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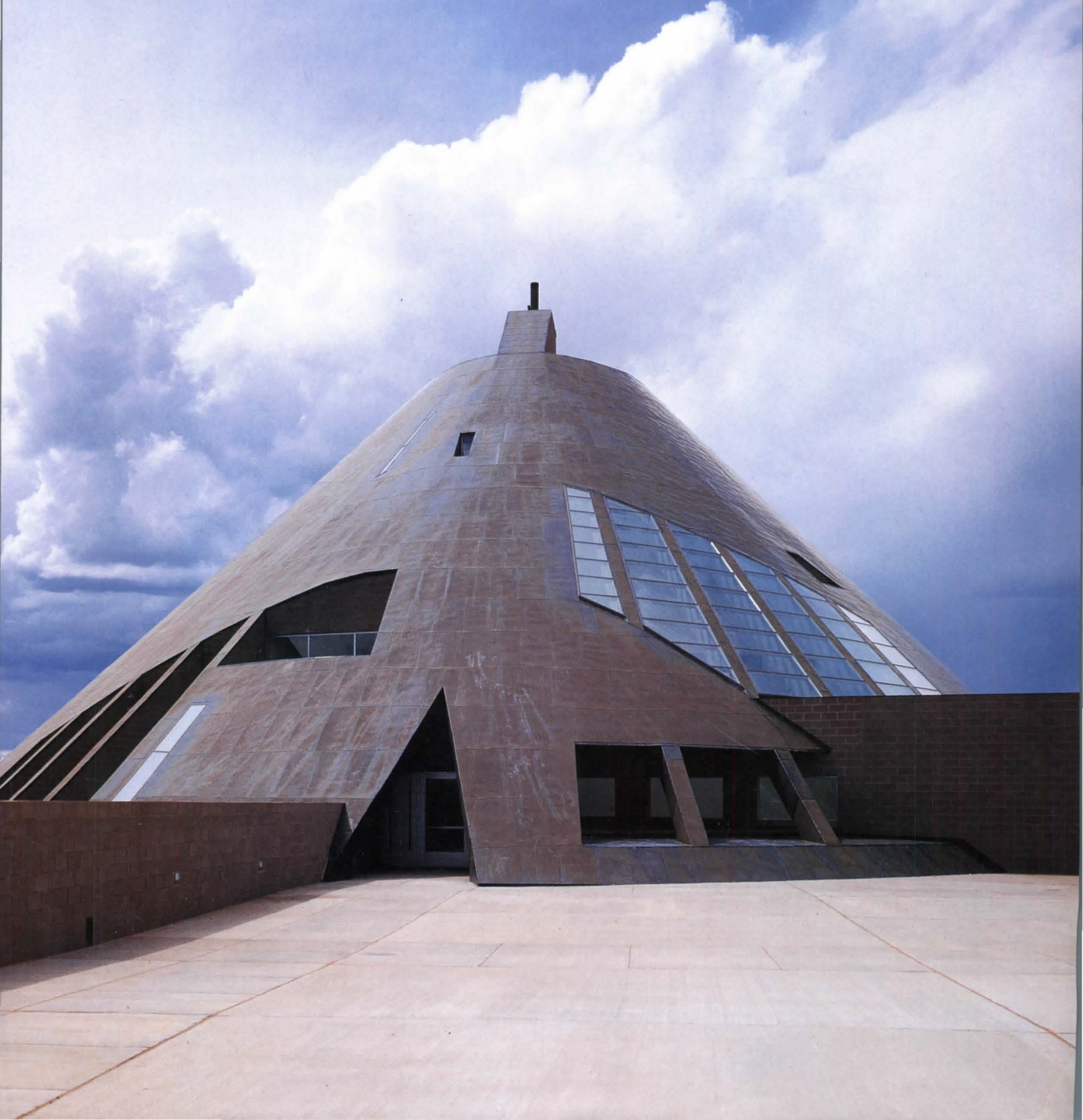


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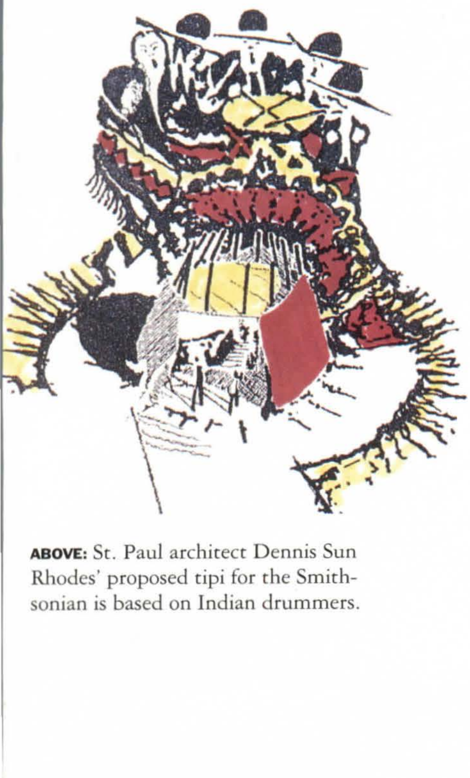
Discovering Native America

American Indian traditions should not be neglected as a contemporary design source.



ABOVE: St. Paul architect Dennis Sun Rhodes' proposed tipi for the Smithsonian is based on Indian drummers.

Antoine Predock calls his American Heritage Center, featured on our cover, the "volcanic archives" and likens the conical building to nearby Laramie Mountain. But it doesn't take a Sioux medicine man to divine the center's unmistakable likeness to a Plains Indian tipi. Appropriately, Predock evokes the ancient forms of North American Indians rather than the Eurocentric imagery of Colonial settlers, linking this country's heritage to its indigenous roots.

Predock's design represents a long-overdue reassessment of the cultural achievements of America's oldest inhabitants, whose lands stretched from the Aleutian Islands to the tip of Tierra del Fuego. Until now, established institutions have been slow to treat this legacy as truly American. The Dallas Museum of Art, for example, only recently opened its Museum of the Americas to showcase Colonial art alongside Indian artifacts, uniting the two cultures as an historical continuum. Olmec sculptures, Anasazi ceramics, and Yupik Eskimo masks are now treated on a par with paintings by Frederick Church, Georgia O'Keeffe, and Andrew Wyeth. Even more significant is the Smithsonian Institution's National Museum of the American Indian in Washington, D.C., which will be constructed on the last available space on the Mall. When it opens in 2001, the museum will give Indian culture as much prominence as the European and Asian collections housed in the neighboring institutions on the Mall.

This more inclusive view of American history stems in part from the efforts of American Indians to reassert their rights to tribal lands, develop local commerce, and gain economic clout. When the 1988 Indian Gaming Regulatory Act legalized gambling on reservations, many tribes realized a new source of revenue for community-based projects. For the first time since the Bureau of Indian Affairs established the reservations in the 19th century, Indians have their own money. This economic independence allows them to make their own decisions about the design of new buildings on their land. Instead of putting up with government-issue trailers and one-story boxes, tribes are independently commissioning new public buildings, including schools, health centers, and ceremonial structures. These commissions require that architects study local traditions to avoid trivializing Indian symbols and forms. It is not enough to decorate a building with totems or animal forms. The complexity and variety of America's many tribes have generated numerous symbols and forms with different meanings to different Indian cultures. As Arapaho architect Dennis Sun Rhodes notes, "The coyote may be sacred to one tribe, profane to another."

The federal government is finally providing one means of achieving culturally specific design for native people. Recently, the Design Arts Program of the National Endowment for the Arts joined forces with the American Indian Council of Architects and Engineers and the Department of Housing and Urban Development's Office of Native American Programs to produce *Our Home: Giving Form to Traditional Values*, a guidebook to help architects incorporate traditional American Indian forms into housing. More importantly, the guide describes the Indians' deferential attitude toward nature. "They are connected to the land and grounded by it," notes the guide. "The land and its many forms are sacred to The People."

Contemporary architects have much to learn from this respect for the landscape and the communal decision-making that has always generated Indian forms. Now that architects freely appropriate historical forms, they should look beyond our ties to Europe to reevaluate the American Indians' legacy. Native sources of inspiration can charge new architecture with a deeper cultural resonance—whether it's built on or off the reservation.

Deborah K. Dietsch


OF THE ARTS

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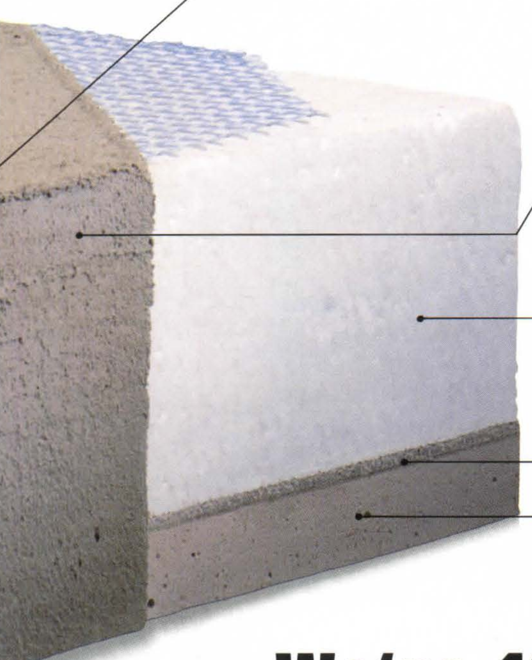

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Letters

Gay pride

We were disappointed to read the negative letters in the August 1993 issue concerning our organization and the Colorado boycott. The hatred and intolerance expressed in these letters demonstrate a need for education and advocacy in the design community on behalf of gays and lesbians. The Organization of Lesbian and Gay Architects and Designers (OLGAD) was founded in 1991 to meet this challenge.

We feel that the AIA should refuse to support bias in all areas, based on the Institute's code of ethics. We are continuing to work for these goals by organizing Design Pride '94, an International Lesbian and Gay Design Conference, scheduled for June 24, 1994, in New York City.

Through these activities, we hope to enlighten those who flaunt their ignorance and intolerance in our professional publications.

Daniel J. Lansner, AIA, OLGAD Chair
Jane Greenwood, Associate Chair
Hal Hayes, Architecture Caucus Chair
New York City

Plea for leadership

I was saddened to read your editorial regarding the potential disintegration of the Architects Registration Council of the U.K. (ARCHITECTURE, September 1993, page 15) and what it suggests about the future of architecture in the U.S. I believe the "diminishing stature" architects face is the result of our own zeal to insulate ourselves from the liability associated with the complexity of our own services. Anyone familiar with standard AIA contracts is aware of how far we have gone to protect ourselves from the rising cost of litigation.

Unfortunately, it may also shield us from the leadership responsibilities once exclusive to our profession. Until we develop and recognize methods by which architects may begin to safely reacquire responsibility for their own work, our services will continue to be devalued by the same people who view our construction documents as nothing more than certified artist's renderings.

Daniel J. Lemieux, AIA
Washington, D.C.

Los Angeles transit

It is great to see an article that focuses on development in the neighborhoods around LA's reemerging transit system (August 1993, pages 93-99). But the article is undercut by ignorance of local history. The author states that "the romantic memories of the early electric railway in LA can hardly be compared to LA's new mass transit network" of 400 miles. In its heyday, the Pacific Electric boasted 1,200 miles of track. LA's far-flung character, often credited to the automobile, was built on extensive public transportation. The failure to understand Los Angeles's loss makes it difficult to appreciate the potential for its revival.

L. Stanton Shipley, AIA
Atlanta, Georgia

Correction

Pages 19 and 27 of our November 1993 issue were transposed by our printer. The news story "Mark Mack Exhibition in San Francisco," which begins on page 26, continues on page 19 of that issue.

Events

December 6-8
Restoration '93, a conference at the Hynes Convention Center in Boston. Contact: (617) 933-9699.

December 9-11
Secure and Livable Communities: Crime Prevention Through Environmental Design, a conference at Techworld in Washington, D.C. Contact: (202) 785-5912.

December 10
National Endowment for the Arts application deadline for Design Arts project grants for organizations. Contact: (202) 682-5437.

December 10-12
New Art Museums, a symposium to dedicate the Frederick Weisman Art Museum, at the University of Minneapolis. Contact: (612) 625-9678.

December 11
Centers and Edges of Architectural Practice, a colloquium given by Harvard University Graduate School of Design. Contact: (617) 495-4315.

January 1, 1994
Deadline for submission of abstracts for the Textile Technology Forum '94, sponsored by the Industrial Fabrics Association. Contact: Mike Ravnitzky, (612) 222-2508.

January 14
Submission deadline for proposals to preserve New York City's African Burial Ground, sponsored by the New York Coalition of Black Architects, the National Organization of Minority Architects, and the Municipal Art Society of New York. Contact: (212) 878-7012.

January 19-21
Second annual Rebuilding America conference, focusing on implementation of private and multisector joint ventures to improve cities. Contact: (203) 852-0500.

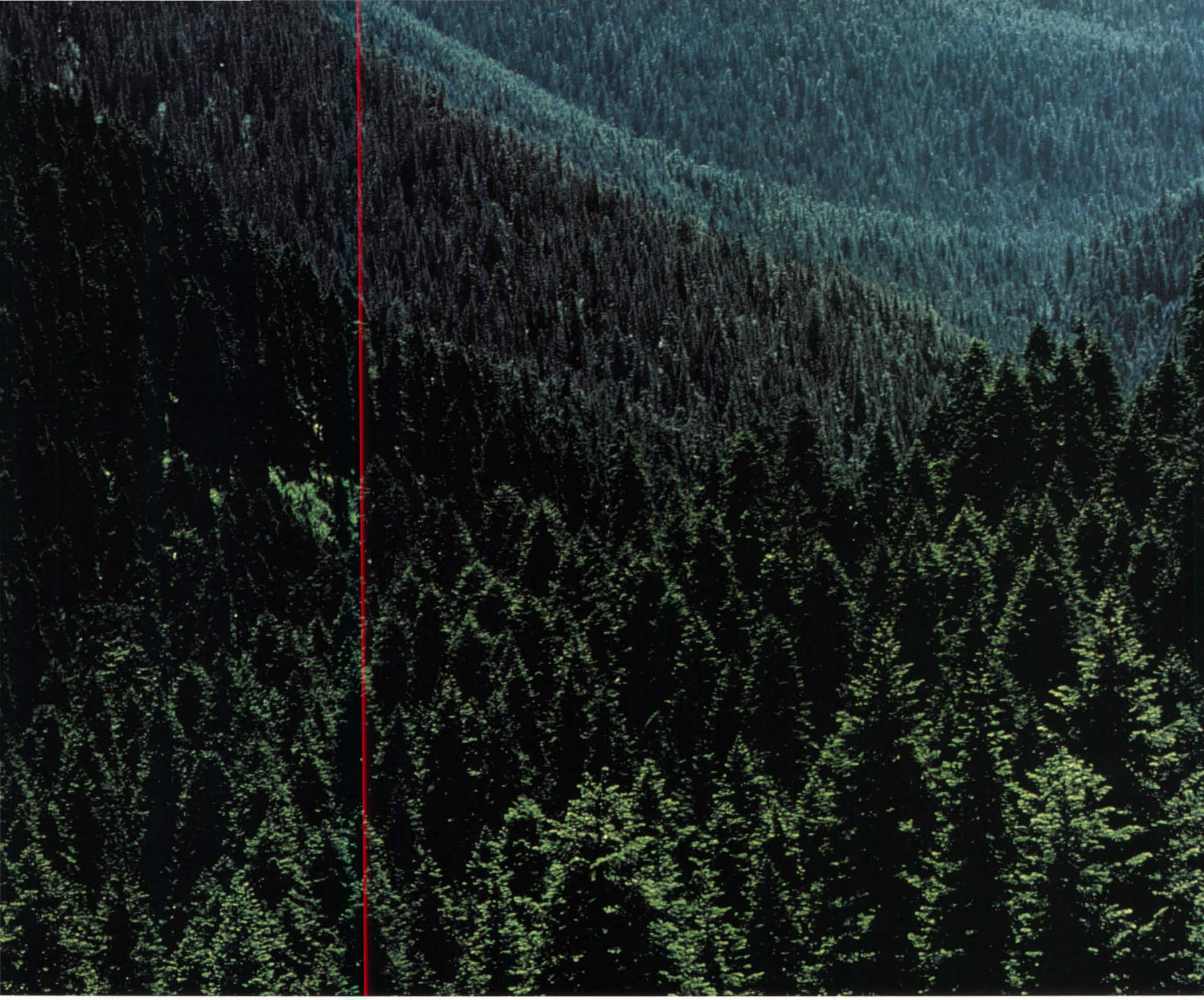
January 21-24
National Association of Homebuilders annual convention at the Las Vegas Convention Center. Contact: (202) 822-0200.

January 31
Submission deadline for the 1994 Richard Kelly Grant for innovative concepts or applications of light, sponsored by the New York Chapter of the Illuminating Engineering Society. Contact: Holly Bernard, (212) 248-5000.

January 31
Submissions due for the Tucker Architectural Award for designs incorporating natural stone, sponsored by Building Stone Institute. Contact: (914) 232-5725.

February 1
AIA's Accent on Architecture at the National Building Museum in Washington, D.C. Contact: Melissa Houghton, (202) 626-7514.

February 11
Entry deadline for the Young Architects Competition, sponsored by the Architectural League of New York. Applicants must have completed architecture school within the past 10 years. Contact: (212) 753-1722.



News

Architectural Center Opens in Pittsburgh

Not even Philip Johnson, who hailed his PPG Place as "one of the greatest spaces on the planet," can take credit for putting Pittsburgh on the architectural map. The newly opened Heinz Architectural Center, ensconced within the century-old shell of The Carnegie Museum of Art, joins H.H. Richardson's Allegheny County Courthouse and Jail, Frank Lloyd Wright's nearby Fallingwater, and Henry Hornbostel's Soldiers' and Sailors' Memorial as a compelling excuse to flock to Pittsburgh with sketchbook in hand.

Founded in 1990 with a $10 million grant from the Drue Heinz Foundation, the 17,000-square-foot, three-level Architectural Center is designed by New York-based Cicognani Kalla Architects to house more than 3,000 architectural drawings, models, prints, and photographs in a former gallery situated between The Carnegie's 1907 east facade and its sculpture court. In the marble wall of the balcony surrounding this court, the architects carved a threshold to four galleries, a screening room, library, and support spaces.

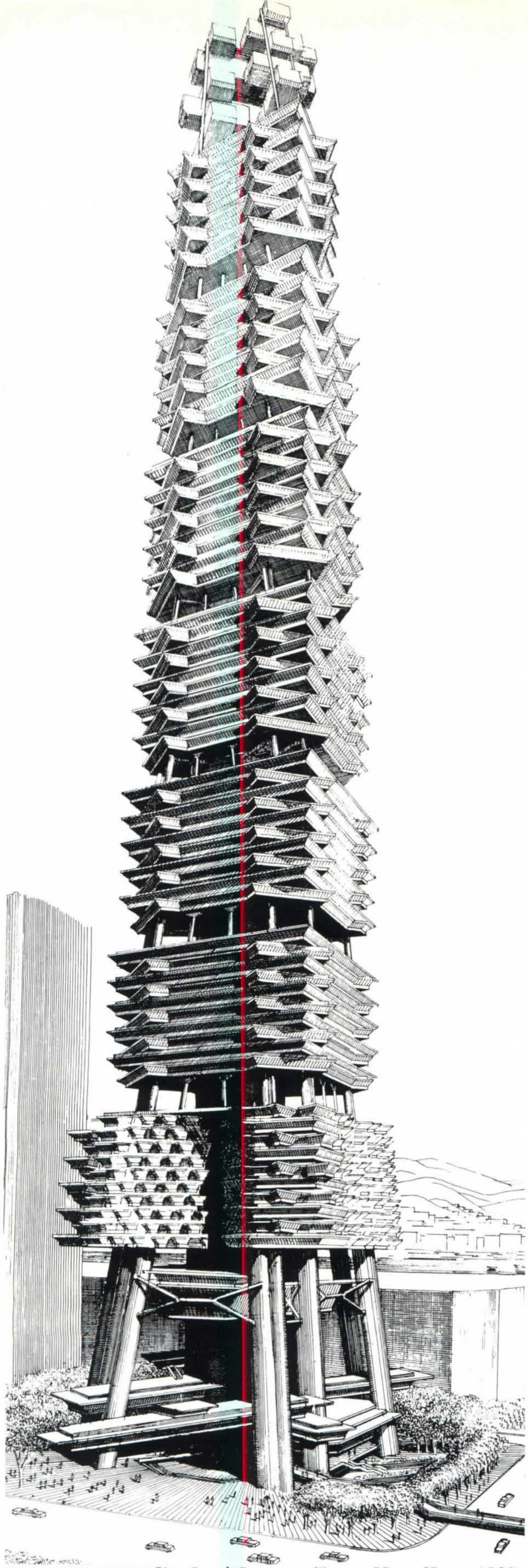
For conservation purposes, only a fraction of the drawings in the collection are displayed at one time, hanging on linen-sheathed walls in dimly lit galleries. These rooms contrast with the center's three-story-high reception hall and two-story library. Cicognani Kalla troweled the walls of both spaces with bright, pigmented plaster, an unexpected reprieve from the clinical look of the adjoining 1974 museum extension by Edward Larrabee Barnes. "At the request of Mrs. Heinz," explains Pietro Cicognani, "nothing is white."

Although the collection surveys the architectural history of Pittsburgh and western Pennsylvania, it places the region within a national and international context. Most impressive is the preserved interior of Frank Lloyd Wright's San Francisco field office, on permanent exhibit.

To counter the monumental scale of the rooms that comprise the original building, Cicognani Kalla's interior astutely emulates the even daylight and intimacy of Sir John Soane's museum in London. In a short time, the reception hall will rival Soane's carefully cluttered rooms, given the restless pace of the center's peripatetic curator, Christopher Monkhouse.—*M. Lindsay Bierman*

RECEPTION HALL: New window to east courtyard punctures existing museum wall.

RECEPTION ENTRY: Metal-framed doors open to 1907 marble sculpture court.



COMPETITION ENTRY: *Sino Land* Company Tower, Hong Kong, 1989.

Paul Rudolph Exhibits in New York City

Paul Gauguin painted landscapes in Brittany, but it was in Tahiti that he found deeply saturated colors intense enough for his strange and wonderful palette. Like Gauguin, Paul Rudolph has found hospitable ground on exotic shores for the past 20 years, working in Southeast Asia in conditions conducive to his vision. Accelerating economies, urbanizing cities, internationalizing cultures, and inexpensive labor have supported projects commensurate with Rudolph's maturity: designs ambitious in scale and rich in spatial complexity. With deep involutions and cantilevered projections, Rudolph's multifaceted buildings thrive in the intense chiaroscuro cast by the equatorial sun.

Two concurrent shows in New York City focus on the Asian phase of one of America's great architectural careers. At the National Institute of Architectural Education (NIAE), "Explorations in Modern Architecture, 1976-1993," curated by Donald Albrecht, displays 13 Paul Rudolph-designed projects—most in Southeast Asia. They portray almost two decades of work and the intimacies of his thought in drawing.

"From Concept to Building: A Project in Singapore by Architect Paul Rudolph," the Cooper-Hewitt Museum exhibit curated by Marilyn Symmes, showcases the Concourse, a 700,000-square-foot multi-use complex. Commissioned in 1979, the project was built and designed in two phases and is now being completed. These exhibitions run until February 12 and 13, respectively.

For Rudolph, the pleasures of design, like those of building, are sensuous and start at the drafting board. The 75-year-old architect has always practiced close to graphite, as he works a blank sheet of paper in an obsessive quest for space. Both exhibitions document a prodigious paper trail, one that reveals the spatial generosity of Rudolph's work.

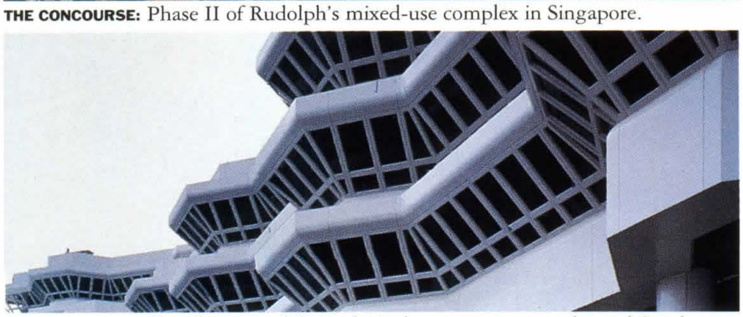
Movement characterizes the Concourse, especially in Phase I, which was never fully completed. The shopping complex spirals around its interior plaza and curves in an S into the base of the 41-story office tower; the top floors spiral up through a succession of terraces to the pinnacle. The design undergoes several formal transformations as the building changes use and exposure. As in most of the towers of this generation, Rudolph urbanizes the first floors of the base with ramps, stores, concourses, and escalators, creating an open vertical city whose soffit line, about five stories tall, defines a traditional walk-up scale. In the tower's upper reaches, the sculptural involutions invite terraces that form a facade of hanging Babylonian gardens: Rudolph brings the ground up to the sky. In the Phase II tower, which only houses offices, he humanizes interiors with numerous three-story atriums—socializing spaces that break up the usual pancake stack. Often accused of formalism, Rudolph in fact uses form to enrich life in a building.

The distant ancestor of many of Rudolph's designs is Frank Lloyd Wright's Price Tower in Bartlesville, Oklahoma, which, despite its brilliance, bore few progeny. The echo of Wright's design is especially audible in the NIAE show, where several of Rudolph's skyscrapers recall the dense intricacies of the Price Tower. But while the origins of Wright's forms are organic, Rudolph mutates carefully worked-out geometric forms and makes them organic. Rudolph entrusts his buildings and spaces to interlocking geometries that systematically repeat a highly developed and complex cell.

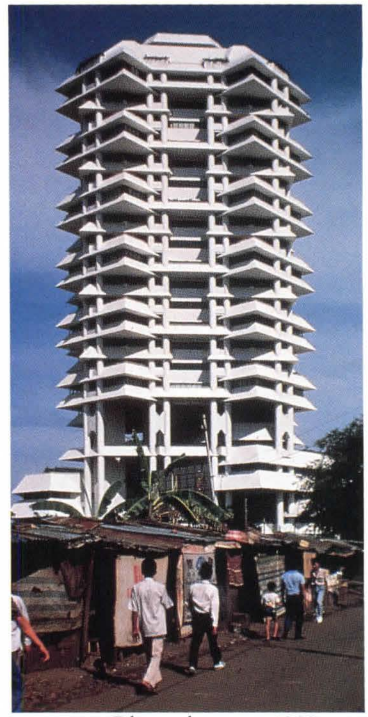
Both shows are especially timely and important in the reassessment of Modernism now underway, demonstrating that one of Rudolph's great contributions to architecture is the investigation of the high rise as a type. Opening form has been his special challenge in skyscrapers, where the efficiencies of repetition and the exigencies of air-conditioning encourage faceless containers. The drawings in both exhibits show how Rudolph avoids the box by building his designs up from the modular parts he painstakingly invents to form socializing spaces inside and habitable spaces outside the building.

At NIAE, the drawings of Rudolph's own penthouse on Beekman Place are so involved that they constitute a window into the architect's subconscious. They are a key to understanding his buildings, which are layered vertically as well as horizontally, framing themselves in the near, middle, and far ground, at all scales, without figural focus to stop the eye and control the play. The architect is not interested in structure for structure's sake, but structure for the sake of space. For Rudolph, space is oxygen.—*Joseph Giovannini*

THE CONCOURSE: Phase II of Rudolph's mixed-use complex in Singapore.

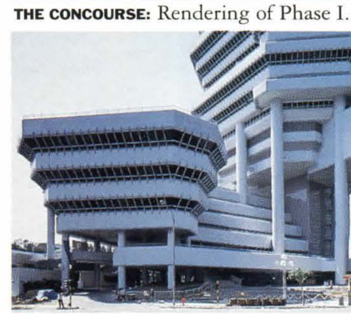


THE CONCOURSE: Cantilevers and faceted windows punctuate sculptural facade.



INDONESIA: Dharmala tower, 1988.

THE CONCOURSE: Rendering of Phase I.



THE CONCOURSE: Stacked volumes.

Details

The University of Maryland has announced the finalists in its design competition for a new $80 million performing arts center. They are **Antoine Predock** of Albuquerque; Los Angeles-based **Barton Myers Associates**; **Cesar Pelli & Associates** with Baltimore's **RTKL Associates**; **Pei Cobb Freed & Partners**; and **Moore Ruble Yudell** of Santa Monica. **Antoine Predock Architect** is designing an Hispanic Cultural Center in Albuquerque, New Mexico. **Skidmore, Owings & Merrill** has named **Adrian D. Smith**, a design partner at SOM's Chicago office, to succeed former Chairman David M. Childs as the firm's new CEO. **SOM** has also won a design competition for a mixed-use development in Potsdam, Germany. Harvard's Graduate School of Design last month awarded the Prince of Wales Prize in Urban Design to **Fumihiko Maki** and Swiss architect **Luigi Snozzi**. Boston's **Kallmann McKinnell & Wood Architects** is designing classroom facilities for the Ohio State University School of Business. Washington, D.C.-based **Shalom Baranes Architects** has been commissioned to design a master plan and renovations at the University of Pennsylvania School of Law and a master plan for 10,000 housing units in Rostov, Russia. Seattle-based **Miller/Hull Partnership** has been commissioned to design a nature center at Yaquina Head in Newport, Oregon. The State of New York unveiled plans for a new $319 million, 50,000-seat baseball stadium on 13.2 acres of riverfront property in midtown Manhattan, to be designed by **Cooper, Robertson & Partners**. In New York, **Kohn Pedersen Fox** has been selected to design a new facility for the Museum of American Folk Art. **James Stewart Polshek and Partners** has been commissioned to renovate and expand the Museum of the City of New York. **Cambridge Seven** is designing a new public library for Troy, New York. A new television program titled "The New Modernists: Nine American Architects" has been produced by Michael Blackwood and will profile **Tod Williams**, **Billie Tsien**, **Steven Holl**, **Henry Smith-Miller**, **Laurie Hawkinson**, **Mark Mack**, **Michael Rotondi**, **Thom Mayne**, **and Stanley Saitowitz**. New York City architect **Robert Allen Jacobs** of Kahn and Jacobs died November 4 at age 88.

News

Coop Himmelblau in Los Angeles

UTOPIAS: Coop Himmelblau's design.

The Victory of Samothrace, poised at the top of a flight of stairs at the Louvre, would look different at eye level in a square room. For two concurrent exhibitions at the Los Angeles County Museum of Art (LACMA), "Expressionist Utopias" and "John Heartfield," the Vienna-based firm Coop Himmelblau designed the equivalent of the Louvre's flight of stairs within standard-issue galleries. The installations break open the museum box and immerse the paintings, drawings, and models in active spaces that provoke the senses and heighten visual awareness.

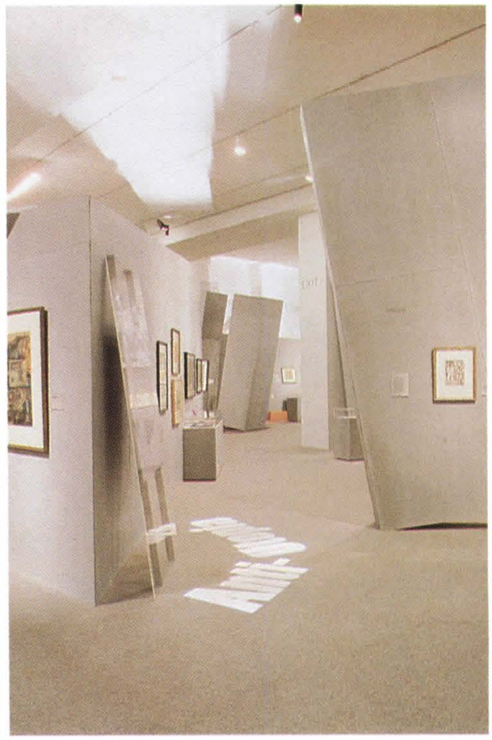
"Expressionist Utopias," the more ambitious of the two installations, is designed as a dancing landscape of shifted, broken, floating, and tilted planes and columns. None of the paintings or drawings hangs directly on existing gallery walls. The materials—steel and concrete panels, ribbed plexiglas, and light—echo those used by Expressionists.

Five thematic zones—Paradise, Metropolis, Architectural Fantasy, Anti-Utopia, and Film and Stage—can be seen through one another in an environment that is purposely relational. The visual juxtapositions provoke unexpected connections. From Paradise, the listing towers of light in Metropolis, glimpsed through cleavages in floating walls, can be understood as an early 20th-century utopia that grows out of a 19th-century Romantic paradise. Nowhere is the layout strictly linear and chronological, and the unplanned views between sections suggest thematic associations.

