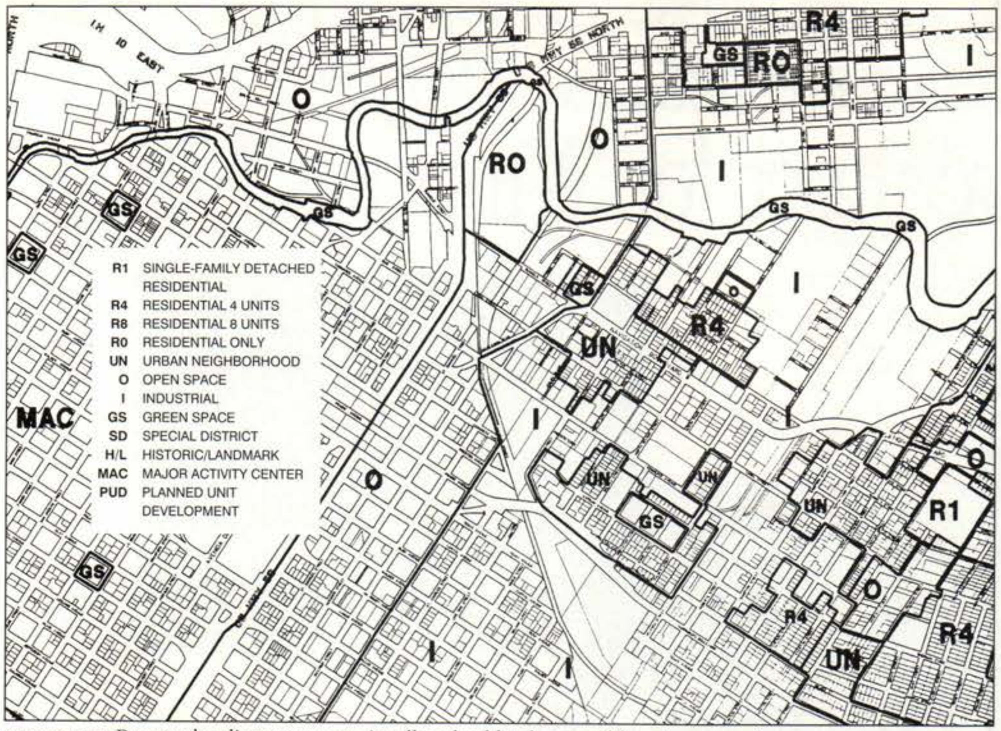

ZONING MAP: Proposed ordinance conventionally solved land-use problems by separating uses.

not pay as much attention to the political side of things as we should have," admits city councilman Jim Greenwood, who led the zoning fight for the past three years.

Overall, the battle over zoning was messy, divisive, and frequently irrational. Mayor Bob Lanier supported zoning, but only at the last minute, while all of his closest political allies lobbied against it. Architects initially embraced zoning, then cooled when the issue became detached from a comprehensive planning effort that was required by Texas law. "We were going to end up with a second-rate ordinance and no planning, the worst of both worlds," says architect Frank Kelly, who campaigned against zoning on behalf of Citizens for a Better Houston.

That "no planning" objection sounds more sensible than it really is. Zoning is still the basic legal tool for planning in Texas. Without it, planning is not going very far. What has been lost is an opportunity for this sprawling, Balkanized city to come together and forge a vision for the future. Nobody expected zoning to solve all of Houston's problems, but it could have established a broad common ground where whites and minorities, professionals and blue-collar workers, and neighborhoods and city government could have started building a city together. Instead, the zoning battle has produced more cynicism and fragmentation, and no solutions.

Despite all the hype about innovative "Houston-style zoning," with performance criteria substituted for the familiar checklist of "Thou Shalt Nots," the proposed 1993 ordinance turned out to be just another conventional document, in which land-use problems are solved by separating uses. It recommended nine base zoning districts: four residential; three commercial; one industrial; and a district for greenbelts, parks, and other open spaces. Yet, except for tattoo parlors, package stores, and adult businesses, all old uses were grandfathered. Zoned Houston was going to look remarkably similar to unzoned Houston, a message that zoning advocates kept repeating in hopes of allaying public anxiety. Instead, intelligent voters began asking themselves, "If zoning isn't going to change things, why do we need it?"

As the last major American city without zoning, Houston had an historic opportunity, a responsibility even, to produce something bold and provocative. To encourage new uses and remix old ones; to integrate transit, housing, and open space. Instead, it settled for the same tired formulas. The Open or "O Zone," covering 225 square miles, has few restrictions and was clearly created to appease big developers, who weren't frequently opposed to zoning anyway. Zoning for the Major Activity Centers (MACs) offered little more than setback formulas.

"It was a milquetoast document," claims architect William Stern. "It included a few good things for neighborhoods with marginal deed restrictions, but it was terrible beyond that." But even if the ordinance had been divinely inspired, it's questionable whether

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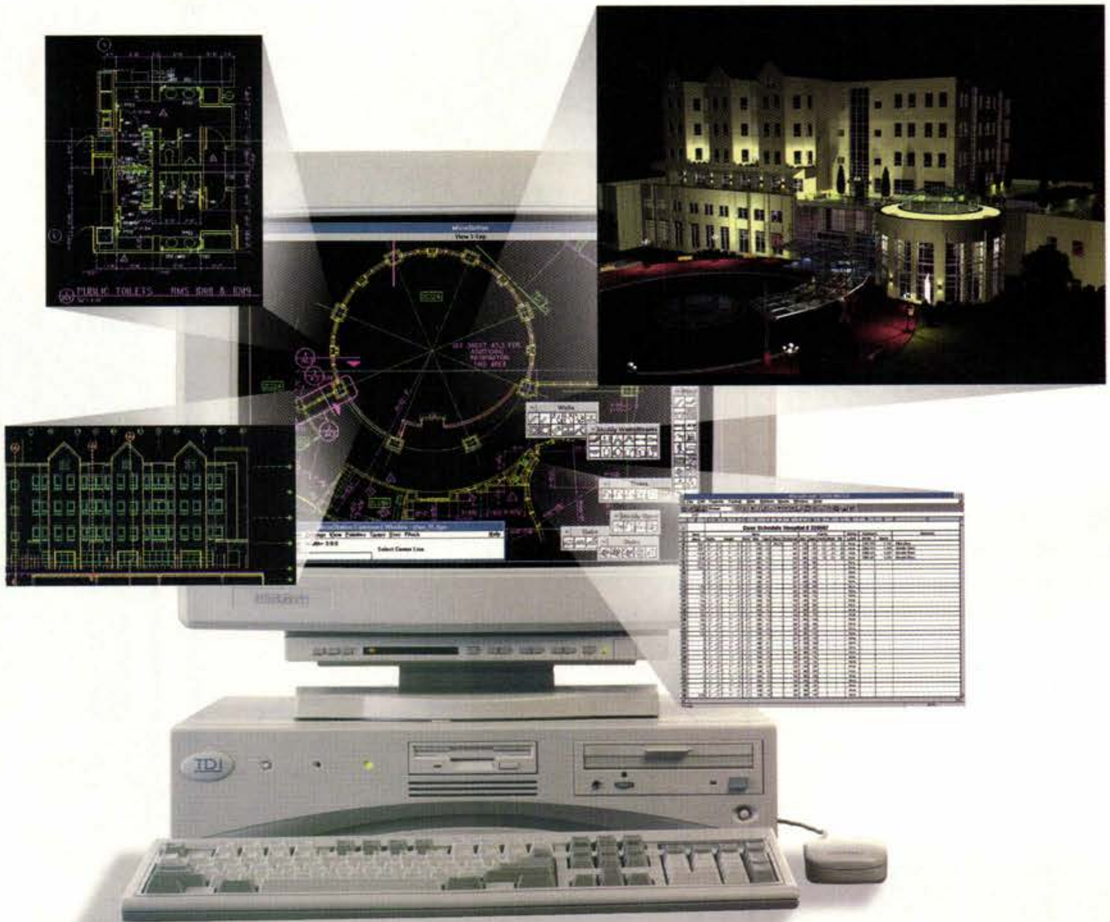

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blanket zoning was the right approach for a city of 579 square miles, with fluid boundaries and an entrepreneurial soul. Creating smaller planning districts, each with its own identity, would have made more sense and been more consistent with the city's laissez-faire past. The Houston ordinance was prepared by committee, then turned over to city hall technocrats, who, in hopes of getting it passed quickly, made it dry, knotty, and visionless.

This zoning-by-committee played right into the conspiratorial rhetoric of Barry Klein, who persuaded many people that a zoning mafia was about to impose draconian restrictions on their property, without consulting them. He also drafted an amendment to the city charter, approved overwhelmingly on January 15, requiring that any future zoning proposals be subject to a binding referendum and enacted only after a six-month review period. "If the November vote buried zoning six feet under, the charter vote in January buried it 10 feet," says University of Houston law professor John Mixon.

Not everyone is quite so pessimistic, however. Some zoning advocates point to the low turnout (19 percent) and the closeness of last November's vote and vow to be back in three to five years. Moreover, despite rejecting zoning again, Houston is clearly not the city it was 20 years ago, when half a dozen people called most of the shots. It was a banker's and oil tycoon's town then. Today, power is more evenly distributed among lawyers, academics, and CEOs, many of them recent immigrants with different ideas about how cities should operate. Various public opinion polls show that Houston is rethinking its go-for-broke development philosophy of the 1970s and early 1980s.

But if the close November vote suggested the awareness of a new era in Houston, it also demonstrated that no one is quite sure what that new era will demand. Houston's proposed zoning ordinance basically legitimized the status quo; it protected some neighborhoods and big developers and ignored everything else. The critics who said, "Why bother?" were right.

Houston's challenge is to channel its energy and inventiveness into an ordinance that not only protects neighborhoods but also nurtures new forms of urban life: combinations of commercial and institutional development in the vast O Zone; a broader range of housing; and more rational use of public transit. To do that, zoning advocates will need to behave more like Ross Perot than Michael Dukakis.—*David Dillon*

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Flexible Laboratories

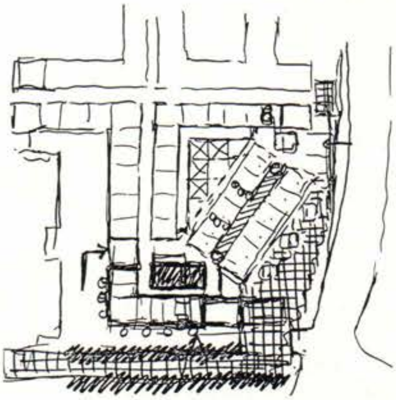
Adaptable workspaces encourage research scientists to shape their workspaces.

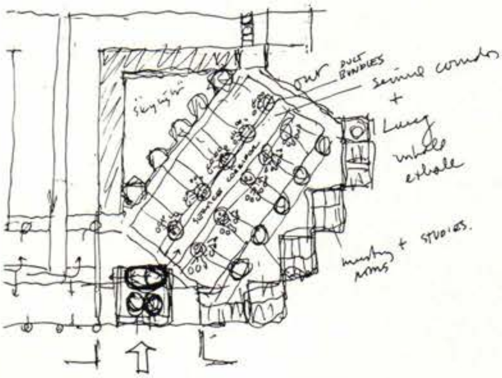
BELOW: David Rinehart's conceptual sketches for UCLA's Molecular Sciences Building reveal clustered ductwork that serves as the building's "lungs."

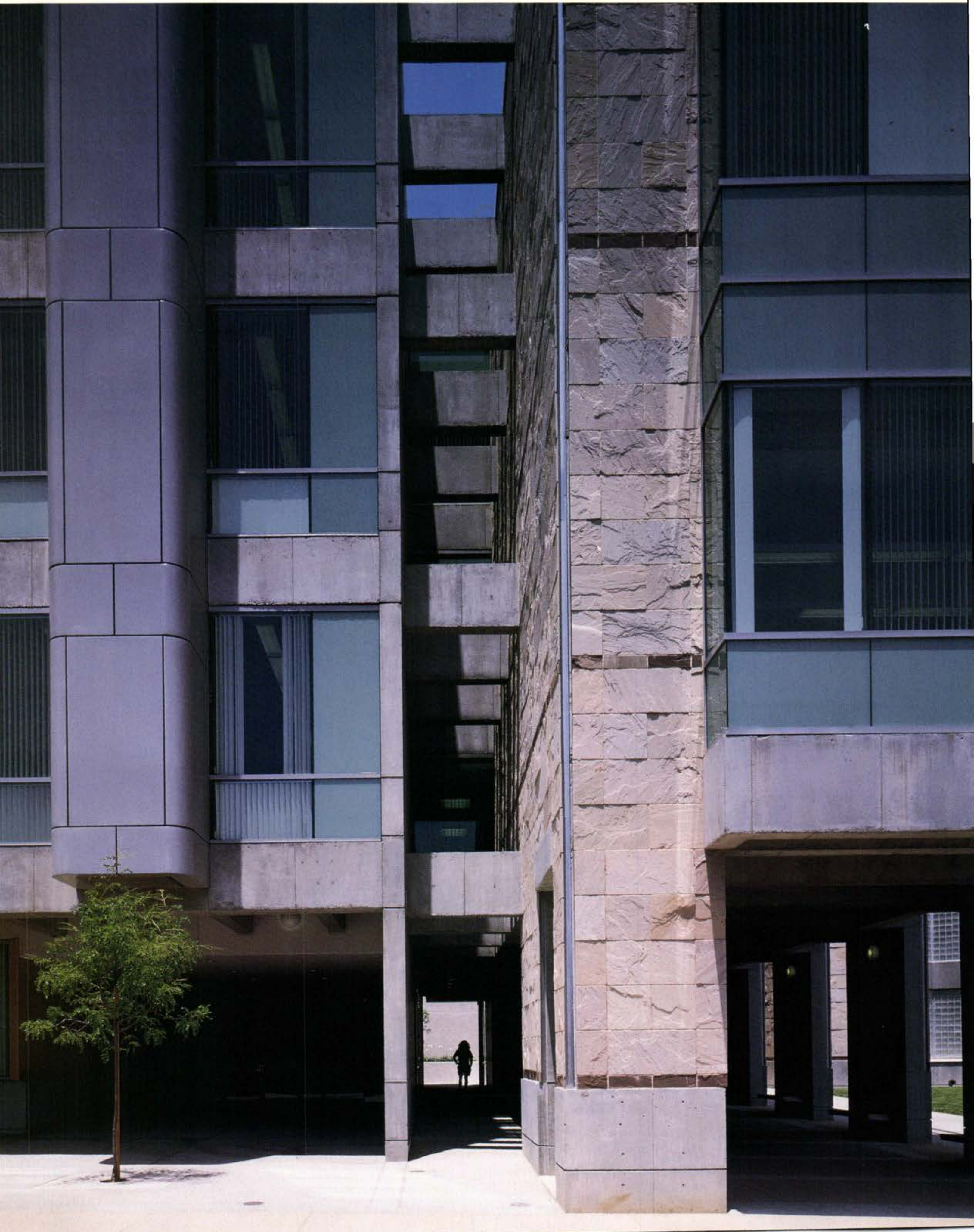
Architects designing laboratories today still look to Louis Kahn's prototypes—the Richards Medical Research Building (1964) and Salk Institute (1965)—for inspiration. Although Kahn's Richards complex, with its clear divisions of "served" and "servant" spaces, offers a model of spatial efficiency, the building proved to be a functional disaster. The Salk Institute, on the other hand, is still revered by its occupants. Kahn's emphasis on natural light—both in laboratories and communal spaces—is uplifting, and the Salk's flexible laboratories, with their interstitial mechanical floors, continue to be adaptable to the needs of today's scientists. Anshen + Allen Principal David Rinehart points out that, in the 30 years since he worked with Kahn on the Salk, the average size of a scientist's workbench has grown to accommodate today's more high-tech instruments. "A scientist's work changes over time, and so do the scientists who occupy the space," notes Rinehart, the architect of the Molecular Sciences Building at UCLA. He adds that one of the reasons the Salk is so highly successful for its occupants is that Kahn's scheme became "more general rather than more specific."

The laboratories in this issue indeed reflect the lessons of Kahn, albeit with improvements. Anshen + Allen relegated the mechanical systems to ducts on the outside of the UCLA building, like the Richards, allocating more space to the labs within. Zimmer Gunsul Frasca Partnership's Fred Hutchinson Cancer Research Center, like the Salk, incorporates interstitial mechanical floors; and The Hillier Group's Princeton Materials Institute is daylit by an atrium that encourages scientists to congregate for informal discussions. At the new Center for Biotechnology and Bioengineering by Bohlin Cywinski Jackson, daylit stairwells, like the Salk's open-air stairways, encourage casual meetings among scientists.

All these buildings offer generic, modular laboratories, wherein scientists can shape their own work environments. While these adaptable spaces accommodate state-of-the-art equipment, they are also flexible enough to meet the evolving needs of science for decades to come.







architectural expression appropriate to its function on the gateway facade of the building. Each part was then systematically integrated within a clearly expressed, free-span concrete structure. The result is a building designed as a body of systemized parts ordered within a clear formal hierarchy and structural frame. "The intent was to get a well-integrated design between the utility systems and the structure of the building," explains Principal David Rinehart.

The choice of materials was based on performance and the ability to create a sense of place. Different materials effectively code the separate parts. The structure was cast in concrete, and the air handling system was built of metal. Green glass was chosen for the enclosure, and fritted glass selected as a sunscreen to cut glare. Sandstone was applied to clad the wall surfaces, avoiding the nondescript brick so frequently employed at UCLA.

Anshen + Allen created a classic systems building, but not one reduced to a forced simplicity: The architects let systems proliferate as necessary, acknowledging the complexity of a difficult program. Unlike the nearby MacDonald Medical Research Laboratories by Venturi, Scott Brown and Payette Associates, where the facade unexpectedly contradicts its own regularity to leap as an arch over a walkway, Anshen + Allen's design is complex without contradiction. All parts behave within a strict set of rules.

To humanize the introverted typology of research labs, the architects open the circulation system to the out-of-doors with an exposed stairwell and an open-air corridor that rings the chemistry labs. A hall down the spine of the chemistry wing serves as a sanitary service corridor that isolates potentially dangerous materials. Students and teachers will eventually occupy the outdoor corridors as streets, bringing out their chairs and desks.

Frequently, in laboratories, the systems do not quite add up to architecture, but Anshen + Allen consciously addressed the possibility of this shortfall by trying to transcend the parts. The lightness of the research building's facades succeeds in distinguishing the structure on campus and imparting a certain urbanity. A technological message emanates from the steel plenums and stacks, which acknowledge the high-tech character of the building without gratuitous display.

Anshen + Allen's design achieves clarity and presence in an architectural orchestration that is far greater than the sum of its systems. Within a program of constraints, they found room for grace.—*Joseph Giovannini*

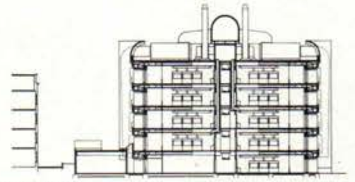
FACING PAGE: Aluminum-clad biology laboratories (left) are separated from sandstone-clad administrative offices (right) by a deep architectural reveal. **BELOW:** Spatially rich southern facade, housing biology labs, fronts street that will form main axis into campus. **BOTTOM:** Administrative offices at the end of each lab block are joined by a monumental concrete staircase. **FOLLOWING PAGES:** Ducts are boldly expressed on the chemistry wing, which is ringed by exterior corridors.


EXIT

PREVIOUS PAGES: Concrete stairwell forms knuckle between two lab wings.
BELOW: Exterior corridor of chemistry wing encourages outdoor research.
BOTTOM: Chemistry labs are lined with banks of fume hoods.
FACING PAGE: Interior courtyard contains structure that houses nuclear magnetic resonance equipment.
SECTION: Chemistry wing is divided by perimeter and central corridors.
PLANS: Building comprises biology wing (left) and chemistry wing (right).

MOLECULAR SCIENCES BUILDING
UNIVERSITY OF CALIFORNIA, LOS ANGELES
LOS ANGELES, CALIFORNIA

ARCHITECT: Anshen + Allen, Los Angeles—Jack MacAllister (principal-in-charge); David Rinehart (principal-in-charge-of-design); Thomas Chessum (project architect); Tony Moretti, Andy Labov (design team)
LANDSCAPE ARCHITECT: Rios Pearson
ENGINEERS: Ove Arup & Partners (structural/mechanical/electrical); Rogoway/Borkovetz Associates (civil)
CONSULTANTS: McLellan & Copenhagen (lab); Hanscomb Associates (cost); Warren Blazer Associates (acoustics); Rolf Jensen & Associates (code); Lerch, Bates & Associates (elevator)
GENERAL CONTRACTOR: Robert E. McKee
COST: \$37.8 million
PHOTOGRAPHER: Timothy Hursley



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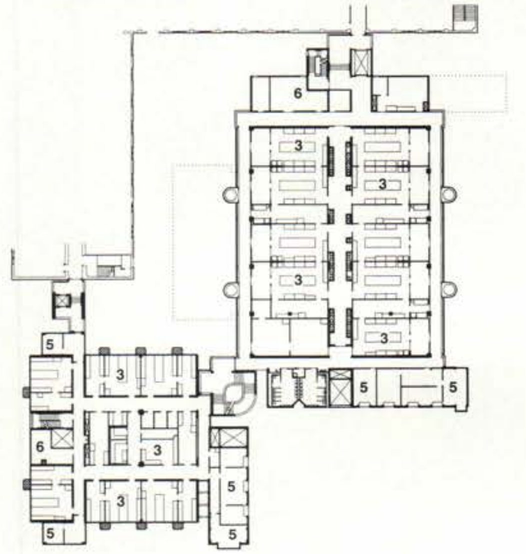

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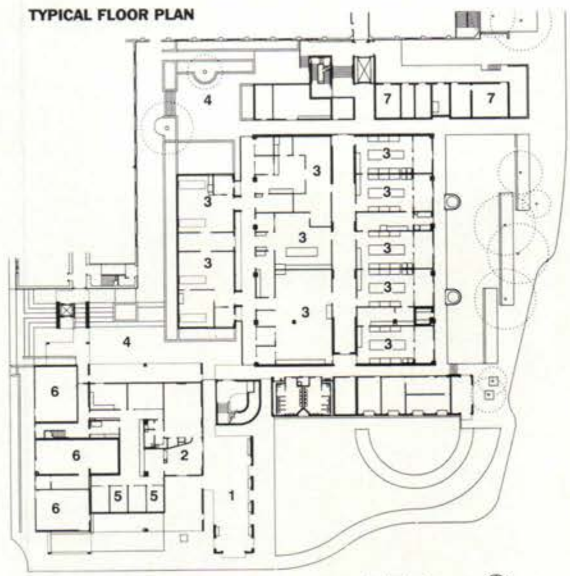