In adjacent galleries, John Heartfield's highly charged political posters, designed in Germany and then England from the teens through the 1940s, are hung on floating panels. Supported on metal scaffolding anchored to museum walls, the panels thrust the posters into the gallery like billboards. "Why hang exciting art in a boring way?" asks Coop Himmelblau Principal Wolf Prix. Squares of light projected onto the posters cause them to glow in the darkened gallery so that they seem to hover beyond their supporting planes. Several walls project beyond other walls in layers that create collages of space similar to Heartfield's collaged images.

In the 1970s, Coop Himmelblau first constructed its ideas about building directly from intuitive, gestural sketches in museum installations called "Form Mutations," where abstract forms changed freely into others through a process of apparently spontaneous mutation. The LACMA installations are, in a sense, a return to the firm's first built works: Without the paintings, prints, and drawings, the installations are rich enough spatially and materially to be self-sufficient. Their autonomy does not sideline the art, however. Artists who mistrust strong architecture out of the fear that it inevitably dominates will find these installations complicit with the art: The installations do not overwhelm the Expressionist work, but help explain and exemplify it.—*Joseph Giovannini*

LAYERS: Paintings mounted on steel-framed plexiglas.



PARTITIONS: Tilted planes and columns animate space.

MATERIAL COLLAGE: Exhibit recalls Expressionist works.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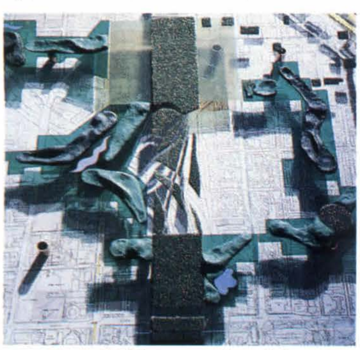
News

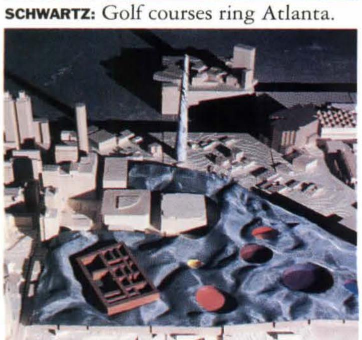
Atlanta Charette for Public Spaces

In preparation for the 1996 Olympic games, Atlanta has recently begun to improve the quality of the city's public realm. The Architecture Society of Atlanta (ASA) and the Corporation for Olympic Development in Atlanta (CODA) cosponsored a four-day charette in October to generate proposals for International Boulevard, a downtown area that will connect several Olympic venues. Explains ASA Program Coordinator Patricia Kerlin, "Our goal was to raise general awareness of the city's architectural fabric and speculate about possibilities of form and space."

The six charette teams—comprised of architecture students from universities throughout the South—were led by architects, educators, and urban theorists: Diana Agrest; Enric Miralles, an architect from Barcelona who designed sporting venues for the 1992 Olympics; Kemp Mooney; Mack Scogin; Michael Sorkin; and Martha Schwartz. As part of Atlanta's Master Olympic Development Plan, ASA and CODA will be cosponsoring a design competition in the spring for five downtown "art parks"; a second neighborhood charette is in the planning stages for 1994.—*Raul A. Barreneche*

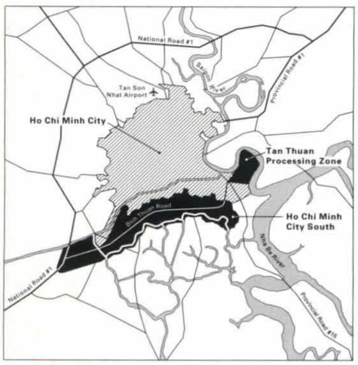


SCHWARTZ: Golf courses ring Atlanta.



AGREST: Tower marks city center.

News



HO CHI MINH CITY: New urban center.

Urban Competition Held for Ho Chi Minh City

Vietnam, which has rapidly embraced a free-market economy, is now poised for major development. About 75 percent of Vietnam's work force is employed in the private sector, and the nation has drawn more than $7 billion in foreign investment over the past four years.

As part of this Vietnamese expansion, a competition was held in June to design a 6,500-acre city-center development on a wetland outside Ho Chi Minh City, formerly Saigon. The San Francisco office of Skidmore, Owings & Merrill won the master-planning commission; Koetter, Kim & Associates of Boston was awarded the urban planning project for the central business district, where Tokyo-based Kenzo Tange Associates was selected to design a group of buildings. Ehrenkrantz & Eckstut Architects of New York City also competed for the project.

The jury for the competition comprised Lu Trieu Thanh, director of Vietnam's General Research Institute of Planning and Design; Vo Viet Thanh, deputy chairman of the Ho Chi Minh City People's Committee; Le Van Nam, supreme architect of Ho Chi Minh City; Ngo Viet Thu, designer of Ho Chi Minh City's Reunification Palace; urban planner Jonathan Barnett of Washington, D.C.; and Lawrence S. Ting, a member of the development team.

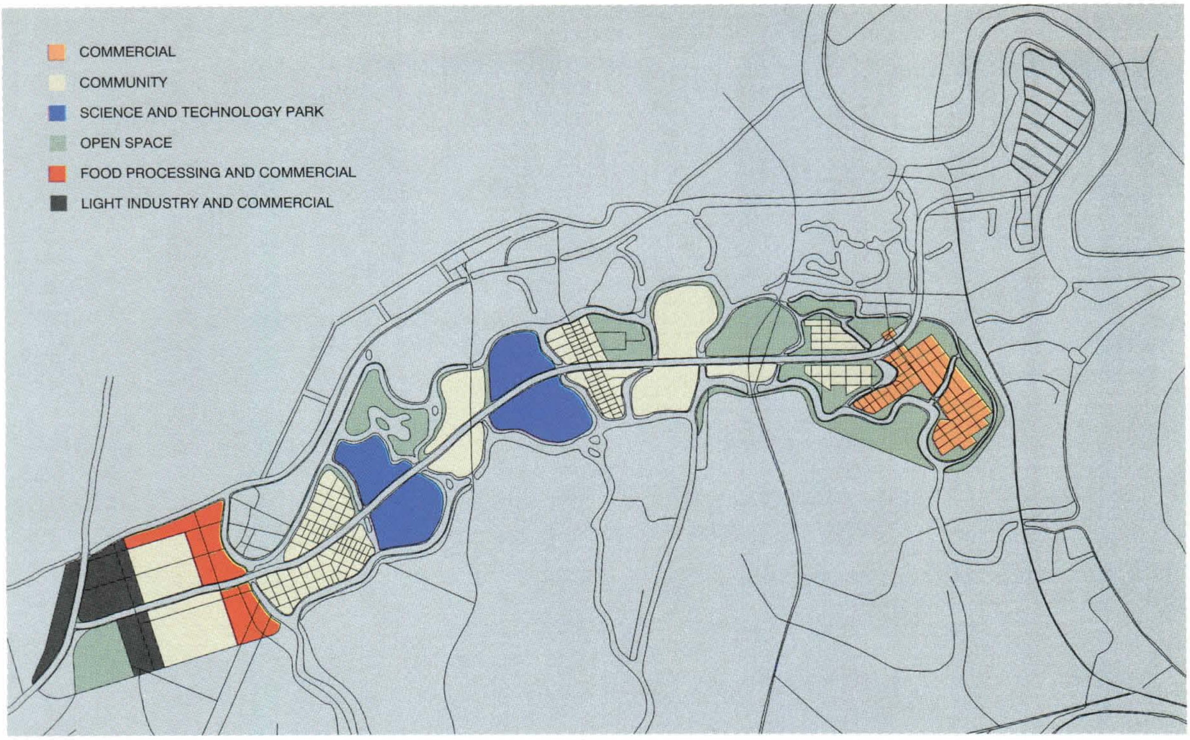
Details of the winning proposals remain secret, however. The project's developer is a joint venture of the Ho Chi Minh City municipal government and the Central Trading & Development Corporation of Taiwan, also known as the Phu My Hung ("wealth, beauty, progress") Corporation. The project's developer has declined to release any information about the competition "due to the need to proceed with caution on a project of this magnitude."

The project will extend 11 miles along the planned Binh Thuan roadway directly south of Ho Chi Minh City in Nha Be. Construction of the road is now underway.

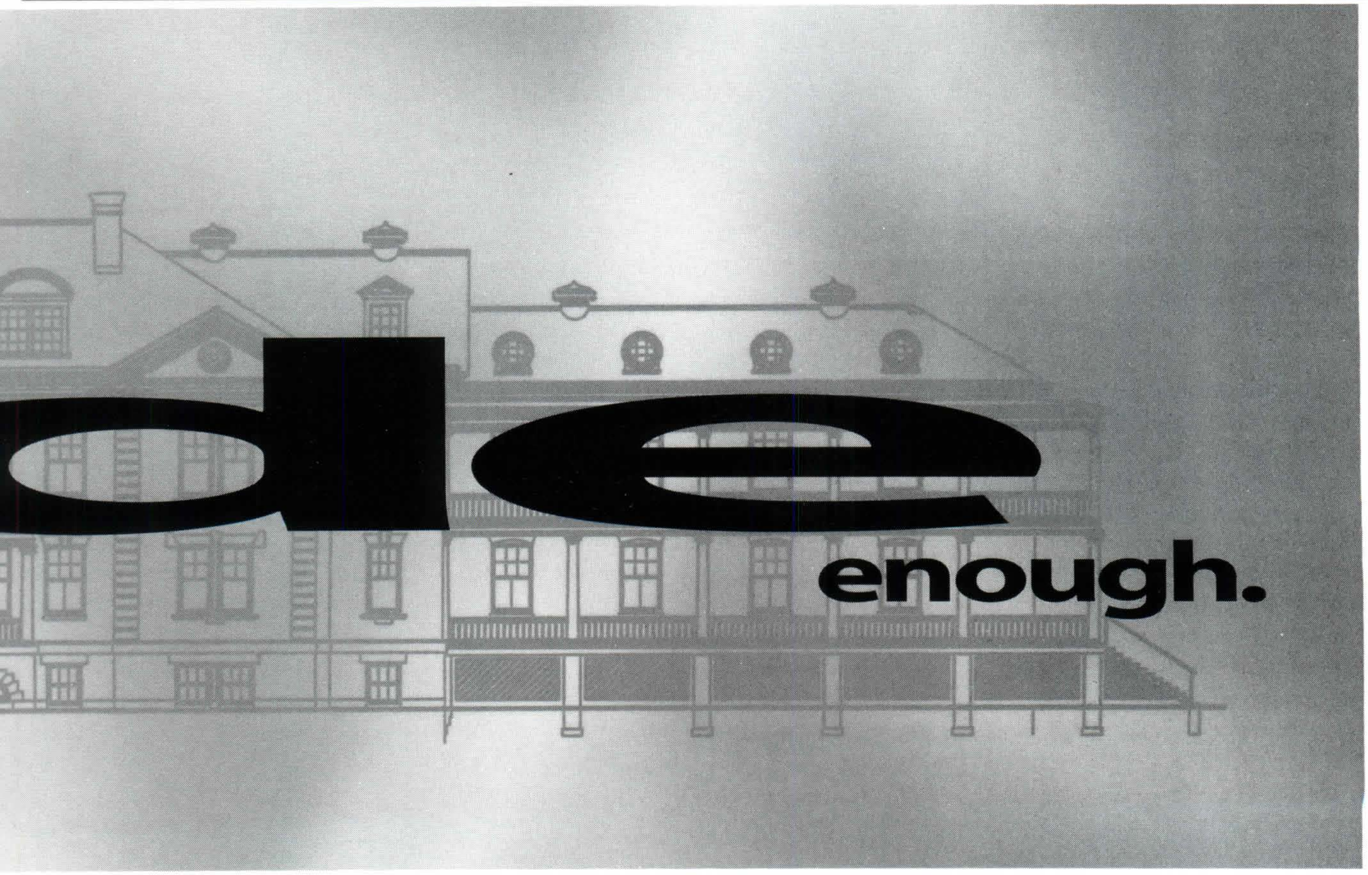
SOM's scheme is intended to preserve the Nha Be area's many canals. Plans include an international business center, residential developments, schools, hospitals, stores, and recreational areas. Infrastructure needs alone in Nha Be are projected to cost $242 million.

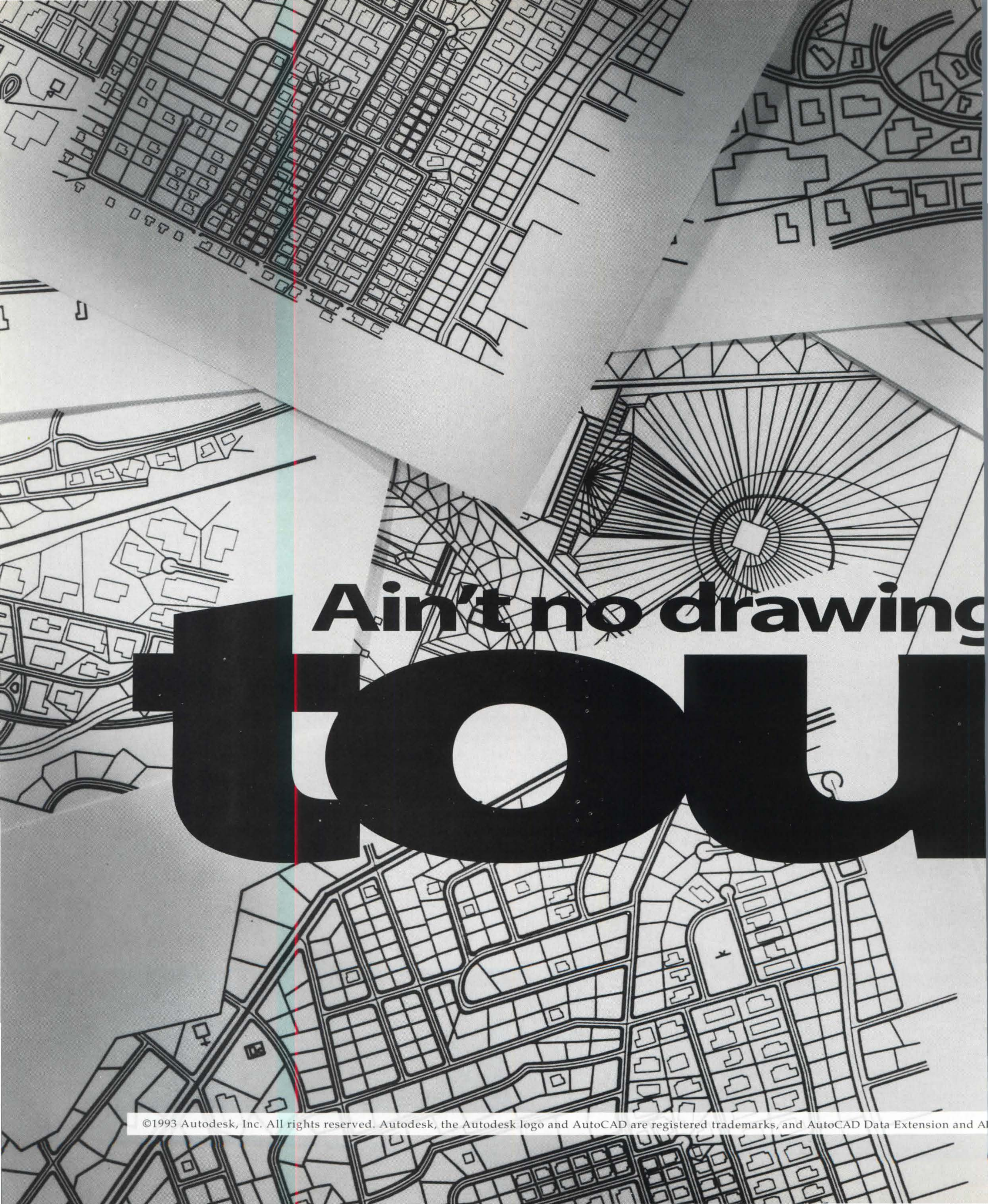
The U.S. continues its commercial embargo against Vietnam, but President Clinton's September 15 policy change now permits American companies to bid on construction projects financed by the World Bank or other international agencies. Prior to leaving office, President Bush moved to allow U.S. companies to open offices in Vietnam and to enter into contingency contracts with the Vietnamese that would take effect upon the lifting of the U.S.'s sanctions.

Meanwhile, the Chicago Group, a consulting firm, is planning to take American architects and engineers to Vietnam for a week in January 1994 to check their prospects of participating in the developing country's more than $800 million of infrastructure projects.—*Bradford McKee*



MASTER PLAN: SOM's winning scheme for Ho Chi Minh City South.

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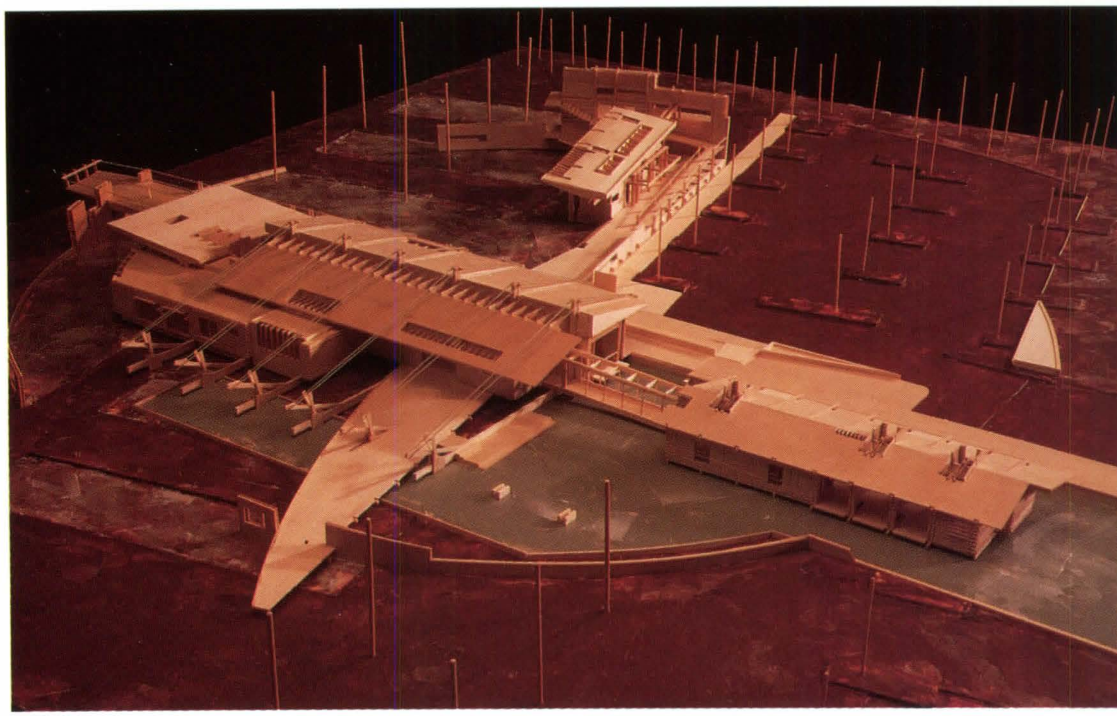
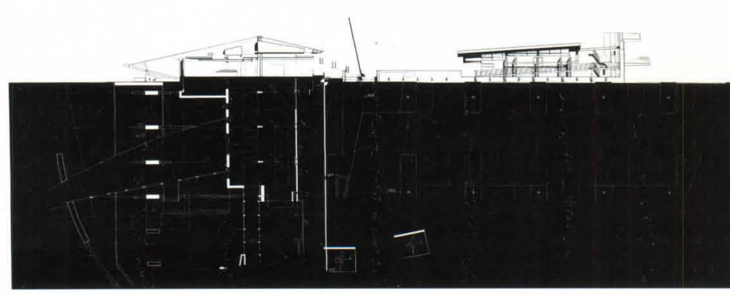


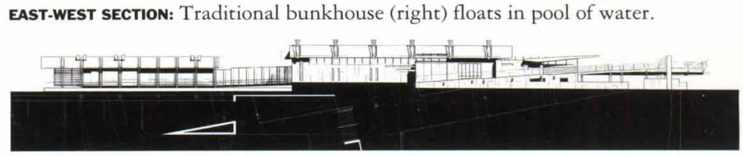
Cherry Lane Visitors' Center
Lewiston, Idaho
GBD Architects

Portland-based GBD Architects combined the disparate geometries of site topography and nearby pine orchards in the design for a new visitors' center. The 18,000-square-foot complex for the Potlatch Corporation will comprise an exhibit hall to showcase the company's wood products, a floating bunkhouse connected by bridges, and outdoor recreation areas. Ramps extending from the main building will offer views of the orchards, a basalt cliff to the south, and the Clearwater River to the north.

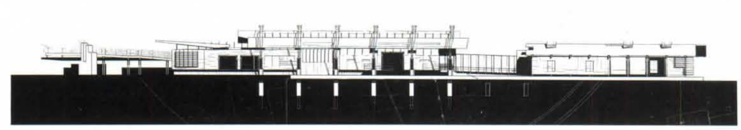
The center will be constructed of traditional wood framing and exposed laminated wood beams manufactured by the Potlatch Corporation. The exterior will be clad with wood battens and plywood veneer panels. The $2 million project is scheduled for completion in 1995.—*R.A.B.*



EAST-WEST SECTION: Traditional bunkhouse (right) floats in pool of water.

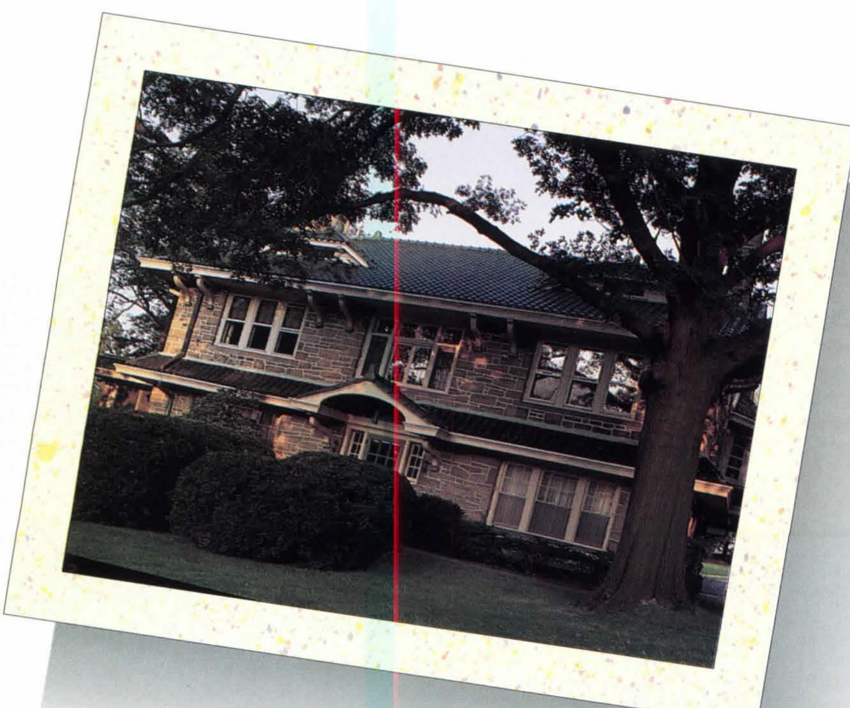


SOUTHEAST ELEVATION: Posts recall peavey poles used by lumberjacks for logrolling.



NORTHEAST ELEVATION: Exteriors clad in white pine, cedar, redwood, and Douglas fir.

1926 An illustration of a Ludowici roof as proud owner's investment and architect's trophy component.



1993 A photo of the very same work of art as cost-efficient tile.

To the eye, the Ludowici roof on Southminister House in Mount Lebanon, Pennsylvania is beautiful indeed.

You might think that a pretty penny was paid for the roof on this former home, now owned by the Southminister Presbyterian Church as assistant minister's residence and activities center. But the life cycle cost of this roof would make it a thing of beauty in the eyes of even the most avid of penny-pinchers.

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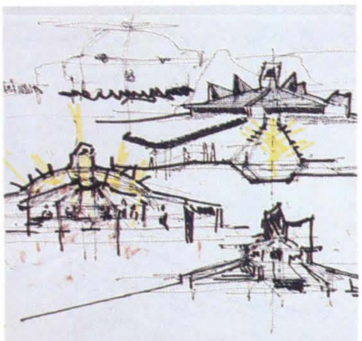
On the Boards

Diné Museum Center
Window Rock, Arizona
DCSW Architects

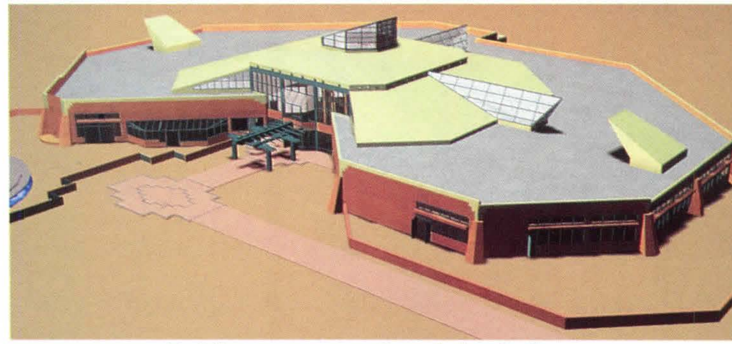
Sited among the rugged red sandstone cliffs of Window Rock, Arizona, a new 55,000-square-foot museum and learning center will house one of the world's largest collections of Navajo artifacts.

Following the symbolic spatial arrangement of Navajo structures, the center's functions are oriented to cardinal directions: The main entrance is located to the east; the learning-oriented museum, to the south; administrative work areas, to the west; and the library, to the north. As in traditional tribal dwellings, visitors will move through the center in a clockwise direction.

The building's exterior will be composed of colored concrete block. Inside, exposed laminated timber framing will support a glass and copper roof. Construction of the $6 million project is scheduled for completion in late 1994.—*R.A.B.*



CONCEPT: Responds to Navajo symbols.



COMPUTER MODEL: Building geometry recalls typical native hogans.

NORTH ELEVATION: Entrance and large windows offer desert vistas.

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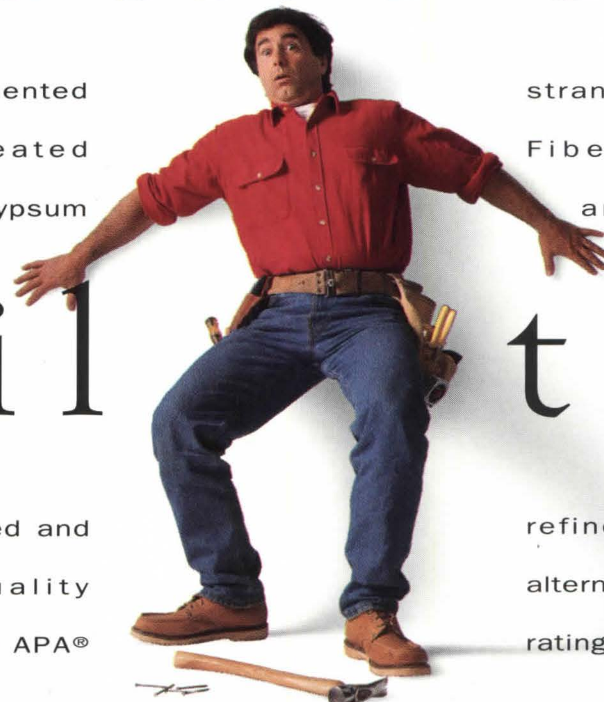

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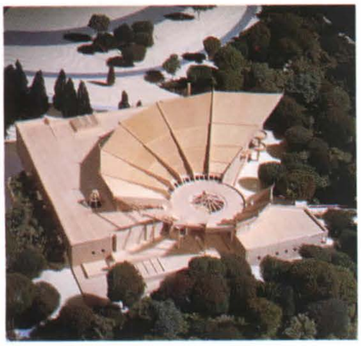
On the Boards

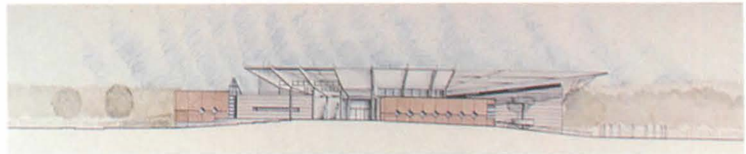
Cultural Resources Center
Suitland, Maryland
Polshek Metcalf Tobey & Partners
Native American Design Collaborative, Architects

The National Museum of the American Indian's Cultural Resources Center will provide a care and storage facility for the museum's library, archives, and artifacts. Located on the Smithsonian's Suitland Collection Center campus, the 150,000-square-foot facility will also house conservation, research, and ceremonial spaces.

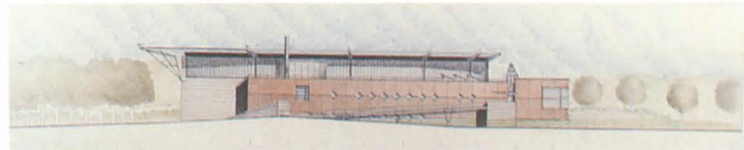
Polshek's design incorporates imagery based on the Indians' reverence for nature: Its segmented roof form recalls the structures of pine cones, nautilus shells, and spider webs. Walls framing the circular lobby will be finished in horizontal bands of rough stone. The center's roof will be constructed of cedar shingles atop exposed steel trusses. Construction is scheduled to begin next August, with completion by late 1997.—*R.A.B.*



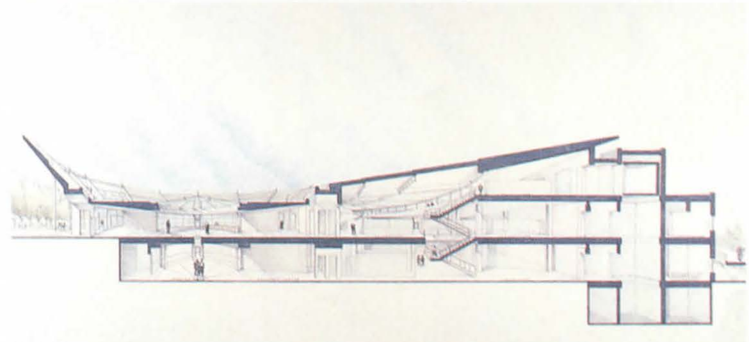
MODEL: Roof emulates organic forms.



EAST ELEVATION: Scheme responds to campus plan and natural forms.



WEST ELEVATION: Base crafted of precast terra-cotta panels.



SECTION PERSPECTIVE: Collection housed on three levels beneath radial roof.

Virtual Architecture

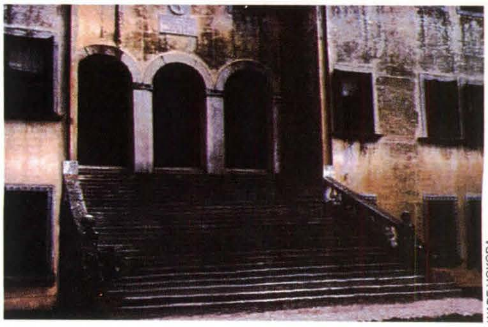
Computers are challenging traditional notions of space.

Before me is a rectangular writing surface on which I put down characters, as scribes have done for millennia. This surface rests on a desktop that is strewn with documents and file folders. A couple of communications devices connect me to the outside world, and nearby is a trash can into which I can drop discarded drafts. As you may already have guessed, this office is not made of metal and wood and glass; it is displayed on the screen of my laptop computer, which balances on my knees. My body is actually in an airplane, and I'm thousands of feet above the highest rooftop—somewhere in the vicinity of Detroit.

A year from now, the electronic device in my lap will incorporate a faster processor, more memory, and better graphics. And, in another year, the computer technology will be better still. Pretty soon, the virtual office that I carry around will be three-dimensional, and it will be rendered in highly detailed, photorealistic, full-color perspective. I will move about it in real time, as I would an actual office. I will even be able to hold face-to-face meetings in my laptop computer through video teleconferencing.

If I have enough computing power and some appropriate software at my disposal, and if I care to put on some sort of head-mounted stereo display, I can immerse myself in my virtual office instead of just peering at it. With a glovelike gesture-sensing device, I can manipulate the objects that I find there and perhaps even experience force feedback that makes them appear solid. And headphones can provide dynamically adjusted stereo sound to simulate the acoustic experience of being there. Now the virtual architecture is no longer merely glimpsed, like a theater set, through a tiny proscenium; it interposes itself between me and my physical surroundings, and it almost completely masks out the actual architecture beyond. Urban space is stealthily being invaded by architecture snatchers—alien intelligences

RIGHT: An exhibit from a proposed virtual museum. Andrea Palladio's Villa Godi as it was actually built (left) and a computer reconstruction (right) of the differing scheme Palladio published in his *Four Books of Architecture*. **BOTTOM RIGHT:** Close-up of entrance to Palladio's Villa Godi as built (left) and computer simulation (right).



WADE HOKODA

(silicon and software) are substituting something that looks increasingly like a physically built form for the old, familiar thing.

The dematerialization inherent in this technology extrapolates the dreams of the old Modernists far beyond anything that could be achieved with the sparest of steel structures or the most transparent of curtain walls. Finally, it is possible to create an architecture of nothing but space and light—an architecture from which weight and substance have been eliminated entirely.

Furthermore, the computer is the most powerful mass-production device that the world has ever seen. That little office on my laptop screen is a completely standardized work environment—an exact replica, right down to the smallest detail, of hundreds of thousands of others that simultaneously exist on other screens. Every time somebody runs the software, a new instance of this type is automatically created. Mechanization, more totally than ever before, takes command.

Building type transformations

Dematerialized, electronic architecture allows the freest of free plans. Le Corbusier vividly demonstrated long ago how interior elements could float away from the structural grid; support and space planning could henceforth be treated as separate issues, with the architectural expression of each following its own logic. Now the digital telecommunications networks that blanket the world are creating a new kind of grid—an increasingly dense pattern of information access points. As a result, my electronic office does not need to be adjacent to the offices of my colleagues and co-workers. It does not even have to remain fixed in any one location. By plugging into a telephone jack in a hotel room, the RJ-11 connection on the airplane seat in front of me, or even my cellular phone, I can receive and exchange information. By eliminating or radically reducing the need for physical contiguity, the information grid dissolves the social glue that holds traditional, preelectronic buildings and cities together, and it leaves a residue of recombinable fragments.

Consider banks, for example. It used to be that a bank was a dignified pile of bricks and mortar on Main Street. It housed the employees, customers, and front- and back-office activities of the institution, and it publicly represented that institution's presence and power. Now a bank is a network of automated teller machines (ATMs) and a node in the international money transfer network that shifts trillions of dollars a day through a couple of mainframes in some nondescript office building somewhere in New York. Its space does not have to be contiguous; there is little need for the front office to be adjacent to the back office, for the ATMs to be near human tellers, or for the ATMs to be concentrated in one place. And the interface presented by the ATM screens is probably a more important public representation of the institution than the street facade presented by its head office. The residual fragments of traditional bank buildings have recombined with parts of other buildings to create new types; we find ATMs in supermarkets and airports, point-of-sale terminals in stores for credit card and debit card transactions, and the beginnings of home banking through personal computers in living rooms. And our behavior patterns have correspondingly changed; I rarely have reason to enter a bank building, but when I reach Chicago, I will pause at an O'Hare ATM to get cash for my cab.

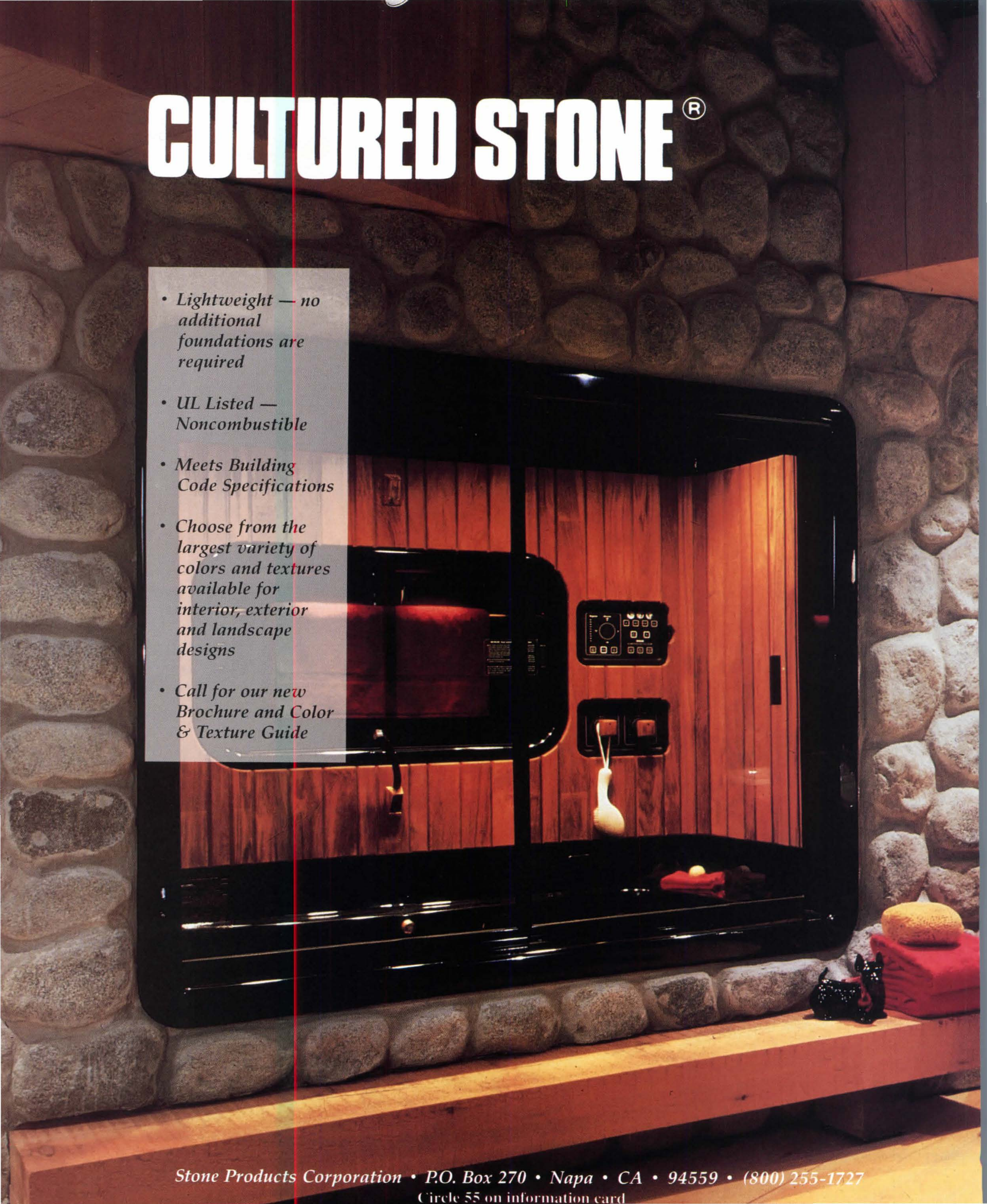
I might also stop at a newsstand to pick up a *Chicago Tribune*. But I could also get it, along with an increasing number of other newspapers and magazines, by dialing into America Online and bringing up an electronic version on my laptop screen. This linkup is just the beginning. Increasingly, the idea of the local newspaper will be challenged by that of the personal newspaper—one that is tailored automatically to individual interests, rather than those of a geographically defined community. This personal newspaper can be plucked from the network wherever you happen to be, whenever you want it.

Soon, when the cable coming into my house has more bandwidth, I will be able to get videos in the same way—by downloading as I need them, rather than by going to the neighborhood video store.

Virtual spaces

Traditional, physically constructed, and strategically located distribution points for newspapers, magazines, and videos will cease to exist. Printing plants and warehouses will be replaced by servers—computers that store texts, images, audio recordings, and videos and provide access to them via the network. Occasions for constructing buildings at fixed locations will be eliminated, and the design of databases and computer interfaces—the virtual spaces in which these publications are to be displayed, browsed through, and selected—will become far more important.

If I want to buy a book, I can now call up the Library of Congress Catalog to my screen and search it for whatever I may want. When



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I find something that interests me, I can check to see if it is in print. If so, I can immediately order a copy and have the book charged to my credit card. A few days later, the publication is express delivered from some distant, unseen warehouse to my door. In this case, one of the traditional movement patterns of urban life (particularly in college towns) has been transformed by digital telecommunications. I have not needed to go to the library or to the bookstore; their virtual equivalents have come to me. And the location of the warehouse has been of no interest to me at all. I can purchase computers, shrinkwrapped software, bottles of wine, airplane tickets, and many other goods in much the same way. As the automobile and the freeway allowed suburban malls to compete increasingly effectively with downtown retail areas, so the personal computer and the information superhighway now introduce a new challenge to established forms of retail space.

Cyberspace displacements

When I go to London's National Gallery, I can explore a virtual museum before I walk through the actual one. Just near the front entrance, there is a room filled with computer workstations on which I can search a database for digital images of the works that may interest me. When I have finished, I can get a personalized, laser-printed guide that shows me exactly where in the building to find the real things. In a more radical form of the virtual museum, there are no longer any real things to find. For example, my colleague Howard Burns and I, along with our students at the Massachusetts Institute of Technology, have been exploring the design of a virtual museum for the works of Palladio. Because many of Palladio's projects were never built, or have been altered or destroyed, you cannot go and visit the actual buildings. But a virtual museum can contain three-dimensional digital models of these projects, and visitors can have the computer-simulated experience of walking through them. The visitors do not even have to visit in the usual sense; instead of being a building, this virtual museum might simply be a server that provides any computer on the international network with access to the collection of digital reconstructions.

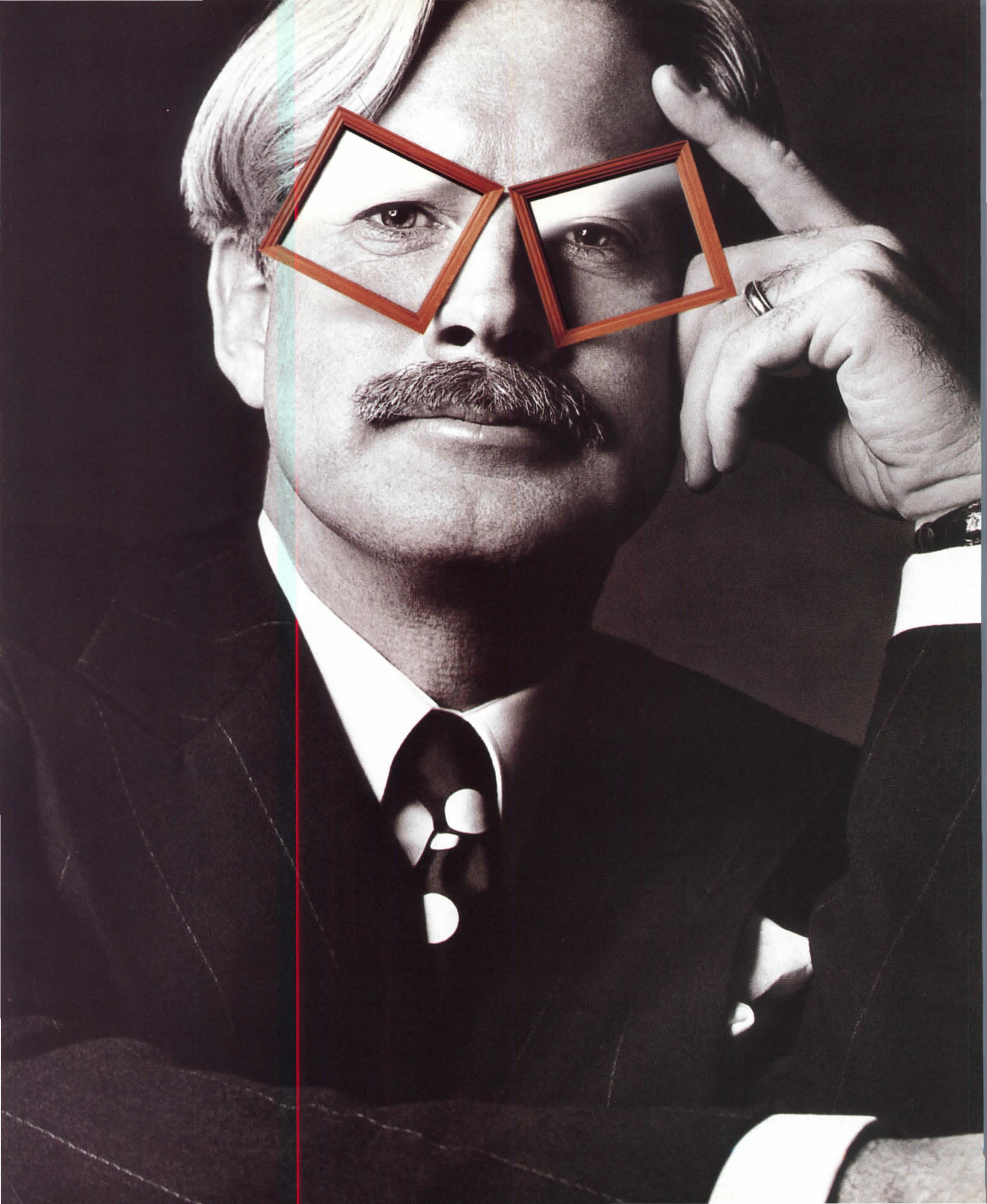
Just as industrialization and mechanical transportation ruptured and remade older urban patterns, such displacements of preelectronic space by cyberspace will surely shape the new urban landscape of the 21st century. We should remember, though, that the digital revolution has not altered basic human needs or eliminated our ultimate reliance on tangible goods and services. However dramatic the restructuring wrought by electronically mediated virtuality and telepresence, there will still be times and places to get physical. We will still want to meet our friends face-to-face. We will still eat real food in convivial surroundings. We will still need shelter from the wind and rain and a warm place to sleep. But there will be very fundamental changes in those hitherto durable relationships of information, materials, and action that historically have established building types and organized cities.

Spatial mutants

Cyberspace and urban space will overlay each other and interconnect in complex ways. Construction of information superhighways and the cabling of dwellings will raise problems of how to provide equitable access to the new employment, education, information, and entertainment opportunities that result. As more and more social interactions take place on the net, through bulletin board systems, in on-line chat rooms, and in other such places, issues of how to form virtual communities and refashion a public realm will seem increasingly pressing. At the same time, digital telecommunications and electronically mediated action at a distance will eliminate many of the locational imperatives that have defined architectural programs, urban land use, and transportation patterns of the past. Cyberspace will reconfigure the uses of physical spaces and real time slots. It will lead to the disintegration of many traditional building types and recombination of the remaining pieces with computational devices, telecommunications networks, and software to generate unprecedented mutants.

As my flight circles over the breathtaking expanse of the Chicago street grid, I recall a telling glimpse of one such recombinant fragment. I recently walked through the sunny piazza of Vicenza and noticed a group of businessmen meeting and taking their morning coffee. They sat at a table, almost in the shadow of Palladio's great Basilica. And in front of each, glowing and beeping, was a laptop computer accompanied by a cellular phone. At that spot, architecture and cyberspace—the traditional meeting place and the virtual office—fused to create something fundamentally new.—*William J. Mitchell*

William J. Mitchell is dean of the school of architecture at Massachusetts Institute of Technology.



WESTERN FRONTIERS

Architects break new ground by transcending regional clichés.

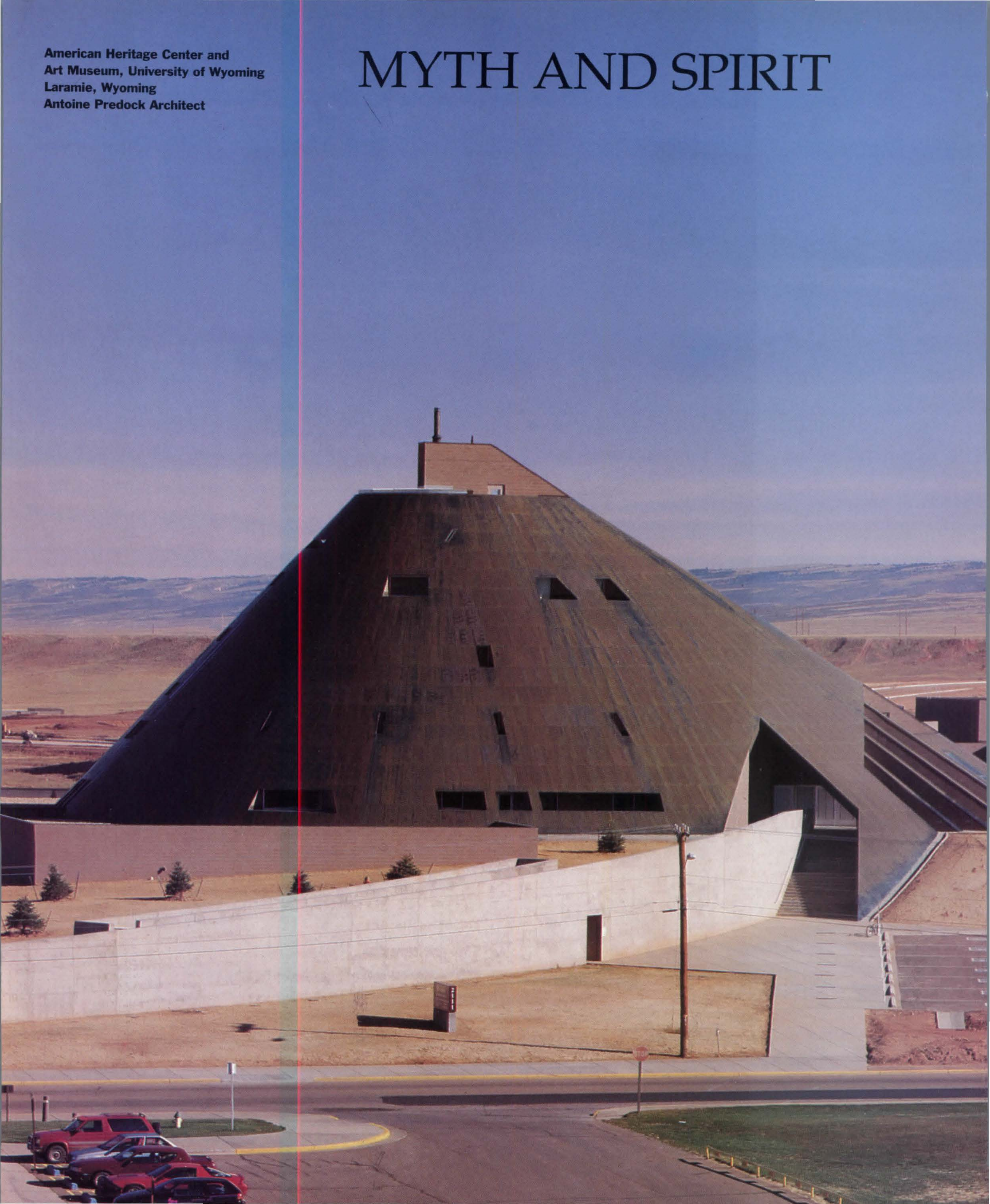
From the folktales of Paul Bunyan to Hollywood fables of cowboys and Indians, few places have been as romanticized as the American West. However, as demonstrated by the projects in this issue, the most significant new architecture in the West departs from the stereotypical images of the region with innovative responses to local traditions.

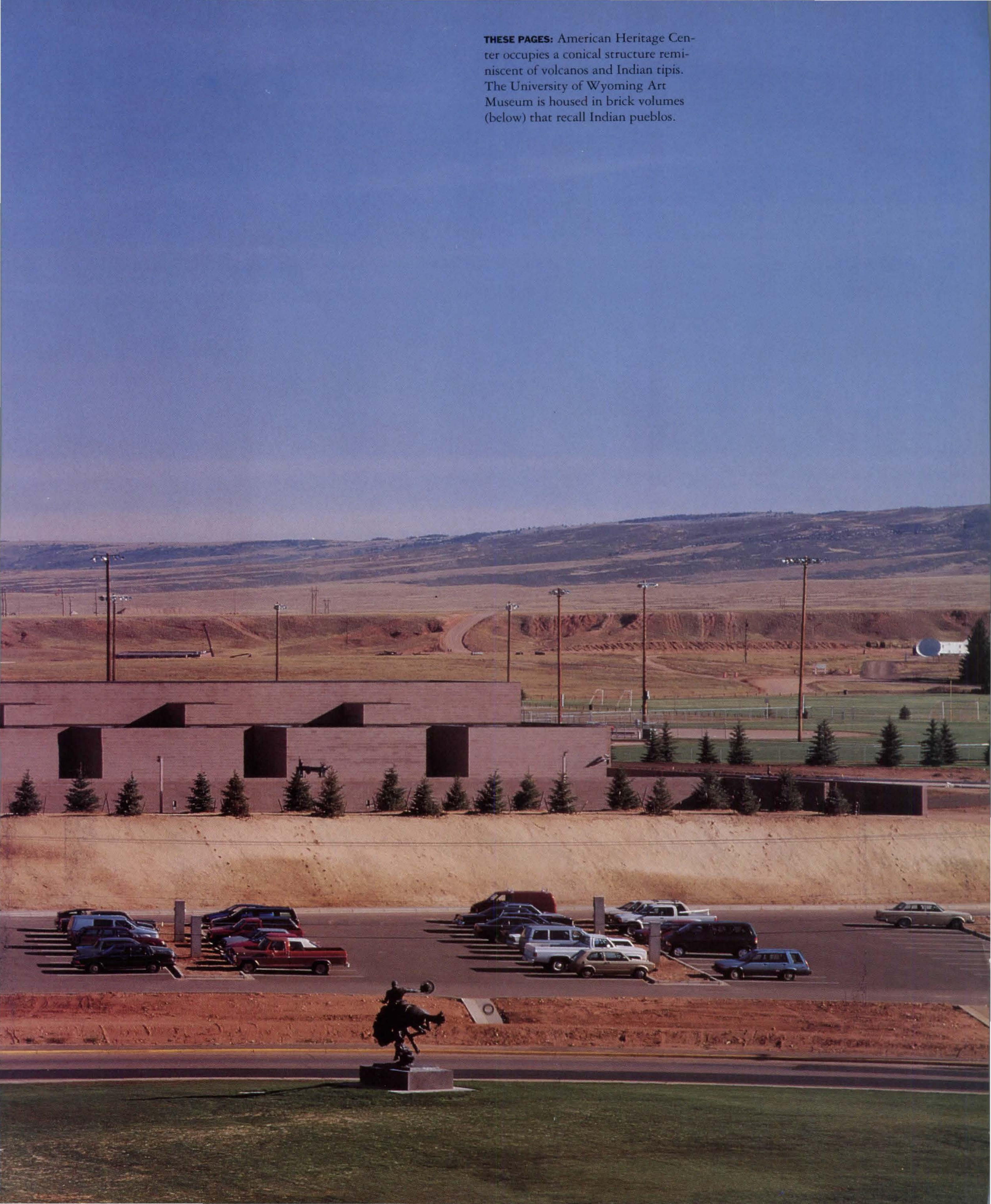
Antoine Predock's American Heritage Center and Art Museum at the University of Wyoming exemplifies this approach. Evoking a range of mystical images, from tipis and pueblos to a UFO, the structure is sited between the university's sports arenas and the vast Wyoming mountainscape, relating the axes of man and nature. A new concert hall in Aspen Meadows, Colorado, by Harry Teague Architects similarly responds to open expanses of nature as well as a Bauhaus-inspired campus. Teague's underground structure—topped with a roof that echoes the Rocky Mountains—bows to the existing campus while asserting a new identity.

The West is no longer an unspoiled frontier, and architects must respond as much to suburban sprawl as to nature. In the design for a public library in the "edge city" of Bellevue, Washington, Zimmer Gunsul Frasca Partnership introduces a pedestrian-scaled landmark that challenges misguided patterns of suburban development. On the Warm Springs Indian reservation in Oregon, Portland-based Stastny & Burke crafted a museum that recalls traditional tribal dwellings through a sensitive interpretation of native symbolism. The result translates the mythic folklore of the past into meaningful architecture for the future.

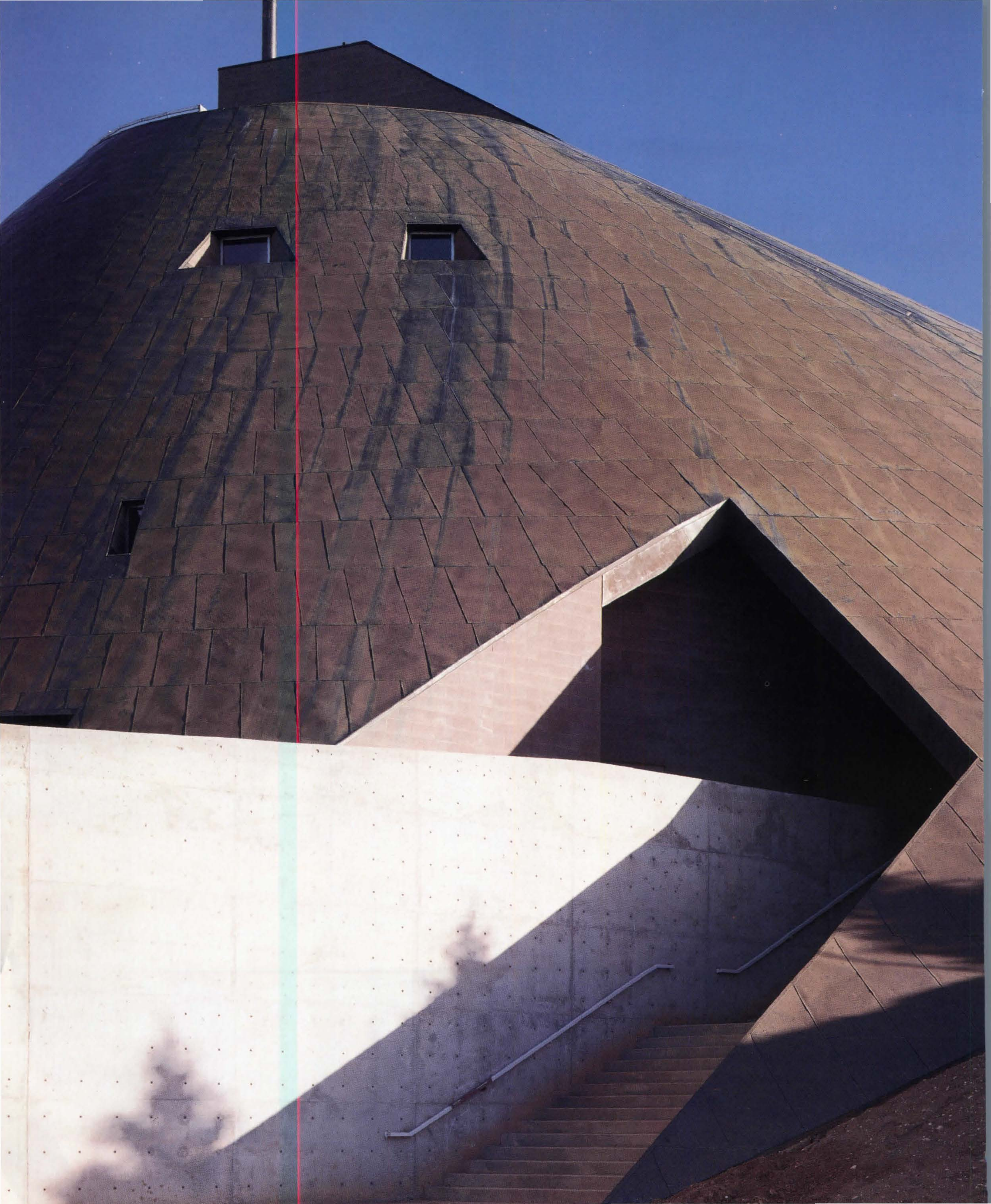
American Heritage Center and
Art Museum, University of Wyoming
Laramie, Wyoming
Antoine Predock Architect

MYTH AND SPIRIT





THESE PAGES: American Heritage Center occupies a conical structure reminiscent of volcanos and Indian tipis. The University of Wyoming Art Museum is housed in brick volumes (below) that recall Indian pueblos.



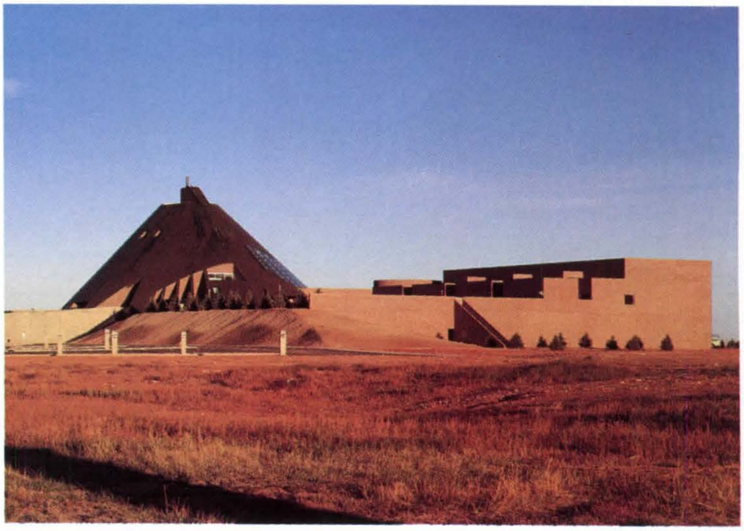
Antoine Predock has long been a student of the earth and sky and how people build a place between the two. Nearly six years ago, when the University of Wyoming at Laramie held a competition for its American Heritage Center and Art Museum, Predock had a perfect program to mate with the larger assignment of evoking Western legends and spirit. The institution owns artifacts ranging from saddles to mineral maps and stills from Hollywood Westerns. Moreover, Laramie's modern cowboy history is predated by centuries of Indian culture. Strip away the thin layer of contemporary buildings and paved roads, and a mythopoetic Wyoming emerges.

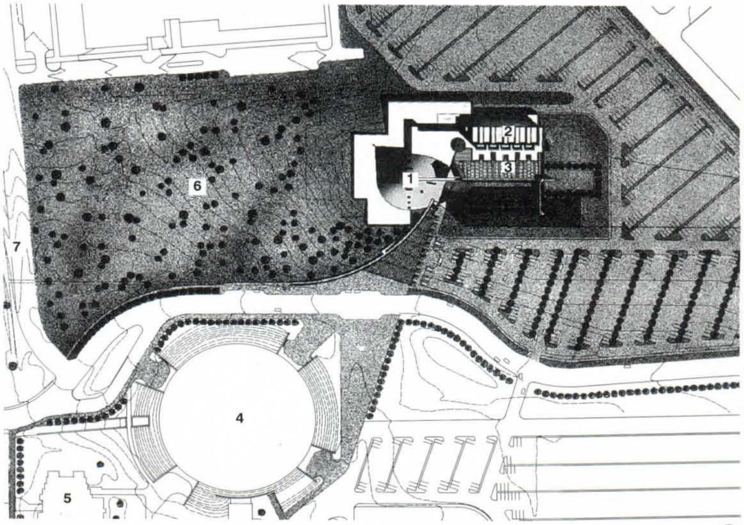
On a 26-acre site, at the eastern quadrant of this land-grant university campus, next to football and basketball arenas, Predock has designed and rubbed a strange and magnificent lamp, and the genii loci have indeed appeared. Geometrically, the building's dominant shape is simply a cone with a leaning central axis that throws the Platonic solid off center, dynamizing its solidity. But Predock has imbued the cone with mythic and ancient associations. Its patinated copper surface, already stained with weeping, is punctured with small, cryptic windows and sliced at the top to form a succinct plateau.

The cone also alludes to old tipi encampments in Laramie, documented by photographs in the American Heritage Center's archives. From certain angles, the windows resemble eyes, and the building recalls an ancient or futuristic war helmet, or a UFO. Both familiar and strange, the building is oneiric, evoking images appropriate for the collection it houses. Predock, who wrote conceptual notes to himself on his butcher-paper sketches—"geology ranch," "reliquary," "mystery"—calls it the "volcanic archives." Indeed, when smoke rises from a stovepipe chimney that pierces the cone's top, the building appears on the verge of erupting.