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7 STORAGE

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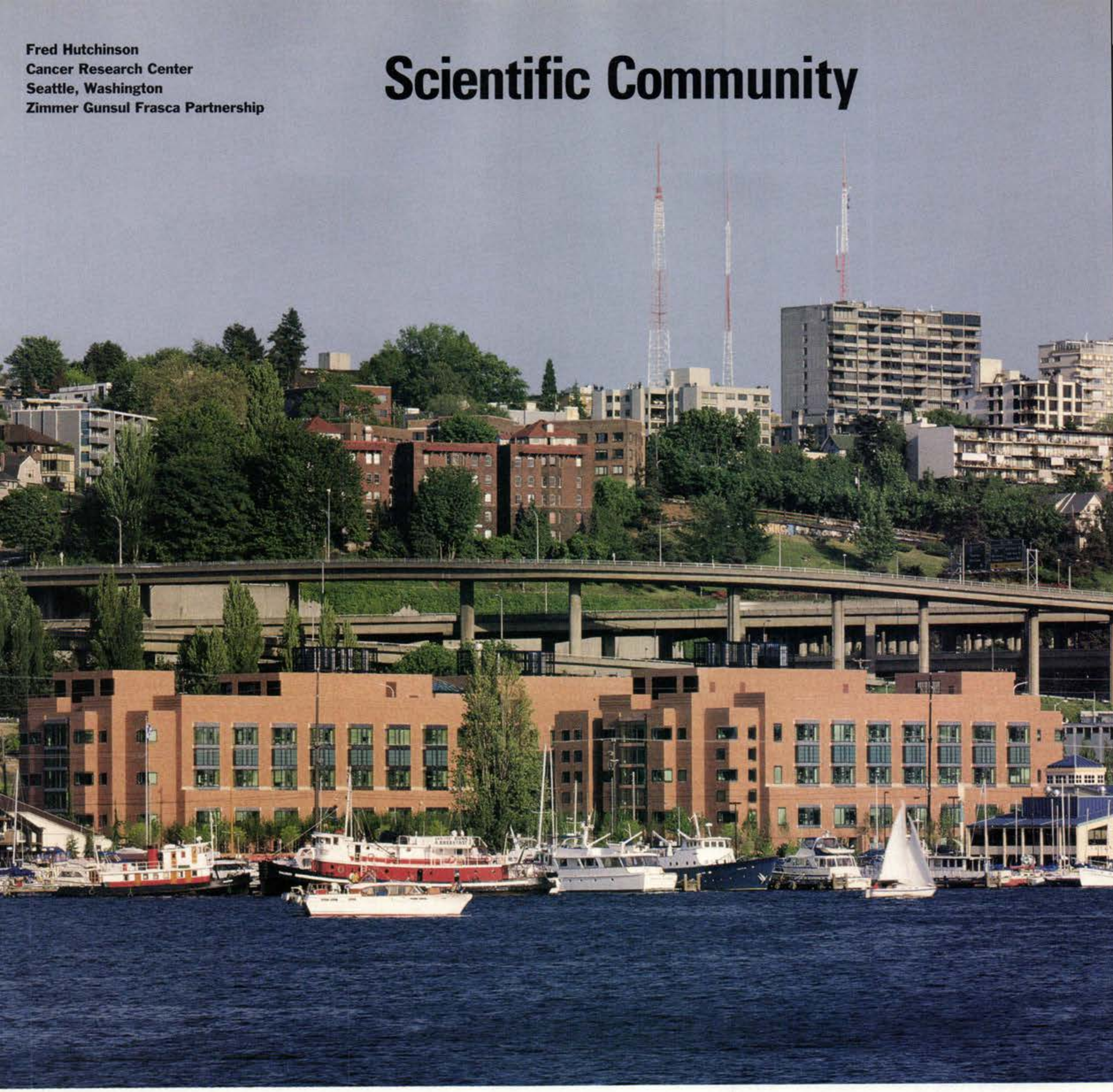
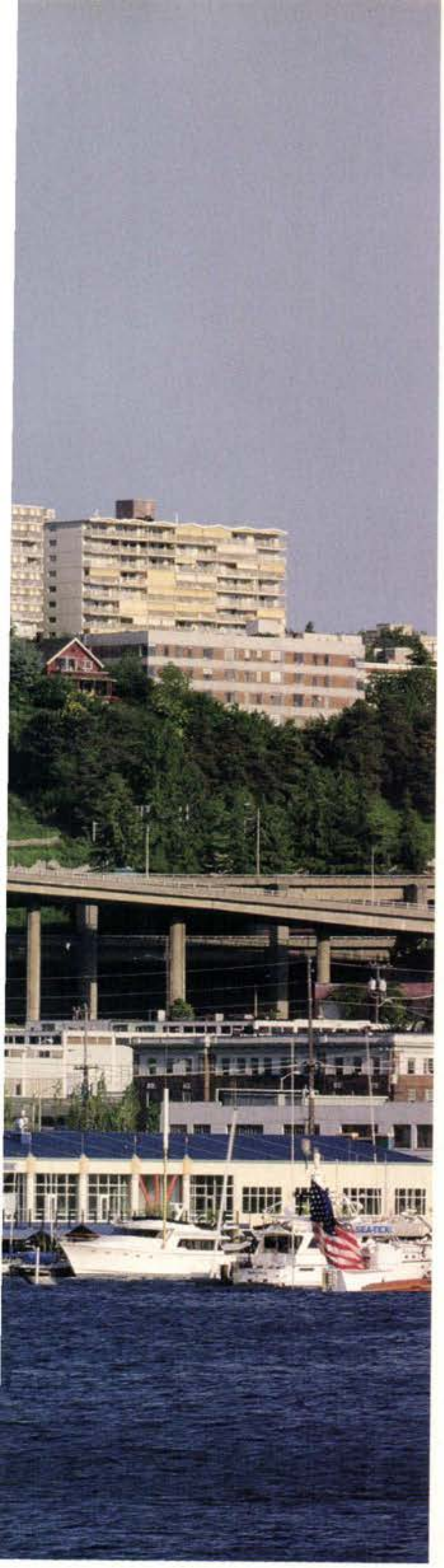
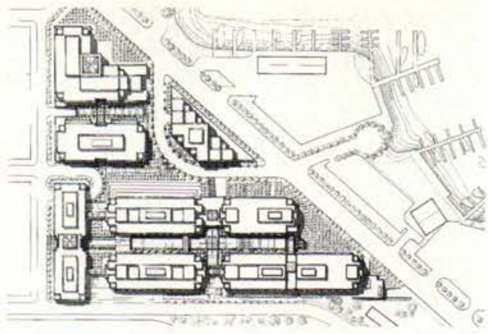
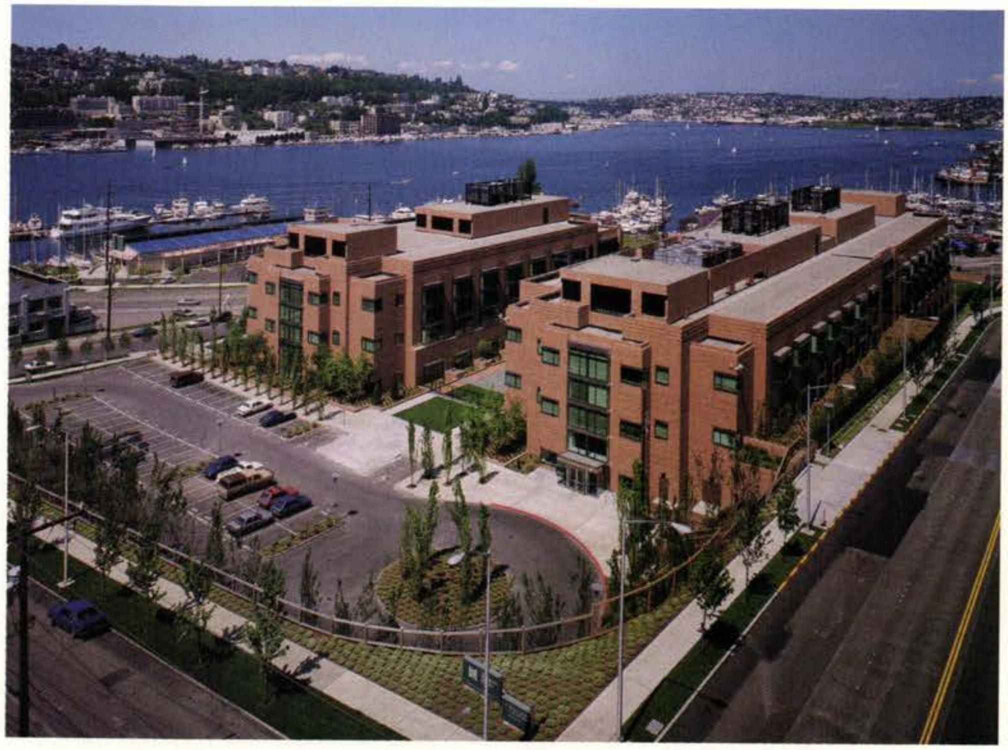
Seattle, Washington
Zimmer Gunsul Frasca Partnership

Scientific Community









ABOVE: New Basic Sciences Building anchors foot of Seattle's Capitol Hill in evolving waterfront neighborhood.
SITE PLAN: ZGF's master plan shows completed basic sciences division (bottom right) and future buildings, which will house clinical research (bottom left) and public health sciences (top).
ABOVE RIGHT: The cancer center is being developed in three phases on a 10.3-acre site overlooking Seattle's Lake Union. The complex will expand over the parking lot to the south.

Inside and out, the first building on the new grounds of the Fred Hutchinson Cancer Research Center looks deceptively simple. Designed by the Seattle office of Zimmer Gunsul Frasca Partnership (ZGF), the building sits quietly at the foot of Seattle's Capitol Hill, commanding the breadth of Lake Union over the masts of schooners and sailboats docked at the water's edge. The researchers who work here, however, have little time to admire the view. Since the center's founding in 1975, its scientists have pioneered the war against cancer; and to further that herculean struggle, the center's new building harbors an interstitial core that is as well equipped, technologically advanced, and streamlined as the latest battleship.

Scientists at the center decided to construct a new complex of buildings eight years ago, when it became clear that zoning complications affecting their downtown Seattle site would hinder future growth. But instead of abandoning the city for the surrounding suburbs, the institution acquired a 10.3-acre site along Seattle's evolving Lake Union waterfront. The neighborhood is diverse, a shabby but picturesque collage of modest houses and industrial buildings located between the University of Washington campus and Seattle's central business district. The sweep of the lake is the neighborhood's forecourt; the elongated, hillside ramp of a freeway plunders its heart.

On a triangular parcel flanked by the waterway to the north and the freeway to the south, ZGF devised a campuslike master plan to house the center's three primary divisions: basic sciences, clinical research, and public health sciences. The architects envision the campus as a dense scientific community, where chance meetings outdoors might lead to enlightening discussions. Although the master plan is subject to ongoing refinement, the Basic Sciences Building is now complete, with construction documents underway for the clinical research division to the south.

ZGF initially proposed a campus of bar-shaped buildings constructed in massive steps from the lakefront road to the top of the hill. This parti was obvious, but proved too expensive. To cut costs, the architects reoriented the buildings to the grid of streets that extends south. "We avoided the Corbusian vision of a tabula rasa," notes ZGF Principal Robert Frasca, "and tied the project into the existing infrastructure." As a result, the discrete rectangular volumes of the newly completed Basic Sciences Building face the main road and lakeshore at an angle. Given the center's primacy in Seattle, one would expect its compound to present a monumental facade to the city, in this case a grand, memorable backdrop to the drama of the waterfront. Most disappointing, therefore, is the treatment of the residual space between the building and the main street's edge as a loading dock and an inaccessible bosque.

The architects' massing of the Basic Sciences Building inevitably, if unfairly, invites comparison with Kahn's Salk Institute. Like Kahn, ZGF divides the building into a pair of linear volumes separated by a courtyard. As at Salk, the center's courtyard is directed to the water, but here the relationship between the architecture and the site is neither as poignant nor as elemental. Because of Seattle's rainy climate, the architects join the pair of Basic Sciences buildings at the second level by a steel-supported, glass-enclosed bridge. This bridge virtually encloses the courtyard at the lakefront end, emphasizing the view toward the parking lot; without the bridge, the exterior volume of space would run unimpeded toward the water, and the grassy parterre between the buildings might appear from a distance to drop off like a bluff.

ZGF was asked to design the building from the inside out, on a budget that subordinates external architectural subtleties to practical internal demands. The architects nonetheless achieve a resolved and dignified image for the center: The building's concrete frame is

TOP LEFT: Bosque of birch trees defines edge of main road.
ABOVE LEFT: San Francisco-based landscape architect Peter Walker articulated courtyard with grass parterres and gravel paths.
ABOVE: Steel-supported bridge connects Basic Sciences' East Building (right) with West Building (left) at second level. Courtyard encourages interaction among staff.

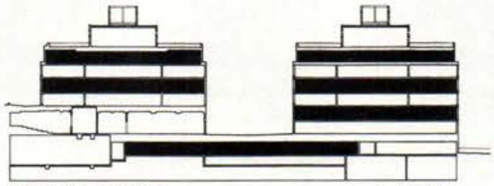
sheathed in a tailored brick facade, punctuated by steel-framed bay windows and modestly adorned with stainless steel spandrels. The elegant effect of the whole is decidedly characteristic of ZGF's work but rather surprising, given that over half of the project budget was spent on mechanical systems.

The most valid comparison between the Hutchinson Cancer Research Center and the Salk Institute lies in the great mechanics of ZGF's interior. Kahn's interstitial design was a model for Frasca, who incorporated a fully accessible, walk-through mechanical floor above each of the Basic Sciences Building's three laboratory floors. This arrangement will allow the center to renovate its new laboratories for less than half the cost of altering those in a conventional building. Most importantly, the relocation of lights, ducts, and fire systems in the new building requires negligible disruption to ongoing research.

The center's new laboratories are distinguished from those at other research institutions not only by their adaptable character, but also by their careful integration into an efficient, machinelike system of offices, support spaces, and equipment rooms. On each of the laboratory floors, the architects cluster offices at each corner of the building, at the end of two long, parallel, double-loaded corridors. These corridors extend north-south, from a window onto the lake toward another onto the city; recessed doors open on one side to a central zone of support spaces, and on the other to laboratories at the perimeter of the Basic Sciences Building.

According to Dr. Paul Neiman, director of the basic sciences division, the center's laboratories are "conducive to long hours of research," referring to the daylight and water views that permeate the work areas through broad bay windows. Indeed, this is the strength of the architects' design; and in this neutral, even stark, interior, the waterfront and distant hills remain ever present as one moves through the building's upper floors.

TOP LEFT: Laboratories overlook Lake Union through bay windows.
ABOVE LEFT: ZGF clustered offices and common areas at each corner of the Basic Sciences Building.
ABOVE: Brick planters at edge of courtyard double as seating. Stainless steel spandrels adorn windows.

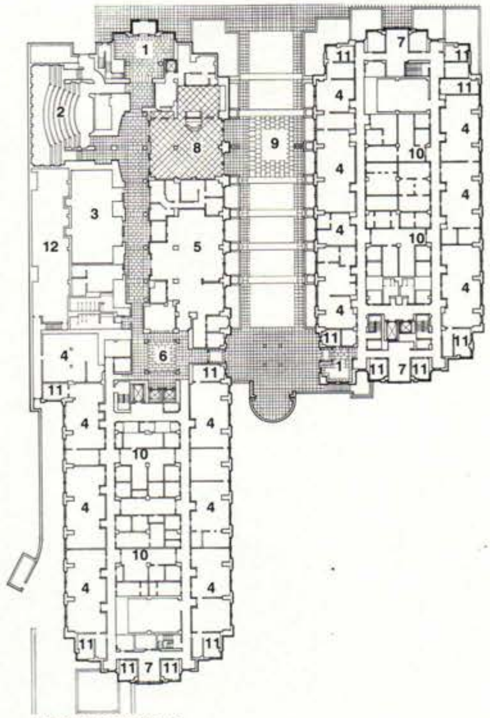


EAST-WEST SECTION 20'/6m

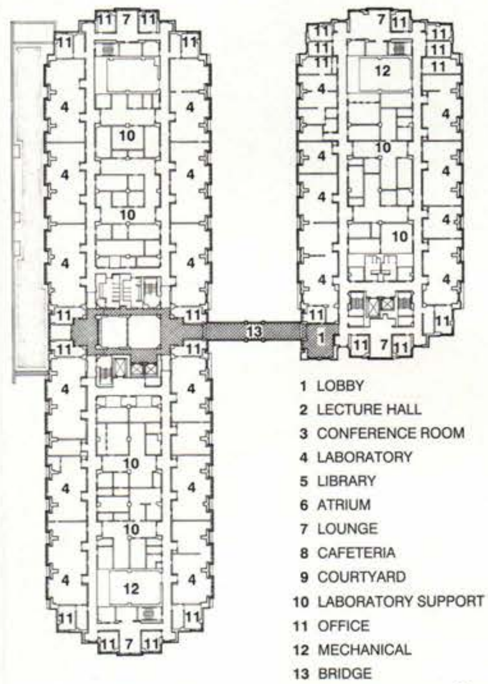
J. F. HOUSEL

FRED HUTCHINSON CANCER RESEARCH CENTER SEATTLE, WASHINGTON

ARCHITECT: Zimmer Gunsul Frasca Partnership, Seattle—Daniel Huberty (partner-in-charge); Robert Frasca (principal designer); Larry Bruton (technical design partner); Greg Baldwin (principal planner); Jack Cornwall (project manager); Dave Neal (project architect); Paul Engels (senior designer); Brooks Gunsul, Steve Adams, Bill Auld, Sean Canady, Jan Eckelman, Carl Freeze, Juli Hughes, Kim Jennings, Lloyd Lindley, Bertha Martinez, Craig Norman, Michele Sainte-Starbuck, Todd Stine, John Thompson, Sandy Tobkin, Peter van der Meulen, Bob Zimmerman (design team)
LANDSCAPE ARCHITECT: Jones & Jones
ENGINEERS: Affiliated Engineers (mechanical/electrical); KPFF Consulting Engineers (structural/civil)
CONSULTANTS: McLellan & Copenhagen (laboratory planning); Engineering Consultants (fire control); COM Group (telecommunications); Hornall Anderson Design (graphics); Towne, Richards & Chaudiere (acoustics/vibration control); The Hysen Group (food service); Lerch Bates Hospital Group (elevators)
GENERAL CONTRACTOR: Baugh/Koll Joint Venture
COST: Withheld at owner's request
PHOTOGRAPHER: Strode Eckert Photographic, except as noted



FIRST FLOOR PLAN



SECOND FLOOR PLAN 20'/6m

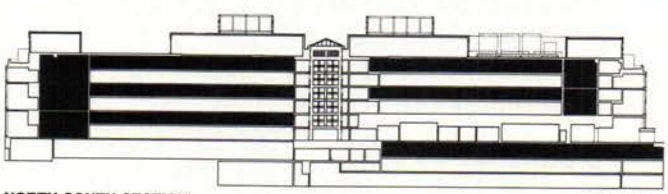
The layout of the Basic Sciences Building is not merely economical: The studied density of offices, laboratories, and support areas, for example, and even the size of the typical floorplate—20,000 square feet—are designed to ensure interaction among the center's staff. "Scientists don't call each other and say, 'Let's get together and talk about this,'" affirms Guy Ott, the center's vice president of operations and facilities. "Discoveries are made in casual conversation, when researchers bump into each other in the public spaces of the building."

With the idea of interaction in mind, ZGF attempts to integrate the laboratory floors in section by connecting them with a central, six-level-high atrium. This room is the most ambitious and impressive public space of the building, but the least successful. In concept, the atrium is a fishbowl, allowing colleagues who work on different floors to spot each other and meet in one of the glass-enclosed conference rooms or lounges grouped around its perimeter. For this concept to work, the atrium needs an invitation to spontaneous discourse, in this case, a grand stair. By Frasca's own admission, however, it is tricky to meet stringent fire codes in Seattle; and forced by the reality of code and budget, he enclosed the fire stair at the atrium's corner. The rooms around the atrium, too, are cut off from the noise and action of the place, reducing the potential crossroads of the building to an elegant but lifeless void.

Despite the drawback of the atrium, the Basic Sciences Building is a viable prototype for future buildings on the site. In time, the courtyard will double in length and culminate in another atrium, terminating the axis to the lake. Even better, surface parking to the south will disappear underground. Lauding ZGF's logical and economical approach, Dr. Robert Day, the center's director, notes: "The architects gave us an identity. For the first time, our cancer center has a discernable presence in Seattle."—*M. Lindsay Bierman*

TIMOTHY HURSLEY

FACING PAGE, TOP RIGHT: ZGF incorporated an accessible mechanical floor between each laboratory level.
PLANS: Employees enter southeast corner (left plan, top). Cafeteria opens onto courtyard (left plan). Laboratories and offices flank perimeter.
SECTIONS: ZGF designed six-level-high atrium to encourage interaction among research scientists.
ABOVE: Glass-enclosed, beech-framed lounges and conference rooms overlook slate-floored atrium.



NORTH-SOUTH SECTION

20'/6m

Center for Biotechnology and Bioengineering
Pittsburgh, Pennsylvania
Bohlin Cywinski Jackson, Architect

Academy of Steel

BELOW: Biotech center anchors east end of six-building complex; second phase is now under construction.
BOTTOM RIGHT: Rugged qualities of building recall steel-manufacturing heritage of Pittsburgh.
FACING PAGE: Bohlin Cywinski Jackson rotated corrugated-steel volumes away from center's orthogonal grid toward city views. Extended framework (left) hints at future connections to other buildings in technology park.
FACING PAGE, DRAWING: Sketch of site section shows relationship between building and topography.

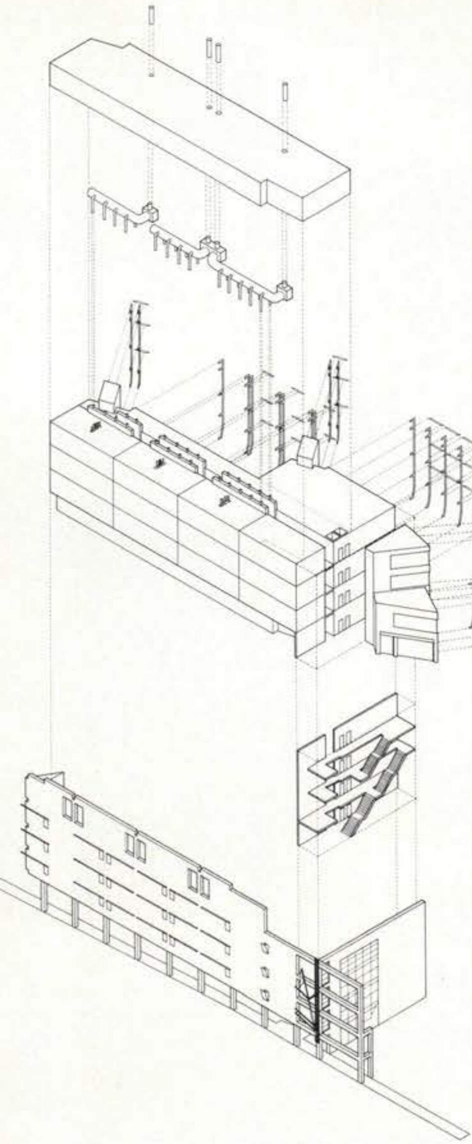
Rising from the mammoth ruins of the steel industry that built this city-in-the-hills is Pittsburgh's latest symbol of recovery from a dependence on Rust Belt economics. The University of Pittsburgh Center for Biotechnology and Bioengineering, designed by Bohlin Cywinski Jackson, tightly interweaves laboratory suites and offices for researchers exploring new medical technologies. The 90,000-square-foot building nods to the blue-collar legacy of its site while setting the stage for a new generation of technology-driven development along the banks of the Monongahela River.

The first of six buildings planned for the 25-acre Pittsburgh Technology Center—a joint venture of the University of Pittsburgh, Carnegie Mellon University, and the Commonwealth of Pennsylvania—the biotechnology facility shoulders the city's hopes for a surge in economic growth based on the strengths of its universities. Strict site guidelines governed the location of the biotech center, which respects a "build-to-plane" along which all primary facades must be constructed. The architects accepted the constraint of a north-facing plane almost to the letter, producing a taut, steel-paneled facade with few windows. A ground-level colonnade establishes a pedestrian spine that will someday link all six buildings.

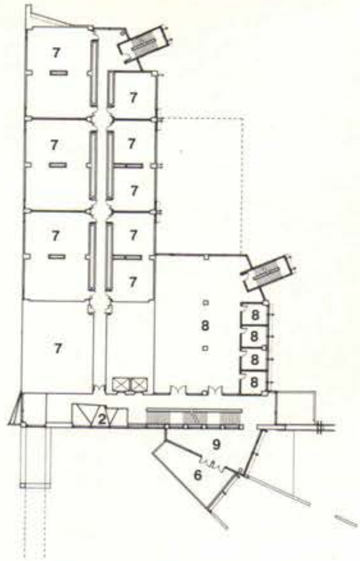
Several proposals for the site had been considered since the demolition of the old Jones and Laughlin Steel Company rolling mills in the mid-1980s. The final master plan calls for hedgerows composed of shade trees that will separate the buildings and divide the park into outdoor rooms. Bohlin Cywinski Jackson used the proximity of one of the natural walls as both an opportunity to screen the service entry of the center and an inspiration for an expressive steel-and-glass wall that slices the building's west facade.

A tight program and idiosyncratic site drove the center's design. First, the old mill's massive foundations and sluiceways limited

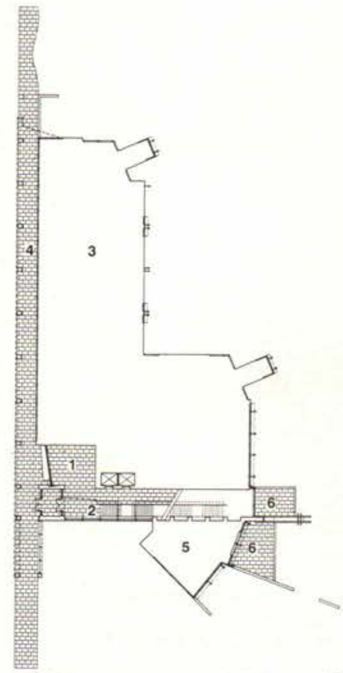

sun
north light
city/river views
hedgerow views
services entry
to parking



AXONOMETRIC: Building volumes are arranged off planar public facade.
TOP RIGHT: Metal-clad river facade draws inspiration from steel mills.
BOTTOM LEFT: Long eyebrows, grilles, and colonnade punctuate planar facade.
BOTTOM RIGHT: Smooth and corrugated-steel panels dovetail on east facade.
FACING PAGE, BOTTOM LEFT: Stair towers thrust outward from boxlike volume.
FACING PAGE, BOTTOM RIGHT: South-facing offices are screened by steel-supported shades that add depth.
PLANS: Offices are concentrated on south facade to take advantage of views. Lab flexibility was achieved by isolating air risers beside central corridor.

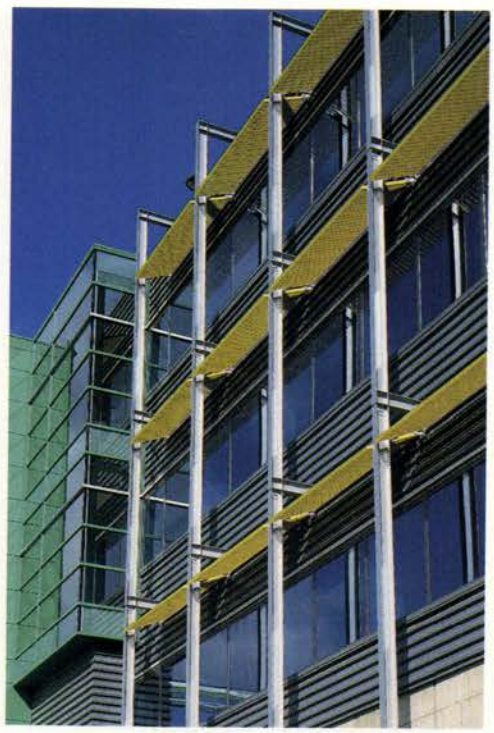


TYPICAL FLOOR PLAN



FIRST FLOOR PLAN

1 LOBBY
2 ATRIUM
3 LABORATORY SUPPORT
4 ARCADE
5 LOADING DOCK
6 TERRACE
7 LABORATORY
8 OFFICE
9 CONFERENCE ROOM



BOTTOM: Atrium is light-filled and open to dramatic views of Pittsburgh skyline and steep slopes of river valley. **FACING PAGE:** Minimally embellished stair hall borrows machine esthetic of the exterior with exposed-steel sections on balconies and crisscrossing steel bars that brace curtain wall.

how deep the new building could penetrate below grade. Then the laboratory use of the building required that air intake be located on the lower level, with rooftop exhausts to prevent recirculation of contaminated air. Last, many functions specific to the building—ranging from a vibration-free imaging facility to animal cages—were most efficiently placed at ground level. All that demand for first-floor space was a strong generator of the piano nobile concept for the building, which places public space on the second floor. Most of the 90,000-square-foot biotechnology center consists of generic laboratory space, which is being outfitted as grant proposals are funded. A modular system of 400- and 600-square-foot labs allows for ever-shifting spatial configurations.

Having met internal demands, the designers turned their attention to the envelope. On the north facade, where the fenestration is limited by labs that require solid walls for storage and equipment, elements such as decorative steel grilles add scale. The rigidity of the planar north facade gives way to a rich play of surface textures on the sides of the building open to river views, especially at the southwest corner, where two corrugated-steel wedges jut out. "Many of our buildings reveal themselves, and I think this one does that very well," remarks Peter Bohlin, partner-in-charge of design.