In terms of context, the American Heritage Center relates axially to the football stadium to the south and alludes to the flat-domed basketball arena across the street. But Predock's peaked form more directly connects to the landscape. The circularity of the shape calls out in all directions, gathering the distant plains and ranges within its orbit. Predock creates another attachment to its surroundings by aligning the building between Medicine Bow and Pilot's Knob peaks—what he calls the "rendezvous axis," after the ancient gatherings of Indian tribes. The building, finally, is sited on a cross-axis

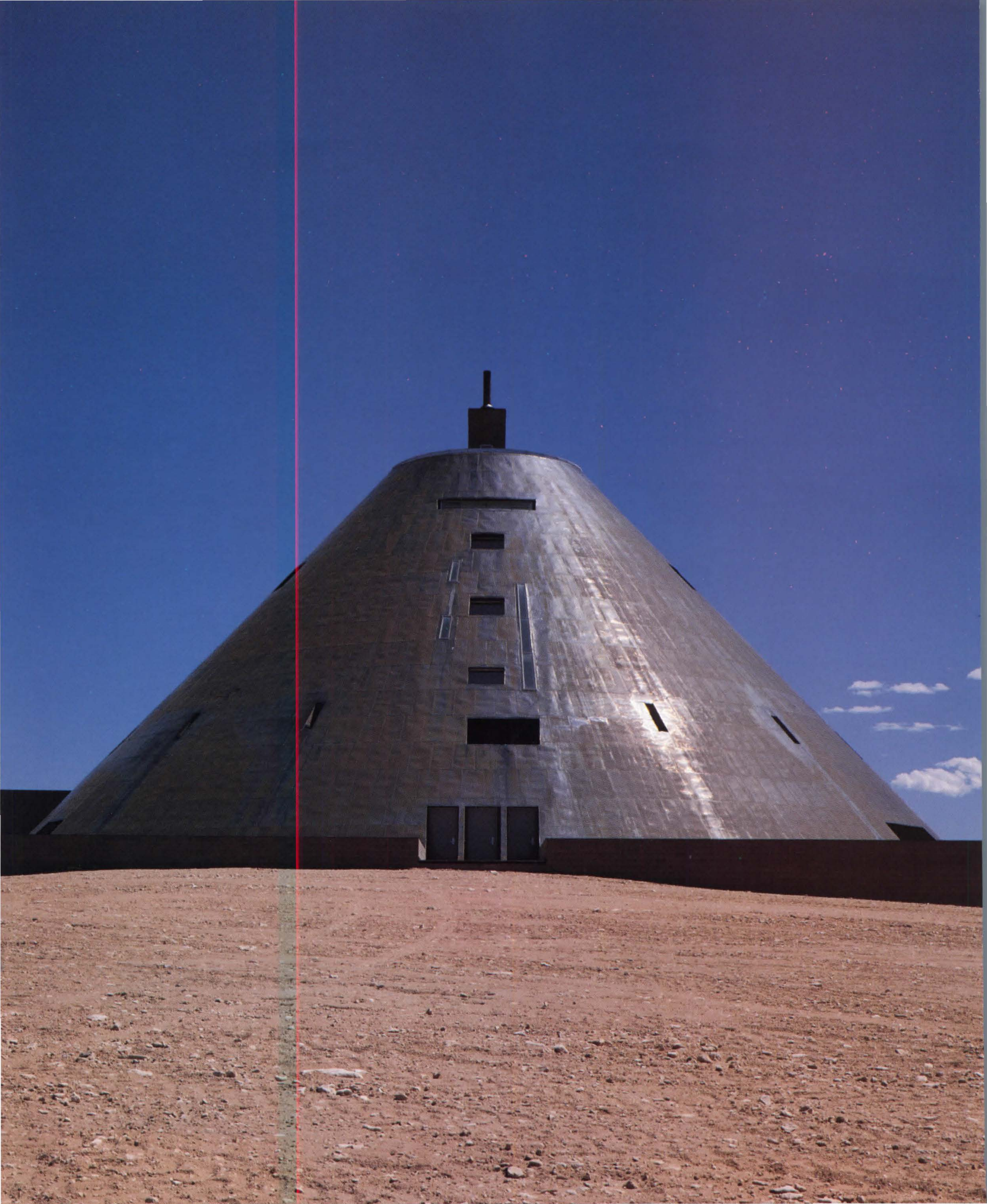
FACING PAGE: Heritage Center's copper-sheathed, steel-framed concrete cone is pierced by a two-level entrance.
BELOW: Center is entered from ramp (left). Staircase from parking lot (right) ascends to sculpture court.
SITE PLAN: The American Heritage Center and Art Museum is located to north of the University of Wyoming's circular basketball stadium.
FOLLOWING PAGES: Sun activates copper surface. By night, interior lights emphasize axial relationships of windows.



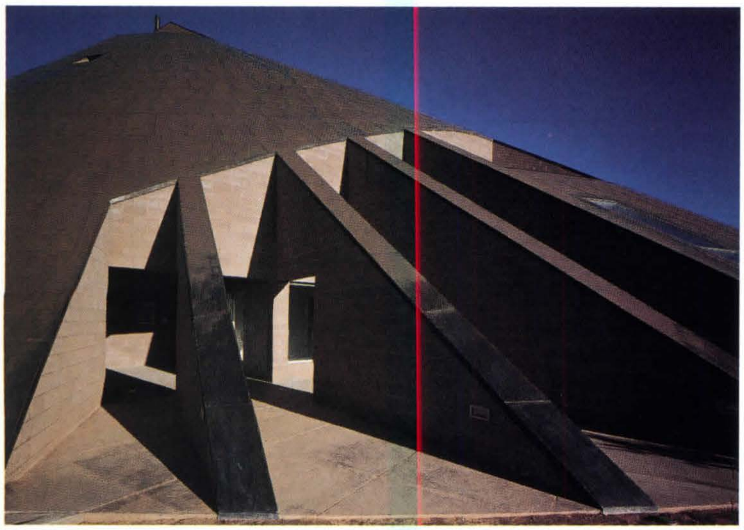


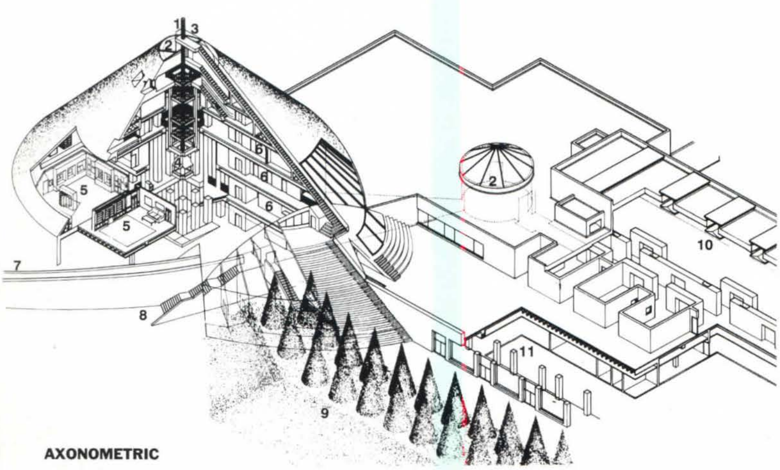
SITE PLAN

1 AMERICAN HERITAGE CENTER
2 UNIVERSITY ART MUSEUM
3 SCULPTURE COURTYARD
4 BASKETBALL ARENA
5 LAW SCHOOL
6 BERM
7 CEMETERY



BELOW: Cone is segmented with openings leading to two-story atrium.
BOTTOM: Cutaway of Heritage Center reveals timber scaffolding at center, surrounded by five floors of offices.
FACING PAGE: Reception area in the Heritage Center opens onto sculpture terrace of the University Art Museum.





AXONOMETRIC

1 CHIMNEY
2 SKYLIGHT
3 OVERLOOK
4 FIREPLACE
5 RESEARCH ROOM
6 OFFICE
7 RAMP
8 STAIRCASE
9 BERM
10 GALLERY
11 DINING ROOM

of the stadium and the landscape, at an intersection of the works of man and nature.

While Frank Lloyd Wright's organic architecture opened buildings to the landscape a century ago, Predock's shamanistic architecture opens them to the myth and mysticism of land and culture. Wherever Predock designs, he addresses the larger natural and mythic context and content of a site and program—what might be called its "spirit lines"—along with the immediate, more mundane urban and functional issues. His work, which has been unfairly overidentified with the West and Southwest, is regional only in the sense that inherent in any region are subjects to be addressed or summoned by the design. At Predock's Arizona State University Fine Arts Center, for example, the crisp forms of the outdoor amphitheater chisel the pellucid desert light and recall through their mysterious geometries ancient observatories in the Yucatan and India.

In Laramie, when Predock berms up to the building, he creates a plinth that recalls the horizontal mesas of the West. The rise he sculpts by grading earth at the front of the building also extends the slope from a nearby cemetery, giving this ground a gravity.

The building houses two institutions. The cone and its base house the American Heritage Center, primarily an archival research institution for scholars. A long, terraced volume with flat roofs, trailing the conical structure on its lee side, houses the University of Wyoming Art Museum. The museum's crisp lines and solid massing recall early buildings of Pueblo Indians, and when visitors are seen along its parapets, silhouetted against the sky, photographer Edward Curtis's portraits of American Indians come to mind.

The museum's blocklike structures are constructed of sandblasted concrete blocks specially formed with a coarse aggregate. Predock sustains themes of the land through materials that emphasize the elemental. Concrete floors are simply sealed and left exposed. The sheets of patinated copper applied to soffits are so sensitive they register hand and tool prints, recalling Indian petroglyphs.

Set atop a plinth, the cone may mark a landscape, but geometrically, the closed form presents no natural opening for an entrance. Predock addresses rises and breaks through the base of the cone to form an entry. The wall is really a force vector that continues into the building where its thrust carves a two-story lobby within the volume of the cone, roofed by an irregular skylight striated by the structural steel ribs of the cone. The

vector pierces a circular rotunda that serves as the knuckle between the cone and the rectangular galleries beyond. Small slotted openings ring the rotunda near the ceiling, refracting light. Another small window set in the roof sends a shaft of light to a silver dollar planted at the center of the concrete floor, marking noon on the summer equinox.

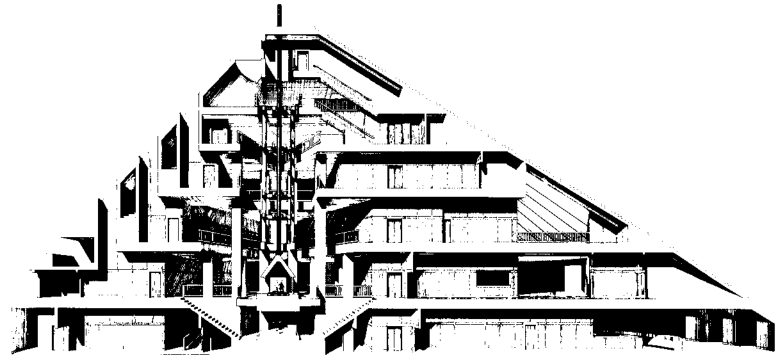
The vector that breaks into the cone also sends off a shoot into the volcano where, at its center, a five-story atrium rises to skylights at the apex of the cone. This narrow space, clearly, is the heart of the building, where Predock cultivates interior mysteries as in an old European church built over a crypt. The atrium is thickly planted with a grove of columns of stacked concrete block that, above two stories, metamorphose into thick timber members. The timber supports a stovepipe connected to a hearth at the center of the space. The columns grow out of the basement where columns define a four-poster space intended for "sacred" objects from the collection; Predock envisioned an historic Spanish saddle here. Originally, a staircase from the main floor descended into this space, as in a crypt of a church, but building codes worked against unifying the two spaces. The descent now remains conceptual. In the lower level, to the side of this reliquary space, a door opens into the large Anaconda wing, which houses a collection of metallurgical maps of the world's underground.

The closed and opaque volcanic form, which is so mysterious on the outside, restricts views from inside through its small windows. Predock often edits views, to eliminate parts of the landscape corrupted by insensitive building. But here, the esthetic need to close the exterior form conflicts with the need to open interiors generously to the outside. Similarly, the curved, leaning walls of the building do not accommodate the linear organization of bookshelves and file cabinets, especially on the smaller, upper floors which resist straight, conventional furniture.

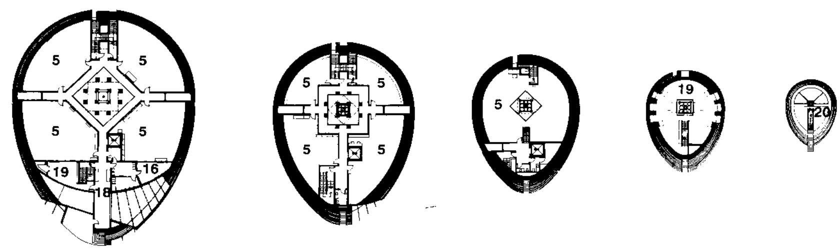
If ever an institutional program complemented its environment, it is the American Heritage Center and Art Museum, largely because so much of both collections interpret and document the history and culture of the West. Predock's building, which intensifies the landscape and Indian associations, seamlessly merges with them, becoming of Wyoming rather than just about Wyoming and the West. The building is the largest artifact in the collection, but a living artifact with the ability to de-accession itself and dissolve into a larger ethos. *—Joseph Giovannini*

FACING PAGE: Two-story entrance reception area of center incorporates balcony overlook and fanning skylights. **BELOW:** Rotunda, located to the northeast of the cone within museum block, doubles as a gallery and transitional knuckle from archive to exhibitions. **BOTTOM:** Main gallery of the museum is flanked by corridor leading to exhibition spaces and sculpture terrace. **OVERLEAF:** American Heritage Center centers on a timber-framed hearth.

FACING PAGE: At the top of the Heritage Center, stovepipe chimney emerges from timber scaffolding and disappears into top of skylit cone. **SECTION:** Heritage Center is organized with archival storage on the ground floor, offices above, and five-story atrium with central fireplace. **PLANS:** Principal archives and museum staff rooms are located on the ground floor, with public museum rooms and reception areas on the main floor. The upper floors within cone house offices, collections, and reading rooms.



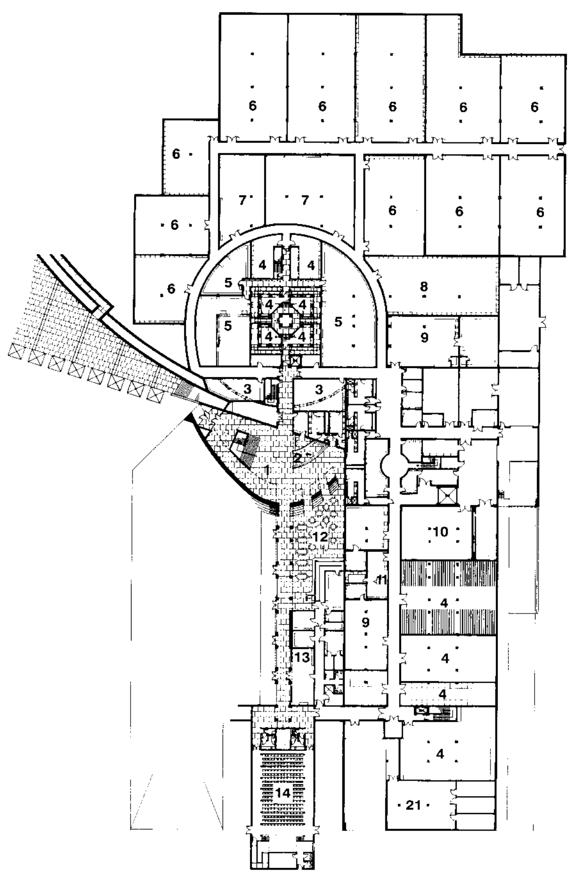
WEST-EAST SECTION



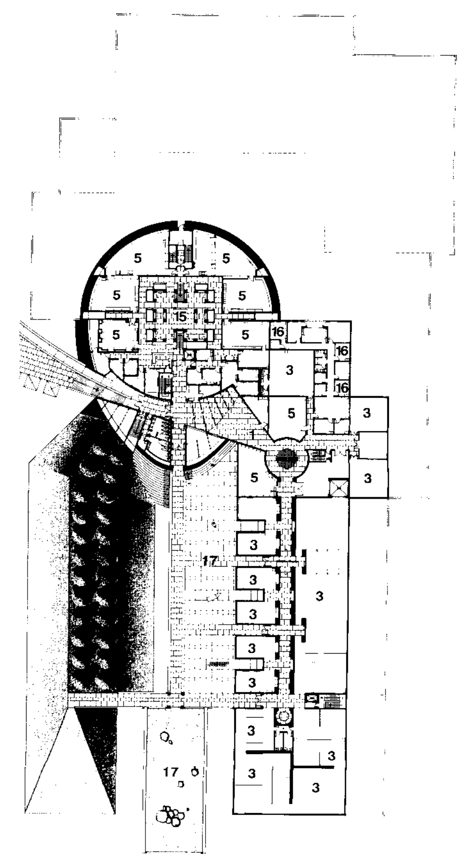
UPPER FLOOR PLANS

AMERICAN HERITAGE CENTER AND ART MUSEUM, UNIVERSITY OF WYOMING LARAMIE, WYOMING

ARCHITECT: Antoine Predock Architect, Albuquerque, New Mexico—Antoine Predock (principal-in-charge); Geoff Beebe (associate-in-charge); Derek Payne (project architect); John Jacob, Jorge Burbano, Brett Oaks, Paul Gonzales, David Hrabel, Sam Sterling, Chris Romero, Bob Romero, Phyllis Cece, David Somoza, John Flemming, Rebecca Riden, Lorraine Guthrie, Jon Anderson, Pedro Marquez, Linda Christensen, Jeff Wren, Hadrian Predock, Peter Karslen, Eileen Devereux, Chris Purvis (design team)
LANDSCAPE ARCHITECT: Antoine Predock
ENGINEERS: Robin E. Parke Associates (structural); Bridgers & Paxton (mechanical)
GENERAL CONTRACTOR: Kloefkorn-Ballard Construction/Development
COST: Withheld at owner's request
PHOTOGRAPHER: Timothy Hursley



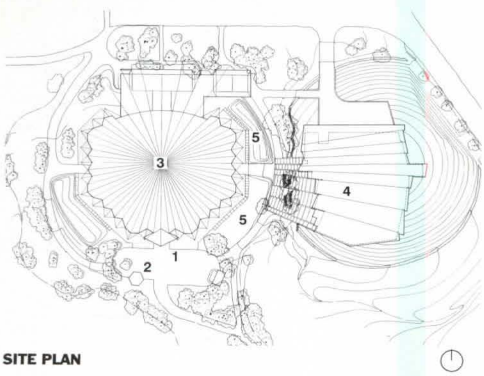
GROUND FLOOR PLAN



MAIN FLOOR PLAN

1 LOBBY
2 SHOP
3 GALLERY
4 VAULT
5 RESEARCH ROOM
6 MANUSCRIPT ROOM
7 ART/ARTIFACTS ROOM
8 AUDIO VISUAL ROOM
9 LABORATORY
10 WOOD SHOP
11 PHOTO STUDIO
12 DINING ROOM
13 CONFERENCE ROOM
14 AUDITORIUM
15 FIREPLACE
16 OFFICE
17 SCULPTURE COURT
18 BALCONY
19 LOUNGE
20 OBSERVATION DECK
21 MECHANICAL

Joan and Irving Harris
Concert Hall
Aspen, Colorado
Harry Teague Architects



SITE PLAN

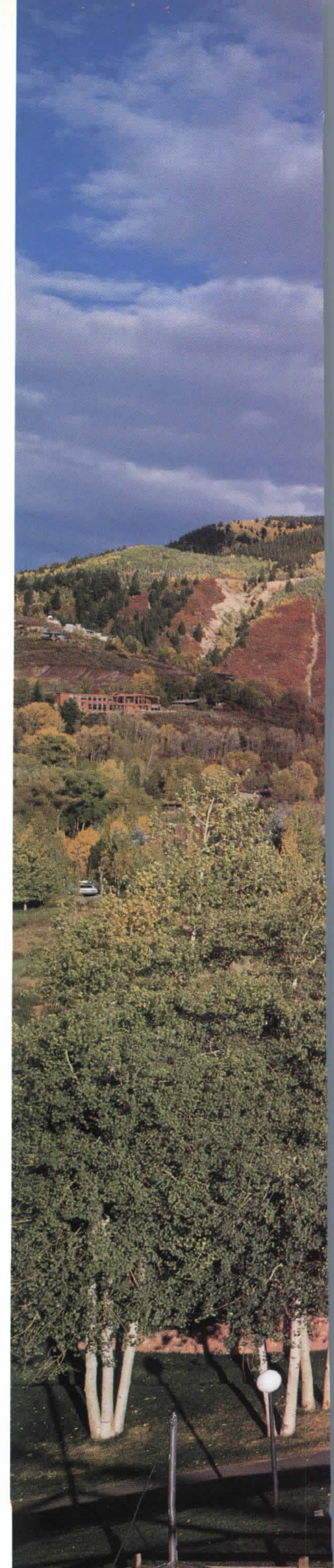
1 PLAZA
2 TICKET BOOTH
3 PERFORMANCE TENT
4 CONCERT HALL
5 SEATING BERMS

TOP: Entrance and lobby on the western facade face a small, newly created plaza. Retaining walls around plaza are constructed of local sandstone.
SITE PLAN: To the west of the concert hall is the Aspen Meadows Music Tent, a landmark to which the new hall is subordinate. The planes of the new building's concrete roof radiate from the center of the tent.
FACING PAGE: The Harris Concert Hall is partially sunk into the earth and covered by a broad, asymmetrical roof that suggests the snow-capped peaks of the surrounding mountains.

The Joan and Irving Harris Concert Hall in Aspen Meadows is as site specific as architecture can be. Designed by Harry Teague, this new 500-seat auditorium for performance and recording is so responsive to its surrounding landscape, and so deferential to the buildings that make up the Aspen Institute, that the design could not have been rightly constructed anywhere else. Aspen Meadows, the campus of the institute, is familiar to architects and designers who have attended the International Design Conference held there each June. To visit the Meadows is to move back in time to the 1940s and '50s, the postwar era that saw the transplantation of Bauhaus design to America. Walter Paepcke, the Container Corporation mogul who founded the institute, succumbed early to the influence of Walter Gropius, Marcel Breuer, Laszlo Moholy-Nagy, Josef Albers, and Herbert Bayer. A distinguished Bauhaus designer who came to live in Aspen in 1945, Bayer was appointed the architect of the institute's academic buildings, housing, and landscape, and it is to his designs that Teague's concert hall defers.

Bayer's modest structures are, for the most part, constructed of exposed concrete block with fenestration modeled on the Bauhaus factory esthetic. Here and there, a polygonal roof, sheathed in white hypalon, echoes the surrounding snow-capped peaks. Bayer transformed several of the central campus meadows into grass-covered earth sculptures, to be experienced as close-at-hand, human-scale abstractions of the undulating silhouette of the nearby mountain range. His most important building is the 1965 Music Tent, the institute's icon and landmark.

Realizing that his 44-foot-high, 20,000-square-foot concert hall would dwarf Bayer's tent, Teague inserted its auditorium and stage into the ground. Because of the underground water level, the excavation could be no more than 25 feet deep. Little more than the roof and the lobby facade are visible; the rest of the structure above ground level is



MUSICAL EXCAVATION

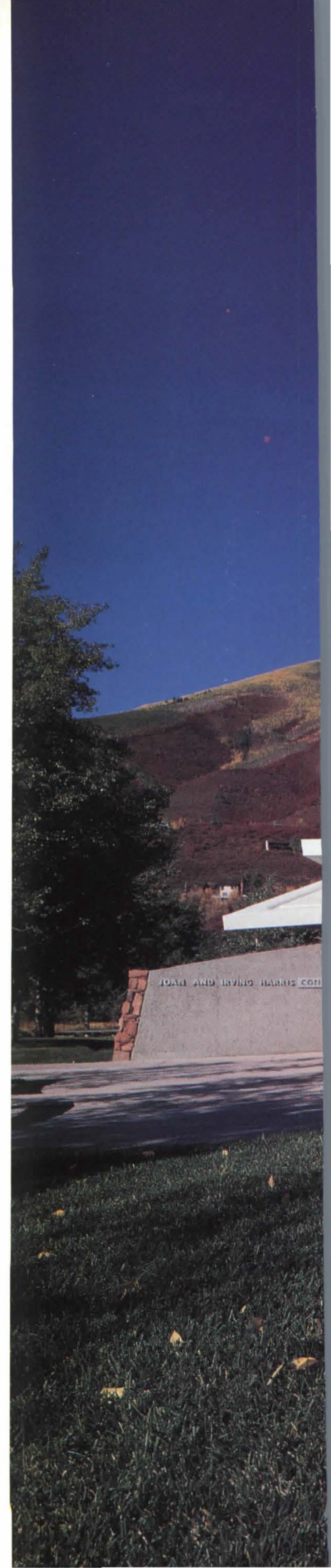
ABOVE: From the east, an earth berm conceals almost all of the concert hall's facade except its roof profile.
FACING PAGE: The entrance facade to the west is constructed of reinforced concrete with a multicolored aggregate of local pebbles. Standard roll-up aluminum and glass garage doors form floor-to-ceiling windows.

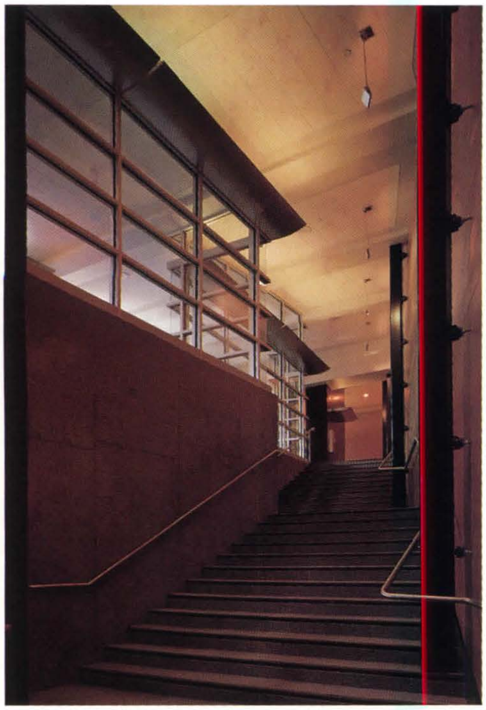
concealed by a grass-covered berm, continuing Bayer's earth forms. Spanning sandblasted concrete walls that barely emerge from the berm, the white hypalon-sheathed roof—a broad, jagged arrangement of tilted planes, as eccentrically layered as the surface of a glacier—looks like a chunk of the winter Rockies up close. These planes radiate from the center of Bayer's tent, but they are asymmetrical and more contemporary in manner. "My building is a cadenza to the formal statement of the tent," notes Teague.

Visitors entering the concert hall cross a newly created plaza shared with the tent. The lobby is Spartan, but warmed by the polished cherry wood wall of the stair hall opposite. As concert-goers descend the three broad flights of stairs to reach the subterranean auditorium, the interiors gradually grow more luxurious. The auditorium is a magnificent room, also sheathed in cherry wood, polished to the luster of a violin.

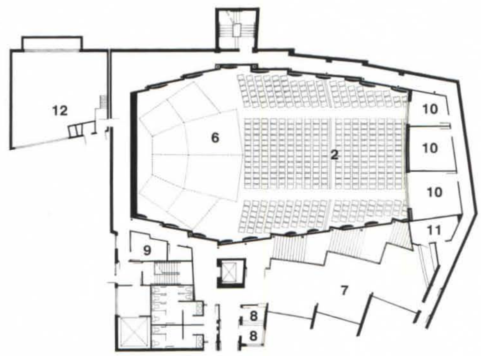
Assisted in his design of the concert hall by San Francisco-based acoustician Elizabeth A. Cohen, Teague developed a basic, shoebox-shaped auditorium that measures 33 feet high at the maximum to provide the required acoustical volume. To accommodate varying degrees of sound absorption and reverberation for different types of performances, the wood walls conceal 40-foot-high, sliding fabric panels. The plaster ceiling is a marvel of acoustically determined intricacy, consisting of small incremental shapes, curved, stepped, angled, and tipped to disperse as well as to create paths for sound. Through these devices, the hall can be adapted for three basic sound requirements: performance ranging from medium-sized orchestra to chamber music groups, large orchestra rehearsal, and all types of musical recording.

Burying most of a concert hall and covering the rest of it with earth berm presented a formidable design challenge for structural engineer Greg Luth. The earth pressure on the east and west concrete retaining walls was estimated to measure 10 times the force of an

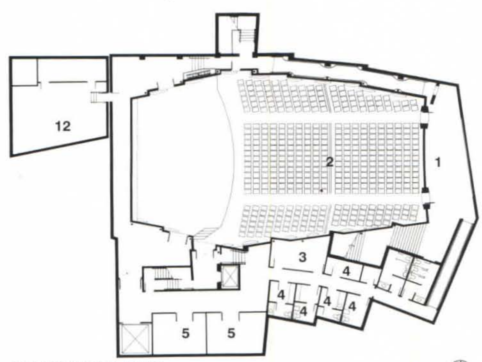




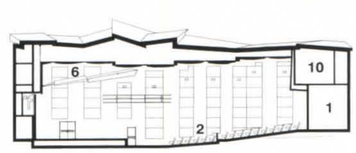
ABOVE: View up the stairs from auditorium reveals cherry paneling, chosen by Teague to suggest violins, violas, cellos, and basses. The concrete block shell of the auditorium is braced by sound isolators attached to steel columns that support roof trusses. **FACING PAGE:** Folding garage doors (left) open to the plaza. Curved light fixtures, extending from door tracks, were designed by Teague. Stepped glass wall encloses three flights of stairs leading down to auditorium.



GROUND LEVEL PLAN



LOWER LEVEL PLAN



NORTH-SOUTH SECTION

1 FOYER
2 PERFORMANCE HALL
3 GREEN ROOM
4 DRESSING ROOM
5 INSTRUMENT ROOM
6 ACOUSTICAL SHELL
7 LOBBY
8 BOX OFFICE
9 MANAGER'S OFFICE
10 CONTROL ROOM
11 KITCHEN/BAR
12 MECHANICAL

ABOVE: Three-sided shell beneath the acoustic canopy at the rear of the stage can be adjusted to form an intimate space for chamber music, or folded back into the rear wall. To accommodate a full orchestra, the stage extends beyond the first few rows of seats. **FACING PAGE:** In contrast to the budget-induced severity of the entrance facade and lobby, the auditorium is a lustrous, elegantly proportioned room. Cherry-veneered, hollow pilasters conceal movable sound-absorbent panels. The plaster ceiling is intricately modeled to disperse sound.

JOAN AND IRVING HARRIS CONCERT HALL
ASPEN, COLORADO

ARCHITECT: Harry Teague Architects, Aspen, Colorado—Harry Teague (principal-in-charge); Joede Schoeberlein (project architect/project manager); Alan Gass (project manager); Brad Zeigel, Christopher Melton, Katalin Domoszlay, Mark Mahoney, Suzannah Reid, Jim Trewit, Dewey Webster, Jennifer Smith (design team)
LANDSCAPE ARCHITECT: Design Workshop
ENGINEERS: TSDC of Colorado (structural); Engineering Economics (mechanical/electrical)
CONSULTANTS: Landry and Bogan Theater Consultants (theater); Cohen Acoustical (acoustics); Wessleman Design Associates (signage)
GENERAL CONTRACTOR: Shaw Construction Company
COST: Withheld at owner's request
PHOTOGRAPHER: Timothy Hursley

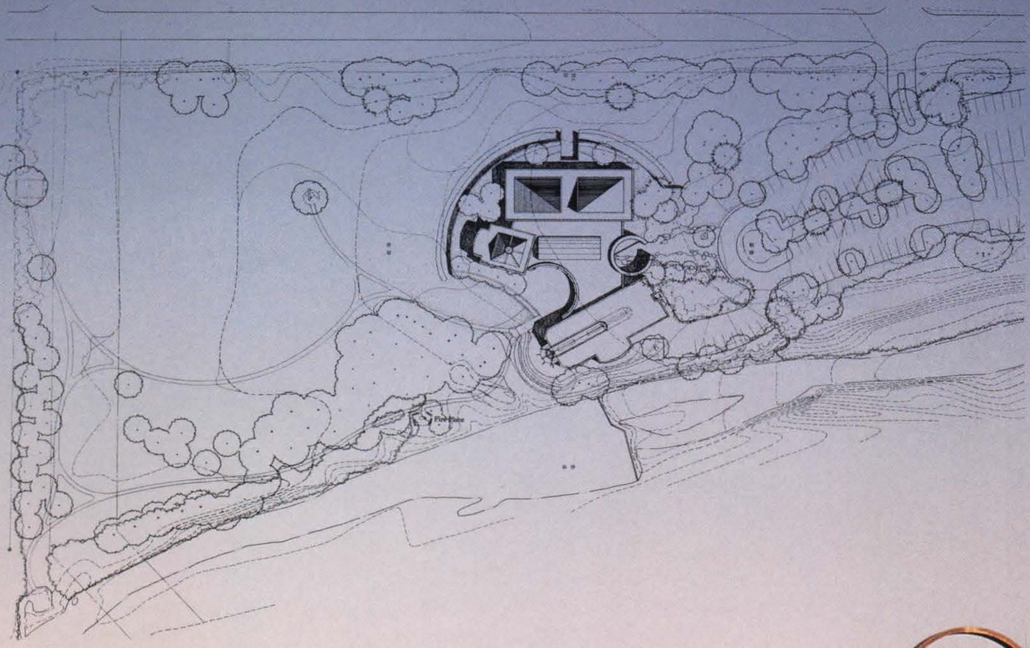
earthquake. Further complicating the design problem was the intricately tilted roof, which spans a distance of 65 feet across the width of the hall and is required to support as much as 115 pounds per square foot of snow. For acoustic purposes, the steel members supporting the concrete roof slabs had to be of minimal depth to maximize the volume available. Luth devised shallow steel roof trusses, which, in addition to supporting the roof, deliver its tremendous load to counteract the earth pressure against the retaining walls like flying buttresses.