The center's clients were keenly interested in a facility that would express ideas of technology, and a building made of metal pieces was settled upon as the right way to satisfy that desire—particularly on the factory-laden banks of the Monongahela, where the demands of the industrial process created structures that were not so much buildings as they were machines for making steel. Any success at recapturing some of that raw beauty is to be applauded, and the center meets the challenge of its tough industrial site with enough muscle to make old Pittsburgh stand up and take notice.—*Vernon Mays*

CENTER FOR BIOTECHNOLOGY AND BIOENGINEERING PITTSBURGH, PENNSYLVANIA

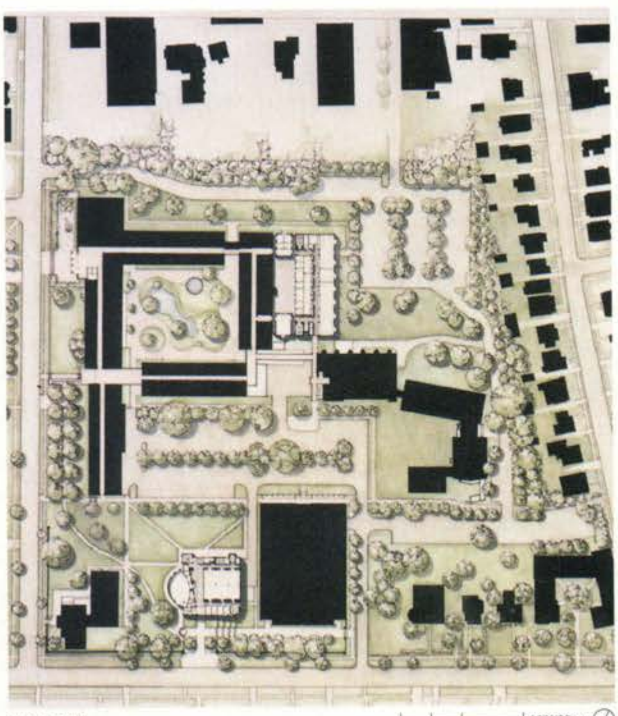
ARCHITECT: Bohlin Cywinski Jackson, Pittsburgh—Peter Q. Bohlin, Jon C. Jackson (principals-in-charge); Robert S. Pfaffmann, Charles J. Cwenar, Karl A. Backus, Lisa M. Hayes, Rene Quinlan, Jeffrey D. Wyant, Michael D. Maiese (design team)
LANDSCAPE ARCHITECT: GWSM
ENGINEERS: Dotter Engineering (structural); P.L. Frank (mechanical); Caplan Engineering Company (electrical); Hannigan Engineering (soils); BBN Laboratories (site vibration analysis)
GENERAL CONTRACTOR: TEDCO Construction Company
COST: $11.6 million
PHOTOGRAPHER: Karl A. Backus


EXIT
Corridor
Elevators

Bowen Hall
Princeton University
Princeton, New Jersey
The Hillier Group, Architect

Material Discourse

ABOVE: The entrance to Bowen Hall, housing the Princeton Materials Institute, is aligned with McKim, Mead, and White's 1913 gate, which once opened onto athletic fields.
SITE PLAN: Bowen Hall occupies a prominent site along Prospect Street, the southern entrance to the engineering quadrangle. The building is flanked by Machado and Silvetti's parking structure to the east.
FACING PAGE: A panel of ceramic tiles above Bowen Hall's main entrance provides a richly textured mosaic. Meant to recall the self-replicating patterns of fractal geometry, the mosaic also pays homage to Venturi, Scott Brown's Venetian Gothic heraldry over the entrance of Wu Hall.



SITE PLAN

Princeton University's 400-acre campus offers a field guide to American architectural history, from a 1754 progenitor of Ivy League buildings to Benjamin Latrobe's 1805 Prospect Hall to 1905 entry gates by McKim, Mead, and White. A Collegiate Gothic graduate school by Ralph Adams Cram and a perfect pair of Greek Revival temples are juxtaposed against Marcel Breuer's 1957 garden apartments and Minoru Yamasaki's 1965 Expressionistic icon for the Woodrow Wilson School of International Relations. Wu Hall and the Lewis Thomas Laboratories—1980s labs by Venturi, Scott Brown—and Machado and Silvetti's award-winning 1990 parking garage top off the 20th century.

Rather than attempting to blend in with this eclectic context, Hillier Group Principal Alan Chimacoff has produced a laboratory building that offers an abstruse yet elegant metaphor for the sciences pursued within it. The Princeton Materials Institute (PMI) is a research complex where engineers and scientists join to study the makeup of various materials to fabricate better ones. The 40,000-square-foot laboratory, called Bowen Hall, occupies a prominent site on Princeton's engineering quad, an 11-acre assemblage of 1960s-era buildings at the eastern end of the university's campus.

The quad is linked to the university's core by Prospect Street, which is lined by the famous "eating clubs"—dining halls designed by McKim, Mead, and White; Cope and Stewardson; and others. The distinction of the new building's location stems not from its immediate surroundings, but its history: The site was once a ballfield where Lou Gehrig and George Bush once played. A decorative 1913 McKim, Mead, and White gate, designed to mark the field entrance, had for 40 years enclosed a parking lot. The gate now designates the PMI and its court, a new 1-acre greensward for the campus. To the east, Machado and Silvetti's metal-screened garage provides a contemporary counterpoint.


WEN HALL

FACING PAGE: Laboratory is clad in 8-by-8-inch dark ironspot brick. Granite grid wraps offices and lounges.
BELOW: Auditorium is housed in curved volume on western facade. The complex restored an acre of green space to the campus in an area that had been a parking lot since the 1950s.
BOTTOM: Lab is expressed as aluminum-clad cube within Bowen Hall. Machado and Silvetti-designed parking garage flanks east elevation.

Chimacoff designed the five-story laboratory as a cube within a cube: An inner block of laboratories is ringed on three sides by offices to form the overall cube. This 10,000-square-foot volume is punctuated by a round stair tower at its southeast corner and a square tower at its northwest entrance, aligned with a prominent pedestrian way. On the western end, Chimacoff pushed a curved auditorium out of the cube. Inside, the east-facing laboratories are separated from the auditorium and western offices by a 40-foot-high atrium aligned north-south through the building's upper three stories.

The atrium allows PMI scientists to see one another coming and going, encouraging interaction among a group whose natural inclination is to bury into their research like rats in a hole. "I never thought you could have daylight in the middle of a building," notes geochemist Edward Vincenzi, who studies the aging of cement and other construction materials. "It really changes your mood."

The laboratories, housed in the metal-clad, inner cube, are treated as large open rooms that accommodate modular arrangements. A 12-foot floor-to-ceiling clearance, determined by zoning restrictions that limit the building's height to 60 feet, required exposing all ductwork along the laboratory ceilings. Chase walls on the north and south sides of the laboratories distribute air to a conventional mechanical system housed on the fifth floor. Two truncated metal pyramids on the roof are flues for high-velocity exhaust fans. Lounges, which are contained in the northwest tower, facilitate informal discussion among researchers. Although the labs are not daylit, offices, auditorium, and public rooms boast operable windows. On the first level, a café promises further interaction.

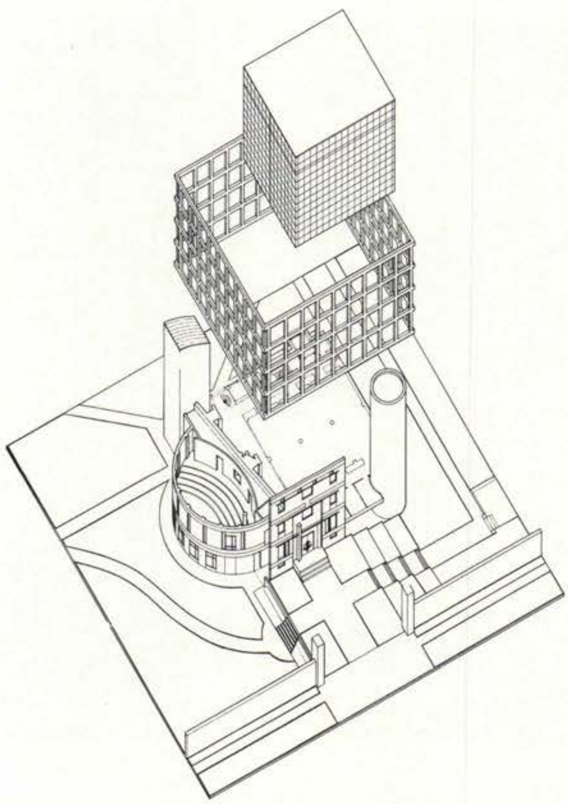
Chimacoff views his design as analogous to materials science, comparing it to silicon technology, in which neutral silicon is made useful by virtue of what is done to it. Like silicon, the building is a neutral cube, represented by a tartan grid of granite bands,

FACING PAGE: Auditorium is treated as a hemicycle on western facade. A café is located below it; the roof forms a balcony for third-story offices.
BELOW: Northwest corner entrance tower is aligned with walkway from main campus. Third and fourth floors of tower contain staff lounges.
BOTTOM: Chimacoff conceived the building as a cube of laboratories within a larger cube, articulated by a grid. Stair tower, entrance tower, and auditorium punctuate cubic volume.

brick cladding, and steel bullnoses. This grid is given character, Chimacoff says, by being "attacked," like silicon, by internal and external forces: the atrium, which breaks the grid with an angled wall; the auditorium, which pushes out a round volume; and the adjacent parking structure, to which the aluminum-clad laboratory responds.

The architect is fascinated by the work of a PMI scientist who studies clam shells, attempting to reproduce their thin but durable qualities in metal and ceramic microlaminates. Chimacoff offers a similar interchange of materials as an analogy between his building and what goes on inside it: Metal moldings are embedded in the southern facade and "disappear" into the masonry; the metal laboratory block matches the color of the granite; unusual 8-by-8-inch bricks resemble ceramic tiles. But this varied materials palette fails to enhance the simple parti of the building—a cube within a cube—and instead presents a fragmented expression to outsiders. Given the various complex sciences housed within the building, wouldn't it have made more sense to provide a unified image for a little-understood discipline?

Chimacoff's design is more successful in providing a practical space for research that accommodates changes in scientific work. While it may not exhibit the graceful inventiveness of Machado and Silvetti's steel-lattice parking structure, the PMI's massing and textured southern facade relate to the scale of Princeton's turn-of-the-century eating clubs, and its turreted form vaguely recalls the towers and steeples of Collegiate Gothic buildings. The lab's varied textures are certainly more beautiful than its featureless 1960s neighbors, and its communal spaces attract researchers from the rest of the quadrangle. Indeed, PMI chemist Vincenzi sums up the architecture when he points out, "The building is pretty bold. It would look out of place on the main campus." But he adds, "The sense of bringing scientists together through architecture, that works."—*Heidi Landecker*

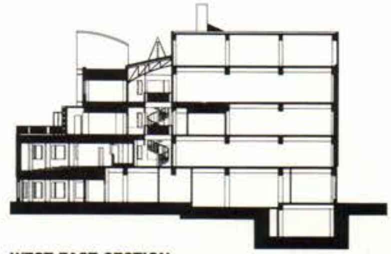


BOWEN HALL
PRINCETON UNIVERSITY
PRINCETON, NEW JERSEY

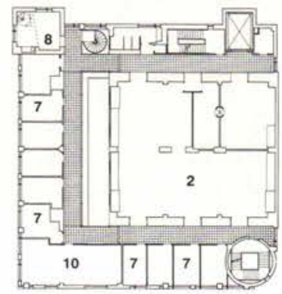
ARCHITECT: The Hillier Group, Princeton, New Jersey—Hank Abernathy (principal-in-charge); Alan Chimacoff (design principal); Abeth Slotnick (project designer); Marcia Wallach (project architect); Walter Broner (technical coordinator); Tim Hartley (production manager); Greg Moten (specifications); Hee-Young Ahn, Bob Barnett, Laura Carlson, Dan Cummings, Steve Diehl, Phil Dordai, Somsamay Homphotichak, Nancy McKendrick, Jason Ramos (project design team)

LANDSCAPE ARCHITECTS: The Hillier Group, Van Note-Harvey Associates
ENGINEERS: DiStasio and Van Buren (structural); Van Note-Harvey Associates (civil); Flack + Kurtz (mechanical/electrical)
CONSULTANTS: The Henderson Corporation (construction management); Jerry Kugler Associates (lighting); Acentech (vibration/acoustics); Geotech (soils)
COST: Withheld at owner's request
PHOTOGRAPHER: Jeff Goldberg/Esto

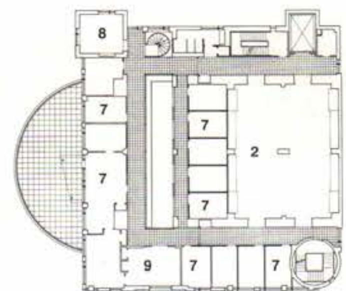
ABOVE: Main lobby rests one-half story below second floor to accommodate gradation in site. Cut-out wall facing main entrance reveals atrium.
RIGHT: On the second floor, 40-foot-high atrium acts as auditorium lobby. View toward main entrance reveals curved top of cut-out wall.
FACING PAGE: Spiral stair at northern end of atrium connects four stories. Chimacoff enclosed ducts from offices within "flying duct trusses" at each end of atrium. They connect to main ducts in chases outside labs.
PLANS: Building is organized as cube of laboratories, surrounded by offices and communal spaces.



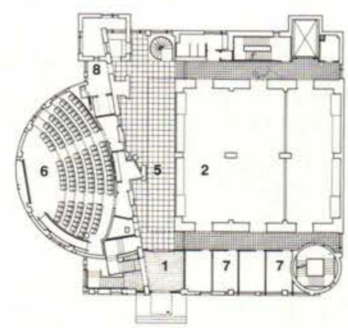
WEST-EAST SECTION



FOURTH FLOOR PLAN



THIRD FLOOR PLAN



SECOND FLOOR PLAN

FIRST FLOOR PLAN 20'/6m

1 LOBBY
2 LABORATORY
3 CAFÉ
4 MECHANICAL
5 ATRIUM
6 AUDITORIUM
7 OFFICE
8 LOUNGE
9 CONFERENCE
10 SEMINAR ROOM

Chemistry Building Addition
Bryn Mawr College
Bryn Mawr, Pennsylvania
Ellenzweig Associates, Architect

Elemental Solution

On Bryn Mawr's quietly proper campus of Collegiate Gothic dormitories and academic buildings, two opposed corners provide a spark that keeps the 65-acre site from falling into a perpetual slumber. One is Louis I. Kahn's Eleanor Donnelley Erdman Hall (1965) on the east edge of the campus; the other is the Marion Park Science Center on the northwest corner, a lackluster complex of 1960s buildings hidden at the foot of a hill. The new Chemistry Building and Science Library, designed by Ellenzweig Associates, transforms the Science Center into a firm campus anchor, incorporating outdoor and indoor public spaces that function as magnets for students.

The new 62,000-square-foot building comprises symmetrical wings that form the top of a T, projecting from the older chemistry building. In material, color, and scale, the addition blends in with other buildings in the complex; yet its more elegant proportions, crisp detailing, and smooth fenestration rescue its neighbors from dreariness.

The somewhat rundown teaching laboratories in the older buildings provide a solid contrast to Ellenzweig's new labs, which include undergraduate facilities on the first floor and graduate research labs on the second level. The library, on the top floor, is constructed around huge exhaust shafts, which draw air at 3,000 feet per minute through ducts from the 73 fume hoods on the first and second floors and vent it through 8-foot stacks from the roof. Outside air is supplied through intake louvers in the rounded, lead-coated copper penthouse.

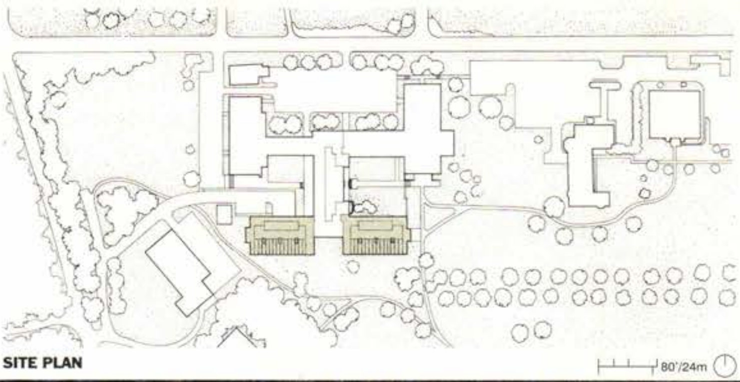
The new, open-plan freshman laboratories are close in concept to their predecessors, although they have been updated throughout with state-of-the-art equipment and handsome, blond oak custom cabinetry. Workbenches are set in islands, allowing easy and constant supervision of students by instructors. Cooperative fume hoods are lined along the interior wall, and scant desk space is inserted underneath north-facing windows.

By contrast, in the past, the graduate-level labs separated desk, workbench, and fume hood. Here, desks are clustered in semiprivate cubicles, separated from the workbenches by an open corridor. Shelving for materials rises above the workbenches to create privacy and reinforce concentration.

The library on the top floor is furnished with movable shelving, with a capacity for 150,000 volumes, and brings together a number of science branches that had been scattered about the complex. Ellenzweig placed it on the third level instead of at grade, following the hierarchy in the existing buildings; it would have been too costly to remove the labs and library already in place. The older library adjacent to the new one has been handsomely restored to take advantage of a well-proportioned, high-ceilinged periodical room. A reading room in the new wing at the east end of the building is encased within a two-story glass protrusion that serves as the building's main entrance at ground level. Lighted at night, the enclosure forms a beacon for the science complex.

Before the new wings were added, the complex, located at the foot of a hill at the northwest edge of the campus, was practically invisible. Ellenzweig reoriented the complex by placing its new main entrance in the east elevation, at grade on the second level and at the crest of the hill facing east toward the center of campus. The architects placed the entrance just off axis from the terminus of a revered allée of trees known as Senior Row. The building drops 23 feet as it moves west with the incline, allowing the undergraduate first floor to flow into the downward slope of the hill. The lower floor, as well as the basement of the west wing, are distinguished by horizontal bands of a darker brick. It's a modest decorative touch, but its presence, along with other well-handled details, gives the extension a trim efficiency that reflects its scientific purpose.—*Peter Slatin*

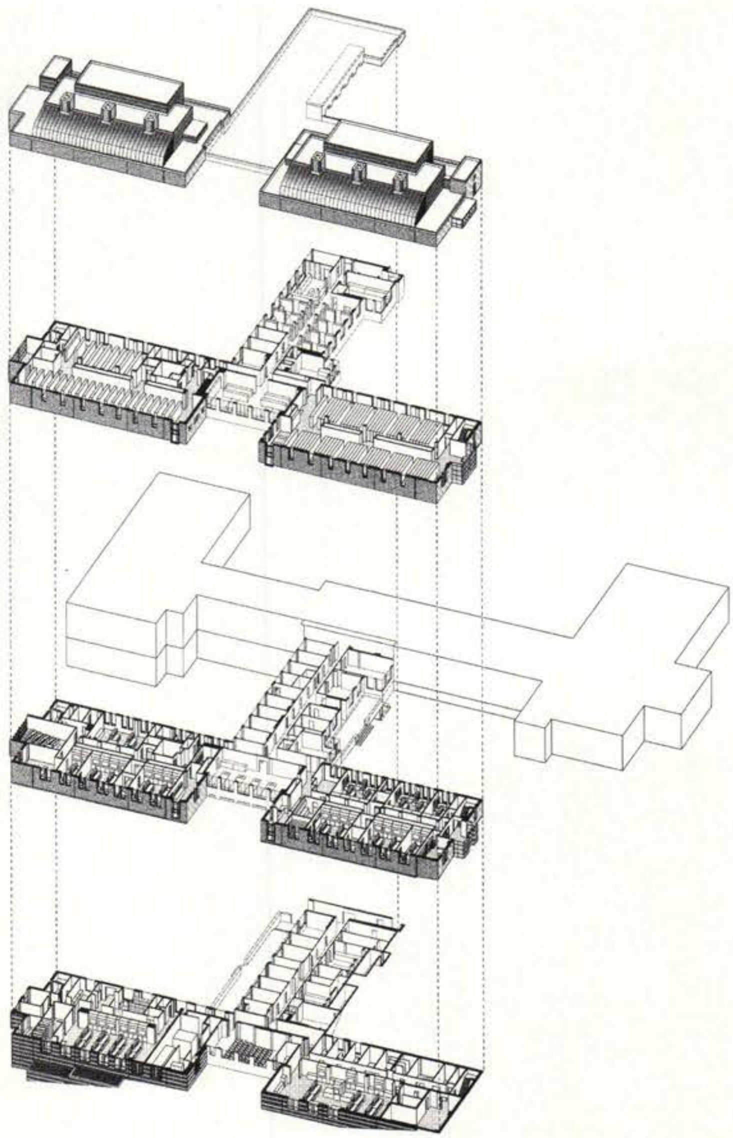
Peter Slatin is a New York-based writer.



SITE PLAN

SITE PLAN: New wings flank existing chemistry building that projects from center of Bryn Mawr's science complex. Addition forms western terminus of allée (bottom right).

BELOW: Lead-coated copper penthouse, punctuated by decorative chimneys that house venting stacks, is curved to blend with rooflines of nearby Collegiate Gothic buildings.

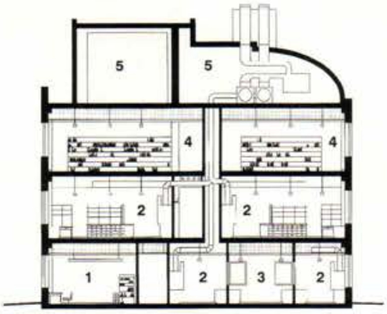


FACING PAGE, TOP: Entrance and library are lighted at night, creating a beacon for the science complex.

FACING PAGE, BOTTOM: Fenestration orders in new wing express differing functions on each floor.

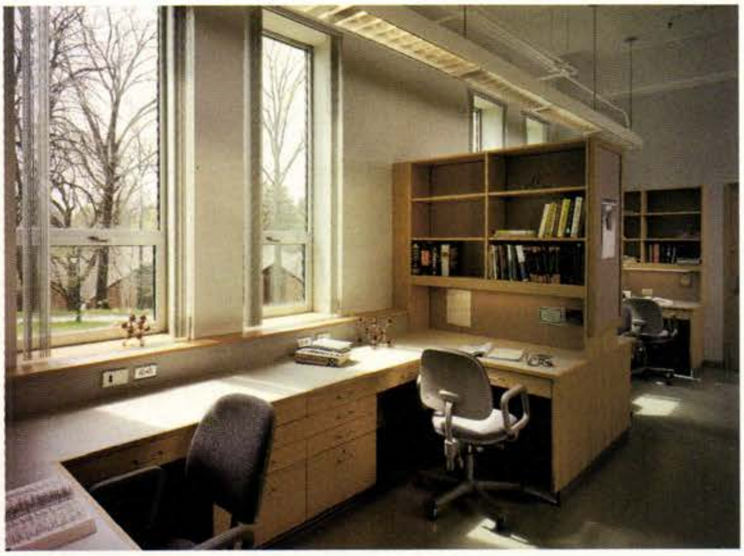
AXONOMETRIC: To conform to the older lab structure, Ellenzweig located library on top floor and labs on lower floors.

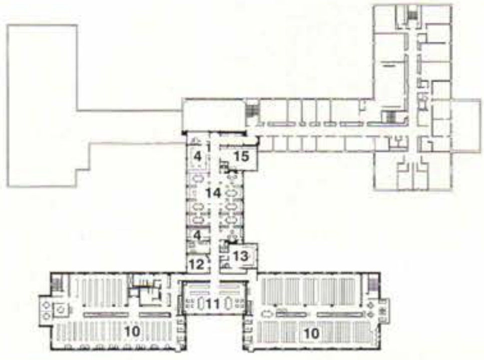
BELOW: Variegated banding and restrained, crisp detailing streamline north facade. Projecting windows indicate small lounges.



NORTH-SOUTH SECTION 10'/3m

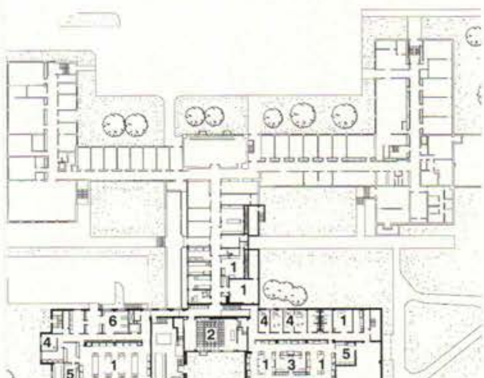
1 OFFICE
2 LABORATORY
3 INSTRUMENT ROOM
4 LIBRARY
5 MECHANICAL





THIRD FLOOR PLAN

SECOND FLOOR PLAN



FIRST FLOOR PLAN 40'/12m

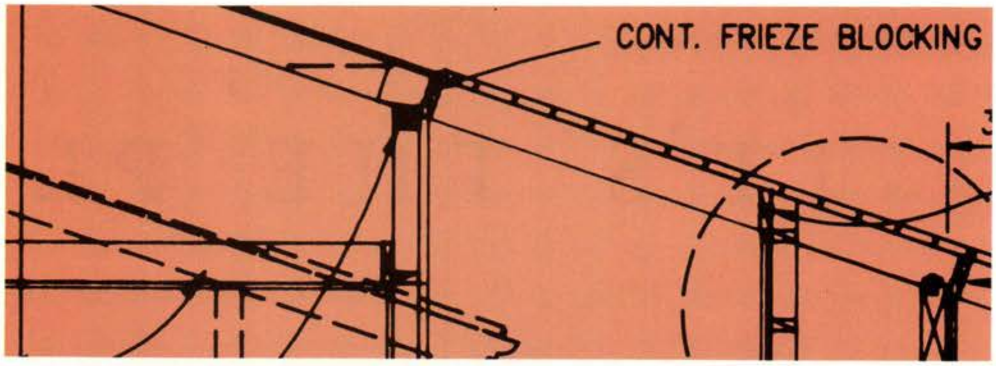
1 LABORATORY
2 LECTURE HALL
3 INSTRUMENT ROOM
4 OFFICE
5 PREPARATION ROOM
6 STOCK ROOM
7 ENTRANCE
8 CONFERENCE ROOM
9 LOUNGE
10 STACKS
11 PERIODICALS
12 MICROFILM
13 WORKROOM
14 REFERENCE
15 COMPUTER ROOM

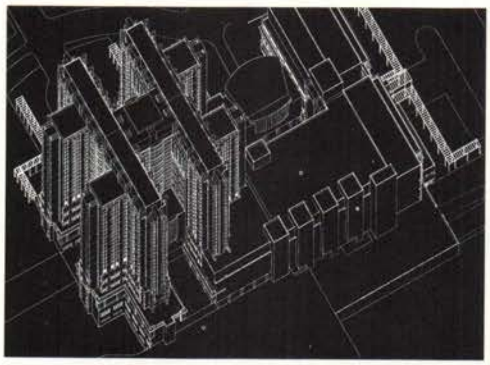
CHEMISTRY BUILDING ADDITION
BRYN MAWR COLLEGE
BRYN MAWR, PENNSYLVANIA

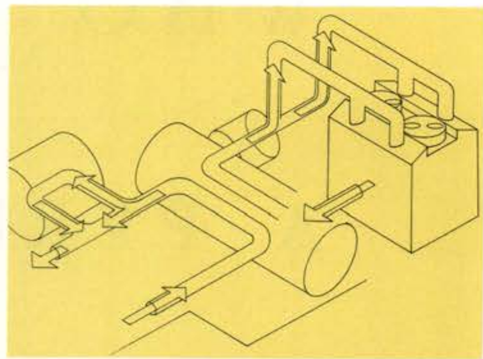
ARCHITECT: Ellenzweig Associates—Harry Ellenzweig (design principal); Miltos Catomeris (project architect); Curt Heuring (project manager); Neil Cahalane (assistant project manager); Leslie Sims, Doug Carr, Gerritt Frase, Charles Navratil, Samuel Isenstadt, Mark Wilhelm (design team)
LANDSCAPE ARCHITECT: Coe Lee Robinson Roesch
ENGINEERS: BR+A Consulting Engineers (mechanical/electrical); R.W. Sullivan (plumbing/fire protection); Keast & Hood (structural); John F. Kennedy Associates (civil); Site Engineering (geotechnical)
CONSULTANTS: Taylor Carboni (furnishings); Jon Roll Associates (graphics); Hal Cutler (code); Vermeulens (cost estimating); Jay Lucker (library)
GENERAL CONTRACTOR: R.M. Shoemaker
COST: $14.5 million
PHOTOGRAPHER: Steve Rosenthal

PLANS AND SECTION: Undergraduate labs are located on the first floor; research takes place on second floor.
FACING PAGE, TOP: Introductory labs are open-plan islands for supervision.
FACING PAGE, BOTTOM: Grad students work in window-side cubicles across from lab benches and fume hoods.
BELOW: Ellenzweig renovated high-ceilinged periodical reading room in older building with new window mullions, custom shelving, and lighting.

Technology & Practice







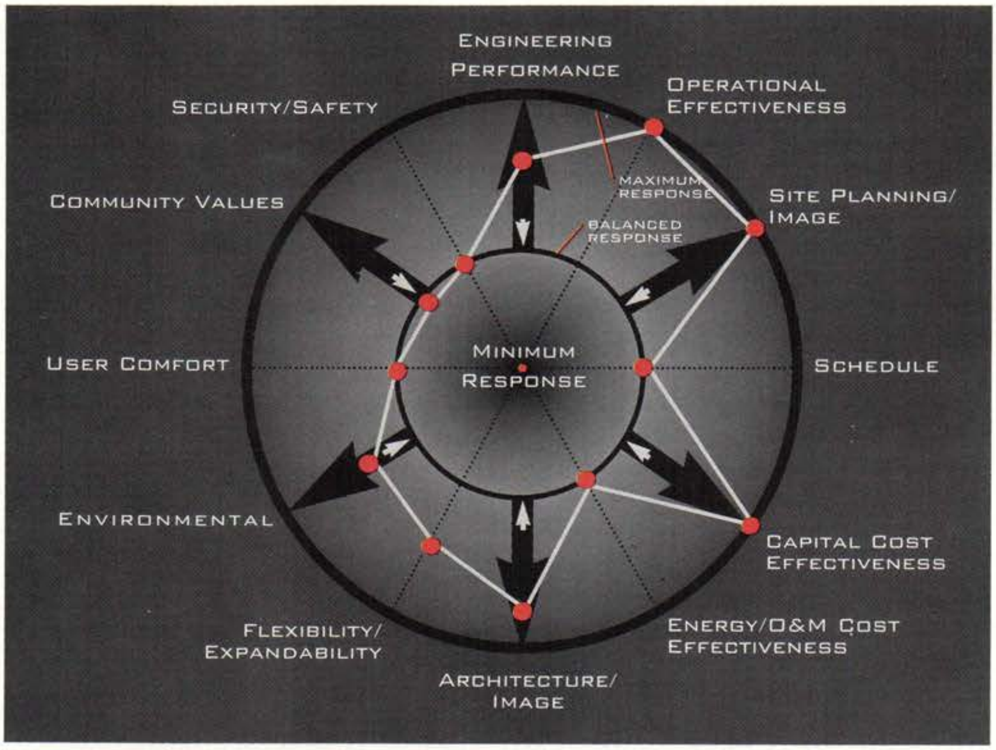
Reform is a subject that is solidly addressed by this month's Technology & Practice section. Changes in the construction process, in America's healthcare and energy policies, and in computer technology are forcing architects to look for ways to expand, refine, and improve their practices.

To many architects, value engineering is akin to a tax audit. But, new team-oriented approaches to value engineering are involving architects, instead of leaving them out in the cold. The results are cost reductions without design compromises.

The healthcare reform proposed by the Clinton administration means reform for healthcare architecture. Architects are now being called upon to design a new generation of facilities that are speedily constructed and efficiently organized.

Refocusing our nation's energy policy has resulted in new research centers such as the Solar Energy Research Laboratory in Colorado. The lab incorporates well-developed conservation systems, plus new technologies such as photovoltaics.

In the architect's office, change is a fact of life. This month's computer feature takes the worry out of buying a plotter by assessing the different types of devices on the market and their applications for firms large and small. Change is inevitable, but those architecture firms that are willing to experiment with new techniques are bound to both grow and prosper.



Surviving Value Engineering

Analyzing cost-cutting processes can maintain and even improve a design.

ABOVE RIGHT: Smith, Hinchman & Grylls' diagram explains value engineering priorities for its research building at the University of Cincinnati. Higher priorities include building image, site planning, and cost.

Value engineering makes architects see red. Who can blame them? At its best, this management tool opens design to the scrutiny of outsiders who suggest ways of increasing the project's value while saving money. At its worst, value engineering is misapplied to bald cost cutting that has nothing at all to do with value and offers every risk of damaging a design.

But value engineering has become a fact of life in the U.S. construction industry during the cost-conscious 1990s. It is prevalent in major government projects, for which value engineering is now required, and in complex industrial, healthcare, and transportation facilities, for which it is almost routine. Understanding how the process is intended to work and how it can improve a project can give an architect the advantage when confronted with a value engineering study.

Phased analysis

Value engineering is a structured method of analyzing and fine-tuning a project to satisfy the owner's functional requirements at the lowest cost. A true value engineering effort results in a project with the greatest possible long-term value, while considering life cycle costs and the integrity of the original design, explains Ginger Willingham, vice president of Dallas-based value engineering consultant VEI and president-elect of the Society of American Value Engineers (SAVE). "Architects think a value engineer is someone who looks over their shoulder and sees what they did wrong. That's not it at all," asserts Willingham. "Value engineering looks at a project from a functional viewpoint and at the alternatives available to meet that function."

Although value engineering is sometimes undertaken by construction managers or contractors, significant value engineering studies, especially for government projects, are usually conducted by an outside team of professionals led by a value specialist who has been trained, tested, and certified by Northbrook, Illinois-based SAVE. Value engineering teams may include as few as five members—an architect, several engineers, and a contractor may be sufficient for a small job—while larger, more complex facilities such as hospitals or industrial buildings may require a team of 25 or more specialists.

The value engineering process established by SAVE, which can last from three to five days, consists of several phases that must be followed in order. Team members begin by gathering information about the project scope and solutions from architects, owners, and others and analyzing the program's required functions. Then the group holds a brainstorming session to come up with alternative ways of achieving the functions. Brian McGauley, a project manager of Dallas-based Aguirre Associates who frequently serves as a value engineering team member for other architects' projects, says all ideas are welcome at this point. "We put a bowl on the table, and anyone who says, 'No,' or 'It can't be done' has to throw in a quarter," he explains.

The team then evaluates the ideas and selects the strongest suggestions. Those ideas are incorporated into a written value engineering proposal, presented to the owner and architect by the team. The owner, working with the architect and other consultants, subsequently determines which suggestions to adopt and which to ignore.

Painful realities

Value analysis—the methodology that became today's practice of value engineering—was developed in the early 1950s by Lawrence D. Miles, an analyst at General Electric. Miles' procedures were picked up by the U.S. Navy's Bureau of Ships and have since been applied to construction by federal agencies, including the Department of Defense, the Environmental Protection Agency, and the General Services Administration (GSA). Value engineering is currently mandated on federal projects worth $1 million or more, according to the final revision of *U.S. Office of Management and Budget Circular No. A-131*, published in June 1993. That document "requires federal departments and agencies to use value engineering as a management tool, where appropriate, to reduce program and acquisition costs."

Although the idea behind value engineering is difficult to argue against—getting the best building for the best price—its reality can be painful, especially if the term is applied too loosely. One architect remembers a job on which a contractor picked up a set of plans designed by his firm for a government project and claimed that value engineering could cut the cost substantially. When the architect would not approve the changes that had been proposed, the contractor took over the job and was awarded half the projected savings by the government. Shortly after project completion, the building developed structural problems and the contractor filed for bankruptcy.

Even in less dramatic circumstances, the value engineering process can have unwelcome consequences for the architect. John Laping, principal of West Amherst, New York-based Kideney Architects, says there is a tendency for value engineering to "cut, cut, cut until there isn't much architecture left." In recent plans for a one-story nursing home, for example, Laping included bay windows as an amenity in tenant rooms to increase surface area without adding square footage. The windows were removed following a value engineering study aimed at cutting costs and were later listed as a bid alternate.

Indeed, until recently, the success of most value engineering studies was measured in terms of money saved rather than in terms of value achieved, which is less easily calculated. When success is measured by return on investment—$10 saved for every dollar spent on value engineering, for example—even a conscientious value engineer can be driven to suggest changes that detract from the project's quality, according to Michael Dell'Isola, a certified value engineer and vice president in the Alexandria, Virginia, office of Hanscomb Associates, a construction management firm. "Good practitioners try to avoid it, but if you are expected to save money, you have to save it," Dell'Isola explains.

Value over money

To shift the emphasis from savings to quality and value, some practitioners and owners are beginning to measure the success of a value engineering study by the number of suggestions accepted, rather than by the amount of money saved. The GSA, for one, has recently rewritten its value engineering guidebook to stress value over money. Walter Wappaus, general engineer with GSA's office of design and construction, explains that the agency will no longer use value engineering as a tool to pull over-budget designs out of financial trouble and compromise the quality and scope of the projects. At GSA, saving money is no longer the goal of every study. "We feel that the projects that do produce savings will pay for the [overall] value engineering program," Wappaus maintains.

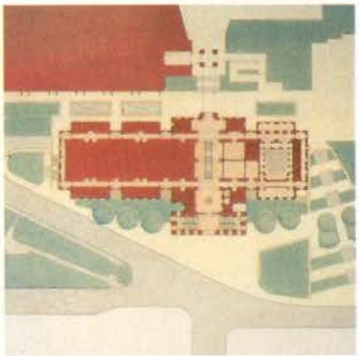
In shifting value engineering's emphasis, GSA and others, including Utah's Division of Facilities Construction and Management, are also shifting the typical value engineering timetable. In the past, studies strictly aimed at slashing costs were started after design was finished and the bids came in high, a process frowned upon because of its limited usefulness. More often, value engineering studies were undertaken when the design was 35 percent completed. Now, however, value engineering is becoming more common during schematic design, when major conceptual changes can be made more easily and the owner can alter initial assumptions.

Such was the case with the Salt Lake City Community College Library, designed by Salt Lake City-based Astle/Ericson & Associates. A value engineering study undertaken during schematic design called into question the siting of the building, dictated by a 20-year-old campus master plan. As a result, the architect and the state jointly agreed to reorient and

Science Research Building
University of Cincinnati
Michael Graves, Architect
Smith, Hinchman & Grylls
KZF Associates

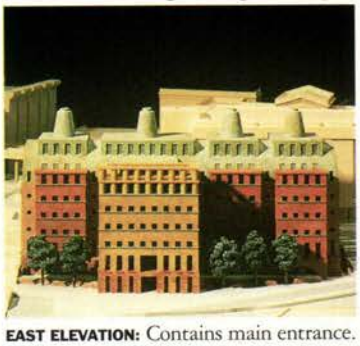
Value engineering is responsible for keeping the 95,000-square-foot, Science and Engineering Research Building on budget without detracting from its bold design. The two-part value engineering effort succeeded because it employed a "force field analysis" at the conclusion of the project's schematic design phase in March 1991, explains architect Stephen J. Kirk, vice president and director of facility economics for Smith, Hinchman & Grylls Associates, the firm that led the value engineering process and also provided planning and lab consulting services to the university project.

The analysis required each participant—owner, architect, engineer, user group member, facility manager, and constructor—to write



SITE PLAN: Circulation a top priority.

BRIDGE: Link to engineering building.



EAST ELEVATION: Contains main entrance.

down the best and worst features of the project. The team then reviewed the list and sought to enhance the strongest aspects of the design and to correct the weakest. "Unless you ask people about the best features, they do not want to talk about the bad ones," explains Kirk. "If we fixed the bad features, we would be helping to create a better project."

Ensuring that the building functions optimally on its site, which is expected to become a major circulation route for both students and those working in the labs, was a top priority of the value engineering effort. Some other priorities that were identified by the team included maximizing the research building's operational effectiveness while minimizing initial capital costs and maintaining a strong architectural image for the structure, according to Kirk.

The building's distinctive copper roof, although an expensive item, was cited by many participants as an essential design feature so it was not changed during the value engineering process. Instead, attention was focused on finding a better use for the six-story building's attic. The value engineering team developed a plan to shift mechanical equipment from the basement to the attic, which simplified construction of footings as well as foundations.

Estimates of early plans revealed the roughly $30 million project was $7 million over budget before the first study. A two-day value engineering workshop generated 145 ideas, 40 of which were developed to save $6.87 million. Suggestions accepted by the owner included bracing the structure without moment frames, saving about $106,000, and adding 1,000 square feet of cleanroom laboratory space, which added $537,000 in expenses.

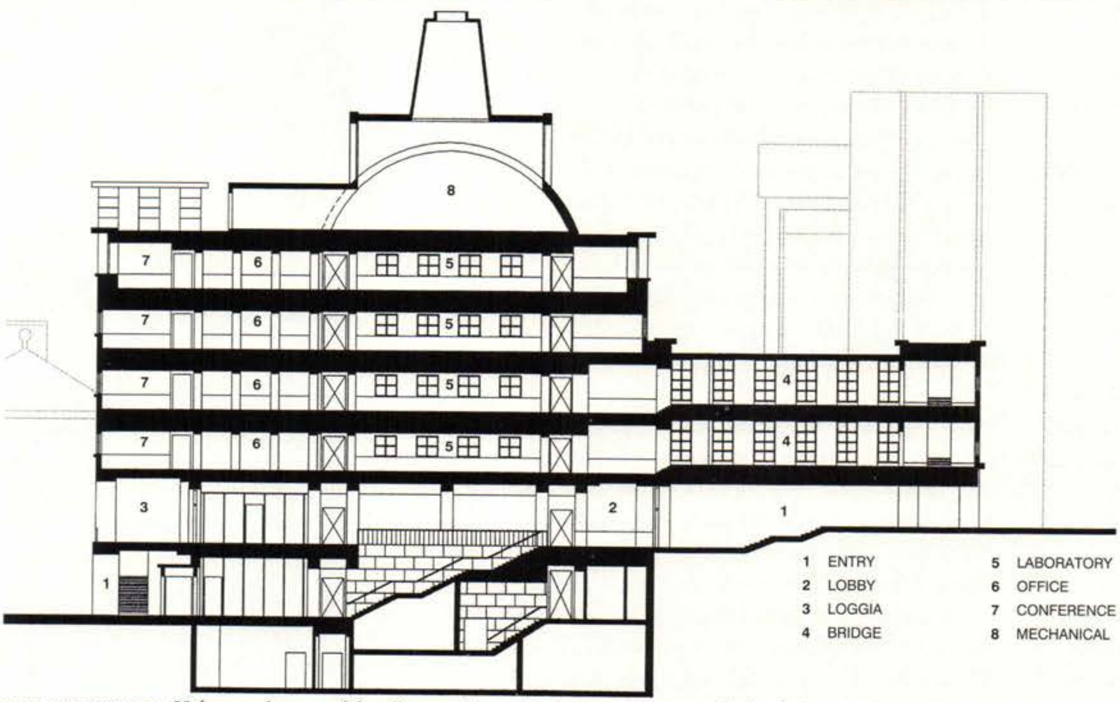
A second, three-day value engineering workshop was held in August during the design development phase. Suggestions made at that stage of design, including rerouting laboratory piping and simplifying stone cladding on upper floors of the research building, were less dramatic in terms of cutting project costs, and more focused on quality enhancement and life cycle cost analysis. About $500,000 was saved as a result of the many ideas generated during the second workshop.

Although the practice of value engineering has become increasingly common on institutional and commercial buildings designed by Michael Graves, the analysis of the University of Cincinnati research building, now under construction, was "more elaborate that anything I've been involved in before," recalls Tom Rowe, senior associate. Changes suggested did not alter the parti, and the process ran smoothly, Rowe adds. "Clients take what we say about design a little bit more seriously," explains Rowe. "At the same time, we have to talk to them from the beginning and show them that we are not spending their money foolishly."

RON FORTH PHOTOS

EAST ELEVATION: Stacks and framing visible during construction.

NORTHEAST CORNER: Steel truss vault.



EAST-WEST SECTION: Value study saves $6 million without altering organization of labs (left) or bridge (right).

move the library to the south, focusing attention inward on the campus to create new quadrants, explains architect Neil Astle. On how he felt about the changes, Astle laughs: "You have to be flexible."

Although the practice of value engineering may be used with any type of contract, the process today is finding a natural place within partnering arrangements, under which the owner, architect, and contractor work together from the start of design, stressing open communication (ARCHITECTURE, October 1993, pages 111-113.)

Lawrence Shaw, who is vice president of Melbourne, Florida-based BRPH Architects & Engineers, a firm that designs technical buildings for the National Aeronautics and Space Administration and other industrial clients under partnering agreements, notes that virtually every one of his projects undergoes value engineering to make sure the right mechanical, electrical, and architectural systems are selected. "It's not adversarial at all. We welcome the input that an outside firm might have looking at our work," he says. Changes were made to skylights, finish systems, and mechanical systems for a BRPH-designed terminal at Florida's Melbourne Regional Airport, for instance, at the suggestion of a value engineering team. "The result was a more economical project that looked just as good or better," Shaw recalls.

Essential elements for success

When the design architect is encouraged and permitted to make a strong contribution to the value engineering process, and if the study is undertaken in an honest and direct manner, then value engineering can introduce a fresh perspective to a design problem. Those familiar with the process warn, however, that the architect should keep in mind several key points to avoid disappointment and potentially damaging consequences.

Critical design issues and decisions should be made known to the value engineering team at the outset. The value engineering team is more likely to respect the architect's design if members understand what the architect believes to be important, points out Eugene Kohn, a principal of New York City-based Kohn Pedersen Fox who is currently working as a value consultant to the Port Authority of New York and New Jersey. "There must be some concept so strong and so valued that you feel is the guts or essence of the design, perhaps to do with space or light," notes Kohn, "that you must explain carefully and fight hard for."

The owner should not be misled by misguided or unsafe value engineering suggestions. Any changes to the design accepted by the architect become the responsibility of the architect, not the value engineer, after the project is built, warns William A. Stimson, a principal of the Orlando office of Hansen Lind Meyer. "If a building that I designed falls down, it would have the same ramifications as for a doctor whose patient died on the operating table," Stimson adds.

The owner should be encouraged to start the value engineering process early, and the team should study issues appropriate to the level of design. The process can be used to question the owner's programmatic or siting choices, if appropriate.

The owner should be alerted to hire a value engineering team whose professional qualifications are above reproach and whose members are respected by the architectural community. "If you get a good team, it diffuses a lot of misconceptions," explains Hanscomb's Dell'Isola. The owner should also be sensitive to issues of competition: Hiring the architect's immediate competitors to review his or her design should be avoided.

The architect should educate the client about what makes good architecture. If the owner wants to use the value engineering study to reduce quality and cut costs, then the architect should explain long-term maintenance and quality issues, advises Robert E. Gray, an architect and capital manager of the New York State Department of Health's Institutional Management Group. "The architect might respond, 'Yes, you can build a cheaper building, but that's not our understanding of your needs,'" says Gray.

Above all, architects should make every effort to remain open-minded and flexible during the value engineering process. "Sometimes you have to say, 'This is just not acceptable; we just can't do it,' " adds Gray. "But at the same time the architect has a clear obligation to accept good ideas. There is no question that some good ideas come out of value engineering."—*Virginia Kent Dorris*

Value engineering can become part of a project contract. For more information, architects should consider attending the AIA-sponsored symposium titled "Cost, Time, & Risk: Evaluating Project Delivery in the Face of Change," March 25-26, in Austin, Texas. Discussions and exercises will enable participants to compare and develop contracting strategies for various types of projects. Contact the AIA at (202) 626-7535 for details, including speakers, topics, and educational credits.

Curran-Fromhold Correctional Facility
Philadelphia, Pennsylvania
DMJM Architects

An ongoing value engineering effort, led by a construction manager, will ensure the high quality of a 2,000-bed prison and save costs equal to the fees spent for design and construction management combined.

Two value analysis charettes were held early in the design of the Curran-Fromhold Correctional Facility, an intake facility for a variety of inmates. The first occurred during conceptual design and the second took place at the end of schematic design, according to Gregory Offner, senior project manager of the Philadelphia office of Morse Diesel International, construction manager.

"Our philosophy is that value engineering takes place before the architect puts the ink to paper, because if you have drawn it, you've spent money," Offner explains.

SITE MODEL: 2,000-bed prison.

BEFORE STUDY: Laurel Hall (top).

AFTER STUDY: Laurel Hall razed.

The first session evaluated building systems, including mechanical, plumbing, structural, and electrical systems; the second session examined those systems in more detail. In cooperation with the construction manager, architect DMJM studied the placement of inmate services and decided to locate the library, indoor and outdoor recreation areas, and other activities adjacent to the housing units to reduce the staff needed to escort inmates to various activities. "We looked carefully at initial costs versus life cycle costs," says Peter Krasnow, DMJM director of design for justice architecture.

Construction manager and architect assert that the value engineering process helped them maintain the required level of comfort for the least amount of money and that the process was conducted with minimum friction. "We have a lot of respect for each other's talents," says Offner. "I don't get any more kudos for making the architect look bad."

Central Sciences Research Building Addition
Washington University School of Medicine
St. Louis, Missouri
CUH2A, Architect

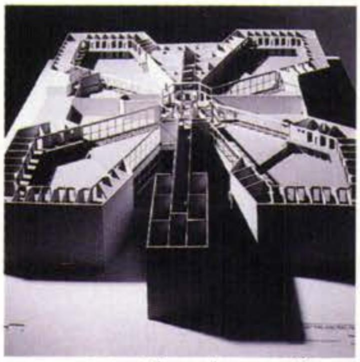
A client's early plan to add 212,000 square feet of research and support space to the north of a medical research lab at Washington University in St. Louis proved less than ideal through value engineering.

Fearing the budget might not be sufficient to cover the ambitious project, CUH2A developed and priced a dozen alternative proposals at various locations. The architect chose a 10-story addition now being constructed to the northeast of the existing Clinical Sciences Research Building. That decision produced an efficient building and saved between \$6 million and \$8 million in structural and seismic upgrading costs for the original structure, maintains Brian Kowalchuk, CUH2A project designer.

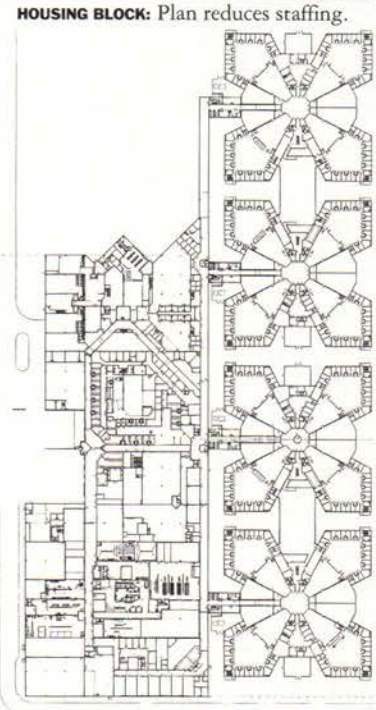
CUH2A met weekly during design with project manager Sverdrup Corporation and Theodore Cicero, the medical school's associate chancellor, to discuss maximizing function at the lowest cost. Cicero represented 15 separate user groups during design of the \$46 million addition.

Modifications that resulted from the value engineering process included splitting the mechanical equipment into three areas to minimize ductwork and increase usable floor space. Sverdrup also recommended that the structure be placed only 24 feet below grade rather than 35 feet below, saving a projected \$650,000 for rock excavation.

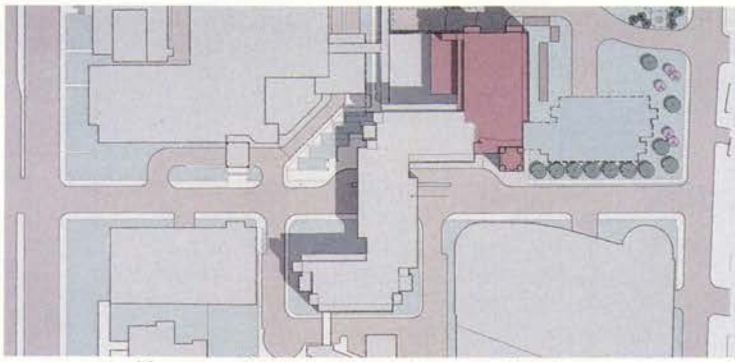
The value engineering efforts grew naturally out of a partnering agreement, which stipulated that the team work together to bring costs and schedule within identified bounds. Although a February 1996 date is set for project completion, the team hopes to finish two months early, in December 1995.



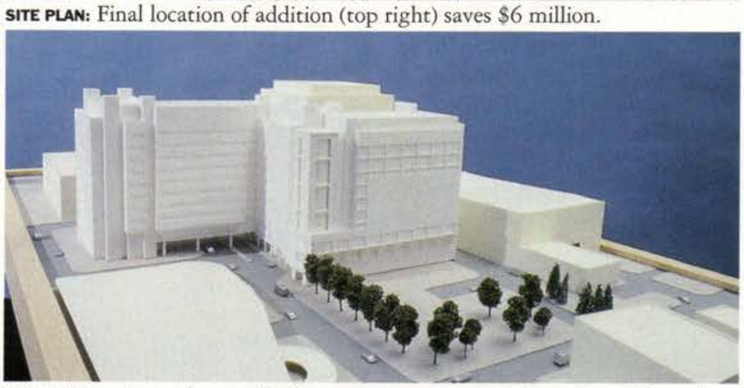
HOUSING BLOCK: Plan reduces staffing.