Because construction did not begin until September 1992, concrete foundations and walls had to be poured during a severe winter. Therefore, the normal construction sequence of foundation, walls, and roof was reversed. The steel columns and roof trusses were erected first so that the intricately tilted concrete roof slab could be poured early, before the worst weather set in. Without the roof, it would have been impossible to pour the concrete foundations and walls before spring. February was the low point, Teague recalls: "When the wind was howling through the plastic sheeting across the gigantic empty excavation, and the workers were warming their frozen hands by the fires, we wondered whether the hole would ever get filled with a concert hall."

Teague, however, prefers to speak in poetic metaphors rather than to recall the ultimately successful 11-month struggle to complete the building on time. In his notes for the opening program, the architect imagines the hall as a "monumental wooden musical instrument, one venerated by an ancient Indian culture in the valley. When these ancients left the valley, they left the instrument, which was covered by earth in later ages. The project is an excavation of that instrument, over which a protective tentlike roof has been erected." For lovers of architecture and music who attended the opening concerts, Teague's mythological interpretation seemed not in the least farfetched. —*Mildred F. Schmertz*

Museum at Warm Springs
Warm Springs, Oregon
Stastny & Burke: Architecture

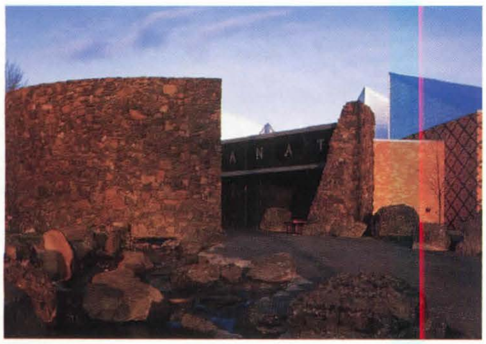
TRIBAL TRIBUTE



SITE PLAN

SITE PLAN: Museum at Warm Springs occupies floodplain at edge of Shitike Creek in Deschutes River Canyon. Ceremonial field extends toward west (left). Parking flanks circular museum entrance courtyard (right).

THESE PAGES: Basalt cliffs surround museum site. Stastny and Burke gathered stones from talus of cliff to build low wall. Trio of roof forms represents confederation of three tribes. Galvanized steel shingles on roofs reflect sun and sky. Steel stanchion marks the west.



ABOVE: Stone wall defines circular entry drum. Architects concealed mortar joints and thickened base of wall to suggest piling of stones.
FACING PAGE, TOP: Steel-supported, perforated-metal screen, recalling a longhouse, filters light over entry to classroom and forms skylight over administrative wing (right).
FACING PAGE, BOTTOM: Stone wall at left extends to edge of amphitheater. Brick wall of temporary gallery (left) is punctuated with stones found on site.

Visiting the new Museum at Warm Springs, Oregon, requires a pilgrimage. The route from Portland plumbs the depths of wet, dark, and forested hills, crossing the Cascade Mountains—about an hour's drive east from the city. Beyond the snow-capped crest of Mount Hood, an abrupt clearing reveals a broad desert horizon: The road emerges onto an arid plateau, above red stone canyons dusted with sagebrush, where ancestors of the Warm Springs, Wasco, and Paiute tribes have lived for 8,000 years. The museum commands a floodplain near the west bank of the Deschutes River, at the eastern edge of the 644,000-acre Warm Springs Reservation. A confederation of the three tribes, who have shared the reservation since 1875, commissioned Portland architects Donald Stastny and Bryan Burke to design not only display spaces for their tribally owned artifacts, but also a monument to three different tribal cultures.

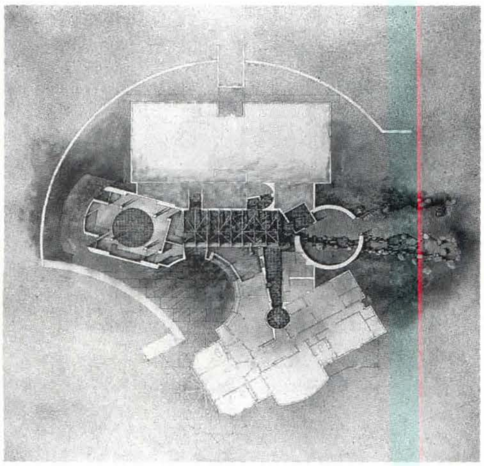
Stastny's involvement with American Indians began when he was a Boy Scout, growing up amidst the Modoc and Klamath tribes of southern Oregon. "I saw the Warm Springs troops dance at a 1957 jamboree," he recalls. "After that, I created my own costume and danced." Stastny and Burke's initial project presentation even included a photograph of Stastny dancing in full dress. "We were selected to design the museum because our understanding of Indian culture transcends pretty pictures," Stastny avers.

The 25,000-square-foot, one-story museum promotes cultural understanding for non-Indians as much as it generates profits to boost the reservation economy. About one-third of the 3,000 tribal members who live on the reservation work in businesses spurred by an economic development program set up by the confederation in the 1950s, including timber products, hydroelectric power, and clothing manufacture. None of these industries, however, is more lucrative than tourism: In the busy summer months, the tribal work force doubles.

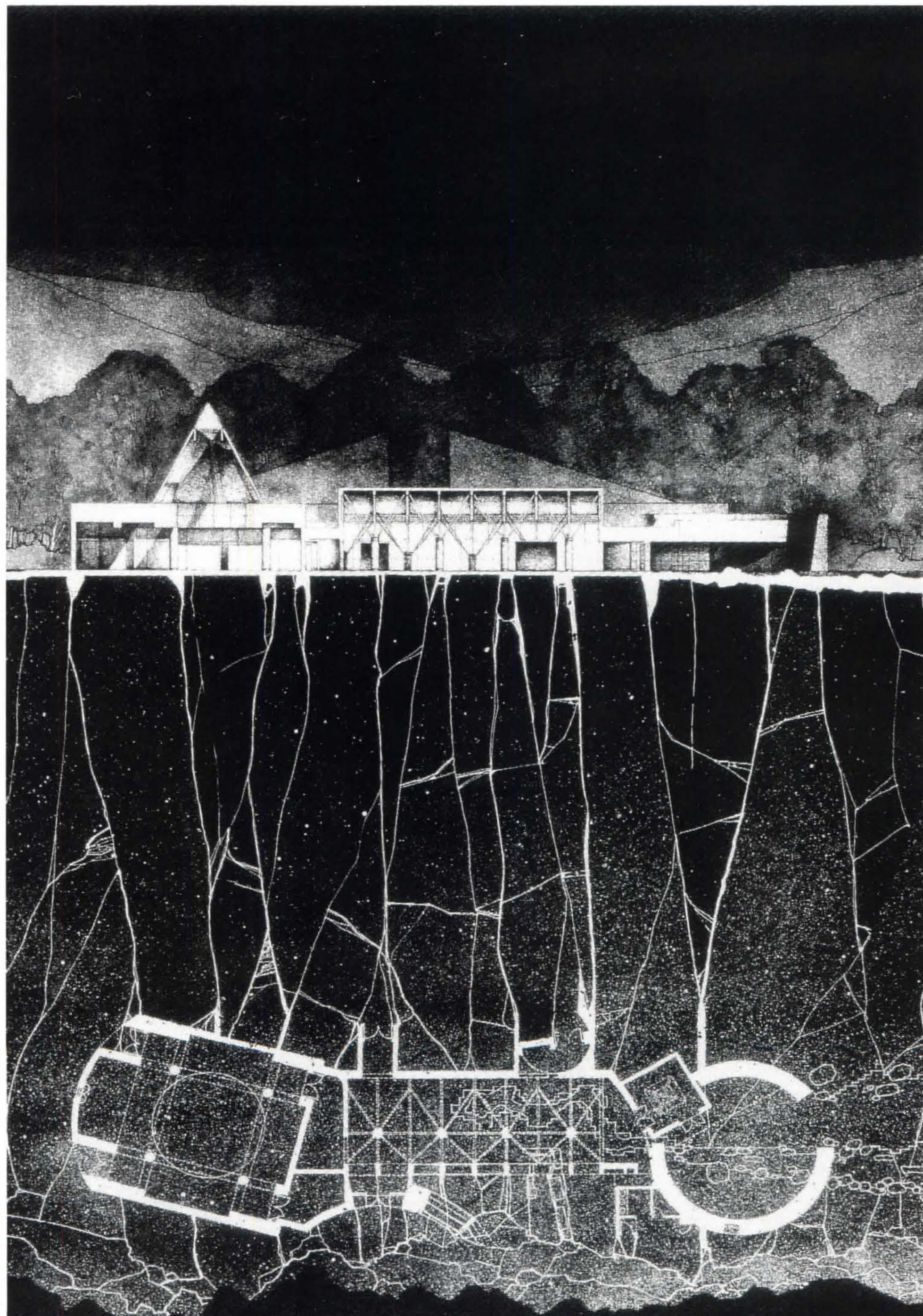
Designing a monumental building to suit the tribal culture is no easy task, especially considering the contemporary tendency to accept scenography as an appropriate response to context. Stastny and Burke's museum achieves a precarious balance of tectonics and applied symbolism, evoking a desert encampment beside an existing creek. "This is what the tribes would have built if they could draw it," Stastny explains. The architects manifest the reservation's trio of confederated tribes in three dominant roof forms. Although none is related to the symbology of a specific tribe, all refer to traditional Indian forms of enclosure: The pyramid above the temporary gallery, crowned by a skylight, represents a tipi; the metal-framed skylight over the administrative wing resembles a longhouse for tribal meetings; and, less obviously, the bifurcated roof above the permanent gallery recalls a travois—the sled used by nomadic tribes to carry their belongings.

The sculptural forms of the roof emerge from a solid base, where Stastny and Burke juxtapose natural and man-made patterns to dissolve the mass of the building. A diamond motif wraps the largest volume, which contains the permanent gallery. Rendered in tawny brick, the surface of the wall looks like fishing nets to some tribal members, the ridges of nearby basalt cliffs to others, and basket weaves to the architects. "The accidental symbolic associations are far better than we intended," notes Stastny. The architects patterned the walls of the temporary gallery, too, punctuating them with a grid of stones found on the site.

Stastny and Burke arrived at the loose configuration of roof forms and building volumes in a decidedly unconventional way. "We gained a deeper understanding of the tribal cultures by listening to stories," Stastny explains. "The Indians guided us along a spiritual path toward the right solution." To generate an informed parti, the architects set up a design studio on the reservation for one week, eliciting reactions to drawings. One



PLAN: Metaphorical creek intersects entry drum (right). Rectangular museum lobby at center leads to permanent gallery (top), temporary gallery (left), and administrative wing (bottom).
SECTION: Compressed volume of vestibule between lobby (center) and drum (right) activates spatial procession into museum. Steel-framed oculus daylights temporary gallery (left).
FACING PAGE: Treelike fir columns and steel brackets support roof. Ash panels on wall at right hang on concealed steel frame. Decorative juniper frame adorning each wall is assembled with bronze bands and rosettes.



ABOVE: Plaster wall extends between museum lobby and administrative wing. Its pigment is derived from color of basalt cliffs north of museum site.
FACING PAGE: Fir columns support roof of temporary gallery. Ash panels clad upper wall beneath skylight. Maple bench follows curve of slate floor.

MUSEUM AT WARM SPRINGS
WARM SPRINGS, OREGON

ARCHITECT: Stastny & Burke: Architecture, Portland, Oregon—Donald J. Stastny, Bryan J. Burke (principals-in-charge); Chris Boothby, Judith Basehore Alef, Kara Adams, Dave Froseth, Louis Gagnon, Richard Heintz, John Holmes, Dustin Posner, Denise Roy, Jeff Tathwell (design team)
LANDSCAPE ARCHITECT: Mayer/Reed
ENGINEERS: Stanley V. Carlson Associates (structural); Carson Bekooy Gulick Kohn (mechanical/ electrical/ plumbing/fire protection); Project Engineering-Confederated Tribes of Warm Springs (civil); Century West Engineering (geotechnical)
CONSULTANTS: Formations (exhibits); Kathrine MacKenzie Dillard (interior furnishings)
GENERAL CONTRACTOR: S.M. Andersen Company
COST: $7 million
PHOTOGRAPHER: John Hughel, Jr.

woman told a story about river basalt, her favorite stone, which members of her tribe collect for various utilitarian purposes. If applied to the museum, she suggested, the rock would charge the building with meaning important to each of the tribes. "We gleaned from her the cultural significance of indigenous materials," Stastny notes. "The cedar that clads the nearby resort hotel, for example, is utterly foreign to the tribes."

Heavy basalt stone, gathered from the talus of a nearby cliff, forms a low wall around the north side of the building and a high wall around the museum entry. Formally, the low wall unifies the aggregation of building volumes that would otherwise appear haphazard. Surrounding the visitor at the moment of entry, the high wall shifts one's attention away from the image of the building to the nature of its materials. The circular plan of both walls symbolizes the cycles of the universe, reiterated by an outer ring of stanchions marking the four cardinal directions. Most importantly, the high wall forms a drum, which to American Indians resonates the heartbeat of all living things.

Water, the source of all life, flanks the pedestrian approach to the museum's east-facing entry. Despite the poetic force of this metaphorical creek, this side of the building is compromised by its immediate proximity to the parking lot, which amounts to a banal forecourt. The material simplicity of the creek bed, however, designed by Portland-based landscape architect Carol Mayer-Reed, rivals Stastny and Burke's treatment of the public spaces inside the museum. The architects transform the creek into a pattern across the slate floor of the lobby, complementing the treelike fir columns that support the roof. Ash-paneled walls, adorned with juniper frames, form a subtle backdrop to the profusion of color and decoration that characterizes the tribal art on display.

On paper, Stastny and Burke's plan appears jumbled, but one experiences the galleries in a clear procession. "We planned this building by intuition," Stastny admits. "We imagined the movement of people through space—not something that merely looks good in plan." As a result, the compression and reorientation at the museum's entry emulates the spatial drama of entering Frank Lloyd Wright's living room at Taliesin West. Approaching on a diagonal from the exterior drum, one enters the low volume of the vestibule. Turning to the side, visitors enter a tall, rectangular lobby, where clerestories along the south-facing wall modulate the sun like the outer wall of a forest.

Stastny and Burke derived their details from traditional native tools and ceremonial regalia. Most convincing are the steel handles of the front door, inspired by an Indian dance bustle. On a larger scale, the bustle appears again in the form of steel mullions along the exterior face of the curved, south-facing window that daylights both the library and museum store. This window forms the back wall of an outdoor amphitheater, which, appropriately, is used for dancing and ceremonies.

According to Michael Hammond, the museum's director, the throng of tourists who now visit the museum ensures the construction of additional galleries on the site. "The architecture is our best billboard," he contends. "The extra money we spent on design is already paying off." At the risk of commercializing their culture, the confederation also is considering proposals for a commercial or retail center nearby, possibly across the highway from the museum. One proposal distills Stastny and Burke's design, reducing it to kitsch; even worse, another scheme evokes, thoughtlessly, the false fronts and motifs of western mining towns.

Chris Boothby, the project architect, points out the tragic irony of tribal efforts to protect their cultural legacy and identity: "The museum would not be necessary without the invasion of the white man," Boothby deplores. "We are extremely privileged to be among those selected to give something back to the Indians." —*M. Lindsay Bierman*

Bellevue Regional Library
Bellevue, Washington
Zimmer Gunsul Frasca Partnership

SUBURBAN PRECEDENT

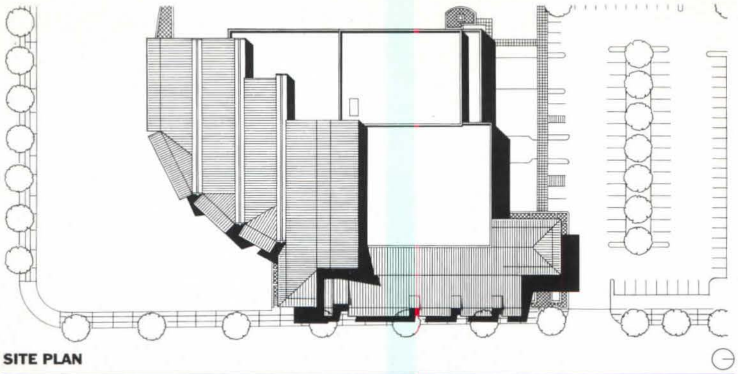
THESE PAGES: ZGF oriented south-facing facade toward Bellevue's commercial core. First-floor loggia defines future path from entry to proposed garden or public building.

Over the past two decades, misguided development has transformed Bellevue, Washington, from an Arcadian bedroom suburb of Seattle into a so-called "edge city." Bellevue's 600-foot-long superblocks suit the scale and the speed of a car, but local planners are now bent on creating a pedestrian-oriented corridor at the edge of the city's patchy commercial zone. In 1988, the city commissioned Portland, Oregon-based Zimmer Gunsul Frasca Partnership (ZGF) to design a new public library that now not only houses Bellevue's books, but also sets a necessary architectural standard amidst a dreary landscape of isolated towers and parking lots. "Bellevue looks a lot like Honolulu," deplores ZGF Partner Robert Frasca. "Tall buildings are interspersed with cottages. We wondered: 'How are we going to make a city out of all this?' "

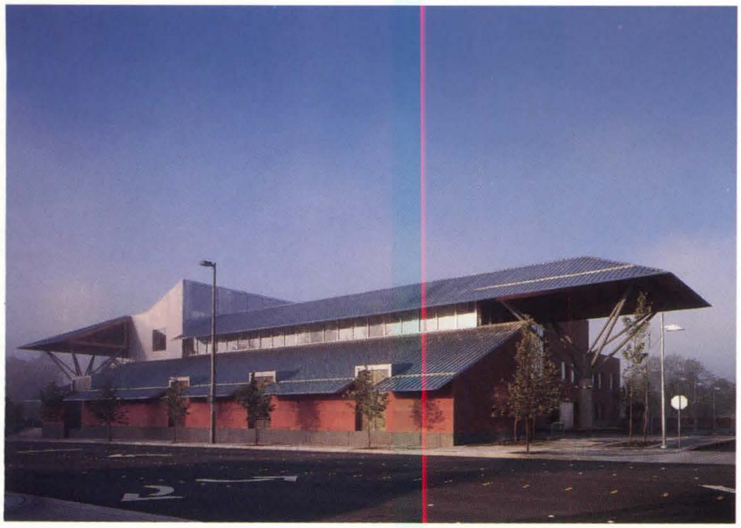
The new Bellevue library is the second of only two new civic buildings commissioned by the city, both of which have spurred surrounding commercial development. The first is a ponderous convention center, designed by New York architects Kohn Pedersen Fox and just completed to the south of the library. Recently, the city proposed to develop the parcel to the west with buildings ranging from an art museum to affordable housing. In any case, the library's extreme popularity, coupled with a contemporary penchant for convenient parking, has at least ensured the construction of an underground garage on the neighboring site. Already, developers of nearby condominiums market a short walk to the library as a real estate commodity.

A typically puzzling array of suburban zoning requirements, easements, and rules for planting determined not only the location of the library on the site, but even some of the massing. As Deputy Librarian Kay Johnson puts it: "It took mathematical wizardry to figure out where to put the building." The most peculiar of these ordinances generated the east-facing facade. Bellevue code requires either an overhanging roof above the sidewalk, or a setback of the wall from the street. The architects chose the former, incorporating a one-story, shedlike wing of public meeting rooms between the edge of the sidewalk and an interior entrance gallery.

Despite the lack of adequate public transportation in Bellevue, the city minimized the number of parking spaces at the rear of the new library to encourage pedestrian traffic through the front, which faces a broad, south-facing lawn. Ironically, this decision was made after the approaching cross streets



SITE PLAN



SITE PLAN: Sculptural volume containing public rooms wraps north- and west-facing administrative volume. **CENTER:** East facade (right) relates to scale of residential neighborhood across the street. Zoning code requires overhanging roof above sidewalk. **ABOVE:** Dormerlike windows daylight public meeting rooms on first floor. Rear canopy (right) marks the north-facing entrance from parking lot. **FACING PAGE:** Treelike support of entrance canopy is inspired by work of Alvar Aalto. Indian sandstone clads second-floor wall. Underside of steel-supported canopies is sheathed in fir. Structural concrete columns rise from underground parking garage.

were widened from two lanes to five, more vast and difficult to navigate on foot than many local highways. With noble optimism, ZGF oriented the library's pedestrian entrance at the head of the lawn, beneath a corner canopy that terminates an elegantly concatenated sweep of glass and Indian sandstone-clad bays. This great treelike canopy, supported by concrete trunks and steel branches, dominates the view along the planned pedestrian route from the south. Viewed from the street, the library's plastic form conveys its civic purpose.

ZGF's south facade manifests the ideal of a pedestrian downtown, but Frasca rightly doubts the possibility. William Ptacek, the library's director, also recognizes the contradiction of Bellevue's urban ideals and suburban planning. "The library needed to acknowledge the reality of the car," Ptacek notes. "We wanted it to reflect the urban/suburban condition." As expected, most visitors enter the library from the parking lot, where in Seattle coffee-bar tradition, an espresso cart beside the door draws as many customers as the first-floor checkout desk.

The location of the espresso cart reveals ZGF's most difficult problem. Understandably, the architects extended two levels of public rooms along the south and east sides of the building, flanking the most prominent facades. As a result, three levels of administrative offices, mechanical rooms, and stacks flank the north and west sides. Despite the lure of the rear canopy, the north facade fronting the parking lot appears residual, more a diagram of interior requirements than a convincing expression of civic grandeur.

The drama of entry into a 40-foot-high, 150-foot-long gallery, however, offsets the functional character of the rear facade. ZGF designed this reception space to collect visitors from three points of entry: the rear door, an underground parking garage, and the front lawn. Public meeting rooms to the east of this gallery overlook the street, and niches along the west wall frame the work of local artists. For security purposes, a single door leads from the gallery into the library's reading and reference rooms.

ZGF attached this zone of entry and meeting rooms to a larger volume that houses the library's primary functions. The building contains 80,000 square feet on three floors, making it the largest branch in the King County, Washington, system. With a capacity of 250,000 volumes, the building is a justly celebrated successor to the dour, 1960s library located 10 blocks to the south.

SOUTH-NORTH SECTION

STRODE ECKERT

SECTION: Saw-toothed roof incorporates north-facing clerestories to daylight second-floor stacks and reading room. Stairs lead from second-floor reference area to mezzanine stacks and offices. **ABOVE:** Slate-floored gallery extends between front and rear entrances. Second-floor reading areas overlook gallery through openings in wall. **FACING PAGE:** Light filters through wood louvers in south-facing windows. Mechanical ducts and fir beams span concrete columns. Supply grilles extend beneath clerestory at right.

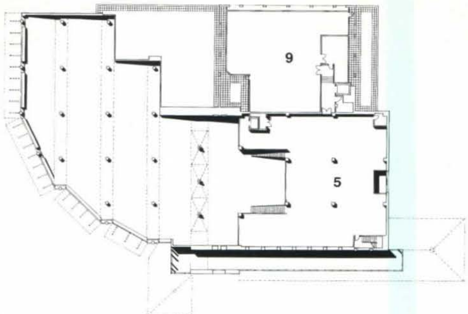
Frasca modestly describes the structural system of the library as "supermarket construction," referring to the raw, industrial character of exposed concrete columns and wood beams in the loftlike public areas. ZGF continues the structural bays of the underground parking garage to support the upper floors, saving money for wood detailing. On the southern wall, the architects expose the thin edge of the exterior stone cladding to reveal the independence of the structure.

ZGF takes full advantage of the long, required setback of the south facade by eroding its mass and flooding the reading areas with light. A loggia shades a continuous wall of glass on the first floor, reversing the urban prototype of a heavy base. On the second floor, the architects extend a continuous, faceted clerestory along the top of the wall, beneath overhanging canopies on the exterior. ZGF punctuated the lower part of this wall with square windows to suggest individual reading carrels, each of which frames a different view of the city. These openings reveal the wall's thickness, where the architects conceal mechanical systems in order to expose the structure of the saw-toothed roof.

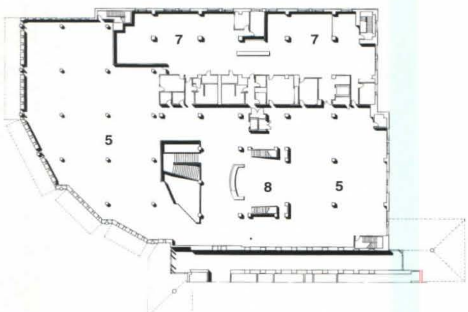
The rhythmic form of the roof incorporates north-facing clerestories, creating a tranquil, open, and airy effect, which brings to mind the best work of Finnish architect Alvar Aalto. "The Pacific Northwest bears an affinity with Finland," explains Frasca, who cites Aalto's work as a source of inspiration. "Light is a precious commodity." North light penetrates the first floor, too, through an opening carved out of the floor that surrounds the stair. ZGF molded this stair in concrete, with a sculptural force that draws visitors into the even daylight that saturates the second floor. While searching for a book or reading in the open stacks upstairs, one always remains in contact with the sky.

In some places, ZGF's complex forms collide in awkward ways, revealing the library's experimental character. The east facade, in particular, suffers at each end, where the front and rear canopies have no clear relationship to the low mass of the wall. At the southeast corner, the asymmetrical profile of an upper level clerestory juts abruptly from the roof. Although more adventurous than the firm's previous work, the library is similarly imbued with ZGF's characteristic expression of urban decorum. "The building is already a Bellevue landmark," boasts Ptacek. "It will improve with age." So, too, will Bellevue's suburban fabric, if its planners follow ZGF's lead. —*M. Lindsay Bierman*

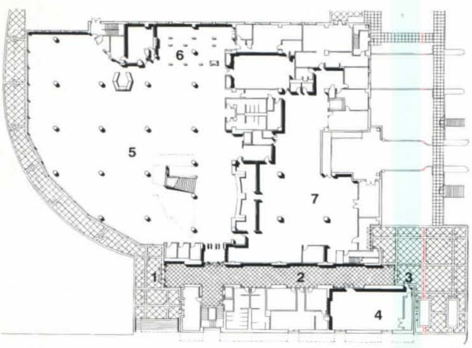
1 PEDESTRIAN ENTRANCE
2 GALLERY
3 PARKING LOT ENTRANCE
4 MEETING ROOM
5 READING ROOM/STACKS
6 CHILDREN'S AREA
7 ADMINISTRATIVE OFFICE
8 REFERENCE
9 MECHANICAL



MEZZANINE PLAN



SECOND FLOOR PLAN



FIRST FLOOR PLAN

BELLEVUE REGIONAL LIBRARY
BELLEVUE, WASHINGTON

ARCHITECT: Zimmer Gunsul Frasca Partnership, Portland, Oregon—Daniel Huberty (partner-in-charge); Robert Frasca (principal designer); Evett J. Ruffcorn (project designer); Stan Zintel, Robert Zimmerman (project managers); Brooks Gunsul, William LaPatra, Bertha Martinez, Terry Johnson, Kim Jennings, Dale Alberda, Christopher Chin, Kevin Gernhart, Carl Freeze (design team)
LANDSCAPE ARCHITECT: Jones and Jones
ENGINEERS: KPFF Consulting Engineers (structural/civil); Notkin Engineers (mechanical); Sparling Engineers (electrical)
COST: Withheld at owner's request
PHOTOGRAPHER: Timothy Hursley, except as noted

PLANS: Zone of meeting rooms (bottom plan) separates entrance gallery from library. Open-plan rooms contain stacks and reading areas. Offices flank west facade (middle plan).
THESE PAGES: Concrete stair connects stacks on first and second floors. Stair leads to mezzanine stacks.

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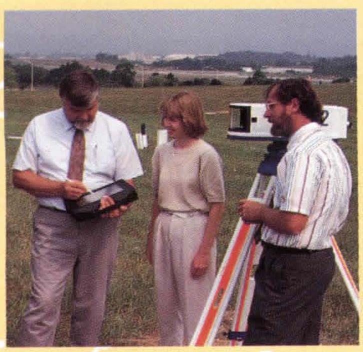
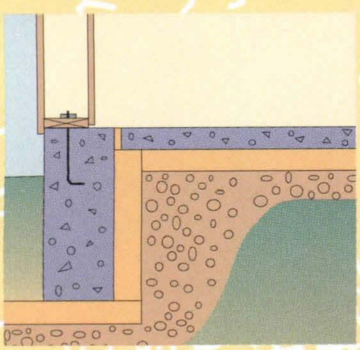
Technology & Practice





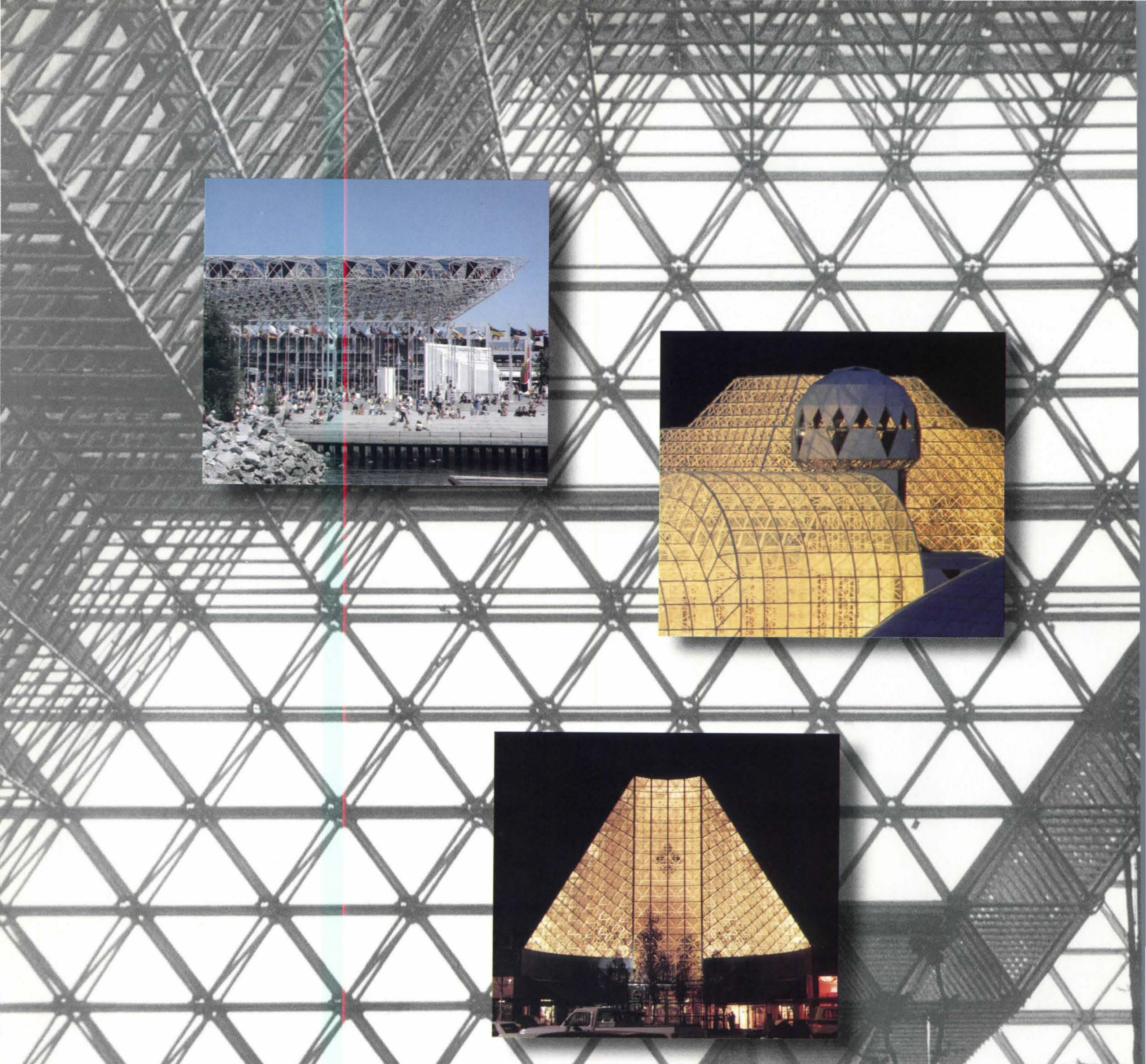
This month's Technology & Practice section reveals how architects are adapting their practices to meet the changing needs of clients and advances in technology. A profile of three Minnesota firms designing community buildings for American Indians reveals how the architects collaborate with their clients to gain a better understanding of tribal symbols and traditions. This cultural sensitivity enables the trio to create buildings with a meaningful identity for native communities, a clientele with growing economic clout.