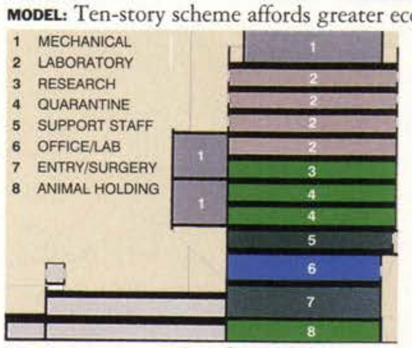
PLAN: Service (left) south of housing.



SITE PLAN: Final location of addition (top right) saves \$6 million.



MODEL: Ten-story scheme affords greater economy over low-rise configuration.



EAST-WEST SECTION: Cantilevered ducts.

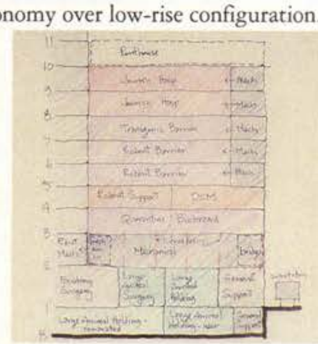
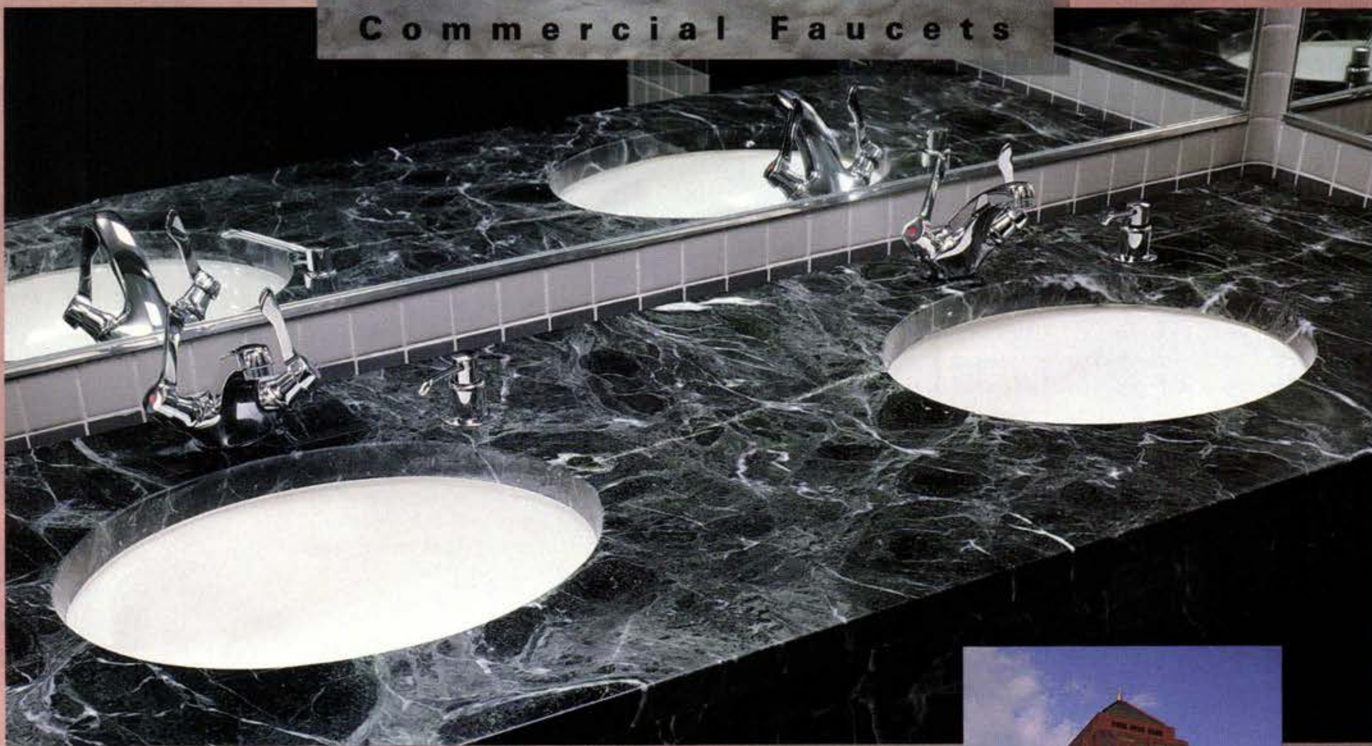


DIAGRAM: Stacking for value.

GROHE

Commercial Faucets



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The anticipation of healthcare reform is expanding the boundaries of architectural practice. Architects are now involved in the planning process for new healthcare facilities much earlier than they have been in the past—sometimes before the project is even a remote certainty. One purpose of this early involvement is to interrelate a hospital's physical plant with its marketing strategy and business plan. Today's healthcare architects are exploring more flexible designs.

Smaller hospitals, *Fewer* beds, Fewer staff · Flexible designs, *Contingency* plans, Prequalified architects · Convertible rooms *Universal* grid · Political mandate, *Accelerated* construction · Intensive client-architect *interaction*

Reforming Healthcare Design

As the great American healthcare debate unfolds, so does a new realm of architectural practice.

President Clinton's proposed Health Security Act is reforming not only the delivery of healthcare services, but the practice of healthcare architecture as well. Administrators of hospitals and clinics, put on guard by the prospects of reform, are stalling plans for new facilities. When they do reach decisions, these healthcare providers place greater burdens on their architects to rescue them from costly overgrowth and redundancy. Often, clients bring external political pressures to their relationships with architects. And in a number of cases, the architect-client relationship is hampered by the fact that the client's own chain of command has changed.

Organizational revolution

Over the past 12 to 18 months, a wave of mergers and acquisitions has transformed the medical industry. Insurance companies are buying controlling shares of hospitals. Independent hospitals are forming huge regional networks around the nation. The two largest for-profit hospital chains in the United States—Columbia Healthcare Corporation of Louisville, Kentucky, and HCA-Hospital Corporation of Nashville—are seeking federal approval of a merger valued at $5.7 billion, among the largest healthcare mergers to date. These reorganizations have reduced the number of hospital entities, altering internal hospital cultures and management philosophies, and changing architects' point of contact. Instead of answering to someone close at hand in the client's facility, the architect may now report to unfamiliar officials farther afield.

Delivery systems are radically changing. Outpatient visits jumped 58 percent between 1985 and 1992, while inpatient admissions fell steadily in the same period; the average hospital remained only two-thirds full. In 1992, 90 million people obtained their healthcare through new types of networks—health maintenance organizations (HMOs) or preferred-provider organizations (PPOs)—up from 25 million in 1985. HMOs such as Kaiser Permanente—which offers a prepaid plan to the 6.6 million people it insures—provide a substantial source of work for architects. Kaiser's Northern California division alone counts about 100 projects currently in progress worth a total of $1.9 billion. PPOs, like those run by Prudential Insurance Company or Aetna Life & Casualty Company, broker volume discounts for healthcare by ratcheting down fees of doctors who join their networks. Doctors gain a large patient base in return.

Intensifying competition

The exclusivity of preferred-provider groups intensifies competition by effectively diverting patients away from higher priced doctors. PPOs began appearing in the mid-1980s as insurance underwriters began fighting soaring medical costs. As the annual rate of medical inflation soared to 9.6 percent in 1990, pressure by indemnity insurers on healthcare administrators to cut costs increased. Supply-side changes, which in retrospect were relatively subtle compared with today's, began affecting healthcare architecture by 1990. Hospitals began commissioning architects to design competitive, "patient-focused" environments, both as a marketing pitch and as a strategy to save on delivery costs.

Last year, President Clinton's campaign to reform healthcare sent shock waves through the entire

BELOW: The $52 million Copley Memorial Hospital in Aurora, Illinois, designed by O'Donnell Wicklund Pigozzi and Peterson (OWP&P)—to be completed by 1995—replaces a 1974 facility that would have taken 10 years to renovate. Architects at OWP&P were included at the earliest planning stages to help reconfigure patterns of healthcare delivery. As a result, this hospital will operate with 20 percent fewer square feet; 33 percent fewer staff; and 40 percent fewer beds.

medical community. An industry overhaul seemed imminent, and as a result, today's hospital administrator is torn between the demands of delivering high-quality patient care and the imperative of emerging on the right side of reforms—whatever they bring. "Clients are expecting that what's being talked about in Washington is not what will really happen," observes David Kuffner, senior principal of O'Donnell Wicklund Pigozzi and Peterson (OWP&P) Architects in Deerfield, Illinois. "So they're saying that it doesn't really matter what healthcare reform will be. We know what it has to be—more efficient, more flexible care, providing access to cover those who aren't covered now."

Architects' early involvement

Kuffner's clients at the Copley-Rush Regional Medical Center in Aurora, Illinois, will provide a praticum for reform-minded healthcare design with their replacement of an existing hospital when it is completed in mid-1995. Kuffner says the OWP&P design team was invited by Copley-Rush officials to the very earliest deliberations over the new facility. Indeed, many architects report that they are involved in the planning of new facilities much earlier now than in the past—sometimes even before the project is certain. One purpose of this early involvement is to interrelate the hospital's physical plant with its marketing strategy and business plan.

In the first phases of design, architects at OWP&P persuaded administration and medical staff to suspend assumptions about the layout of the hospital. The architects could thus devise new functional and spatial relationships that will save the hospital both construction and building life cycle costs. Rather than segregate hospital functions such as the laboratory, radiology, and therapy units, for example, OWP&P architects arranged diagnostic and treatment spaces according to their level of technology and to the most convenient place of service for the patient.

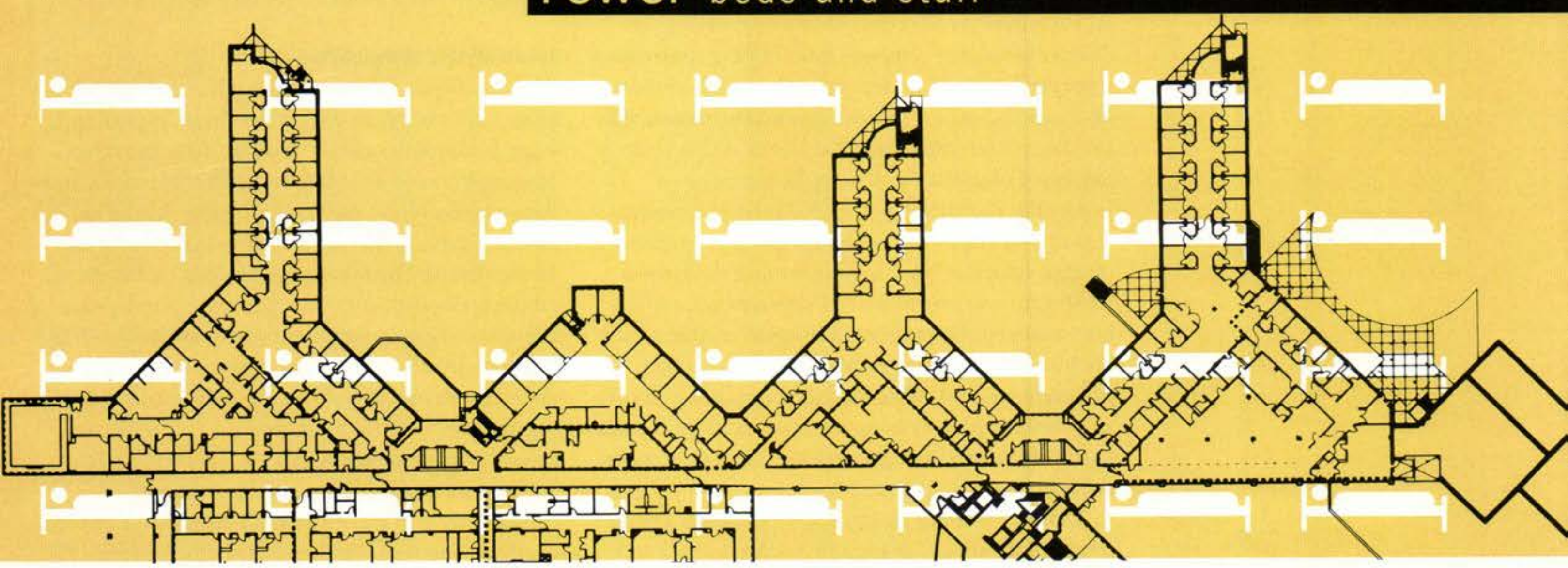
Responsibility beyond design

Projects like the Copley Memorial Hospital represent the greatly expanded role and responsibility of today's healthcare architect. Architects are currently exploring new physical juxtapositions that counter old, inefficient patterns of providing care. "It doesn't cost any more to have architects in the process sooner than later," remarks Derek Parker, chairman of Anshen + Allen Architects in San Francisco. "Clients see that the architect can design new systems in a much more structural way to ensure that the building will come out right later on."

It is revolutionary that the introverted medical establishment would turn so fully to outsiders for advice, but as Parker points out, the anticipation of healthcare reform is expanding the boundaries of architectural practice. That overture alone indicates the worry suffusing the healthcare industry. Among Parker's clientele are an adult hospital and a children's hospital that are merging. The two

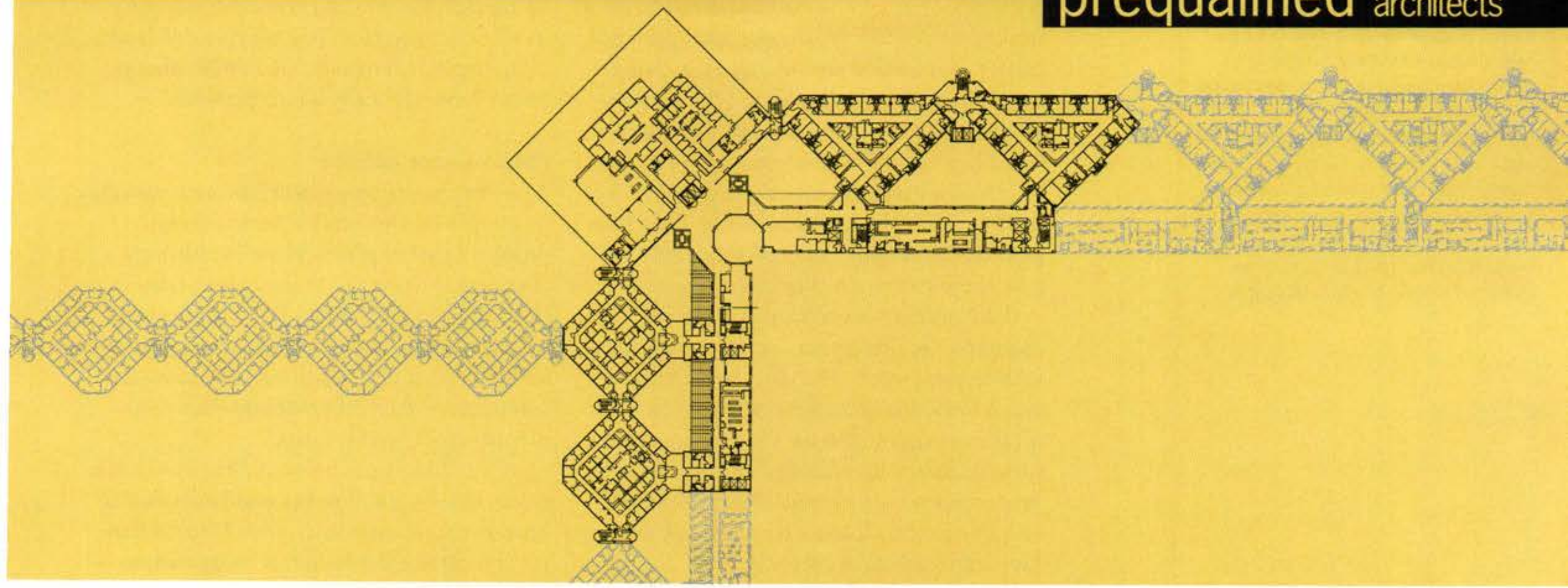
smaller hospitals fewer beds and staff

Architects are exploring new juxtapositions that counter old, inefficient patterns.



Given the uncertainties about healthcare reform, clients are vigilant about keeping their options open.

contingency plans flexible designs prequalified architects



organizations, Parker explains, are looking to his firm to troubleshoot sensitive questions of joining the two cultures. "There's no point in merging unless you become more efficient," Parker notes. Figuring out the best alignments—physical, logistical, and, by extension, philosophical—is a job that falls to Parker's team. "As a profession," he continues, "I'm afraid architects have wanted less responsibility and influence, and in healthcare, we're getting more of both."

Holding pattern

But as yet, most healthcare executives are hedging their plans for new facilities, assert firm principals. "They want to let healthcare reform settle itself out," says Robert Hoye, vice president of TRO/The Ritchie Organization in Newton, Massachusetts. In the Boston area, for example, just after Hillary Rodham Clinton formed her healthcare task force, five major hospitals put their construction plans on ice. One of them, a TRO client, postponed the project, stranding the design team for six months.

Given the uncertainty about the ultimate healthcare reform package, many healthcare clients are vigilant about keeping their options open. St. Francis Hospital and Medical Center in Hartford, Connecticut, is responding to an uncertain future by favoring easily convertible designs by TRO for a new facility. Intermediate-care rooms at St. Francis, Hoye points out, can be reconfigured three ways to accommodate changes in patient volume.

The hospital's "universal" critical-care rooms contain the ports and hardware for practically all intensive-care functions: Critical-care rooms are not expressly dedicated to, say, cardiac or renal treatments. In addition, the structure is arranged on a grid that facilitates modular room changes. "Flexibility," Hoye explains, "is the ability to adapt to what is currently undefined change."

Contingency plans

Kaiser Permanente, widely regarded as a model of healthcare reform, is not holding back but is proceeding advisedly with new building plans. Kaiser is relying on contingency plans for new or planned facilities. "We're requesting designs in multiple sizes," says Kip Edwards, director of facilities design and construction for Kaiser's Northern California region. "That creates a bit of a challenge for the architect, but we're trying to create one design that can be pared back or expanded, depending on future demand."

Integral to Kaiser's contingency planning are stock designs for medical-surgical wards. These self-contained, 20-room templates, designed by Anderson DeBartolo Pan of Tucson, Arizona, are planned for easy addition onto Kaiser Permanente's new ambulatory facilities, if necessary. "They plug together almost like Legos," avers Edwards.

Yet one firm principal who has worked with the predesigned plans expresses reservations. Kaiser's strategy of exploiting stock plans, he admits, represents sound business

ABOVE: Kaiser Permanente is the nation's preeminent health-maintenance network. Many experts view Kaiser as healthcare reform's major model. Like many of Kaiser's facilities, this Fresno, California, medical center, designed by The Ratcliff Architects of Emeryville, California, reflects the uncertain future of the healthcare industry. Kaiser asks architects to devise multiple contingency plans for new facilities— designs that can either be pared back or expanded, according to changing patient volume. Kaiser has preapproved a stable of architects nationwide to whom it will send any future requests for proposals for new facilities.

BELOW: Architects at The Ritchie Organization incorporated convertible features into the design of the St. Francis Hospital and Medical Center in Hartford, Connecticut, that allow the facility to transform quickly to support any degree of inpatient or outpatient care. Intermediate-care rooms conform to any of three layout schemes, depending on what patient volume dictates. And the "universal" critical-care room, which contains the full range of hardware and ports for services required during intensive care, departs from the traditional territoriality of critical-care rooms, which in the past have been dedicated to specific types of support.

planning by a savvy corporation. And Kaiser is hardly the first large client to commission modular designs. Some public school systems and the U.S. Postal Service commission their buildings from a kit of parts. But the arena of healthcare is different, the skeptical principal argues. The healthcare environment changes faster than any other building type interior, and while Kaiser's preconceived designs captured the highest state-of-the-art at the time they were developed, says the architect, "they tend to fix an older pattern in stone as a new pattern is emerging, and unfortunately, by now there's a certain allegiance to them."

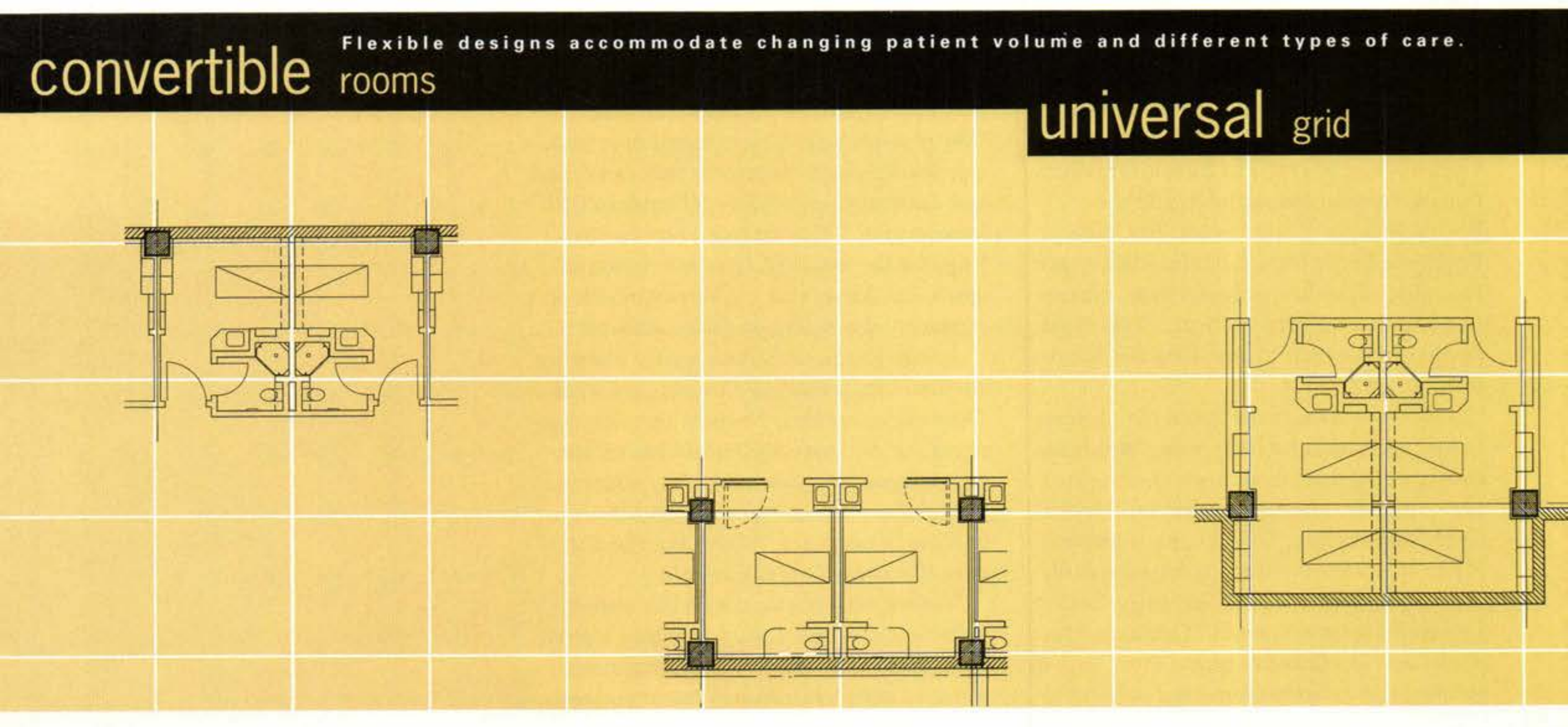
Perhaps more significantly, Kaiser is changing the process for commissioning its architectural work. The HMO has compiled an exclusive list of architecture firms that meet its exacting criteria. Only prequalified firms in Kaiser Permanente's dossier receive new requests for proposals. From there, the selection process follows the standard short-list-interview-award pattern.

This deviation from allowing architects to select contractors and consultants is peculiar to the demands of healthcare practice. Organizations emulating Kaiser's medical delivery may copy the example of the client controlling architectural projects. "In a more traditional process, you design, the client signs off, and you build," says Kit Ratcliff, principal of The Ratcliff Architects in Emeryville, California, which has designed two Kaiser facilities. Kaiser, however, "is a very, very active participant in the process, more so than the conventional healthcare client," he says. "They have the resources to stay involved, and they have an attitude about it." For example, at Kaiser's Fresno, California, facility, designed by Ratcliff, Kaiser was constantly engaging its value engineers. "They are very involved in managing everybody," Ratcliff maintains, "and everybody really has to perform."

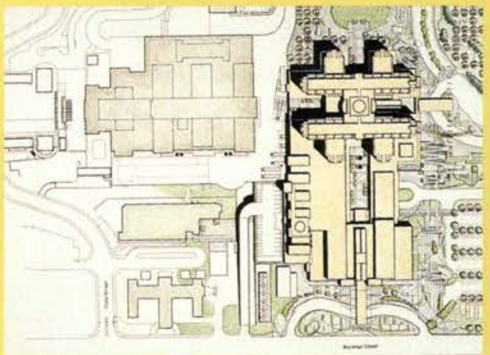
Public-sector politics

As if the client's own anxiety weren't enough to complicate the medical facility design process, external priorities are increasingly changing the practice of designing today's healthcare environments. Political pressures are particularly high at public and university-affiliated hospitals, which must be more accountable to their communities than their private-sector counterparts.

A 2 million-square-foot patient-care tower at the Los Angeles County and University of Southern California (LAC+USC) Medical Center and three other hospitals on its campus—totalling 4 million square feet—are being consolidated into a single, new, 2.4 million-square-foot facility by architects Lee Burkhart Liu (LBL), of Santa Monica, in association with Hellmuth, Obata & Kassabaum. Because it is a public hospital, the center will handle many very sick patients—half of all Los Angeles County's AIDS cases and 70 percent of all sickle-cell anemia patients. Therefore, the monolithic profile of the new design runs counter to the trend of scaled-down outpatient facilities. Instead, it resembles the



intensive interaction Political pressures affect medical facility design. political mandate accelerated construction



tower-and-base model of medical facilities of the 1960s, where rooms and utilities are designed for optimum flexibility.

And, because of its critical position in the community, design of the 946-bed LAC+USC replacement project is being executed on a tight schedule to beat statutory deadlines that have been set by the California legislature. Construction documents must be completed by June 30, which compresses a 48-month design process into 24 months.

Ken Lee, LBL's principal in charge of the project, explains that the deadline will be met by virtue of an ultra-rigid schedule of design review and a value engineering regimen that runs concurrently with the design process. "We have had to establish project guidelines for expedited decisions, scheduling, deliveries, owner review, and peer review to respect the schedule," explains Lee, who heads a design team of 60 people. Any delays could cost the facility its accreditation as well as its state and federal reimbursements for construction costs, which amount to $575 million. In the manner of much of today's healthcare facilities work, an unprecedented onus falls to the architect.

Architects may become similarly mired in the complex politics of university-owned hospitals, explains Richard Dallum, principal of NBBJ in Seattle. Medical staff are being called upon to keep costs down. Those concerns, Dallum adds, are usually contrary to those of hospital board members, who are trying to preserve the institution's image in the community. "The medical staff still have their wish lists, as complete as ever, but the administration comes in to say: 'You can only have this much.' " Consequently, the architects get caught in the middle. Notes Dallum, "We're feeling more intense pressure to keep costs down too, even as we try to adapt a 50- or 60-year-old building" for current and future technologies, such as cellular, microwave, and high-resolution imaging systems.

Making a difference

While quality, access, technology, and cost all tie together, ultimately, the challenges of building for future technologies pale in comparison to the greater problems of clients whose very occupation hangs in utter doubt and confusion. Passage of a landmark healthcare law will help restore a sense of direction, but the Clinton healthcare reform package is currently up against not only rival proposals in Congress, but also a mandate to overhaul the nation's welfare system. In other words, true healthcare reform could take a while. In the interim, healthcare design promises to become even more demanding as clients struggle to keep up with forward-thinking competitors like Kaiser Permanente, and likewise as Kaiser reacts to the newfound gains of other providers. "For architects to be influential, and not boutique designers of small facilities," asserts Anshen + Allen's Derek Parker, "they have to grab an opportunity and spend these exciting times making a difference."—*Bradford McKee*

ABOVE: The 60-year-old Los Angeles County and University of Southern California Medical Center, comprising four public hospitals, is under statutory pressure to consolidate these hospitals into a single facility. Architects Lee Burkhart Liu, with Hellmuth, Obata & Kassabaum, are realigning the four hospitals, with 4 million square feet, into a new 2.4 million-square-foot complex. The final product will house 946 inpatient beds and a panoply of outpatient services. California law dictates that the design process for this project, which easily could take four years, be completed in only 24 months. The deadline prompts strict, faultproof project guidelines; a compressed construction schedule; and an accelerated review program between the client and the architects.

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Choosing the Right Plotter

Six types of output devices now offer more advantages than their predecessors.

ABOVE RIGHT: The Hewlett-Packard DesignJet 200 epitomizes the new, lower cost, faster inkjet plotters that deliver 300 dots per inch.

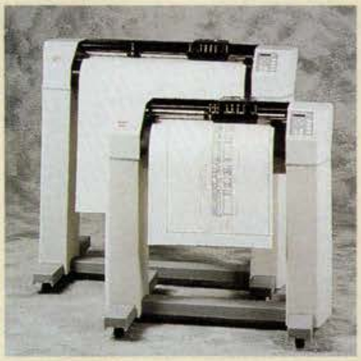
Architects who are considering purchasing a plotter in the next few months face a dilemma that has long dogged computer buyers: Because technology is improving so fast, and prices are dropping, they ask, "Should I buy now, or wait for the next version? Next month, there may be a lower price on the same plotter, or possibly a new one with more features."

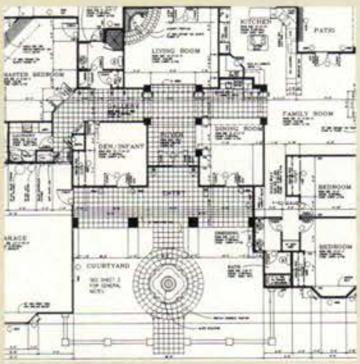
This dilemma can keep you from moving ahead in your practice. The truth is, the upward technology curve will continue for the foreseeable future. Architects now have the advantage of picking a suitable plotter from more than 150 different models offered by 28 manufacturers. "Users have a much more difficult job picking a plotter now," says Mark Lewis, director of product management for CalComp's Plotter Division. "The good news is that there are a lot of choices; the bad news is that there are a lot of choices."

It is natural to ponder the current state of technology, but the most important decisions have to do with an architect's own business. Once a firm has pinpointed its needs, staff can choose from among the available plotter types with the confidence that their choice will serve them well for some time. And they can prepare for the inevitable changes.

Three factors that influence architects most in this decision are cost, speed, and output quality. "Engineers usually have the luxury in the pocketbook that architects don't have," maintains Scott Harlin, vice president of Green Light Communications and a plotter expert. "So every cost has to be researched, and the choice has to serve a purpose for a long period of time."

Even the cost question is not answered simply. The lowest cost plotter may cost more in the long run in supplies and maintenance. Pen plotters generally are lower priced, but cost-per-plot can be higher than other technologies, and these plotters can require a considerable amount of operator or user intervention. For example, if an architect

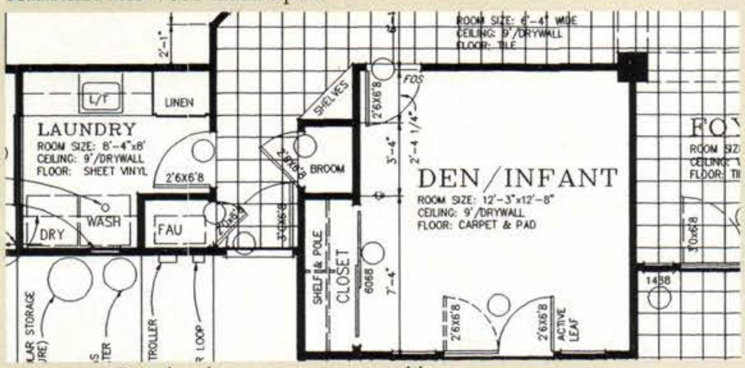




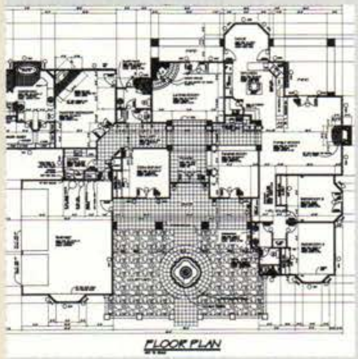
SUMMAGRAPHICS: 7000 model's plot.

Pen plotter: Large memory

Pen plotters are growing faster and more reliable. The Summagraphics' HiPlot 7000 series pen plotters offer high speed—32 inches per second on an axis, and faster on the diagonal—and handle media well with a new kind of high-grip drive system. The 7100 model handles up to D sizes, the 7200 up to E sizes. Each model employs eight pens in various tips and works with all types of media. The HiPlot machines incorporate a large memory and support HP-GL/2, which means that the computer is not tied up sending to the plotter. Although they may skip and run out of ink without warning, pen plotters offer the best detail and an accurate plot at a reasonable cost. Summagraphics firmly believes that there is a strong market for pen plotters and that they should not be relegated to the low-price end of the spectrum. The company is continuing to develop technology for pen plotters, even though it also offers other types of plotters.



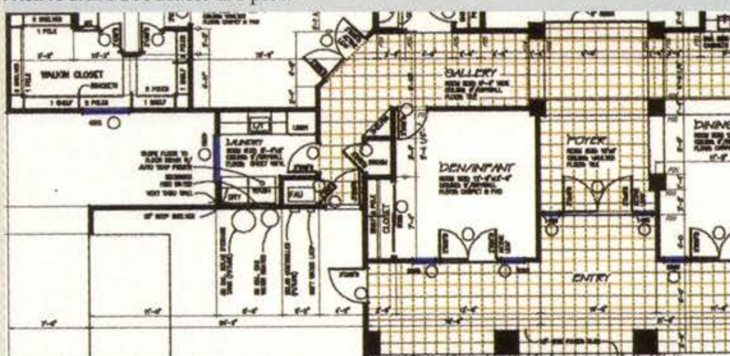
PLOT DETAIL: Detail and accuracy at a reasonable cost.



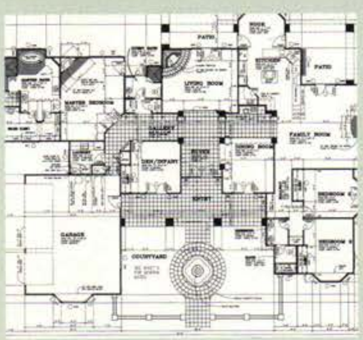
PACIFIC DATA: ProTracer II's plot.

Inkjet plotter: Midrange cost

The Pacific Data Products ProTracer II inkjet is available up to C sizes with 300 dpi resolution. Pacific Data views its plotter as an ideal compromise between a high-cost laser and a low-cost pen plotter for larger-sized media. The ProTracer II still operates at a good speed and quality on a variety of media. Because many architecture firms need the in-house capability for high-quality presentation plots in larger sizes, but would prefer not to resort to a service bureau, inkjets like the ProTracer offer a reasonably priced alternative. The drawback of inkjet plotters is that the media has to be good, often specially formulated. Pacific Data is committed to the inkjet market and believes that it will become the standard, particularly in the larger formats. The compromise will occur in degree of resolution. Although architects might like to have 600 dpi or 1,200 dpi and up, there will be considerable sacrifices in cost and speed, until newer and faster inkjet engines are developed.



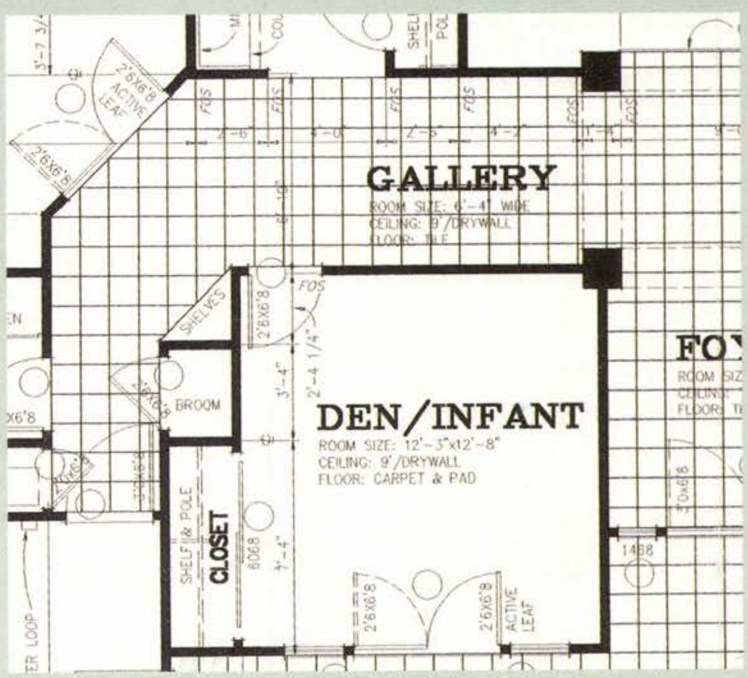
PLOT DETAIL: High speed and accuracy offset relatively low resolution.



HEWLETT PACKARD: 650C's inkjet plot.

Inkjet plotter: High resolution

The Hewlett-Packard 650C inkjet plotter renders very high resolution in large sizes (D and E). The company is competing in quality and price with pen plotters, such as those by Summagraphics and CalComp. The 650C operates at 300 dpi in color and up to 600 dpi in monochrome. At the 300 dpi level, the plotter offers an "enhanced" mode that makes a second pass to produce smoother area fills. At that level, an E-size plot will take about 18 minutes to produce. The plotters include HP-GL/2 language and can work with all other languages and CAD applications. Especially attractive for the 650C is its Macintosh interface kit, which allows the plotter to operate with Mac networks. In the monochrome market, HP offers a large-format inkjet plotter that is intended to be price-competitive with the lower end pen plotters. HP considers the DesignJet 200 series to be especially attractive for the smaller practice.



PLOT DETAIL: Color capability at 600 dpi may render imperfectly on some media.

can afford the time it takes for an employee to keep an eye on that plotter—to load paper and change pen cartridges when they run out—then that time expense is not a critical factor of the bottom line.

Pen plotters

For architect Rick Jack of Rick Jack Designs in Carrollton, Georgia, initial cost was the most important factor. He chose a CalComp DesignMate D-size pen plotter for his own work and for work he does for a local modular home builder. "I picked this one because of the cost," he explains. "I wanted low cost. Speed is not a big issue at this point."

If cost and color are primary considerations, then pen plotters are likely to remain an architect's first choice. "Pen plotters are still the most cost-effective, high-resolution color output device on the market today," asserts Ruth Rhoades, product marketing manager for plotters for Summagraphics. Their speed is rapidly improving, but, asserts Harlin, "with pen plotters, the ink-flow technology is so archaic, that no matter what the specification of the plotter is, the ink won't flow as fast as the plotter is plotting."

According to Ken Freund, managing partner of CK Associates, an Irvine, California, market research firm focusing on wide-format imaging applications, surveys show that the major complaint about pen plotters, besides speed, concerns the pens: They skip and run out of ink without warning, which requires users to intervene and rerun the plot.

But for accuracy, pen plotters are unbeatable because they are vector devices (connecting points with a single line). When creating circles, for example, vector devices draw many small straight lines, with the appearance of curves. Raster devices—like inkjets—fill in an area with dots of ink or color. The differences are not always visible, but when raster output is coarse, jagged lines are evident. Raster devices at lower dots per inch (dpi) show jagged "stepping"—particularly on angles and circles—called "jaggies."

Accurate output is guaranteed from pen plotters. Their limitations are, as Harlin says, principally mechanical, and some rather ingenious methods have been employed to overcome them. For example, firmly securing paper so that fast-moving pens won't wrinkle it or tear it poses a problem. Summagraphics' HiPlot 7000 has such fast accelerations that the company had to redesign both the drive and media handling systems. "We came up with a high-grip drive system," notes Rhoades. "The roller feels like it has adhesive on it, but it's actually thousands of tiny teeth. The roller acts like a miniature sprocket drive and tracks any media reliably."

Pencil plotters

Still, pen plotter speed is limited by the laws of hydraulics: Ink can flow only so fast. If vector quality output at low cost is important, then another alternative should be considered: pencil plotters. These devices are popular in Japan, but remain a niche market in the U.S. There are a number of advantages to pencil plotters, beginning with the same low cost as pen plotters. "The advantage of pencil plotters is that they hold a lot of leads—up to 720—so they require less attendance and can run longer," points out CK Associates' Freund. "They're faster than pen plotters, and the pencil doesn't skip." The pencil plotter can accept pencil leads and pen cartridges to generate output in various colors.

One real plus for an architecture practice that runs a lot of check plots is that the pencil drawings can be edited without having to redraw the whole document. Mark Coyle, who serves as systems manager for R.S. Griffin, a growing firm in Asheville, North Carolina, works with a pen plotter, but has a fondness for pencil: "It's a good takeoff point for other media," Coyle notes. "You can use the plots as base drawings for finished watercolors or hand rendering." Even with its advantages, however, the pencil plotter seems destined to remain relegated to a niche.

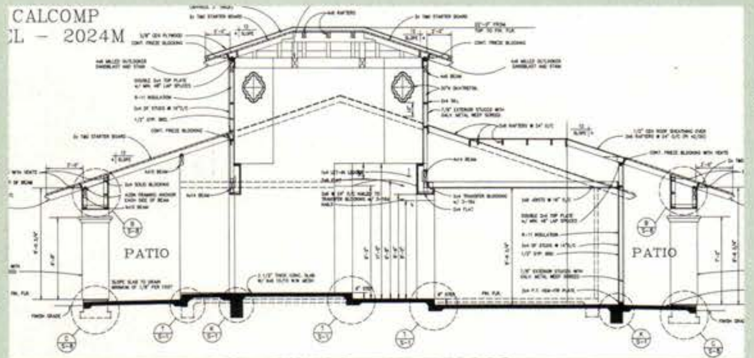
Inkjet plotters

Both pen and pencil plotters are losing ground to fast-growing inkjet technology. For a long time in the plotter market, there was no middle ground between the low-cost pen plotters and the high-end electrostatic plotters. Inkjet plotters are more than filling that middle ground. When speed begins to equal cost in importance, serious consideration should be given to an inkjet plotter.

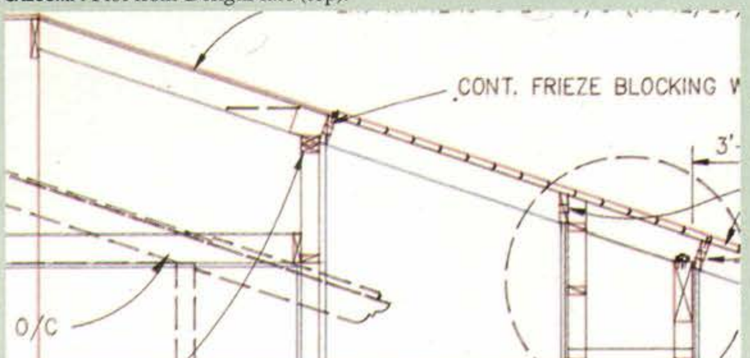
Hewlett-Packard (HP) introduced inkjet plotter technology, which it pioneered on office desktops with its DeskJet series. For architecture practices, HP has created a special series of aggressively priced inkjet plotters in a wide variety of sizes. But HP is by no means alone in this market. "For monochrome, inkjets are the way to go," asserts Summagraphics' Rhoades, "because they'll be 5 to 6 times faster than a pen plotter." What does an architect give up besides price? Quality; inkjet resolution is generally 300 dpi or 360 dpi, which is not acceptable for many architects. HP has a high-end inkjet plotter that

Pen plotter: Large format

CalComp's DesignMate pen plotters are affordable large-format machines that are ideal for the smaller office. CalComp's plotters work with a wide range of software and handle the input of a number of workstations without the need of a network. The chief advantages of these pen plotters are low cost—priced from less than $1,000 to just under $10,000, depending on the output width—and compatibility with a variety of CAD software languages.



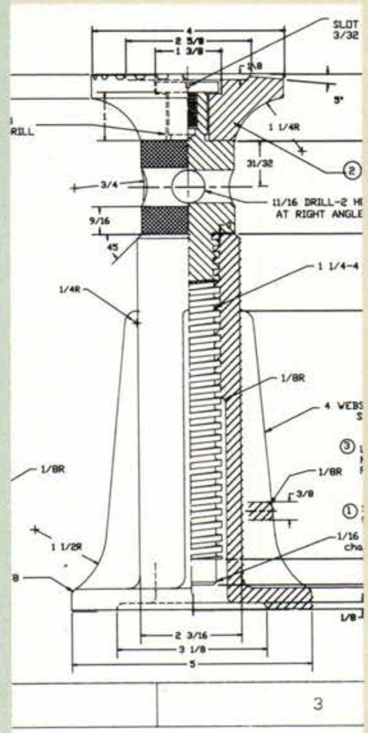
CALCOMP: Plot from DesignMate (top).



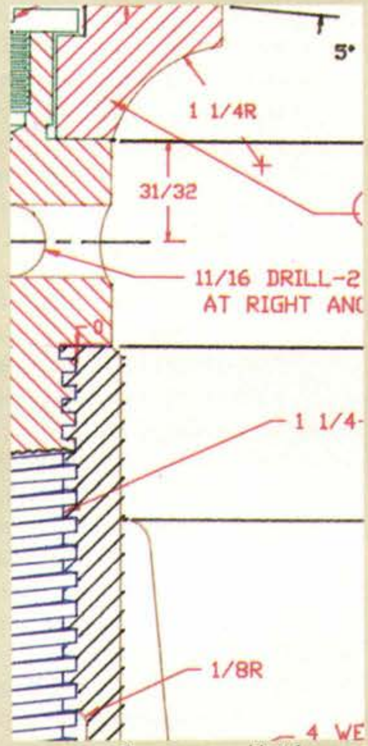
PLOT DETAIL: Low cost and high-quality color sacrifice speed of ink flow.

Pen plotter: Desktop

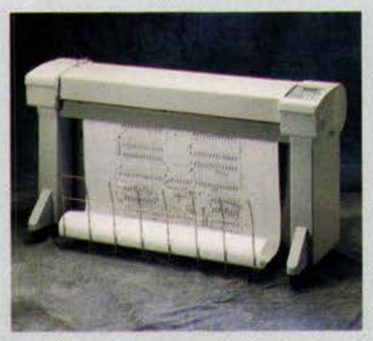
The Roland SketchMate employs an electrostatic paper-holding system that allows it to operate easily at an angle. Roland offers pens in 32 colors (eight may be used at a time) in two tip sizes. The A-size SketchMate is priced at under $1,000; the B size under $1,500. The SketchMate can output on various papers, as well as poster board and transparencies for overhead projectors. For small-scale presentations, the plotter offers attractive final output.



ROLAND: Plot from SketchMate (top).



PLOT DETAIL: Pen-generated brightness.



Pencil plotter: Smooth curves

Mutoh is the only American manufacturer offering pencil plotters, such as the XP-510R model, which can operate longer, when unattended, than pen plotters because so many leads can be loaded into the holders—up to 720, depending on the size. The Mutoh plotters allow users to mix both pens and pencils in the same carousel. This arrangement allows the plotter to be set up to produce check plots in pencil and final plots in pen without having to change equipment in the carousel. Mutoh's research shows that about 60 percent of the plots produced in the average firm are check plots. Since pencil has the lowest cost per plot of all machines, it makes sense to reduce the costs for the majority of the work and then go to pen for presentation work. Mutoh's program gives smoother curves that come close to hand drawing. Although these plotters are the preferred type in Japan, they are not as popular in the U.S.

MUTOH: Plot from XP510R (top).

PLOT DETAIL: Vector-quality output, without unreliability of pen plotter's ink flow.

operates at 600 dpi by making a double pass, but this slows the operation considerably, and the speed advantage is lost.

"In A-size, architects want to go to 600 dpi or 1,200 dpi and on up," states Mark Lee, director of marketing for Pacific Data Products. "But when you start getting into large documents, architects would like to have better resolution. However, there are some upper bounds," Lee adds. "A resolution of 360 dpi is sufficient for today; they will look toward 600 dpi, but you will sacrifice both cost and speed for that resolution."

Quality can, however, be in the eye of the beholder. Jim Zeman, systems manager for The Jenkins Group, a 25-person architecture firm in Itasca, Illinois, went from a pen plotter to the HP 650C, a color-capable inkjet plotter that can also plot up to 600 dpi. "The quality is wonderful," Zeman exclaims. "I would say the inkjet is slightly better than a pen plotter as far as accuracy is concerned." Speed is significantly improved over the older pen plotter: "What took an hour, now takes 10 minutes." Notes Coyle, "You have to look fairly close to see the jaggies."

Cost was also an issue for Zeman in selecting the appropriate plotter for The Jenkins Group—but not the major issue. When it comes to balancing an architect's needs with the technology, he says, there's no reason to hold back on a purchase, if an architect wants both speed and color. "I would tell anyone who ever had any thought of getting into color, this is the time to do it, because the price difference is minimal when you look at what you get for that extra $2,000." Of course, as Zeman points out, the cost of ink cartridges is higher than that for replacing pens in a pen plotter, "but we knew about that coming in, so we weren't surprised. The cartridges are not cheap. It's also a concern if you use a lot of mylar, because that's very expensive and hasn't been perfected for inkjet."

High-speed plotters

At the high end of the market are direct-thermal imaging, electrostatic, and laser plotters, all designed for high speed and quality. CalComp has been aggressive in reducing prices on even its high-end models, so its DrawingMaster series of direct-imaging machines start where high-end inkjets leave off: about $10,000. The high-end electrostatic machines go on up to nearly $70,000 for color. But if quantity of output is essential, these machines are the way to go. They are clearly meant for larger firms that are networked, so that the plotter will not be underused.

Mel Raleigh, a CAD draftsman and system manager for CHMP, an architecture and engineering practice in Grand Blanc, Michigan, has seven workstations that are attached to the firm's CalComp Drawing Master Pro direct-imaging plotter. "We liked the fact that you could hook up and go, without using pens," remarks Raleigh. "Pens were too time-consuming. We needed speed. When I get the drawing done on the computer, the architects want to go to a meeting and don't want to wait for the plot. It can take from 3 minutes to 15 minutes, depending on size, where the same drawing on a pen plotter would take 3 to 4 hours. That's not tolerable any more."

Direct-imaging and electrostatic printers solve a problem of high volume and many users. CalComp even provides a number of ports so that users can hook in directly without having an intervening network. "It does all the thinking for us," notes Raleigh.

The plotters also work well for installations that are networked through a traditional file server. At Ben Thompson Associates in New York City, Bertrell Tyson, project manager, says that the machine requires little attention and is perfect for high-volume output. "We don't like to curtail production too long. The architects just send it to the server and that queues it up, and the prints come rolling. For the most part, when we print, we do something like 10 sheets in a row."

Xerox has developed an advancement in electrostatic printing by exploiting a form of glass to make rectangular nibs, rather than the round metal ones employed before. The company asserts that this technique will impart clearer, sharper lines close to laser quality, at less cost than an actual laser plotter.

Laser plotting is fast and accurate, but becomes very expensive as media size increases. Because the paper or mylar has to pass over a drum that is the full width of the media, the cost of the machinery goes up sharply. For those seeking speed and quality together, however, laser plotting is hard to beat.

Architects who are still concerned about whether plotter technology is going to change so fast that they'll be stuck spending even more money at service bureaus, should take heart from Ken Freund's observation: Changes will be incremental now. "I don't see any spectacular new technology sitting in the wings that's going to pop out," Freund asserts. "There will be a continuing refinement of what's here."—*Ripley Hotch*

Ripley Hotch is an Asheville, North Carolina-based writer who specializes in computers.

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TECHNOLOGY BROUGHT TO LIGHT

Energy Boost

A new national center for energy research relies on daylighting and conservation.