In response to stone's increasing popularity as a curtain wall veneer, architects are refining their treatment of this traditional loadbearing material. An article on dimension stone cladding offers updated methods of anchoring stone to structure and sealing joints to improve the material's durability and to avoid failures.

A feature on portable, hand-held computers recounts how architects have adapted such high-tech tools for working on the construction site. Many of these pen computers are CAD integrated and include communications hardware that provides wireless networking to computers back at the office, enabling a quick turnaround of both drawings and information.

A technology article examines how shallow building foundations—traditionally built in warmer climates—are being adapted for construction in the northern United States, following their success in Scandinavian countries. This modified slab-on-grade construction not only represents significantly lower costs than traditional deep footings, but promises environmental benefits as well.

As architects continue to embrace such advances in technology, they will be better able to meet the demands of an increasingly complex and diverse clientele.



Polls by both AIA and RIBA pinpoint architecture clients' criticism of project delivery.

Surveys Reveal Clients' Views of Architects

AIA Survey of Clients' Perception of Architects	Very Important	Less Important	Not too Important	Not Important
Responsiveness to client	84%	15	1	*
Ability to manage regulations, building permits, etc.	83%	14	2	1
Track record with adhering to schedules	77%	20	1	1
Track record with adhering to budgets	77%	20	2	*
Related prior experience on client's project type	68%	29	2	*
Design quality or esthetic sense	68%	28	3	1
Concern for environmental issues related to the project	66%	29	3	1
Ability to manage the construction process	64%	26	6	3
Overall experience of the architectural firm	63%	31	4	1
References	62%	32	4	1
Ability to provide design/ build services	60%	29	6	4
Fees for the architecture services	55%	40	3	1
Previous experience working for client	43%	38	13	4
Membership in AIA	22%	42	24	10
Size of firm	11%	42	31	14

*Statistically insignificant
Source: AIA

American architects rank high on the respectability index of most business and nonprofit institutional clients, but their British counterparts receive only qualified esteem by comparison, according to two surveys of architecture clients undertaken separately by the AIA and by the Royal Institute of British Architects (RIBA). The AIA survey of 807 clients was conducted by the Roper Organization. RIBA's survey comprised detailed interviews with only 20 clients. Both studies turned up surprising dynamics in clients' priorities, several problems in professional service, and gaps in clients' awareness of architects' expertise.

Architects in the AIA study placed fifth out of 14 professions on the "high regard" scale, behind teachers, scientists, engineers, and doctors. In both studies, clients expressed a great deal of faith in architects' knowledge, experience, competence, and attention to quality. More than 90 percent of respondents in the AIA survey viewed architects' "professionalism" favorably. However, the RIBA study concluded that clients in the United Kingdom do not necessarily view architecture as a "profession," but rather as a "business." They consider architects simply to be "suppliers of goods and services ... {who} do not represent a special case in the eyes of clients."

Similar types of clients were interviewed in each survey. In the AIA survey, 35 percent represented corporate clients, and 65 percent were clients in the institutional sector—health, education, and nonprofit organizations. RIBA's survey was conducted by interviewing government agency officials, development company representatives, corporate clients, and individuals defined as "patrons" of architecture.

In both surveys, clients pinned the word "arrogant" on architects. Fifty-nine percent of AIA survey respondents said they thought architects were at least "somewhat" arrogant. British clients, however, seemed to like American architects better than those in their own country. Seventeen out of the 20 clients remarked that British architects show a dismaying arrogance in responding to clients' wishes and in dealing with contractors and consultants. Six of the 20 clients RIBA surveyed had worked with American architects and remarked that they are "much more in tune with client culture" than are British practitioners. American clients partly corroborated that finding: More than 80 percent described U.S. architects as "concerned" about their individual needs; these respondents were not asked about British architects, however.

Apart from responsiveness, clients want architects who are disciplined. In the AIA study, 77 percent of clients look for architects who are able to show a track record of having stayed within budgets and schedules in completing past projects. In Britain, clients' level of trust in architects' ability to manage project time and costs is "consistently low."

But both studies also found that clients are less concerned about actual fees than about the services they buy. In the United States and in Britain, clients commonly said they are willing to pay for design of high quality, but they resent poor project delivery, cost overruns, and missed deadlines. A recurring theme, RIBA concluded, "was of clients being utterly despairing of the often-cavalier attitude from architects with regard to cost, timetable, and management of the project process."

In fact, the RIBA survey found that in Britain, there is an increasing demand for an intermediary to help the client manage architectural projects. None of the clients RIBA interviewed saw the architect "as a natural team member to handle the management aspects of a project." However, in the United States, the AIA survey found that 85 percent of clients think architects are at least "fairly valuable" in the area of construction project management.

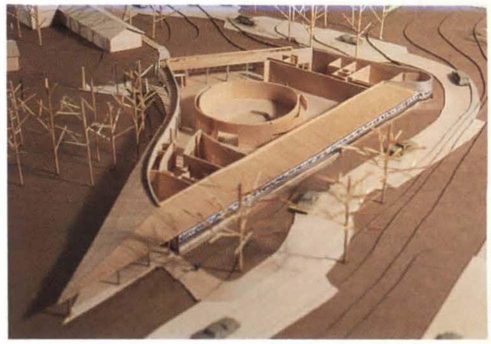
Most prominently, surveys by both institutes pointed out the need for architects to articulate their capabilities more aggressively. RIBA went so far in its survey conclusions as to suggest a campaign in which architects would define themselves and the value of their services more clearly to clients. The AIA study indicates that similar measures would help in the United States, where 61 percent of clients noted they would entrust matters such as zoning to architects, but only 26 percent would call on an architect to help with site selection.—*Bradford McKee*

Designing for American Indians

Three Minnesota firms specialize in architecture for native people.

RICHARD CAIN

DAVID BOWERS



KATE VERMELAND

TOP LEFT: Architect Thomas Hodne's Fond du Lac Community College is designed to celebrate a union of native and non-native cultures.
TOP RIGHT: Native American Learning Center by AmerIndian Architecture is proposed for future site of the National Museum of the American Indian, on the Mall in Washington, D.C.
BOTTOM LEFT: Cuningham Hamilton Quiter's award-winning ceremonial building on an Ojibwe reservation launched a new community for Minnesota's Mille Lacs Indians.
BOTTOM RIGHT: The Mille Lacs Museum, designed by Thomas Hodne, is organized around a round diorama of Indian life; a geometric mural on the exterior is based on Ojibwe beadwork.

On an Indian reservation in central Minnesota, license plates read "Sovereign Nation," revealing the autonomy of reservation life. But in 1989, the independence of the Ojibwe exceeded even the reservation's political boundaries, when the Mille Lacs Band of Ojibwe opened a casino on their land. Two years later, gambling revenues from the casino financed two new schools, a health center, and a ceremonial building for tribal dances.

Since the Indian Gaming Regulatory Act was passed in 1988, new forms of legalized gambling on Indian lands have become a growing industry; there are now some 70 casinos partially owned and operated by native people in 18 states, from Connecticut to California. The Indians' casino-generated wealth means that native people, who once looked to the U.S. Department of Housing and Urban Development (HUD) for buildings on the reservations, can now independently commission architects to design buildings that sensitively respond to Indian culture. On the following pages, projects by three Minnesota firms specializing in architecture for native people reveal the complex process—as well as the personal enrichment—of designing for American Indian clients.

John Cuningham, whose 25-year-old, 100-person firm master-planned the Mille Lacs' new community, says the Indians are like no other clients. He recalls an initial meeting with Tribal Chairman Marjorie Anderson, who looked him straight in the eye and asked, "Will you cheat us?" During programming, the architects, whose design approach incorporates nonhierarchical teams, realized that tried-and-true procedures wouldn't work with the Ojibwe. "You can't just suddenly come to native people and ask, 'Okay, what do you want?'" explains team leader Robert Zakaras, adding that the Mille Lacs, accustomed to HUD buildings, "didn't know they could make choices." Processes such as deciding a building's scale, choosing materials, and staying on a schedule were all new to the Indians, whose calendar is distinctly more circadian than that of most architects. Architect Thomas Hodne, who has worked with many tribes across the country, explains, "The Indians don't live day by day—they live generation by generation."

Hodne generates structures symbolic of Indian culture by asking his native clients to draw the buildings. Such symbology plays an important role in any thoughtful architecture for native people, according to Dennis Sun Rhodes, an Arapaho from Wyoming who directs AmerIndian Architecture in St. Paul. Sun Rhodes points out that the circle, representing the continuity of life, and colors marking the cardinal directions are repeated in many tribes. But he cautions architects against applying such symbols without researching local tribal customs. Adds Thomas Hodne, "You can't design buildings for native people. Architects must learn from what the Indians have to teach us. We are only their interpreters."—*Heidi Landecker*

Fond du Lac Community College
Cloquet, Minnesota
Thomas Hodne, Architect

FACING PAGE, TOP LEFT: Metal trim and cladding are painted to represent colors of cardinal directions.
FACING PAGE, BOTTOM LEFT: South-facing entrance flanks student center and amphitheater. Floor-to-ceiling windows permit views of earth and sky.
FACING PAGE, TOP RIGHT: Hodne derived plan from thunderbird form.
FACING PAGE, MODEL: Ring road surrounds campus, forming sacred circle.
FACING PAGE, PLAN: Cruciform plan organizes building into classroom, administrative, and library wings.

Architect Thomas Hodne's first building for American Indians was the 1972 Native American Center in Minneapolis. For the center, which includes an exhibition area, library, gymnasium, and powwow area, Hodne initially conceived a multi-use, multicultural facility that would unite the Afro-Americans, Latinos, and native people who share the city's core. "When I dropped that idea on the Indians, there was silence," recalls Hodne, a spry, ponytailed sexagenarian who works out of a renovated Victorian in downtown Minneapolis when he isn't teaching at the University of Manitoba in Winnipeg. "Native people don't get up and shout when there's something wrong," Hodne continues. "The native community of Minneapolis didn't want to assimilate. They needed to regain their identity."

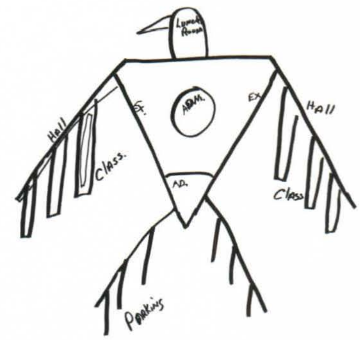
Buildings that assert American Indian identity are what Hodne's practice has focused on ever since, and his recently completed Fond du Lac Community College epitomizes that vocation. In an era when most architecture evolves from Classical orthogonal geometry, Hodne's building forms have been based on buffalos, eagles, turtles, loons, and hawks. Animal forms embody spiritual and psychological meaning for the Indians, and Hodne has created a zoomorphic collection of buildings—including the turtle-inspired Native-American Center for the Living Arts (1980) in Niagara Falls, New York, and the buffalolike Little Wound School in Kyle, South Dakota (1982).

For Fond du Lac Community College, one of only 26 tribally controlled colleges in the nation, the architect convened a design workshop with the college's planning committee, which included residents of the neighboring Fond du Lac Indian Reservation. Hanging 40-inch-wide brown wrapping paper on the walls, Hodne asked the committee members to draw elements they thought should be represented in the new building. The committee produced a thunderbird, a bear's paw, a "sacred circle" (which represents the continuity of life), and a "heart circle" (symbolizing the spiritual heart of a community). "Non-native people may find it hard to relate to these forms," admits Hodne, "but they come from a cultural spirituality. All architecture must reach for a spiritual aspect."

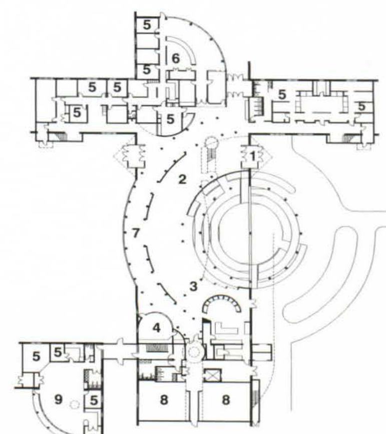
Hodne incorporated all these symbols into the new building for the college, which offers traditional disciplines along with classes in Ojibwe language, American Indian philosophy, and even birch bark canoe building. Because the college states its mission as a "union of cultures," Hodne interprets the building's 50,000-square-foot cruciform plan as both a thunderbird, representing Indian culture, and a Christian cross. The campus's organizing element is a ring road, representing the sacred circle; and a sky-blue, domed "heart circle" forms a ceremonial space and student center. Within this gathering area, stainless steel columns are interspersed with rustic pine posts that seem to march in from the site, symbolizing the commingling of native and non-native cultures. Four metal-clad wings are painted in colors emblematic of the cardinal directions in Ojibwe culture: white for the north, yellow for the south, red for the east, and black for the west."By its design," confides Ojibwe student Victoria Macham, "this building teaches non-natives to ask questions about our culture."

Hodne warns architects who seek American Indian projects to seriously consider native peoples' high regard for symbology and to alter non-native notions about how groups of people behave. "For the Indians, to be in a room with chairs in rows is a sin," he explains. "A circle makes everyone equal." The architect adds that buildings should be designed for easy maintenance: "Native Americans don't have a centuries-old tradition of restoring and maintaining permanent buildings like we do." But what society really needs is to embrace "a very great change in the attitude of the native to the non-native." As Hodne points out, "Architecture isn't the key to that, but it can help."

RICHARD CAIN



RICHARD CAIN



SITE PLAN

1 ENTRANCE
2 CAMPUS CENTER
3 DINING
4 BOOKSTORE
5 OFFICE
6 STUDENT SERVICES
7 LOUNGE
8 CLASSROOM
9 CHILD CARE

Division of Indian Work Headquarters
Native American Environmental Complex
Minneapolis, Minnesota
AmerIndian Architecture

FACING PAGE, TOP LEFT: Headquarters for the Division of Indian Work, to be completed next fall, will occupy a corner site in downtown Minneapolis. **FACING PAGE, BOTTOM LEFT:** The Minnesota State Zoo has commissioned AmerIndian Architecture to design an interpretive trail for its Native American Environmental Complex. **FACING PAGE, RIGHT, TOP TO BOTTOM:** Traditional Indian houses for the Native American Complex include an Eastern woodlands lodge, an Ojibwe birch bark house, a Navajo hogan, and a central woodlands lodge.

Dennis Sun Rhodes began his study of architecture for native people in the communal log house of his great-grandmother, Nellie Three Bulls Sun Rhodes, where all the members of his extended family shared a single room for cooking, living, and sleeping. Raised on Wyoming's Wind River Indian Reservation, Sun Rhodes, an Arapaho native who now directs AmerIndian Architecture in St. Paul, Minnesota, has a unique intuition regarding native peoples' needs. "This communal space developed my worldview," notes Sun Rhodes, "and shaped the entire system of social norms for my tribe."

Sun Rhodes studied architecture at Montana State University and worked in Minneapolis throughout the 1970s and 1980s for The Hodne Stageberg Partners, as architect Thomas Hodne's practice was then called. Sun Rhodes then went back to the reservation to serve as an Arapaho tribal leader, returning to St. Paul in 1992 to establish his own firm with Partner Daniel Feidt.

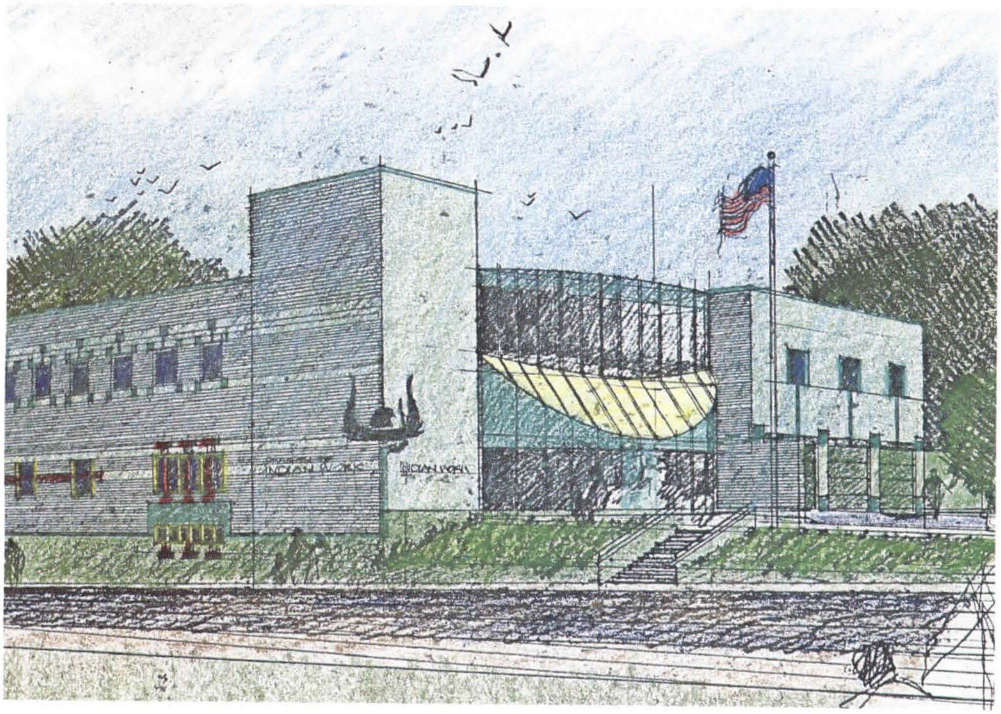
One of AmerIndian Architecture's first projects is a 17,000-square-foot headquarters for the Division of Indian Work (DIW), a Minneapolis agency that provides emergency food, shelter, and clothing for Indians newly arrived in the Twin Cities. (Minneapolis has the largest American Indian population of any U.S. city.) Sun Rhodes explains that since the agency is a resource for Indians from many different tribes, symbolism must be general enough to appeal to several cultures. The symbol Sun Rhodes selected is the moon, which is female in most cultures. "The woman is traditionally the provider of nourishment for survival," Sun Rhodes relates, adding that the Division of Indian Work offers nourishment to Indian families.

Sun Rhodes derived the moon symbol from what he calls a "cultural design workshop" made up of local Indian women who are pipe carriers in the traditional Sioux sundance, a religious ceremony. The pipe carriers favored the moon symbol, in part because in Plains Indian culture, 1993 is the "year of the wet moon," an indicator of wet, nourishing weather in the coming months, and also because the DIW headquarters will be a major urban project. "Its downtown site is where the people who move into the city attempting to survive now converge," notes Sun Rhodes, "so our building will have to relate well to the street life. That's part of the design challenge—not only to give the building a special Indian spirit, but to make the structure come alive at night."

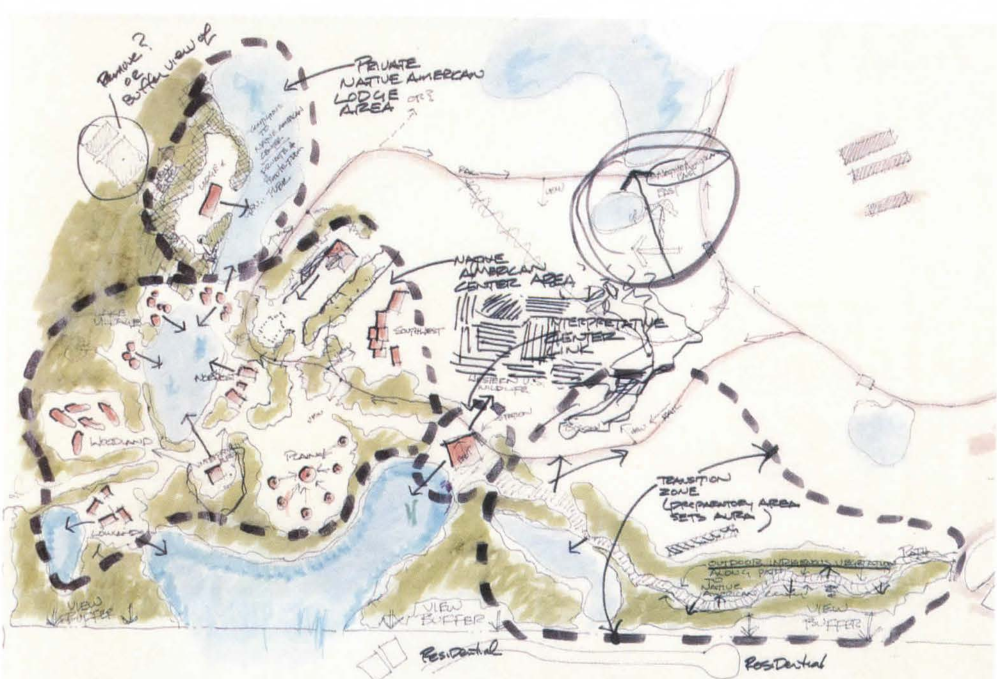
In addition, AmerIndian Architecture has proposed a design for a temporary Native American Learning Center to disseminate information about the future National Museum of the American Indian, to be built on the Mall in Washington, D.C. Sun Rhodes' structure is "inspired by drummers from all Indian nations joining in a circle around a sacred drum." The museum, currently being designed by Blackfoot architect Douglas Cardinal of Ottawa in association with Geddes Brecher Qualls Cunningham of Philadelphia, is scheduled to open in 2001.

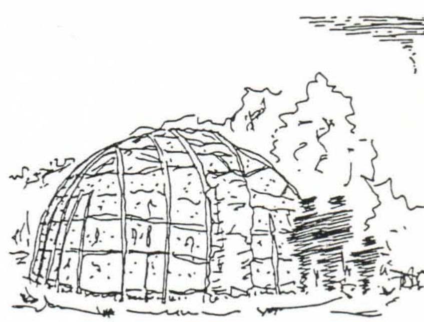
Sun Rhodes advises non-Indians who want to pursue building projects for native people to study the tribe's hierarchy of animal and natural symbols, and its four-directional color code. "You can look at the 'rock art,' or petroglyphs. I've found many symbolic messages by examining the historic record." Sun Rhodes urges architects to seek books on Indian symbology or visit museums that display hide paintings. He also cautions that some Indians still favor assimilation and so are leery of tribal symbols.

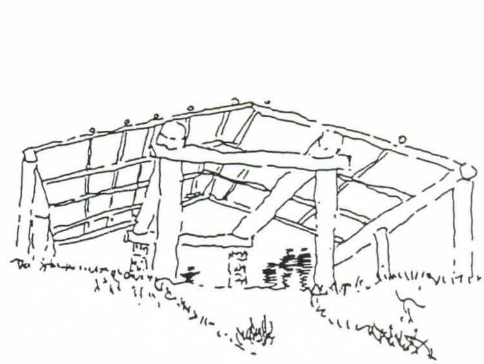
"Take housing, for instance," notes Sun Rhodes. "There are so many middle-class Indian people who want modern conveniences like a two-car garage. And then there's the opposite extreme, those who want a simple log cabin." AmerIndian Architecture strives for a consciousness of symbols among all the firm's native clients. Notes Sun Rhodes, "There seems to be some magic that happens in the creative process when architecture becomes sensitive to the Indian people."



DENNIS GREBNAR







Nay Ah Shing Upper and Lower Schools
Nay Ah Shing Health Center
Mille Lacs Reservation, Minnesota
Cuningham Hamilton Quiter Architects

FACING PAGE, TOP: Nay Ah Shing Lower School focuses on a large, circular play room just beyond the main entrance. The facility serves children from infancy to third grade.
FACING PAGE, SECOND FROM TOP: Nay Ah Shing Upper School includes a circular room for pipe ceremonies, performed by tribal elders. Clerestories light ceremonial circle and classroom wing.
FACING PAGE, RENDERINGS: A new health center offering internal medicine, pediatrics, eye care, counseling, and dentistry is sited on the western shore of Lake Mille Lacs, with windows along the south facade offering lake views. Patients enter a circular waiting area.

Gambling may be a scourge, but for some 650 Ojibwe on the 2,000-acre Mille Lacs Indian Reservation near Onamia in central Minnesota, casinos have brought economic prosperity. Not only has unemployment dropped from 38 percent to 0, but the profitable casinos guaranteed collateral for the sale of an $11 million bond. The Mille Lacs put the money toward creating a new community—starting with two schools, a health center, and a ceremonial building—in an attempt to draw more urban tribe members back to their homeland, 95 miles north of the Twin Cities.

The new buildings dominate a peninsula in Lake Mille Lacs, whose surrounding forest and marshlands have been the Ojibwe homeland since the 18th century, when the northern forest Indians moved south and west, driving the local Dakota Sioux to the Great Plains. Designed by Cuningham, Hamilton, Quiter Architects of Minneapolis, the schools and health center are constructed of concrete and wood, painted earthy colors, with low, organic forms that seem to rise out of the surrounding woodlands. The drum-dance building—a 3,300-square-foot log house—is a modern version of a turn-of-the-century ceremonial building (following pages), based on an archival photograph. When the question arose of which building should be designed and constructed first, one of the tribal elders pointed out that without the ceremonial building, there would be no need for any of the other buildings. "That prioritized our projects," Partner John Cuningham remembers. "There was no further discussion."

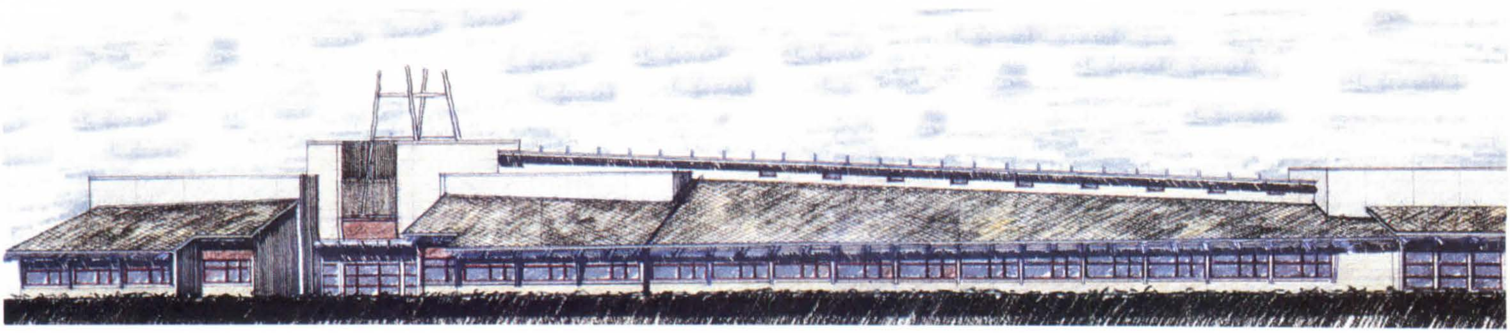
Throughout programming and design meetings, the Mille Lacs made it clear that they wanted their buildings to be state-of-the-art on the inside, but to look like indigenous Indian buildings on the exterior. But, Cuningham explains, "an indigenous Indian building was made of birch bark," and the tribe's idea of a durable building was a functional shingled box, like the kind HUD traditionally dispensed for schools and community buildings on the reservations. The architects' challenge, they realized, was to render a technologically sophisticated building that would evoke the sense of an Ojibwe wigwam.

Through meetings with the Indians, the architects developed a goal of creating culturally appropriate buildings without Indian kitsch, excessive Modernist abstraction, or inappropriate symbols such as tipis. All the buildings are arranged around circular gathering spaces, which dominate Ojibwe cultural and religious ceremonies: A skylit, 80-foot-diameter rotunda forms an indoor play area in the Nay Ah Shing Lower School; a circular entrance court at the upper school accommodates weekly pipe ceremonies.

The architects also realized they would need new approaches to working with clients if they were going to be successful in generating a new Mille Lacs community. When the architects asked the Indians how large they wanted their drum-dance building to be, for instance, the Indians had little perception of size; the architects attended traditional day-long drum ceremonies to determine how many people attended.

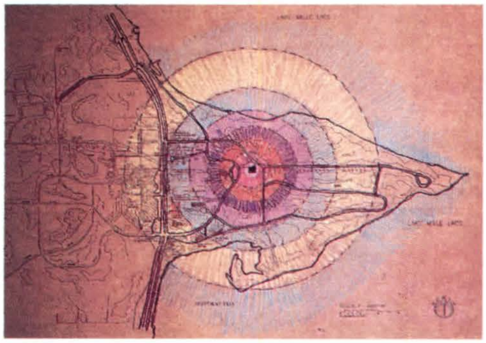
According to team leader architect Robert Zakaras, the team working on the Indian buildings developed a tolerance for slower, more thoughtful processes of resolving basic issues, not to mention a genuine respect for the types of problems Indians have faced for hundreds of years. "As architects, we tend to think we can solve all the world's problems with a building," notes Zakaras. "And there are a lot we can rectify. But to think we can correct 150 years of social injustice with good design is just naive."

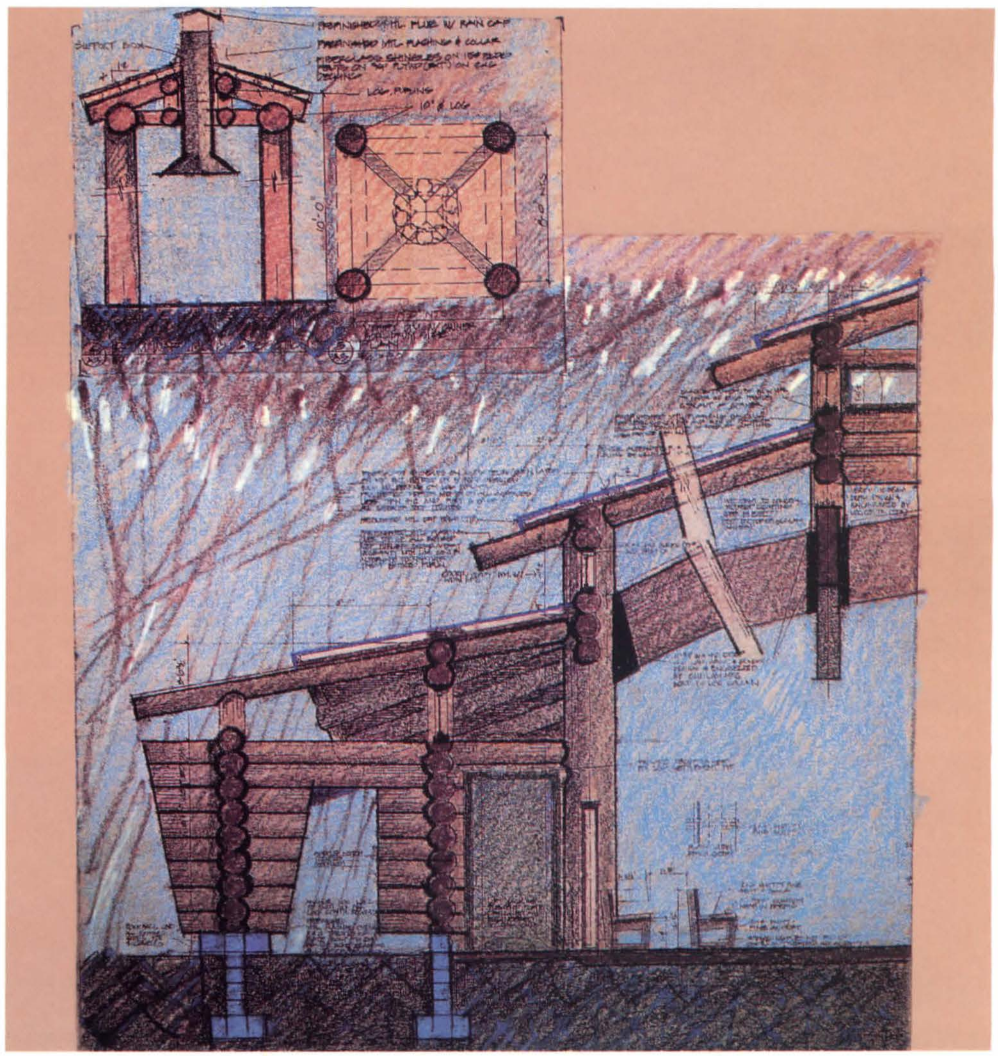
Zakaras and Cuningham both repeat Thomas Hodne's advice that architects designing for native people can't succeed if they attempt to dominate or steer the Indians to specific schemes, pretending to have all the answers. "There's a political and a family life in the tribe that we can only observe and react to," notes Zakaras. "You cannot prescribe solutions unless the Indians direct you."