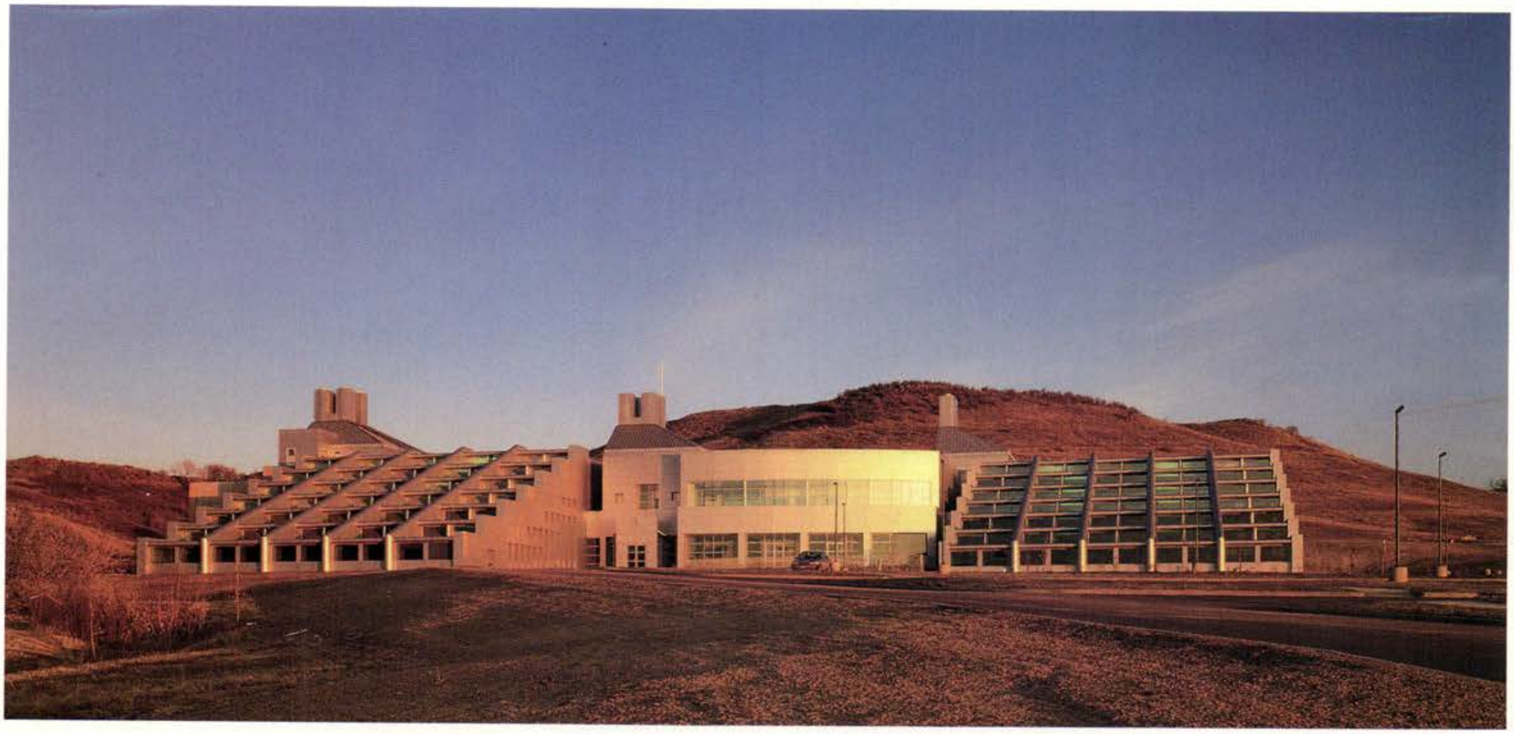
BOTTOM: The National Renewable Energy Laboratory's solar energy research facility is oriented 15 degrees east of due south so its office wings, articulated with stepped clerestories, can take full advantage of sunlight.

Since the early 1980s, renewable energy technologies have been relegated to a low priority on the national agenda. Even in the wake of the fossil-fuel "crisis" in the late 1970s, the U.S. Department of Energy's research-and-development budget steadily declined. In 1980, for instance, the federal budget for research in photovoltaics stood at \$254 million; one decade later it had fallen to \$37 million. President Ronald Reagan and his administration believed that the U.S. energy markets did not require regulation by the federal government. Reagan, in fact, wanted to abolish the Energy Department, which was created in 1977 under President Jimmy Carter. (The department was not dismantled, but Reagan's first Secretary of Energy, James Edwards, was a dentist.)

Today, renewable energy technologies—wind, passive solar, and, especially, photovoltaics—are making a comeback. One important sign is the Solar Energy Research Laboratory, commissioned by the National Renewable Energy Laboratory (NREL), in Golden, Colorado, designed by architects Anderson DeBartolo Pan. As a full-fledged national research center on a par with the nuclear nurseries of Los Alamos, Sandia, Oak Ridge, and Lawrence Berkeley Laboratory, the facility supports leading scientific investigations in photovoltaics, materials research, and superconductivity.

These studies signal a departure from the energy research of the Reagan years, which focused on synthetic fuels, such as shale oil. The practical applications of such fuels proved to be "a total fiasco," argues Bill Browning, director of green development services at the Rocky Mountain Institute, a research organization in Snowmass, Colorado, that takes a strong interest in renewable energy. Research funding for energy alternatives declined in the 1980s, compounded by the expiration of research-and-development tax credits for renewable energy in 1985. This loss of incentives sent developers of renewable energy technologies into a panic, and many renewable-fuel concerns folded. However, according to many proponents of sustainable fuels, a healthy shakeout took place in the renewable energy industry after the tax credits expired: Outfits selling dubious technologies were gone for good.

In designing the first phase of the solar-research facility, Anderson DeBartolo Pan relied on tried-and-true energy conservation strategies to create a building as efficient and inexpensive to operate as possible. Even without gambling on experimental technologies, the recently completed facility—managed on contract for the NREL, an arm of the Department of Energy, by the Midwest Research Institute—is expected to beat national public-building energy-use guidelines by more than 30 percent. "The staff really likes the statement this building makes: It is both energy-efficient and cost-effective," explains Roland Hulstrom, manager of the photovoltaics engineering and applications branch of the NREL, which operates at five separate



HEDRICH BLESSING

BOTTOM: Anderson DeBartolo Pan designed the laboratory to rely on natural light and incorporated efficient heating and ventilation systems and other energy-conserving technologies. **FACING PAGE, TOP LEFT:** North perimeter follows topography of sloped mesa edge. Ventilation ducts are housed in aluminum-clad stacks. **FACING PAGE, BOTTOM LEFT:** Aluminum-clad trusses create open office plan by leaning against lab module to north. **FACING PAGE, RIGHT:** Trombe wall clads south elevation of shipping and receiving area, absorbing the sun's heat and radiating it to interiors.

sites in the Denver area. "The building practices what we preach as a laboratory."

Part of the mission of the NREL is to explore various building systems that rely on sustainable and clean energy sources, such as photovoltaics, high-temperature superconductivity, and other basic energy sciences. Photovoltaic research exploits semiconductor materials to turn sunlight into electricity. The lapse in federal support of photovoltaics allowed the Japanese to surpass the U.S. in the mid-1980s in shipments of photovoltaic equipment, which is the most promising of the renewable energy technologies. The U.S. had been the original inventor and developer of photovoltaics, at Bell Labs and space agencies in the 1950s. Yet by 1986, Japan exceeded the U.S. in support of photovoltaic research; and in 1988, Germany beat Japan. The U.S. finally regained dominance in shipments of photovoltaic hardware in 1993.

Superconductivity holds promises of employing specialized ceramic materials to carry electrical currents with no resistance and to store electricity at relatively high temperatures. Research scientists at NREL also will look into the capabilities of sunlight to turn prosaic substances such as carbon dioxide into useful forms of energy.

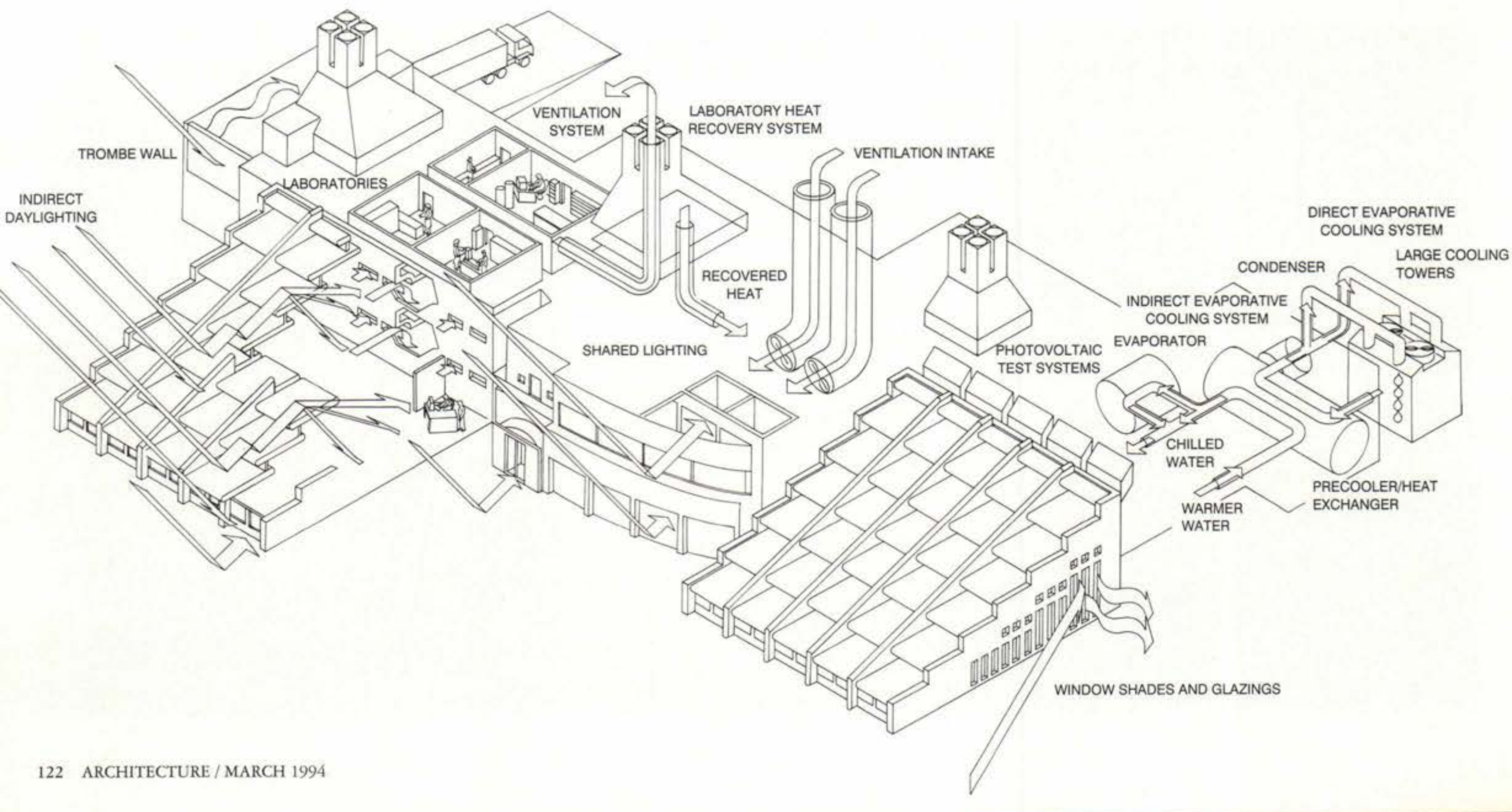
Linear lab distribution

Anderson DeBartolo Pan positioned the 115,000-square-foot, $19.6 million laboratory at the foot of the South Table Mountain mesa on a 300-acre rural site the government will develop as a research center over the next decade, as funding from Congress permits. The architects composed the building as three contiguous volumes offset from one another to conform to the topography of the sloped mesa edge and set the laboratory's back wall into the hill about 60 feet to take advantage of the earth's insulating properties. "We wanted a linear distribution of laboratories," explains principal Jack DeBartolo. "The mesa and the wild grass that covers the site are valued locally. I really felt that this site did not need to be urbanized."

To satisfy NREL's primary objective to foster interaction and communication among researchers, as well as to meet the client's stringent energy-conservation criteria, Anderson DeBartolo Pan separated the building's office and laboratory spaces, grouping scientists' offices in two open-plan wings at either end of the building along its south side and stacking laboratories two stories high in three volumes to the north.

Natural light creates an inviting atmosphere in the glass-enclosed central lobby and cafeteria, located on the building's south perimeter between the office wings. Since the building opened late last year, the atrium-style cafeteria has become so popular with visitors from neighboring government buildings that facility managers have been forced to set up a reservation system for outsiders wishing to hold meetings there.

After overcoming early objections from users, some of whom wanted office space lo-



cated directly adjacent to their labs, Anderson DeBartolo Pan created two open-plan office wings for technicians and scientists so each of the 180 building occupants could have a daylit office within an economical building footprint. Each wing holds 36 cubicle-style offices, as well as 17 private offices, located at the south and north perimeters of the open area. The office wings also contain small conference rooms and central lounge-style meeting areas for informal exchanges between scientists. "These gathering places have turned out to be a real plus," reports Hulstrom. "People are already saying that even if space becomes tight as our laboratory staff grows, under no circumstances should these meeting areas be eliminated."

The offices are grouped under stepped clerestories in 10,000-square-foot, open-plan wings constructed of aluminum-clad trusses that create a 95-foot clear span inside. At their highest point, the trusses literally lean against the boxlike steel-framed laboratory modules to the north. The entire complex is oriented 15 degrees east of due south to take maximum advantage of sunlight in the offices, because natural light is both less expensive and better suited to most office tasks.

Emphasis on daylight

Daylight enters the offices through stepped, horizontal roof tiers separated by windows that also provide occupants with a glimpse of the mountains. Because each tier overhangs the window below it by about 4 feet, sunlight does not enter the windows directly during the warmest months of the year. Instead, natural light bounces off the aluminum-clad roof surfaces; passes through the windows; and is reflected off the office interior's white, acoustic-tiled ceiling, providing occupants with an indirect, diffused light and avoiding both unwanted heat gain and glare (ARCHITECTURE, October 1992, pages 90-91). Only during the winter, when the angle of the sun is closer to the horizon, does sunlight enter directly through the clerestories to provide heat as well as light.

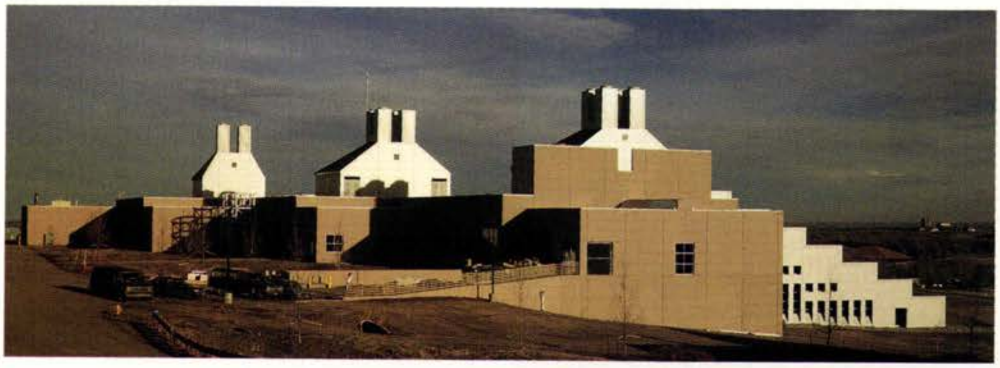
To achieve the most even daylighting possible at the workspace level, Boulder-based lighting consultant Steve Ternoey recommended graduating the light-transmittance value of the clerestory glass. Transparent glass at the upper level of the south-facing office space transmits 78 percent of the light that strikes it, while tinted glass installed at lower clerestory levels, closer to the workspace, transmits just 38 percent. Tinted windows in the east and west office-module walls transmit only 28 percent of available light and are covered with a low-emissivity coating to reduce glare. In addition, these windows are fitted with shades that are automatically raised and lowered by photosensitive controls, although the shades can be adjusted manually by occupants with an override control switch. The woven-fabric shades are 8 percent transparent and allow occupants to sense major outdoor landscape elements even when the shades are closed.

Although task lighting is provided for each occupant, artificial ambient lighting is required for just one hour after sunrise and one hour before sunset each day. Anderson DeBartolo Pan placed the fluorescent lights within the lower roof trays so that artificial light is reflected up and into the space, mimicking the way daylight is distributed.

Laboratory lighting

Much of the Solar Energy Research Laboratory's scientific work revolves around the study of sunlight and its effect on materials. But Anderson DeBartolo Pan illuminated the laboratories with artificial light, which can be controlled or totally eliminated as circumstances warrant. The architects located the laboratories along the building's north side and lighted them with highly efficient, 50-watt fluorescent lamps that produce the same amount of light as standard 70-watt fluorescent lamps. Specifying these lamps saves an estimated $10,000 a year in electricity, according to an analysis of the structure by the NREL. To further reduce electricity costs, artificial lighting fixtures throughout the building are activated by occupancy sensors that turn off the lights 10 minutes after motion can no longer be detected.

Designed for maximum flexibility, the laboratories are based on a 10-foot-by-25-foot module, developed by architects who laid out tape on the floor to indicate required equipment locations. Metal hangers were installed at every intersection of the lab's ex-



HEDRICH BLESSING PHOTOS

BOTTOM LEFT: Photosensitive controls raise and lower shades on east- and west-facing office windows to eliminate unwanted heat gain and glare.
BOTTOM RIGHT: Glazing is covered with a low-emissivity coating that transmits only 28 percent of sunlight and reduces heat gain and glare in offices.
FACING PAGE, BOTTOM LEFT: Cooling system, located in basement, employs a heat exchanger to precool warm water returning from laboratory equipment before it enters mechanical chillers.
FACING PAGE, BOTTOM RIGHT: Cooling towers are larger than required for a building of comparable size, so smaller fans can circulate air, saving energy.

posed-concrete-waffle-slab ceiling to make moving utility lines as easy as possible, and partitions between lab spaces were designed to be easy to relocate as the space needs of occupants change. Each laboratory wing contains two rows of parallel laboratories, separated by a 12-foot-wide utility corridor. The corridor—used for transporting equipment, hazardous chemicals, and other substances—contains 3 feet of space at either side for storage. This central corridor also contains the utility network: Each lab was provided with access to compressed air, hot and cold water, nitrogen, emergency power, and other services for maximum flexibility. A corridor at the south edge of the labs is designed for public use, and a semiprivate third corridor at the north edge of each lab block is designated for technical personnel use.

Labs that handle hazardous waste are physically separated from labs that do not, and they also stand apart from the offices. Parts of the building that house extremely sensitive equipment are designed to be free of vibration. To anticipate changes in research emphasis over time, the laboratories are also designed to be enlarged or moved without disturbing the rest of the various operations of the laboratory complex.

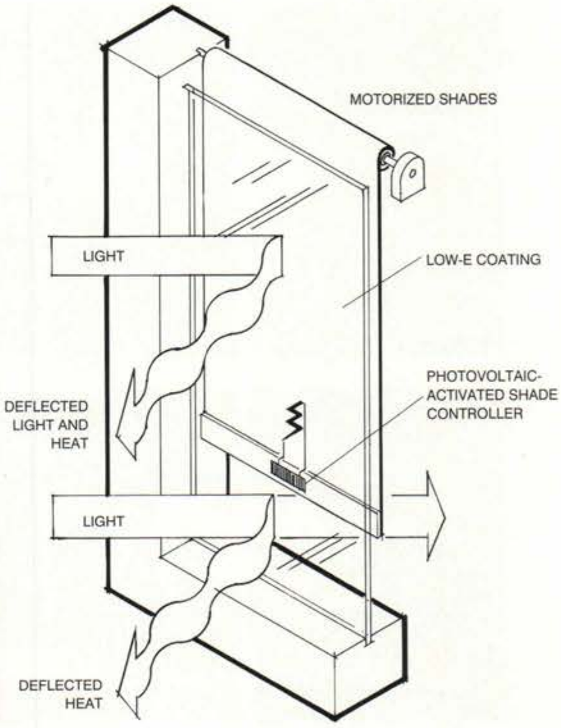
Cooling and heating

Because of the different functions of the laboratories and offices, independent heating, ventilating, and cooling systems were created to serve each type of space, explains Will Brown, a mechanical engineer and Anderson DeBartolo Pan associate. "A segmented system is essential for good protocol," Brown explains. "Safety is a big concern in scientific facilities." The laboratory block is served by a constant-volume system that incorporates 100 percent outside air; offices rely on a variable air volume system that employs recirculated air to reduce energy costs.

In the semi-desert conditions of Golden, Colorado, separate chilled water systems incorporating direct and indirect evaporative cooling proved effective and less energy-intensive than refrigerated cooling systems. They lower the air temperature in both laboratory and office spaces. Under the direct evaporative cooling system, dry air is passed through air handling units, located in the basement, that contain a porous material soaked with circulated water. As the dry air passes through the unit, it evaporates the water and absorbs its vapor. As a result, the air is cooled and its humidity level raised before it is distributed within the building.

Direct evaporative cooling is not enough in July, August, and September, when the air is too humid for the system to be effective, so water chillers and cooling towers were installed to absorb and dissipate the heat. The cooled water is supplied to HVAC equipment and the process cooling water loop, used to cool lab equipment such as reactors and lasers. Heat exchangers are used to precool return water from the building before it returns to the cooling tower.

HEDRICH BLESSING



Although safety requirements demanded as many as 12 air changes per hour for the laboratory spaces, depending on their anticipated function, architects were able to conserve energy by recovering heat from the laboratory exhaust air. That heat, captured by heat recovery systems located within roof-level penthouses that are situated atop each lab block, is then used to preheat outside air coming into the building.

Conservation technologies

To provide appropriate, controllable ventilation to staff working in the open-plan offices, the architects developed "air trees": These are aluminum-covered columns with flared tops fitted with air nozzles like those used to provide ventilation to individual airline passengers. Each column has from four to six air nozzles 12 feet above the floor, aimed to supply air to a specific cubicle. After the air tree concept was developed, the architects built a quarter-scale and then a full-scale prototype and tested the air flow and temperature differentials with infrared photography. "It took the photography to convince people that the system worked," recalls Brown.

Additional energy savings were achieved through the specification of sophisticated HVAC controls. High-efficiency motors that consume from 2 percent to 3 percent less electricity than conventional motors were installed to operate heating and cooling systems. In addition, variable-frequency-drive fans were connected to the office HVAC system. These fans save electricity by operating at between 30 percent and 100 percent of capacity, depending on demand. A larger than usual cooling tower was also installed to reduce the fan horsepower needed to produce the same performance as a smaller, more energy-intensive unit.

Efficient integration

Although experimental photovoltaic demonstration models have been placed at the top of the stepped office wings and are currently feeding power into the local electric grid, architects relied on solar energy to provide heat for only one small section of the building: a loading and storage area located at the west end of the structure. For that building section, architects installed a trombe wall on the south face of the building—a glass-faced, 16-inch-thick masonry wall coated with a black substance that traps and absorbs heat during the day and transmits it back to warm the windowless space behind.

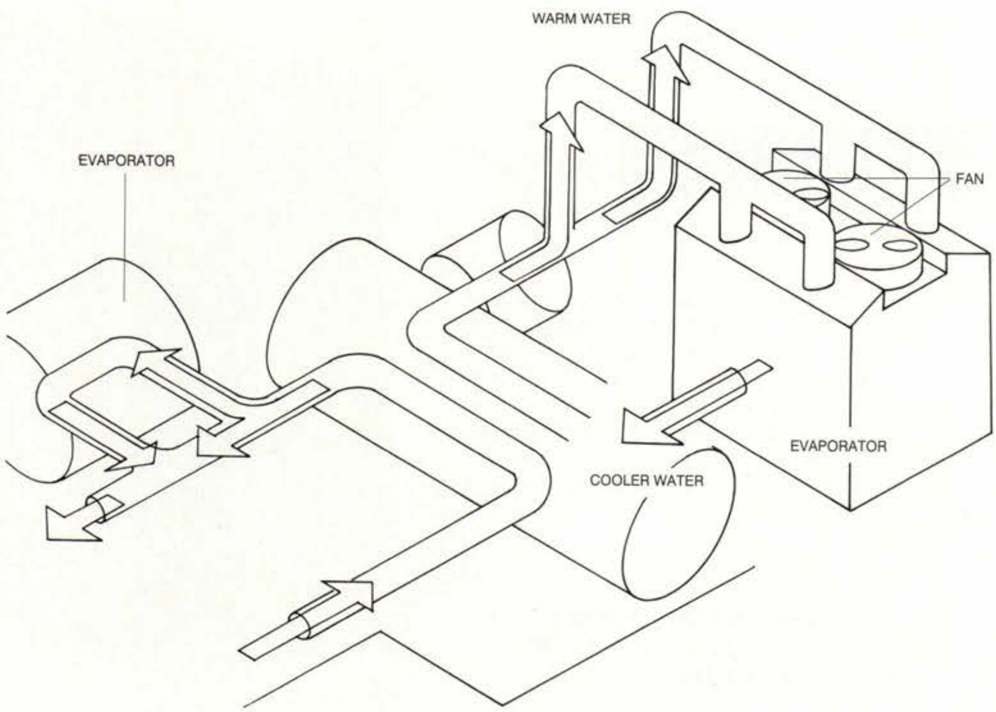
There is little doubt that the energy-conserving approach developed by Anderson DeBartolo Pan for the Solar Energy Research Laboratory played a major role in shaping the form of the building. "We wanted to fully integrate the technology and the architecture," explains DeBartolo.

It is a form that its users are learning to appreciate. "We didn't want just the same old laboratory box," explains NREL's Thomas Mulkey, manager of major construction. The preponderance of daylight in the building, coupled with scenic, outdoor views to the surrounding Colorado landscape, has impressed researchers who have started moving into the building. "It's hard for people who are not in the architectural field to put their finger on it, but the building has an upbeat atmosphere," Mulkey explains.

Indeed, Mulkey says the building will probably become a model for future federal laboratories, because of its low cost—construction cost about $150 per square foot—and because of its effective daylighting and energy-conservation strategies. A computer analysis that compared the solar energy research facility to a reference building that had the same form, orientation, floor area, and HVAC system revealed that the energy-saving technologies incorporated into the laboratory reduced anticipated energy costs by more than $170,000 a year, slightly more than 30 percent, according to NREL. "This building shows that energy-efficient systems can be incorporated into a modern building in a cost-effective way," adds Hulstrom.

Currently, NREL is finalizing a plan to build a second laboratory, patterned after the Solar Energy Research Laboratory and located directly to the east of it, to house a conference center and facility for researching renewable fuels. And construction has already begun on a 6,000-square-foot visitors' center, also designed by Anderson DeBartolo Pan, to showcase the scientists' energy-conscious research. That building is expected to be completed this fall.—*Virginia Kent Dorris*

HEDRICH BLESSING



Products

New designs elevate the quality of healthcare environments for patients.

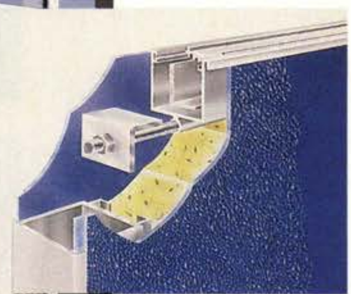
TOP LEFT: Adden Furniture offers four basic patient-care furniture lines, ranging from Classical to contemporary designs. The series consists of Cambridge, which features a traditional scalloped base and delicate detailing on drawer and door fronts; the Concord (as shown), which includes several base and leg options, colored pulls, and laminate tops; the Ashby, which incorporates a waterfall top and a scalloped base; and the Carlisle, designed for the cost-conscious client. Each furniture line offers the option of laminate tops; easy grasp pulls; solid oak drawer fronts; smooth action slides; hardwood oak veneers; and a high-impact, catalyzed finish in four stains.
Circle 401 on information card.