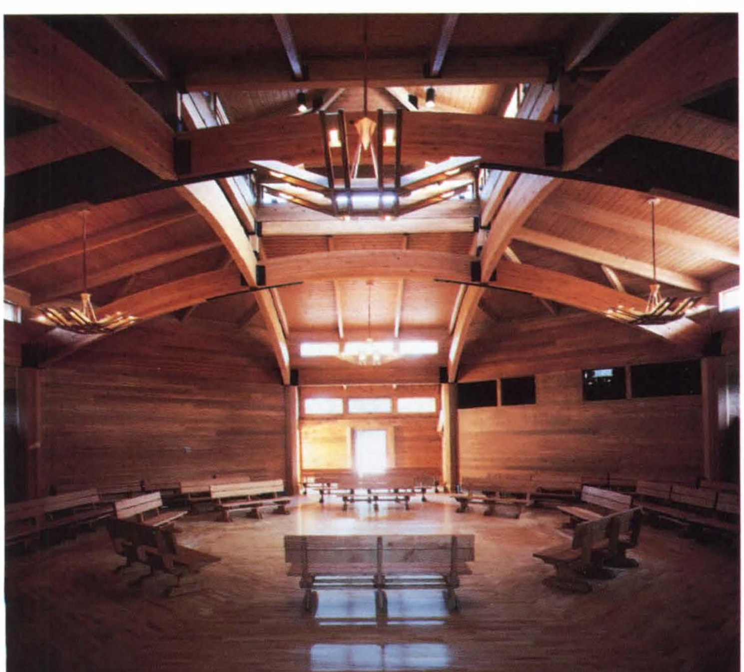


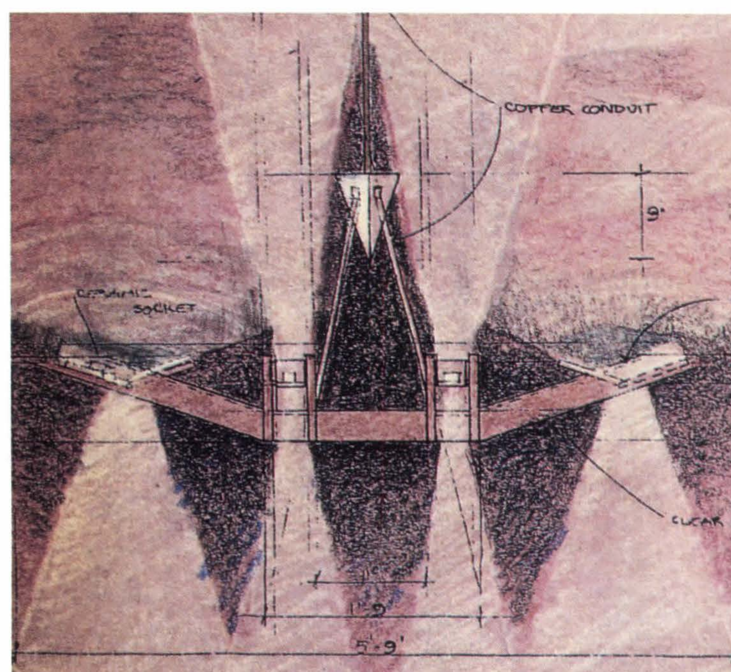
Ceremonial Building
Mille Lacs Indian Reservation, Minnesota
Cuningham Hamilton Quiter Architects

TOP LEFT: Mille Lacs Indians regard their ceremonial building, where spring and fall drum dances offer thanks to the spirits, as the heart of their community, which occupies a peninsula in Lake Mille Lacs.
TOP RIGHT: Section reveals clerestories and octagonal interior.
BOTTOM RIGHT: Ceremonial building is constructed of logs and laminated wood beams and arranged as a square with an octagonal interior. Corner illustration shows drum-warming shelter, where drum is heated over coals before the ceremony.
FACING PAGE, TOP: Log ceremonial building is based on a 1900 archival photograph of original drum-dance building on the Mille Lacs Reservation.
FACING PAGE, BOTTOM LEFT: Interior rises to 30 feet and reflects Ojibwe reverence for natural materials: maple floor, fir structure, cedar log walls.
FACING PAGE, BOTTOM RIGHT: Architects based ceiling fixtures on traditional Ojibwe symbol of bird in flight.








COPPER CONDUIT
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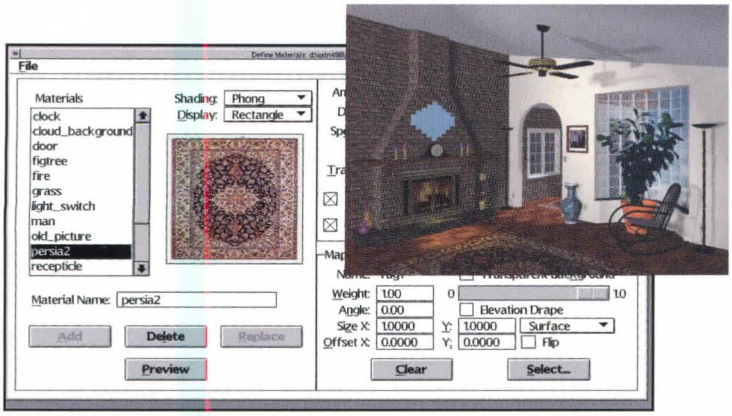
SOCKET
1'-9"
5'-9'



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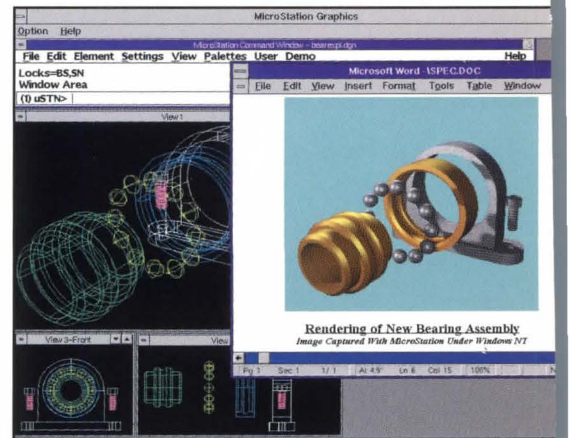

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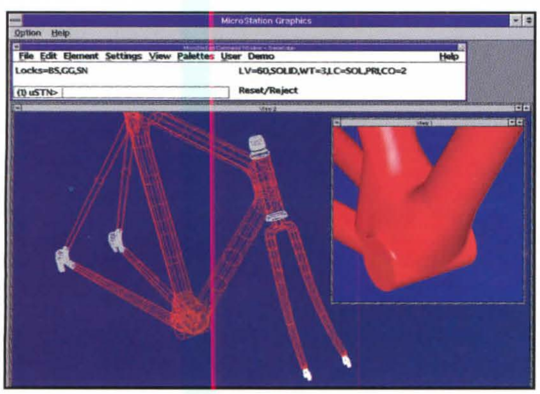

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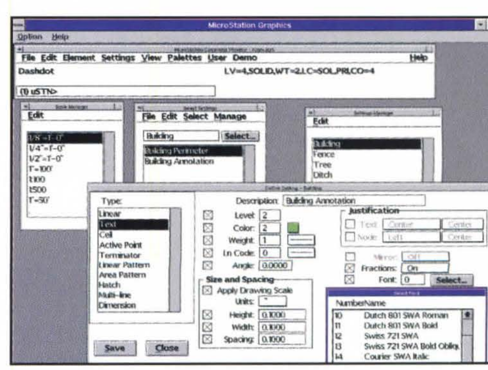

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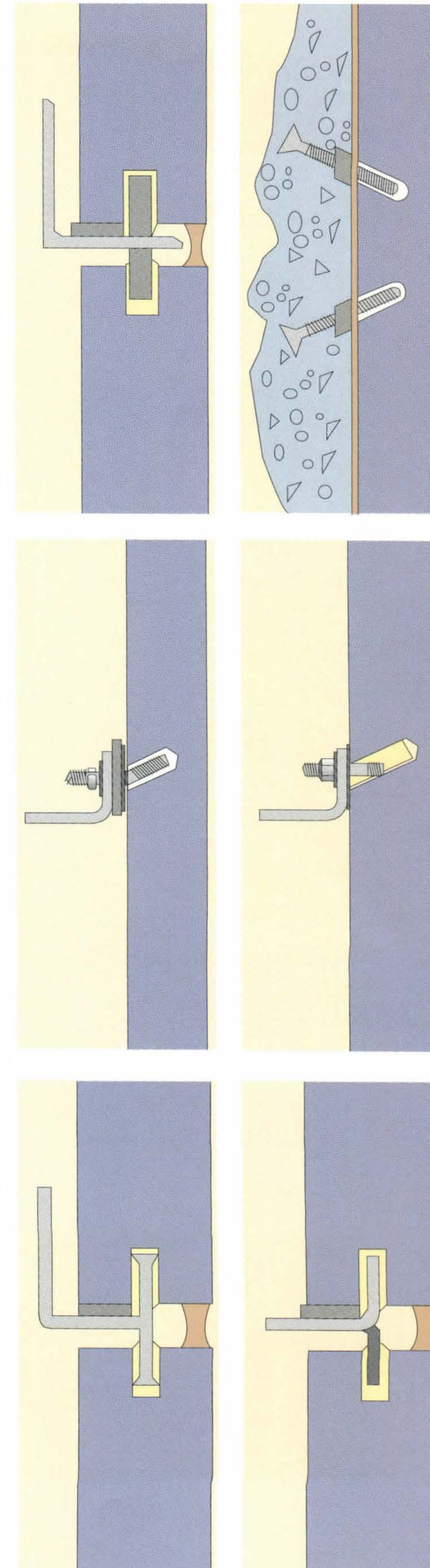
Anchoring Thin-Stone Veneers

Careful connections between stone and structure improve durability and avoid failure.



TOP AND CENTER: Anchors may be inserted into holes drilled into the dimension stone's edge or back face. **BOTTOM:** An alternative method is to cut a slot into the stone veneer to engage the anchor.

Stone today is routinely trimmed to a thickness of $1\frac{1}{4}$ inches or less and treated as a curtain wall component rather than as a loadbearing structural element. The long-term success of such stone-clad architecture now rests as much on the engineering of systems to anchor the stone to a building's structure as on the stone itself.

Thin-stone building cladding—also referred to as dimension stone cladding—must be able to withstand wind, gravity, dynamic and seismic loading, and climatic forces, as well as the chemical assault of acid rain and movement of the building itself, advises Michael Lewis, an architect and engineer with Cincinnati-based THP Consulting Engineers. Lewis is also editor of *Standard Guide for the Design, Selection and Installation of Exterior Dimension Stone Anchors and Anchoring Systems*, a manual being published this month by the Philadelphia-based American Society for Testing and Materials (ASTM).

Anchors are attracting renewed attention today because of the increasing number of problems that are occurring in many thin-stone-clad buildings. The most spectacular stone-cladding catastrophe of recent years occurred at Chicago's Amoco building, where 16 acres of light-colored Carrara marble had to be replaced after individual pieces bowed by as much as $1\frac{1}{2}$ inches. Bill Richardson, a stone-cladding consultant with Rutland, Vermont-based Richardson & Richardson and a contributor to the ASTM guide, maintains that publicity surrounding the Amoco troubles has spurred a needed increase in attention to the design of anchoring systems.

Stone variations

The most important prerequisite to creating a durable dimension stone-clad building is the initiation of a thorough structural or engineering analysis of the stone, its proposed anchoring system, and the structural backup system early in design. Since stone is a natural material that retains its inconsistent physical characteristics after quarrying, its behavior cannot be predicted by engineering tables. Each stone is different, and even stones from the same quarry are subject to variation. For example, different quality levels of granite may vary in strength characteristics by as much as 150 percent.

Stone is a brittle and unforgiving material: It will spall or shatter under various degrees of stresses and strains imposed by insufficient or overrestrictive anchoring support, excessive water infiltration, corrosion, or an incompatible structural backup system.

Anchor types

Although architects can choose from hundreds of different anchors, such supports can be divided into two broad categories: anchors that are inserted into a kerf or slot cut into the edges of each stone panel, and anchors that are inserted into a hole drilled into the sides or rear of the stone panels. An anchor type should be selected only after careful analysis and full-scale testing of both anchor and stone before construction begins.

Anchors that fit into a kerf, such as strap, disk and rod, and split-ear anchors, are popular because the kerf can be milled into the stone efficiently and economically in the shop and allows for maximum erection tolerance in the field. One end of the anchor is inserted into the stone and the other is attached to the backup structure selected to support the stone facade: masonry wall, metal framing, or truss system. It is important that the kerf be deep enough to ensure that the anchor will not disengage if the metal distorts, but shallow to minimize weakening of the stone.

Although the kerf must be sealed to prevent water infiltration and to keep the anchor from shifting, it should not be sealed with mortar or expanding mortar, which can lead to cracking from freeze/thaw action, warns Sy Bortz, a contributor to the ASTM guide and senior consultant with Northbrook, Illinois-based Wiss, Janney, Elstner Associates. Instead, Bortz notes, the kerf should be sealed with nonstaining sealant or caulking.

Other anchors, such as rod and dowel anchors, are inserted into holes drilled into the sides or rear face of the stone panels. A hole is generally preferred over a slot for rods because mechanical stresses in the stone are distributed better around a hole than around a slot. ASTM recommends that the anchor diameter not exceed 1/4 of the stone's thickness and that the anchor be located in the center third of the stone's thickness. Often, dowel anchors inserted in the bottom edge of the stone are combined with an angle to provide gravity support. Sometimes the anchors are finished with tooled or irregular profiles to increase the mechanical connection. When anchors are inserted into epoxy-filled holes, Bortz cautions, analysis of the connection should be made on the strength of the mechanical connection between the steel and stone alone because the epoxy cannot be relied upon to last as long as the stone facade.

Stone backed with precast concrete is commonly fastened with dowel-type anchors. These anchors are inserted into holes drilled to a depth of two-thirds the thickness of the stone, with two or more dowels set at opposing angles to create a strong mechanical bond and reduce the chances of pullout. Similarly, hairpin or spring anchors may be applied, with the two ends of hairpin embedded into the rear of the stone at opposing angles to create a strong mechanical connection. Wire ties are commonly used to connect stone and poured-in-place concrete, but these connections are generally inappropriate for applications in high-rise buildings because they do not create a large enough positive connection between the stone and the backup. Wire ties are generally best suited to low-rise exteriors, or interior applications where they are not subjected to weather conditions.

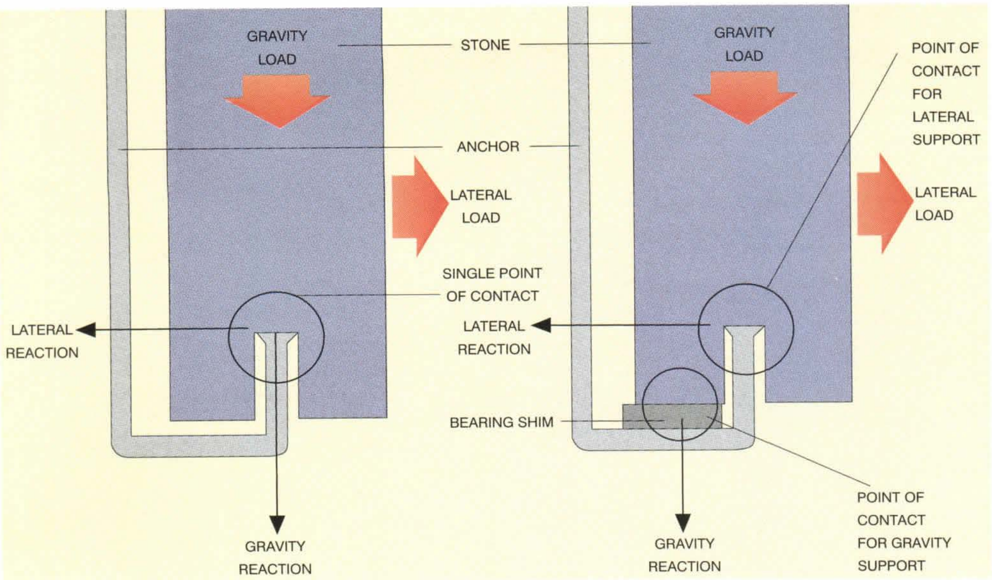
Accommodating movement

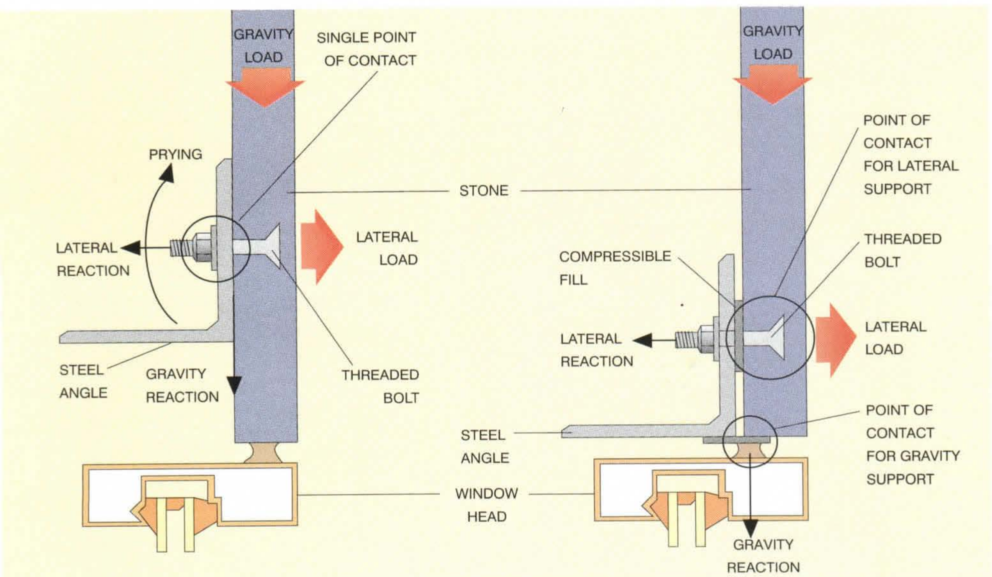
Perhaps the most important consideration to bear in mind during anchorage design, according to Lewis, is the necessity of accommodating movement in the building without stressing the stone. This movement stems from the difference in thermal expansion between the stone, anchor, and its backup; dynamic movement caused by building occupants; and seismic or wind loading.

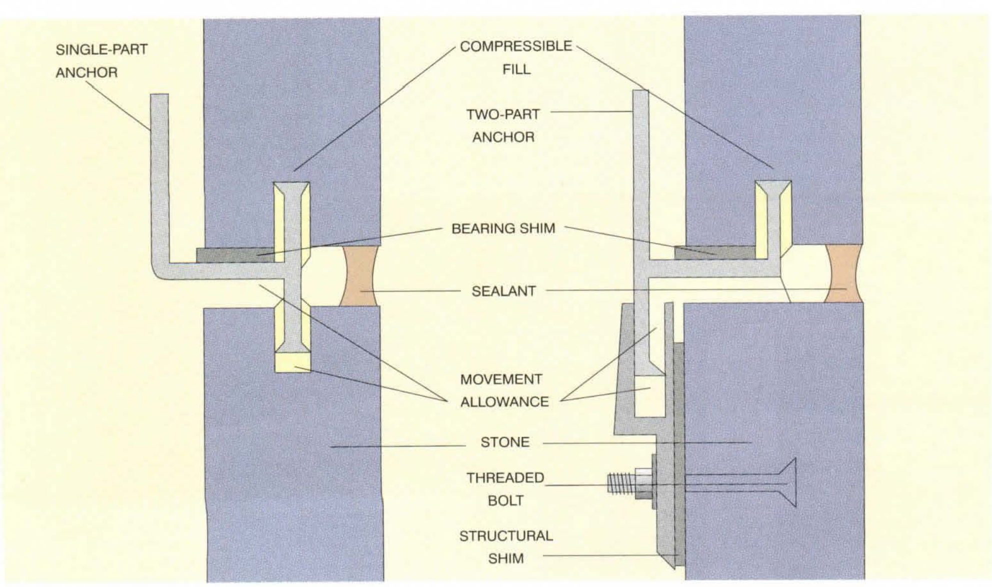
While unrestrained movement of the stone normally does not cause any stress-related problems, restraint imposed on stone movement causes stress, cracking, and eventual failure. Anchorage design must also be sufficient to accommodate stresses that will be imposed on stone during installation, which may exceed stresses after the cladding is installed. After erection, the stone should be inspected carefully for small cracks, since fissures at anchor connections will expand over the life of the building and may become serious liabilities. Anchoring systems also should allow for adjustments to accommodate construction and erection tolerances.

Adverse reactions between the anchor and metallic elements that may be present in the stone also should be avoided. As a rule, any anchor or other metal that comes in contact with the dimension stone should be constructed of stainless steel or nonferrous metal to avoid the possibility of corrosion and expansion that can cause damage.

Architects should keep in mind that the simplest connections are the best. Failures can be minimized by specifying connections made with the fewest number of components possible, and a minimal number of different anchor types: "When you are dealing with stone you don't get much forgiveness," points out Bortz. "It doesn't take much to cause a problem."—*Virginia Kent Dorris*







TOP: When veneers are hung improperly (left), stone bears on anchor at top of kerf to transmit both gravity and lateral loads. Connection concentrates loads at one point and stresses stone, causing connection to fail sooner at loads that are lower than expected. When veneers are hung properly (right), lateral loads are accepted by anchor at top of kerf while gravity loads are transferred separately from stone to anchor through a bearing shim placed under the kerf fin.
CENTER: When veneers are hung improperly (left), anchor bolt connecting angle and stone bears both gravity and lateral loading at a single point, which leads to premature failure of the stone. When veneers are hung properly (right), anchor bolt accommodates only lateral loading while a steel plate supports connection between the angle and stone veneer, accommodating gravity loading. A compressible filler, such as caulking, placed between stone and backup limits the disengagement of the stone from the anchors.
BOTTOM: Only a negligible amount of movement, such as skin thermal differentials and slight lateral sway, can be accommodated by this particular type of connection (left), which is not acceptable for application between floors where movement may exceed allowance. Open track connection (right) can accept long-term vertical or lateral movement stemming from dynamic live loading, floor-to-floor movement, and seismic effects, as well as bending of a high-rise structure.

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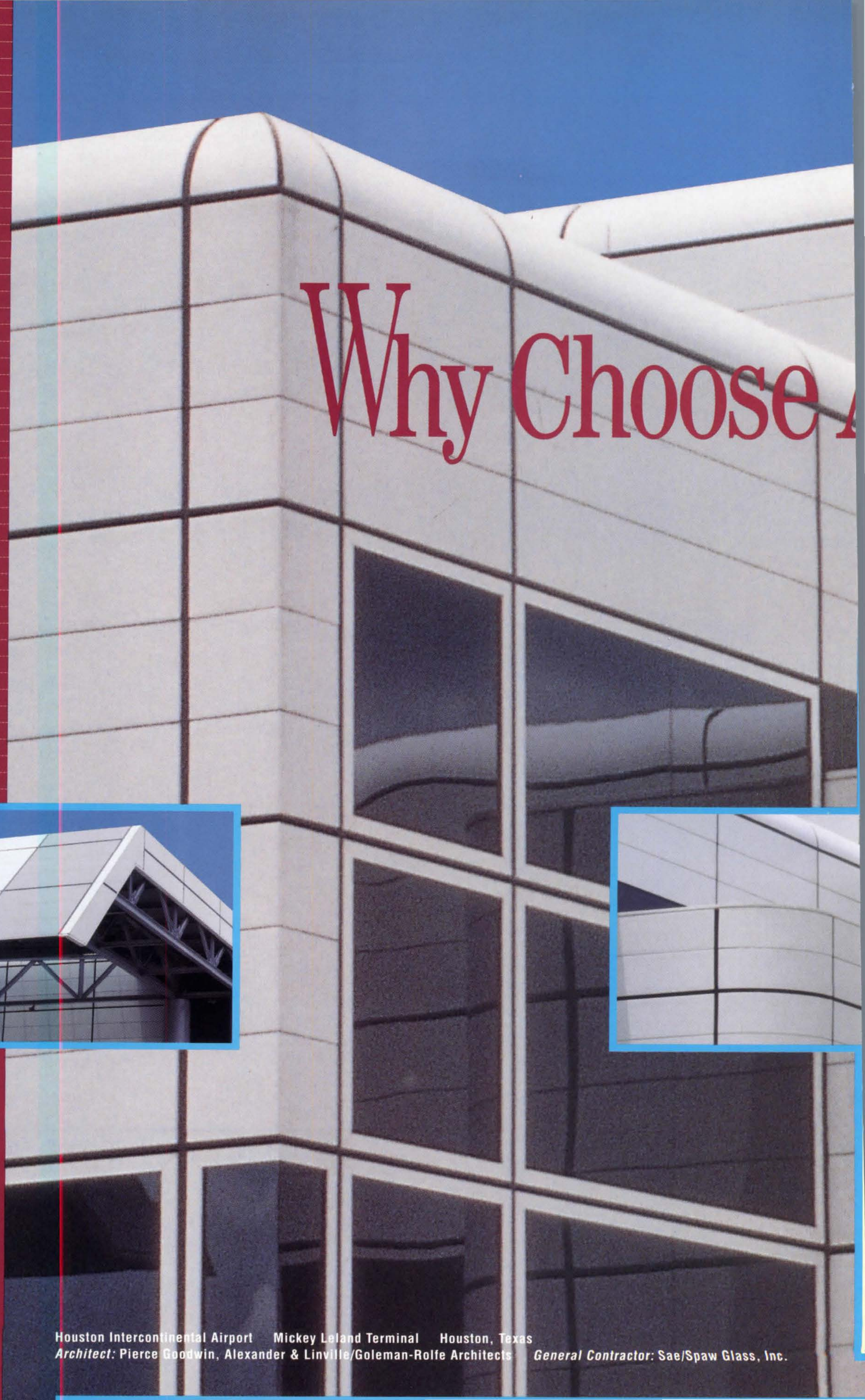


Houston Intercontinental Airport   Mickey Leland Terminal   Houston, Texas
Architect: **Pierce Goodwin, Alexander & Linville/Goleman-Rolfe Architects   *General Contractor:* Sae/Spaw Glass, Inc.**

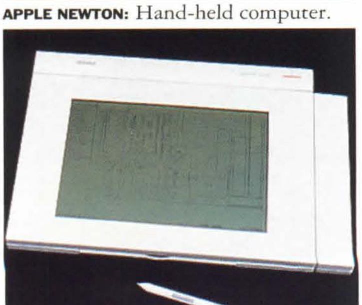
Computers in the Field

Lightweight, keyboard-free, notebook-sized computers are ideal for on-site analysis.

MICROSLATE: Measures field coordinates.

FRANK PRYOR

APPLE NEWTON: Hand-held computer.



PENDRAFTER: Portable VersaCAD.

While computers have become more "architect-friendly" over the past few years, they still have not been embraced by all professionals. This resistance to the technology may finally change with pen-based computing. These new hand-held devices, most without keyboards, can be comfortably picked up and easily learned. It may be only a matter of time before they find a niche in architects' offices. Already, portability has made pen computers invaluable for work in the field. They're being drafted into service, for example, for site analysis, inventories of existing buildings, and construction verification.

A typical pen computer resembles an Etch-a-Sketch. A stylus takes the role of a computer mouse, and the user writes or draws directly on the screen, which, depending on the model, reacts optically or to pressure. Instead of typing from a keyboard, the user writes characters by hand; then handwriting recognition software translates these marks into electronically readable text. Beneath the machine's simple exterior lies a powerful computer capable of displaying drawings, maps, address books, and calendars. Communications hardware built into many models provides wireless networking and cellular phone, fax, and modem connections. Most pen computers currently on the market are notebook-sized, Intel microprocessor-based 386 or 486 computers, although others, most recently the Apple Newton, are challenging that configuration.

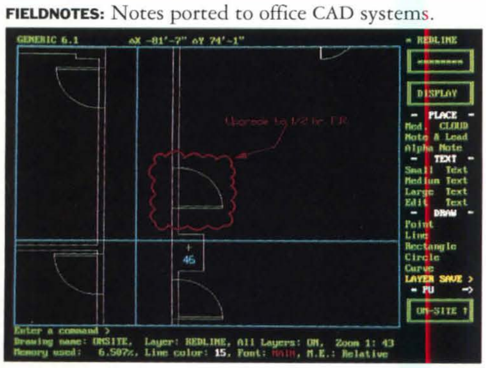
Pen computers reflect the confluence of several recently maturing technologies, including miniature components; thinner, flat-panel displays; longer lived batteries; wireless communications; and the greater computing power required for graphical user interfaces and handwriting recognition. The point and click of the mouse has been replaced by a tap of the stylus. Some pen computer systems feature a miniature on-screen image of a keyboard, and words can be "typed" by pressing on each tiny key in turn.

Translating sketches

Most pen systems have handwriting recognition procedures based on neural network techniques (ARCHITECTURE, December 1992, page 97). Each individual must "train" the computer to recognize his or her handwriting. In most cases, this must be block printing rather than cursive handwriting. Then, when the user writes notes on the screen, the computer translates the block printing into the ASCII equivalent, so the words and numbers can be integrated with word processing or spreadsheet documents.

Similarly, in graphic programs, rough squares, lines, and circles drawn by hand on the screen can be translated into their mathematically precise equivalents for use in CAD software. Not all characters and shapes need to be translated, however. Sometimes it's acceptable for the sketch or handwritten note to be displayed as-is on the drawing, as with, for example, a redline note that will not

FIELDNOTES: Notes ported to office CAD systems.



AEC ON-SITE: Drawings can be redlined in the field.

appear on the final drawings. In these cases, the sketch or note can be drawn in electronic "ink," and the computer will not be slowed down trying to translate it.

Unlike Windows for Pen Computing, which resembles Microsoft Windows, the PenPoint operating system is characterized by uniquely "pen-centric" procedures and a "notebook user interface." PenPoint features a vocabulary of hand gestures based on familiar pencil and paper habits. For example, to switch between computer applications, you simply select from a series of tabs along the side of the screen. To delete a portion of text, you draw a line through it.

Handwriting recognition

According Tom Lazear, president of Archway Systems and author of PenDrafter, pen computing will soon find its way into the CAD mainstream. "I believe the only current obstacles to widespread acceptance are the high pen computer prices, the screen size and quality, the technology's novelty, and the perception that pen computers are somehow less powerful," Lazear claims.

Unfortunately, though indirectly related to CAD, the slowness and imperfections in handwriting recognition may also be major obstacles to the technology's acceptance. Despite the fact that the typical block lettering of architects is far more consistent than handwriting is across the general population, this consistency will not help speed the needed development of more accurate character recognition. According to Charles Han, a San Francisco-based consultant who has been studying pen computers from their inception, "It won't be the architectural profession that will drive pen-based system development. Major developments are driven by the larger business world, then trickle down to other professions as prices drop. Eventually, when handwriting recognition is no longer the stumbling block and other applications are well established, pen companies will begin targeting the architectural profession."

In the meantime, a few CAD programs have been adapted for pen computers. AEC On-Site is a pen-based version of Generic CADD. Architects can load their drawings into the machine, take it to a construction site, and redline the drawings as they make note of construction problems. Later, back in the office, the redlined drawings can be ported back to a CAD system.