TOP CENTER: Cirrus Themes, ceiling panel designs from Armstrong World Industries, is a winner of the National Symposium on Healthcare Design's products competition. Carved designs include Trains, linking railroad cars and tracks together; Primaries, spotlighting the alphabet, numbers, and geometric shapes; Critters, depicting a collection of animal tracks; and Leaves, an assortment of falling leaves. Suggested installations include healthcare facilities, day-care centers, and schools, as well as retail and entertainment facilities. The textured, 2-foot-by-2-foot panels can be easily combined with Cirrus field and border panels. The carved elements can be painted to coordinate with furnishings and finishes.
Circle 402 on information card.

TOP RIGHT: Bentley Mills has designed Kids' Art flooring. This carpet was designed to create a more inviting environment for children in pediatricians' offices, hospitals, and day-care facilities. The flooring is recommended for retail as well as nursery applications. Four colorways are available and include Ted's Teal, Peg's Peach, Greg's Green, and Beth's Blue. A colorful jellybean pattern is available to define separate areas for rest or reading. Additional carpet patterns include dinosaurs and circus characters.
The carpet is manufactured with a continuous filament DuPont nylon, according to the Bentley ChromaTech process, which provides a soil-resistant finish, moisture-proof backing, and wrap-around antimicrobial protection.
Circle 403 on information card.

ABOVE: Haworth offers Places, modular healthcare systems furniture that includes an optional reception and wheelchair counter extension. Places is available in a variety of color schemes and finishes. Panels are available in a vinyl-like finish for abrasion-resistance and easy cleaning. The system includes two-way, pass-through shelving with adjustable heights that allows for effective positioning of computer monitors. The flexible grid and accessories help to free-up surface space.
Circle 404 on information card.

The Vision Lite FRP Flush Panel Door is designed for extreme physical abuse, corrosive environmental conditions, high humidity and sanitary environments. Aluminum skin available; lites optional.



The Continuous Gear Hinge bonds door and frame, which dissipates energy along the length of the door and adds years of maintenance-free life to the entrance. Available on Vision Lite and other Vistawall doors.

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Healthcare cabinetry

American Seating offers a complete modular framework furniture system, comprising steel base cabinets, suspended steel cabinets, wall units, and floor cases specifically designed for healthcare facilities (above). The S-Series system accommodates more than 300 drawer, shelf, and door configurations. The series' steel cabinets and cases are constructed of 18-gauge steel and feature coved bases and drawer corners, as well as flush handles to facilitate cleaning and sterilization. American Seating also manufactures chemically resistant work surfaces and utility handling devices, as well as a broad range of seating for patient care.
Circle 405 on information card.

Windowless views

Artificial Windows, a division of Vemco Corporation, won an honorable mention Nightingale Award for Design Excellence, which was sponsored by the National Symposium on Healthcare Design. Artificial windows consist of a high-quality electrical light box placed inside a wood window frame to offer back-illuminated views of golf courses, beach scenes, and snow-capped mountains. They can be installed in waiting areas, examining rooms, employee lounges, and individual workstations. The windows are available in three sizes and a choice of frame colors, woods, and styles. Personal family vacation photos can be customized or 157 scenic views selected.
Circle 406 on information card.

Treatment chairs

Nemschoff Chairs manufactures furnishings for healthcare facilities, colleges, universities, and the federal government. The company now offers the Pristo collection of treatment chairs (above) for outpatient services and same-day surgery, oncology, or dialysis applications. This collection was awarded a Nightingale at the National Symposium on Healthcare Design. Pristo is available with maple arms and legs, oak arms and trim, or fully upholstered. Seating positions include one that reclines a patient at a 45 degree angle for medical examination. Chairs feature an arm support for intravenous treatment and blood work; drainage bag hangers; and adjustable tray tables.
Circle 407 on information card.

Fabric coating

C-1 Finish, a clear vinyl face-coating developed by DesignTex, enhances fabrics for healthcare environments. The vinyl coating protects fibers by providing high stain resistance that can endure repeated cleanings. This coating lengthens a fabric's life span and reduces maintenance costs while improving flame-retardant properties. The C-1 finish improves abrasion-resistance for greater durability in heavy-duty applications. The coating retains a fabric's stretch and maintains its original design. It was recently honored with a Nightingale Award from the National Symposium on Healthcare Design.
Circle 408 on information card.

Modular nurse station
Milcare, a Herman Miller company, offers an alternative to traditional, fixed nurses' stations with innovative, modular components designed for both clinical and administrative functions (above). The components are suitable for a variety of functions, including securing medication, dictating patient reports, and storing surgical supplies. These components house patient monitors and lab specimens and help to organize the high- and low-voltage cables connected to computers and equipment vital to nurses' stations. Milcare is available in a wide selection of colors, fabrics, and finishes. Its cost is comparable to millwork or casegoods, but the components are purported to be cost-effective when the stations need to be reconfigured or removed. Labor, downtime, and debris are reduced; and the modular components are reusable.
Circle 409 on information card.

Healthcare chair
Sauder Manufacturing Company offers the Wedgewood healthcare chair (above), constructed of ply bends and a solid wedge of hardwood. It recommends the chair for its comfort, durability, design, and affordable cost. Sauder's objective was to create a product with the strength and durability of lightweight laminations of hardwoods to benefit persons who must spend most of their day in either a patient chair or a residence chair.
Circle 410 on information card.

Ceiling tiles
ArKIDtecture Funscapes and Signature Series are customized acoustical ceilings manufactured by Interior Systems, a division of La Crosse Acoustical Tile. These tiles provide a unique way of illustrating a logo or custom design. The design can span multiple ceiling panels or a single panel and incorporate matching colors. Designs include teddy bears, a baseball diamond, dancing sheep, or flying frogs. Suggested installations include children's clinics, schools, arcades, retail stores, and playrooms.
Circle 411 on information card.

Patient technology
Dukane Corporation's healthcare group and communications systems division offers ProCare 6000 to provide a cost-effective patient communications operation. ProCare 6000 features a compact telephone-type base master station that is operated with a touch screen display and keyboard. The system is based on a flexible local operating network technology, which provides the integration of all nurse call components. The phone-style system accommodates up to 16 priority names for assignment to 10 priority ports, which can be configured by bed or station for various responses. The company also provides additional ProCare communication management systems.
Circle 412 on information card.

Healthcare furniture
Healthcare+Plus, a division of LUI Corporation, manufactures modular-designed healthcare furniture. Healthcare+Plus' products include nurses' stations; wall-mounted, flip-down writing desks; interchangeable laboratory storage cabinets; and three lines of laminate-clad patient-room furniture. Each line is available in an extensive range of colors and finishes. Work surfaces are available in chemical- and stain-resistant laminates and in solid-surface materials. Each station can be reconfigured to provide a greater work surface, as well as storage and file space as needed. Powered electrification and wire management capabilities are included in the stations. The laminate surfaces of the stations are accented with a molded polyurethane edging in coordinating colors.
Circle 413 on information card.

Wall-mounted lighting

Zumtobel lighting offers the VE-H, a wall-mounted direct and indirect light fixture for healthcare facilities. The light fixture is available in 4-by-5-inch units comprising two T-8 fluorescent lamp uplights and one 40-watt CFL downlight, which is controlled separately. Internal ballasts, lamps, and electrical wiring are housed in an extruded aluminum gear tray with die-cast aluminum end plates finished in an electrostatically applied, powder coating. Clear plastic lenses diffuse the emitted light. The light fixtures are appropriate for hospitals, clinics, medical offices, and nursing homes.
Circle 414 on information card.

Coordinated fabrics

Columbus Coated Fabrics, a division of Borden, offers Guard 54 Harmony, a collection of wallcoverings and borders for healthcare installations. Guard Harmony's Pediatrics collection is expressed in a series of borders and coordinating sidewalls: Safari, a print featuring giraffes, elephants, and zebras; playful geometric fish called Fin-tastic; Block Party, a pattern that comprises large and widely spaced colored squares; and Freeway, which incorporates widely dispersed stripes. Guard 54 Harmony offers 14 designs in 96 colors and 7 borders with 29 color variations and was awarded a Nightingale at the recent National Symposium on Healthcare Design.
Circle 415 on information card.

Plastic bench

Landscape Forms offers Petoskey, a plastic bench constructed of 100 percent high-density polyethylene primarily formed from postconsumer milk containers. The recycled plastic is molded into timbers and then attached to a metal frame. Benches resist moisture, corrosion, and insect damage. Petoskey's seating panels are available in wood, redwood, Jarrah, and red oak panels; perforated-metal; and steel-rod. The metals are finished with a powder coat that is purported to resist rusting, chipping, peeling, and fading. The finish is available in a variety of colors.
Circle 416 on information card.

Patient-controlled shades

MechoShade Systems manufactures manual and motorized shades to reduce glare and brightness while retaining the view. MechoShades incorporate ThermoVeil Shade Cloth, a woven vinyl sunscreen, available in various densities and colors, that offers solar protection. ThermoVeil is resistant to bacterial and fungal organisms and available in 32 color and weave combinations. MechoShade's patient control system transmits a low-voltage frequency from the headboard and is controlled from the bed's side arm control unit. The shades can also be controlled from a unit within the nurses' station to free up the hospital staff.
Circle 417 on the information card.

Large-capacity elevators

Dover Elevators offers two models of large-capacity elevators for medical facilities. The elevator cars are large enough to accommodate attendants with stretcher beds and wheelchair passengers. Both sizes offer two-speed, side-opening, 4-foot-by-7-foot main doors and a rear door option. Both models are available in speeds of 75, 100, 125, 150, 175, and 200 feet per second. These models are oildraulic, which means that the elevator is supported from below, and are specifically designed for buildings up to seven stories.
Circle 418 on information card.

Slate tiles

Newfoundland Slate offers Trinity Slate, an acid- and stain-resistant, nonfading, fireproof, and noncombustible slate. Trinity roofing slate has a demonstrated life expectancy of 150 years and can be supplied in uniform lengths and widths with random and custom thicknesses available. Trinity flooring and structural slate are naturally cleft with nonslip surfaces and come in plum, blue-green, and olive-green, plus mottled colors for flagstone.
Circle 419 on information card.

Mobile chair

Add Interior Systems offers the company's Warren chair in a wheeled model to address mobility needs for nonambulatory patients. This version features projection arm fronts, a ventilated mesh seat and back, adjustability, and a highly defined curvature. The chair rests on casters and incorporates front-locking brakes. A footrest with a leg support option provides proper under-thigh and heel support. The all-mesh model allows patients to be wheeled into the shower for bathing.
Circle 420 on information card.

ADA tool

Easter Seal Society of New Jersey has fabricated a measurement tool to assist architects and builders in complying with guidelines of the Americans With Disabilities Act (ADA) in both new and existing structures. The ADA Surveyor determines measurements for door widths, heights of handrails and drinking fountains, slopes of ramps, and clearance of bathroom facilities. The tool is similar to a hinged yardstick and was developed by Gary Kaplan, a senior partner of Kaplan Gaunt DeSantis Architects and Designers, headquartered in Red Bank, New Jersey.
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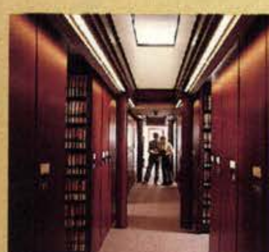

Last Chance

Did you miss valuable information offered by advertisers in last month's issue of ARCHITECTURE?

The manufacturers listed below were advertisers in last month's issue. They are anxious to provide you with their latest product information and literature for your planning needs. To receive this information, circle the appropriate numbers on the self-addressed, postage-paid response card. For product literature from advertisers in this issue, circle the appropriate numbers shown on the advertisements.

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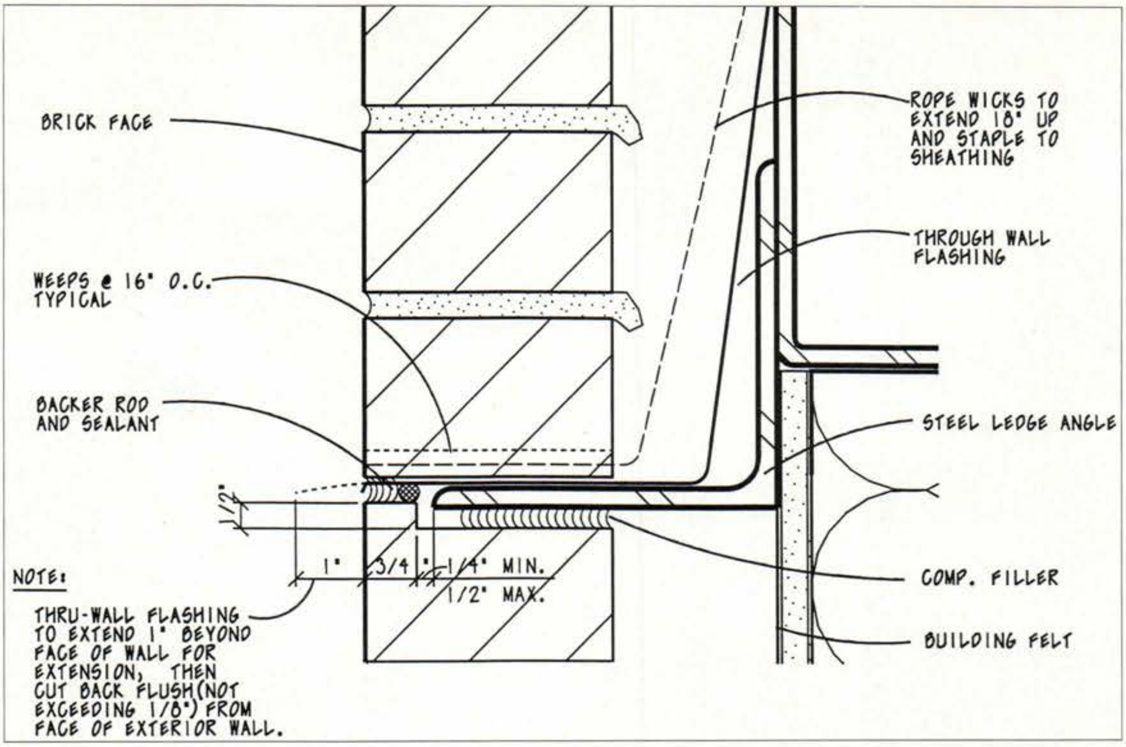


Fire Protection

CSI Section 15335

Dry-pipe sprinklers

With a dry-pipe sprinkler system, the most critical factor in preventing potential cold-weather problems is to install the pipes with a slope that ensures positive drainage in case water remains in the pipe after the system has been tested and the lines have been cleared with pressurized air. At a minimum, the slope should be $^{1}/4$ inch per square foot. Every effort should be made to clear all the water from the pipes and verify that the fittings are tight and dry.

Should water remain in the pipe at a low spot or collect in a fitting or elbow, it will freeze at or below 32 degrees Fahrenheit, increasing the possibility of the pipe cracking. With a dry-pipe system, this damage can cause immediate problems. Once the pipe cracks, the pressurized air will leave the line, setting off the valve that releases water into the pipe. Alarms will sound, and water will start filling the attic and/or plenum. If the water is not shut off quickly, the ceilings could collapse and cause substantial damage.

It is best to avoid a dry-pipe system in locations that are prone to cold temperatures. However, if such a sprinkler system is required, remember to specify an adequate slope for full drainage. Architects should impress upon the contractor the importance of blowing out all the water in the line and double-checking all fittings, valves, and connections.

J. Kenneth Payne, Jr., AIA
The Moseley McClintock Group
Richmond, Virginia

Sheet Membrane Waterproofing

CSI Section 07110

Flashing standards

Brick Institute of America standards strongly advise against termination of flashing behind the face of the wall in brick masonry construction. We derived a flashing detail that allows for inspection by the architect after the installation is completed.

If the architect specifies an EPDM or uncured neoprene sheet for the flashing material, then have the installer lap the flashing 1 inch or so beyond the face of the wall. This extension allows architects to observe whether the material has been installed correctly. After inspection, the installer can trim the flashing flush with the face of the wall.

Our study of brick expansion (detail above) revealed a $^{3}/16$-inch vertical movement. In response, we created a $^{3}/8$-inch soft joint under the ledge angle using an upturned "lip brick." This detail maintains the outside appearance of $^{3}/8$-inch joints.

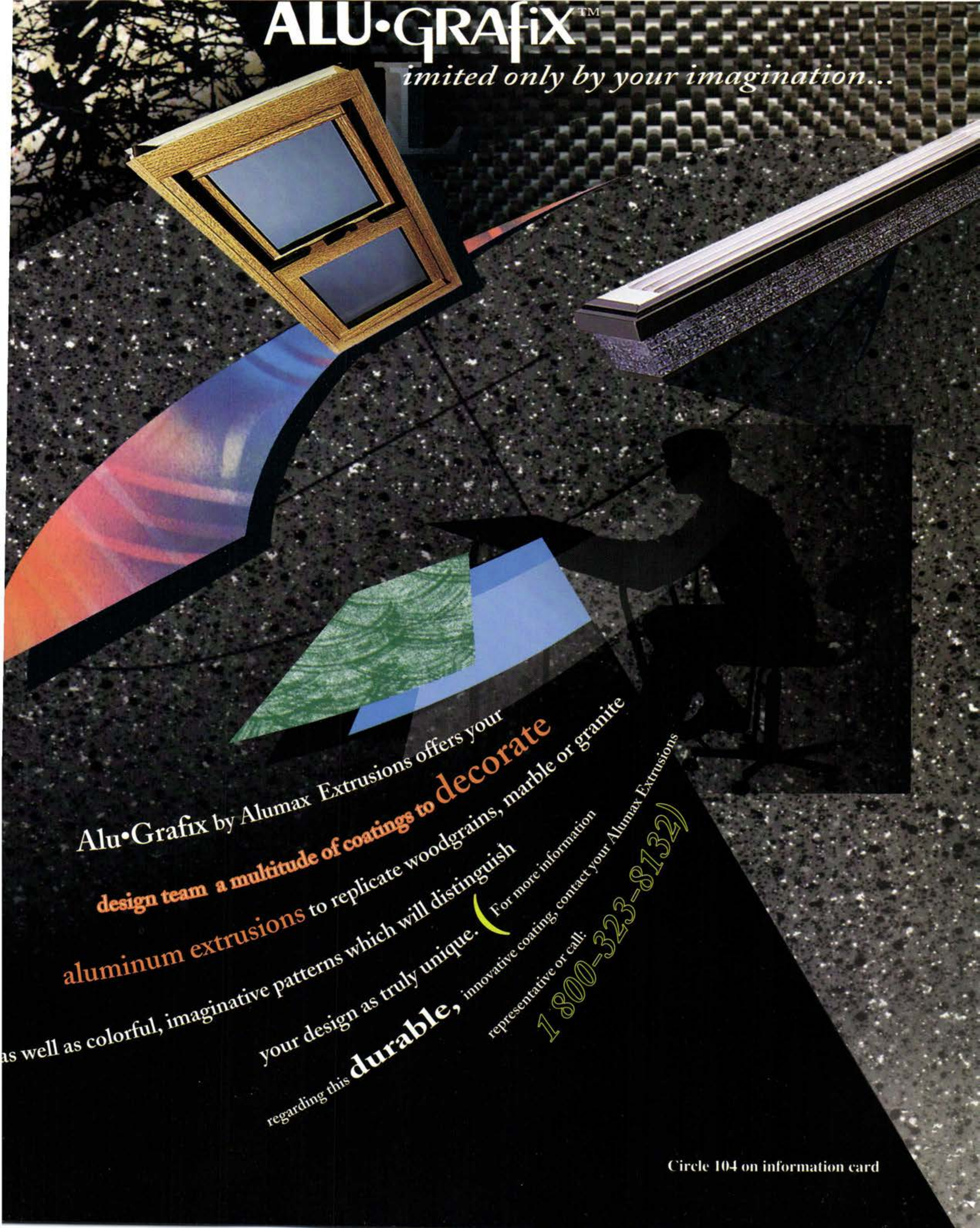
James Draheim and Jeff Stein
Henningson, Durham & Richardson
Omaha, Nebraska

Two-ply roofing

In horizontal waterproofing applications, the designer must consider the specific conditions that the waterproofing system must satisfy to remain watertight. These conditions include membrane adhesion, penetration, and durability; substrate movement; horizontal-vertical transitions; limitations of assembly thickness; and potential construction traffic on the finished system.

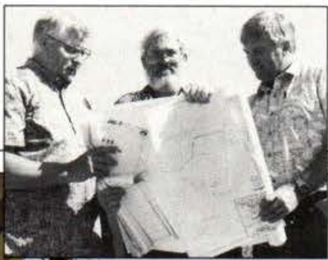
Selection of waterproofing often necessitates a conservative analysis of system attributes and their anticipated long-term effectiveness. We now opt for a polyester-reinforced, SBS modified bituminous sheet comprising a base ply and top ply, both torched in place. The top ply, blended with an integral root inhibitor, is faced with mineral granules and serves as an intermediate traffic surface, prior to placement of topping, paving, or landscaping. The two-ply application provides greater strength and resistance to puncture and permeability, and its inherent elasticity will accommodate both structural movement and bridge cracks and will retain its flexibility in extreme cold. The torched-on installation method provides stronger adhesion and better sealing around connecting elements.

Thomas J. Briney, AIA, Jeffrey K. Brown, and Mark Brandfass
IKM Incorporated, Architects
Pittsburgh, Pennsylvania

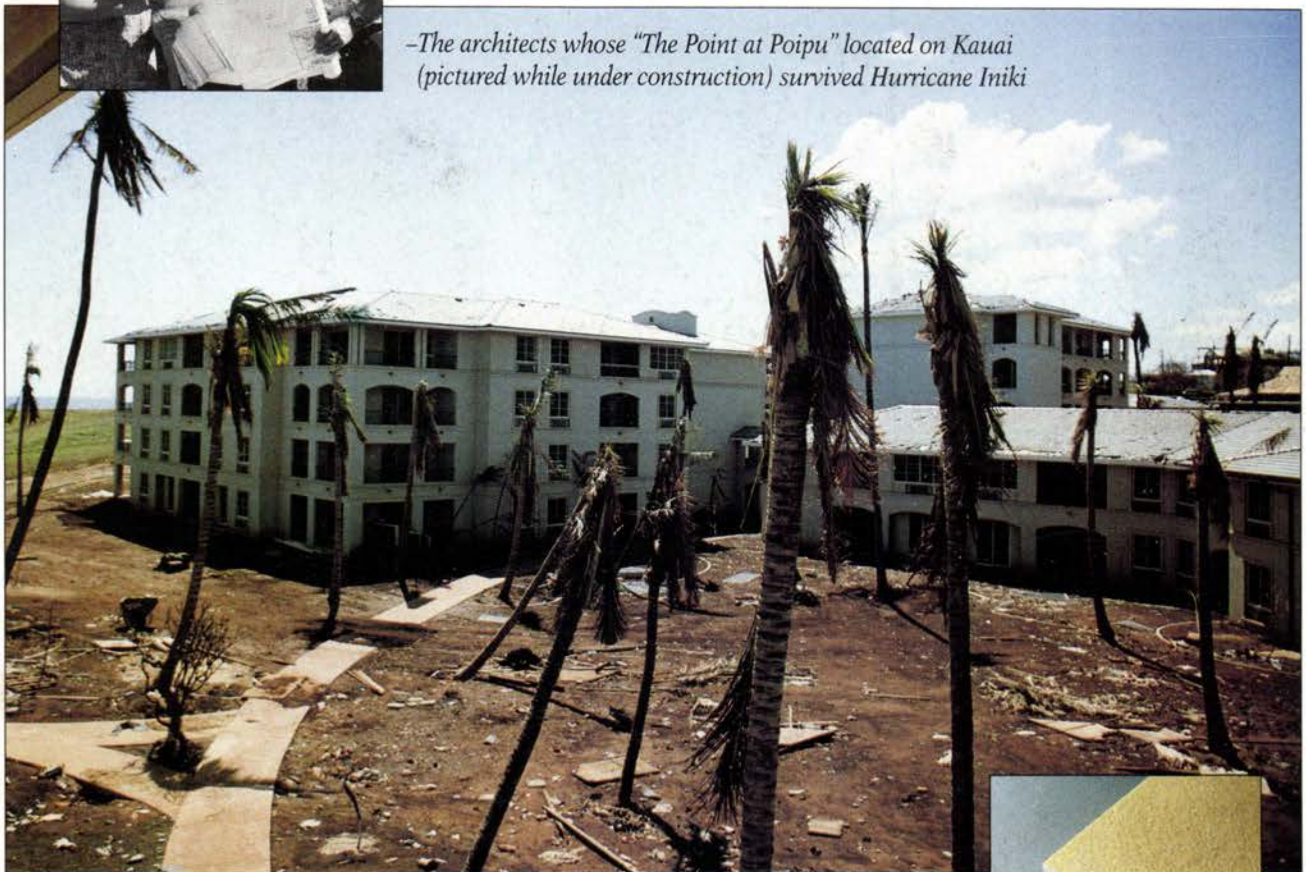


Circle 104 on information card

"We chose G-P Dens-Glass® Gold to protect the project from moisture. We were not expecting a hurricane."



–The architects whose "The Point at Poipu" located on Kauai (pictured while under construction) survived Hurricane Iniki



Architect: Group 70 International, Inc. / General Contractor: Fletcher Pacific Construction Company

G-P: You figured you'd use Dens-Glass® Gold to keep moisture out of the condos, and it ends up ...

ARCH: *...helping the condos stand up to hurricane force winds as well. The combination of the synthetic plaster we used and the Dens-Glass Gold gave the condos more structural stability than regular gypsum board could have.*

G-P: You counted on Dens-Glass Gold for protection from sea spray, right?

ARCH: *Yeah, constant sea spray riding in on lovely breezes up to 42 knots. That was a key reason we specified Dens-Glass Gold–paper-face can't touch it for moisture protection.*

G-P: So when Iniki arrived, the condos survived the winds *and* the rain.

ARCH: *Frankly, we were astonished. You know, over 85% of the buildings on the island were damaged. No one would have expected Dens-Glass Gold to withstand that kind of storm. But it is made for high perfromance. Its construction is totally unique. Silicone and fiberglass, right?*

G-P: Silicone-treated core and embedded fiberglass mats front and back, with the gold-colored alkali-resistant coating.

ARCH: *And it's those fiberglass mats that make it more stable than paper-face.*

G-P: By the way, G-P backs Dens-Glass Gold with a six-month limited warranty against moisture deterioration when it's fully exposed to the weather. It's also warranted for 5 years against manufacturer defects.*

G-P: So, you're a pretty satisfied customer?

ARCH: *And you're a master of understatement.*

*For a free brochure on Dens-Glass Gold including warranty information, call 1-800-BUILD GP (284-5347), Operator 731. For technical assistance, call 1-800-225-6119. (In Georgia, call (404) 987-5190.) Look for us in Sweets, Section #09250/GEN.

Solve it with G-P.℠

Georgia-Pacific

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