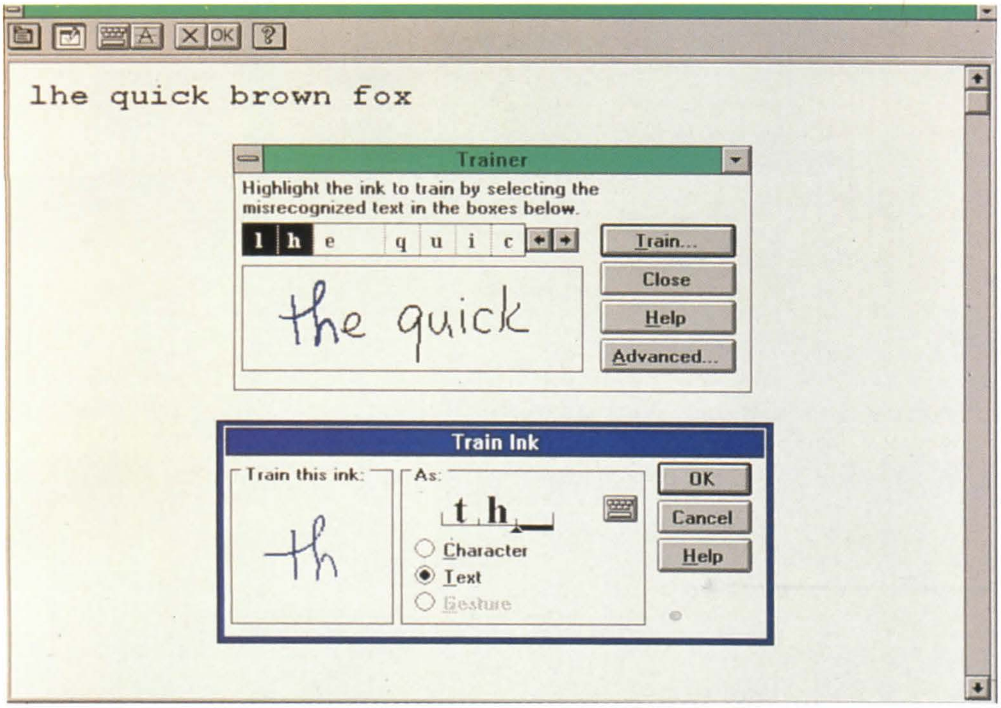
Another early pen-based CAD system is PenDrafter, a pen version of VersaCAD, which was also a pioneer in the early days of microcomputer-based drafting systems. PenDrafter is like VersaCAD except that all mouse and keyboard input is replaced with pen gestures. Commands are displayed on the screen, and the user points with the stylus to select one. PenDrafter is a full-featured drafting system, complete with menus that can be customized, associative dimensioning, reference file capabilities, isometric view projections, symbol libraries, a built-in programming language, and a DXF translator.

Jeff Bergsma, an architect with Team Design in Huntington Beach, California, has been an early adopter of PenDrafter. He appreciates the convenience of taking a pen computer instead of a roll of drawings into the field. "If I find we're lacking a detail," Bergsma explains, "I can call the office on my portable phone. Someone there will load the drawings on their computer, draw the detail, and send it to me within a half-hour through the cellular modem on my pen computer." Bergsma also appreciates being able to enlarge the display of details in the field. "If a builder wonders how something fits together," he notes, "and if you drew the detail accurately enough in the office, you can zoom in on it and see it at a larger scale than you ever could with drawings."

Redlining drawings

FieldNotes is a pen-centric geographic information system (GIS) application designed for data-intensive field applications, such as mapping or inventory management. It supports the redlining of drawings, maps, and photographs linked to GIS or facility management databases. An architect, engineer, or technician can take the computer into the field, call up the pertinent drawings, add information on the run, and eventually merge this information with the central database later when back in the office.

One early adopter of FieldNotes is Jeff Winter, a mapping and GIS supervisor with the Department of Community Development for the City of Corvallis, Oregon. Winter and his co-workers have compiled the city's utility information in a centralized database; the public works department will use pen computers for verifying and updating this mapped information. Winter sees several advantages over traditional verification with paper drawings. For instance, it takes half as much time for the surveyor to input observed information directly into the computer than to make notes on paper and later transfer the data to an office computer. Perhaps more important is the efficiency of user-defined forms



MICROSOFT WINDOWS: Pen version can train a computer to recognize individualized handwriting.

or checklists for entering relevant data. "We will get more accurate information," says Winter, "because the people doing the inventory are writing it down while in the field, and the forms remind them of everything they need to look for. They don't return to the office with incomplete notes, then have to go back out to the field or try to reconstruct information from memory."

On-site applications

Intergraph's MicroStation Review is a manager's version of MicroStation CAD software. Architects who are infrequent users can view and mark up drawings without knowing the full CAD system. Recently, MicroStation Review has been adapted for pen computers and can be employed for supervising on-site construction, surveying existing conditions, or developing as-built drawings. An innovative application of this technology is currently being developed by a consortium, including Bechtel Corporation, the U.S. Army Corps of Engineers, and a group of software and hardware developers. The new technology captures the spatial coordinates of objects in a construction environment and feeds the data to a pen computer. The system has been demonstrated on a Bechtel renovation of the historic Manchester Street Station power plant in Providence, Rhode Island.

A hardware configuration from Spatial Positioning Systems includes two laser transmitters placed at known locations some distance apart on the construction site. They transmit to an optical receiver, which relays the receiver's three-dimensional position several times per second to a MicroSlate pen computer containing the MicroStation Review software. Positions of existing underground utilities can be determined and instantly modeled in MicroStation with pinpoint precision. By verifying the exact location of components during construction, Bechtel Corporation anticipates fewer errors and significant cost savings.

Furthermore, Bechtel expects that this combination of technologies will revolutionize many construction processes. According to Mike Williams, research and development program manager for Bechtel's Engineering and Construction Technologies Group, the benefits extend from the construction site back into the architect's office. "We can upload data to the CAD environment. This gives workers, designers, and construction managers—on-site or off—a way to measure real-world coordinates against the plan."

These examples suggest that, for now at least, pen computers will be found most often in field work. However, consultant Han foresees a day when technological advances will make large-format, flat-panel displays sharp and affordable. "When manufacturers make displays large enough to make architects feel comfortable," he predicts, "we'll be writing and drawing directly on that kind of surface all the time."—*B.J. Novitski*

Pen Computing Resources

CAD Applications

AEC On-Site
CAD Zone
(503) 641-0334

FieldNotes
PenMetrics
(800) 537-3322

MicroStation Review
Intergraph
(800) 345-4856

PenDrafter
Archway Systems
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A corporate office building on a 12-acre nature preserve seems to call for a lot of windows. So architect Frank Tomaino called on Andersen.

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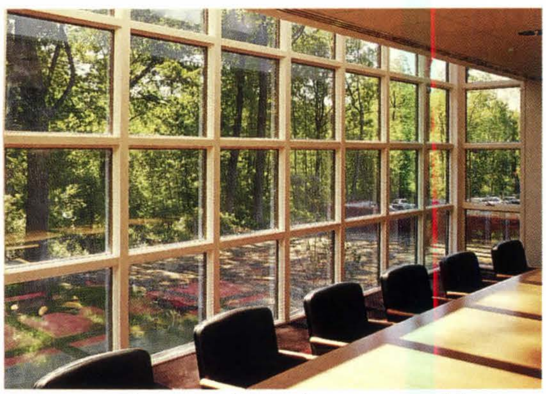

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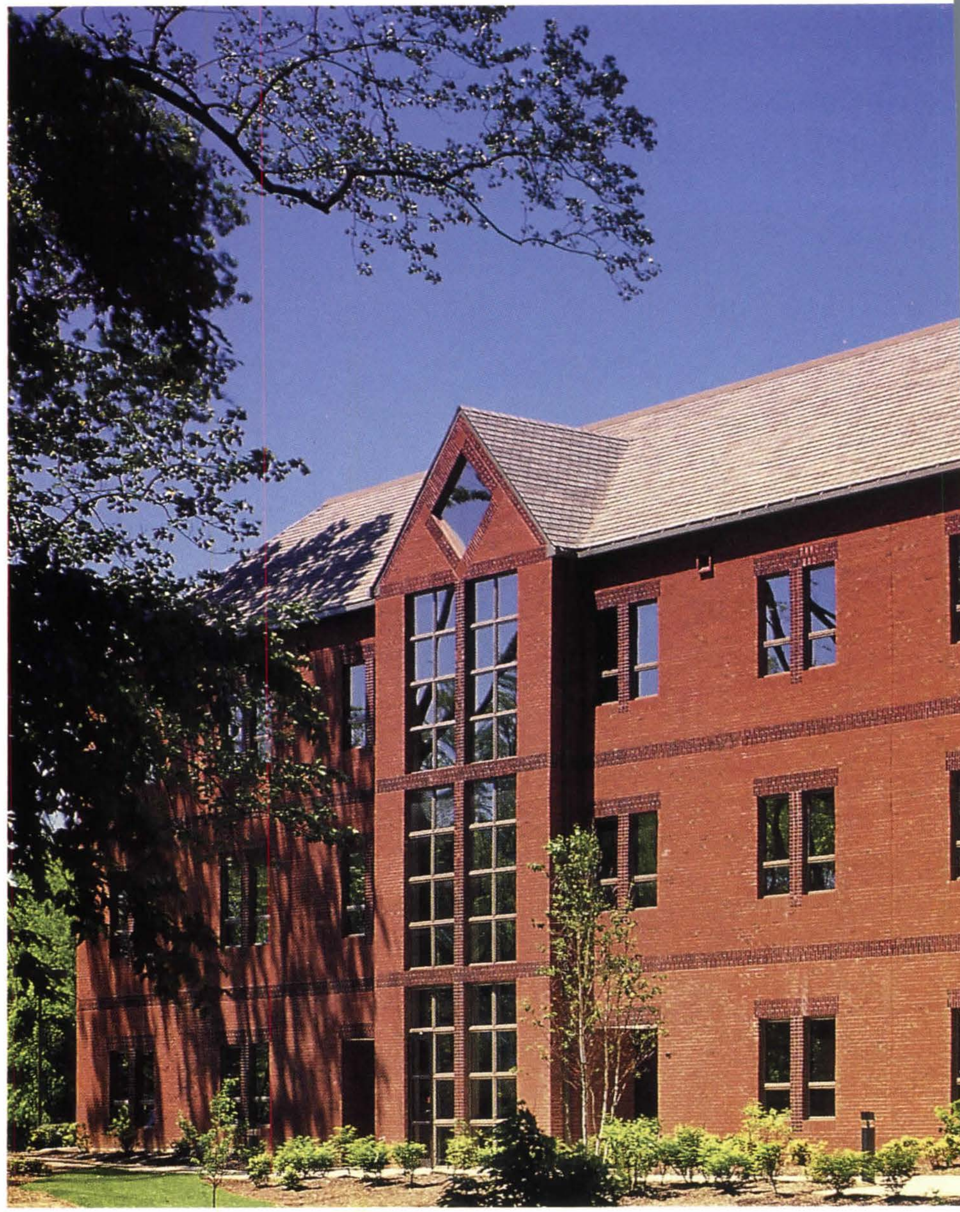

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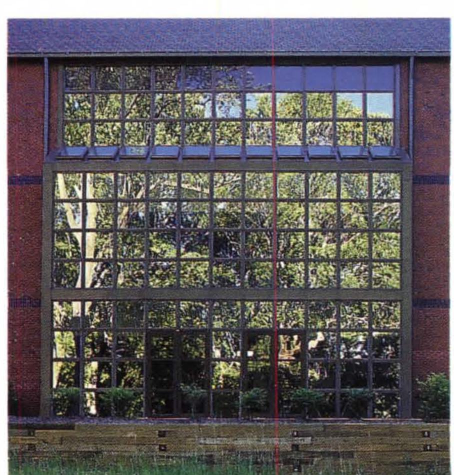

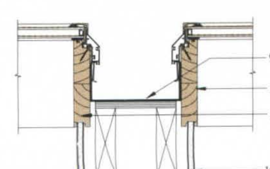

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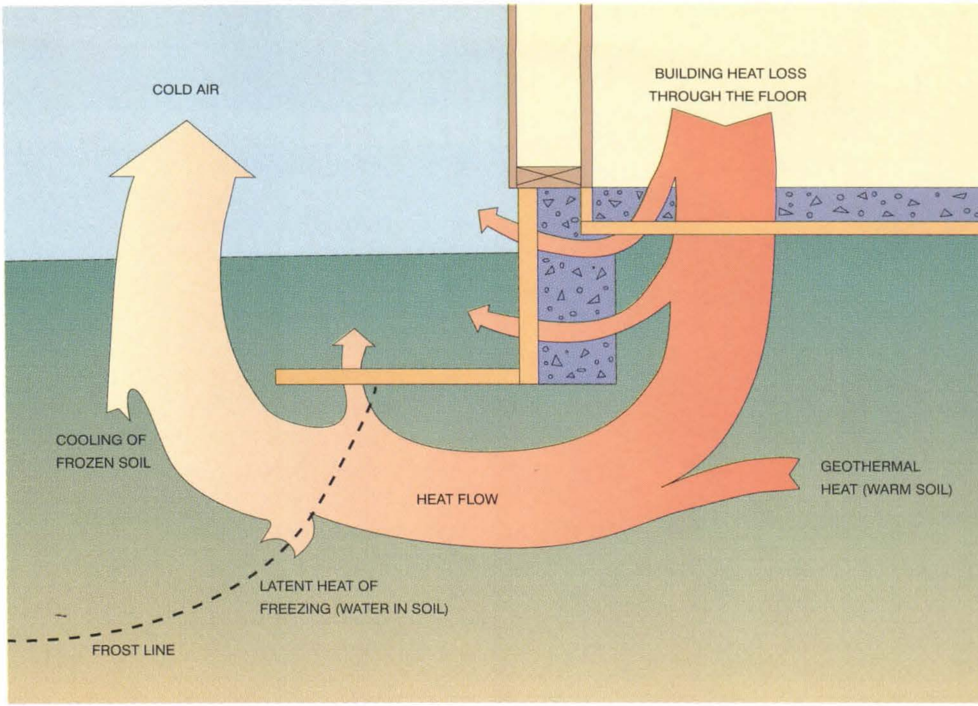
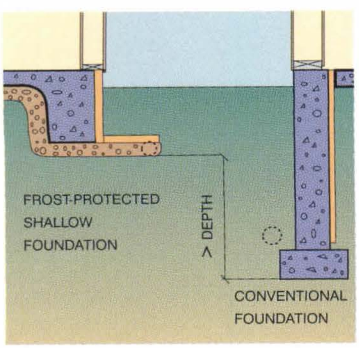
Frost-Proof Shallow Foundations

Adapting foundations designed for warm climates saves construction costs.





ABOVE: Sections of a frost-protected shallow foundation (left) and a conventional foundation (right) demonstrate the difference in depth requirements and the position of insulation.
ABOVE RIGHT: Frost-protected shallow foundation allows building heat and geothermal heat to flow out from the foundation, preventing moisture in the ground from freezing.

New technologies in shallow foundation construction are gaining prominence in the United States. Traditional foundations required in northern areas can measure as deep as 50 inches below finished grade to avoid being heaved or moved by winter frost. The frost-protected shallow foundation method, or FPSF method, alternatively, permits foundations similar in depth to those built in warm climates to be constructed in even the harshest of North American climates. These frost-protected foundations can be designed to measure as shallow as 12 to 16 inches, provided that they are designed with proper insulation and drainage required by the site.

Although only a few such foundations have been designed and constructed in this country, research into their applications is currently being conducted by the Society for the Plastics Industry, the National Association of Home Builders Research Center, and the U.S. Department of Housing and Urban Development (HUD). This ongoing study, for which preliminary results are now available from HUD, may result in building-code changes across the nation that would allow housing and light-frame commercial construction to incorporate shallow foundations.

Shallow foundation construction provides a cost-effective alternative to deep foundations. Savings on construction costs can range from 1 percent to 4 percent of the cost of a conventional, slab-on-grade house, and even more when compared to conventional basement construction. Specifying FPSF details can allow the architect to invest more money and quality design into the structure above the foundation. The environmental aspects of FPSF technology are also compelling. On a site atop unconsolidated soil, for example, specifying a shallow foundation provides an alternative to the heavy equipment and complex engineering of a deep-pile foundation. The FPSF technique also increases the overall energy efficiency and comfort level of buildings, because of the heavier application of insulation around the shallow foundation.

Insulating footings

Shallow foundations are insulated by applying a layer of 1- to 2-inch-thick polystyrene to the vertical sides of the foundation walls on either the inside or the outside, and by extending a "wing" of 1- to 2-inch-thick polystyrene horizontally out from the perimeter of the foundation below grade, at the level of the base of the footings. In some building applications, such as garages and other unheated structures, a layer of insulation is placed below the entire slab as well. As a result of the insulation, heat from the building and from geothermal reactions is directed to the foundation footings and the surrounding soil, effective in preventing frost from forming under the shallow footing where it could damage the building's base.

This insulating system essentially raises the frost level in the ground adjacent to the structure, eliminating the probability of frost occurring under the shallow footings. It is a simple idea, but one that relies heavily on new applications of polystyrene insulation and reliable drainage around the footings.

Scandinavian origins

The frost-protected shallow foundation theory first caught the attention of builders when Richard Morris, senior advisor for the Energy and Home Environment Department of the National Association of Home Builders (NAHB), compiled a report for the Society for the Plastics Industry (SPI) in 1988. Morris's report documented existing techniques for shallow foundations in cold climates.

Morris discovered that slab-on-grade houses were being constructed in the cold climate of Chicago at the turn of the century. During the Depression, for example, Frank Lloyd Wright designed and built a type of FPSF to meet affordable housing needs and applied the technique to his Usonian houses. The foundations that Wright designed were reported to be 6 inches deep, with hydronic heating system pipes laid on a bed of gravel beneath the concrete slab.

Although Morris found the FPSF idea to be relatively new and experimental in the United States, his study had been preceded by extensive research conducted in Scandinavia. In the 1950s, Swedish and Norwegian researchers constructed experimental houses using insulated shallow foundations. These demonstration sites offered practical experience in building the foundations and supplied empirical data on FPSF technology.

By 1972, nearly 50,000 slab-on-grade foundations had been built in Sweden alone. Today, an estimated 1 million such foundations have been successfully constructed in Norway, Sweden, and Finland.

American experiments

Here in the United States, however, only a handful of builders and architects have experimented with the FPSF method. Bill Eich, a builder in Spirit Lake, Iowa, has completed 80 houses with shallow foundations throughout northwestern Iowa over the past six years. Eich estimates that he saves $1,500 in construction costs on each FPSF home built with an attached garage and walk-out basement due to the minimizing of material and formwork with the FPSF technique. "We now use the shallow foundation construction method in all the projects that we do," Eich explains, noting that the logistics are easy. "If we are going to build a house with a full basement, we typically design the garage with a shallow foundation. If we are designing a house with a walk-out basement, we use a shallow foundation on the walk-out side."

Many times, Eich adds, a client would rather have a house designed with a slab-on-grade and a shallow foundation and put the cost savings into a more luxurious, larger single-level residence, than sink the money into the foundation of a more traditional, two-story house with a full basement.

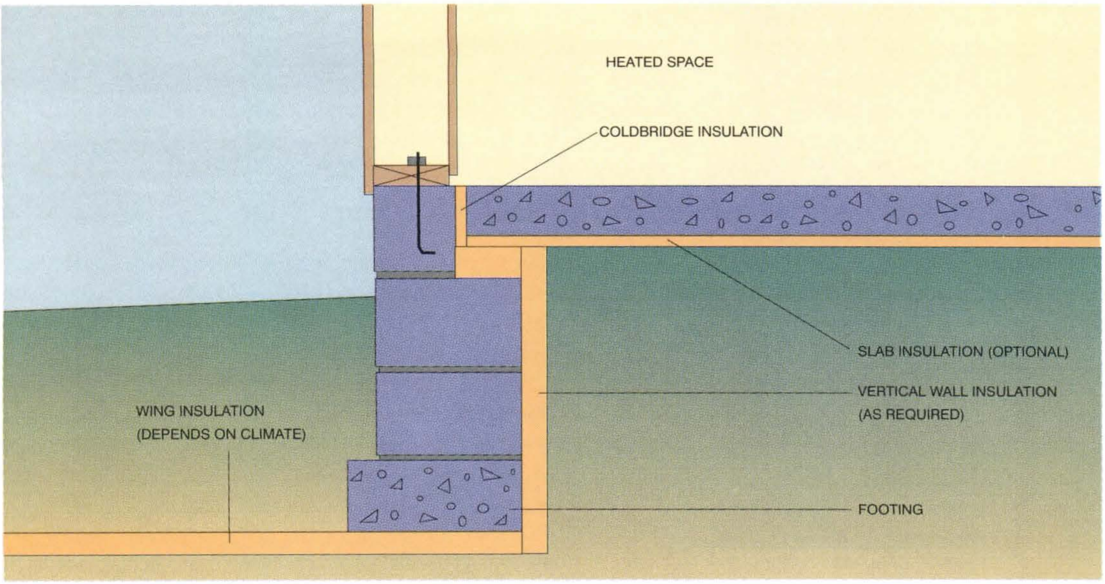
Eich maintains that the FPSF system is quite flexible. Raising the frost level to the height of a shallow foundation by using well-designed insulation is the same regardless of what footing style is chosen, according to Eich. "We have used poured concrete stem walls on concrete spread footings, and permanent wood foundations on pea gravel footings," the builder points out.

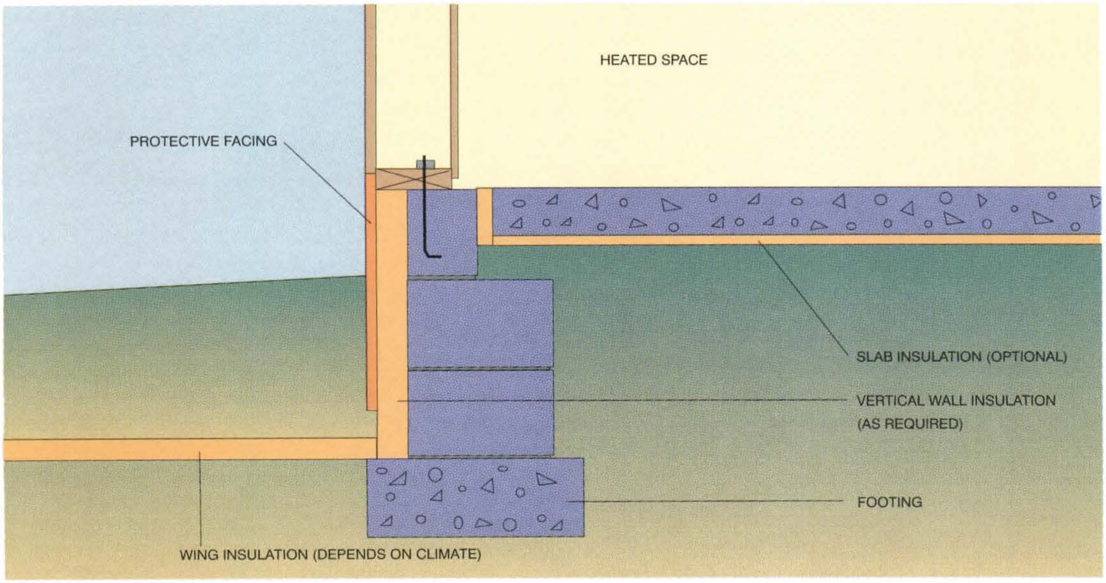
Generally, Eich insulates his shallow foundation designs with R-10 (2-inch) extruded polystyrene, 16 inches down on the vertical exterior face of the foundation, and 12 inches out horizontally from that face. At the outside corners of the structures, where frost penetration can be more severe, Eich applies R-15 insulation and installs it 24 inches out horizontally from the foundation.

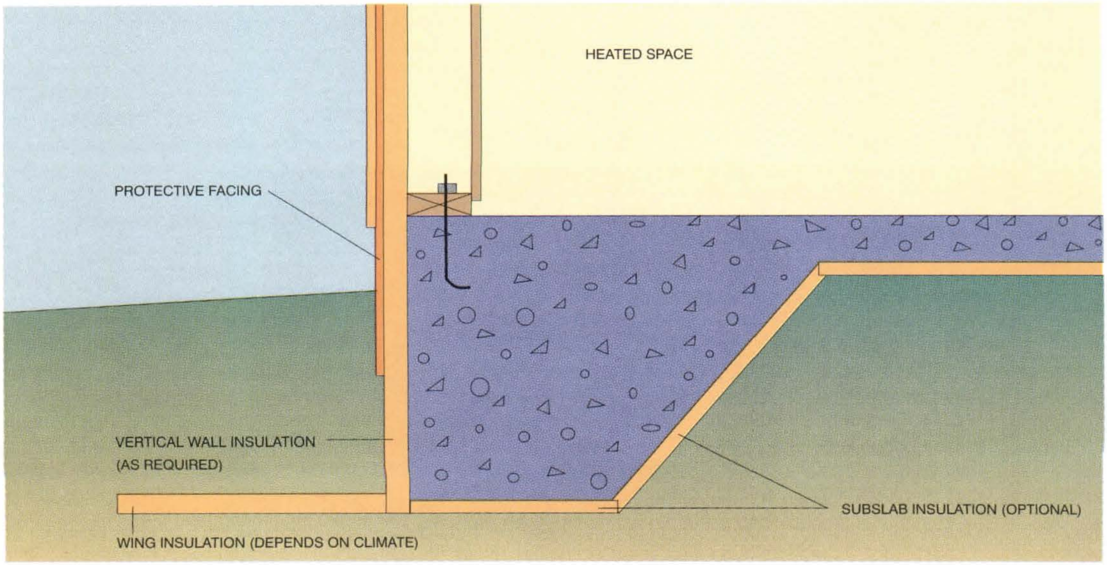
Climate contingencies

The research started by Richard Morris has been continued by SPI and the NAHB Research Center, and the findings were published in a report in 1991. The report relies on computer modeling to analyze the performance of thermal insulation under given weather conditions in the United States. Typical details for various foundation types were developed from U.S. and Norwegian examples, including cast-in-place foundation walls with slab-on-grade; concrete masonry foundation walls with slab-on-grade; and monolithic slab-on-grade construction. The weather conditions for the computer simulations were derived from the analysis of detailed historical data from around the country compiled by the National Oceanic and Atmospheric Administration (NOAA). The computer analysis of frost conditions surrounding shallow foundations for U.S. weather conditions was conducted by the University of Minnesota Underground Space Center, under a contract with the NAHB Research Center.

The report contains a description of the computer simulation of frost conditions, of comparative models, and of the Air-Freezing-Index table from NOAA. A table of insulation requirements in the report shows the FPSF method to be well within the realm of feasi-







TOP LEFT: Three methods are used to insulate shallow foundations beneath heated spaces. In one method, insulation is placed on interior face of a concrete masonry unit stem wall, directly beneath the concrete spread footing. **CENTER LEFT:** Another method is to install insulation on the exterior face of the concrete masonry unit stem wall. **BOTTOM LEFT:** The final method is to install insulation on the vertical exterior face of a monolithic slab.

bility in colder climates. Proposed changes to the language of building codes are also included in the report. The National Building Code is the only model code that already includes a provision for alternative methods of frost protection. The model code states that footings must reach below the local frost line "except when erected on solid rock or otherwise protected from frost."

Suggested building code changes were sent by NAHB to the One- and Two-Family Dwelling Code, the Standard Building Code, and the Uniform Building Code. Both the One- and Two-Family Dwelling Code and the Uniform Building Code have approved the changes to allow alternative methods in language similar to the Building Officials and Code Administrators' National Code. The FPSF method was not called out by name in the codes, but its proponents are encouraged by the fact that the building codes generically permit the application of the technology. But before changes to codes are made, FPSF advocates need more information on the European standards now being developed for shallow foundations by the European Committee on Normalization, the arm of the European Economic Community charged with developing industry standards. Also, FPSF product evaluations such as those underway at NAHB must be completed before any further code revisions are made.

Testing model houses

But computer models and code modifications can only go so far in convincing architects of the reliability of the protection of shallow foundations against movement from frost. So, last winter, the NAHB Research Center, under a HUD grant, gave the FPSF method the true test in relentless cold.

By April 1993, one model house was built in each of the country's harshest environments: Iowa, Vermont, and North Dakota. Bill Eich; Tim Duff, of Kessell-Duff Construction in Williston, Vermont; and Gerald Eid, chairman of the NAHB Energy Committee and president of Eid-Co Homes in Fargo, North Dakota, were asked to supervise construction of these prototypes. The model houses were constructed with foundation systems based on the details presented in the SPI Phase II report and from more conservatively designed examples of Norwegian systems.

The houses were monitored for movement and temperature variations by the NAHB Research Center, a process that further supported the data created by NOAA through the computer modeling. Duff is quite impressed with the model home built in Vermont. Although he considers the FPSF construction still to be in the experimental stages, Duff asserts: "The prototype we built is probably one of the best insulated houses we have completed." The soil around the building is also more stable than the soil around the conventional deep-footing buildings because less frost action affects it, he adds. A conventional foundation wall tries to withstand frost action by having footings below it, Duff explains, while the FPSF foundation decreases the actual frost action by transferring heat from the house to the surrounding soil.

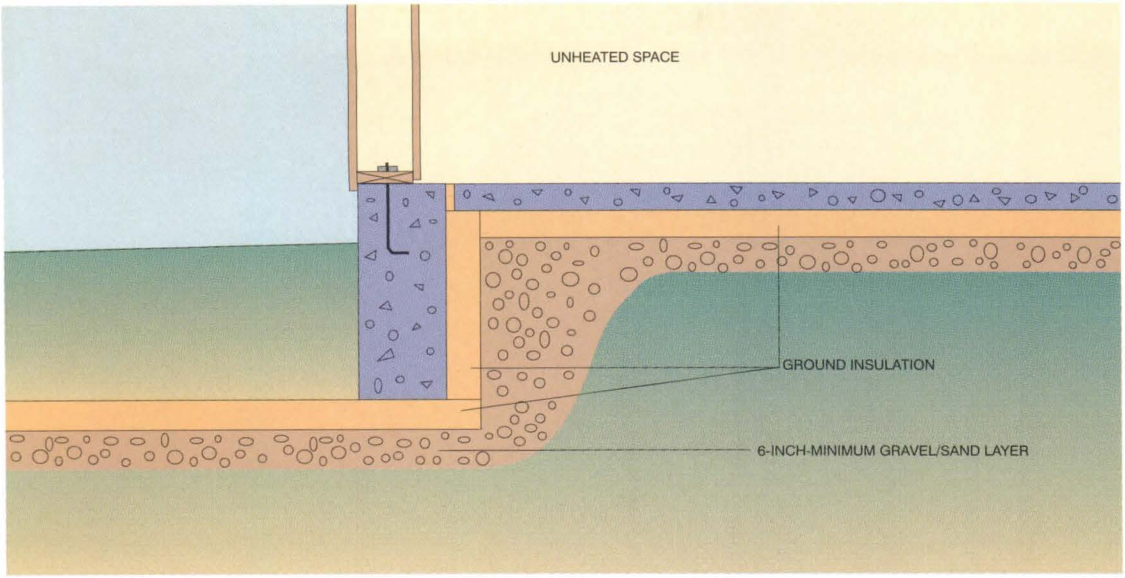
In April, HUD issued the designs of these three demonstration houses—along with climatic information for the chosen regions and descriptions of the monitoring procedure—in its initial report on FPSF, accompanied by a preliminary FPSF design guide.

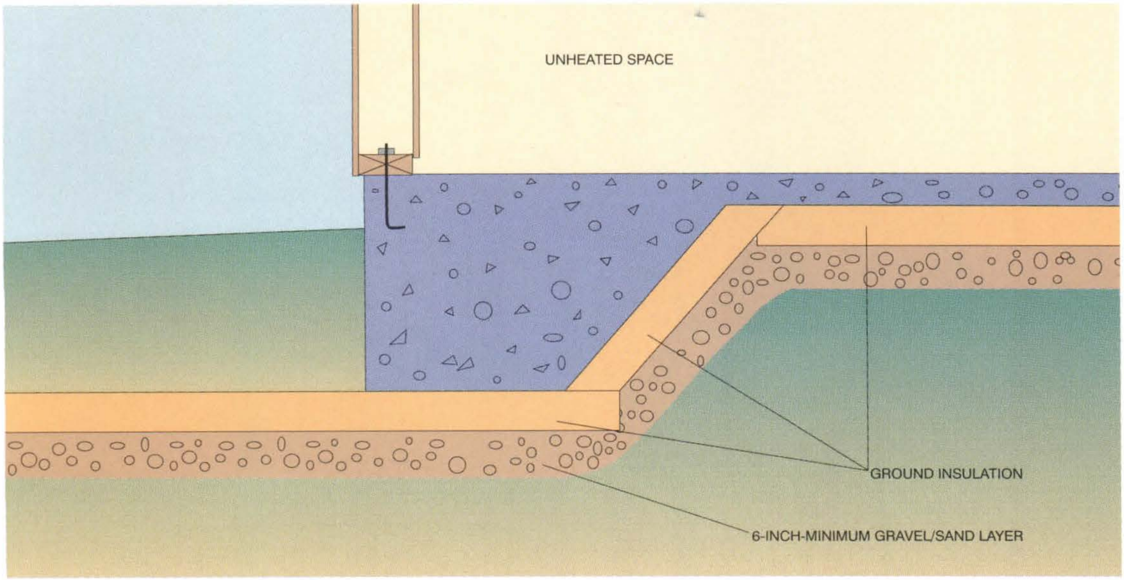
Jay Crandall, a project manager at the NAHB Research Center, is pleased with the performance of the houses. "Above all," he explains, "the FPSF design is an affordable technology. It is ideal for architects who are working on limited-budget projects, where the saving of $1,000 to $2,000 in foundation costs can mean higher quality in the design of the above-ground structure."

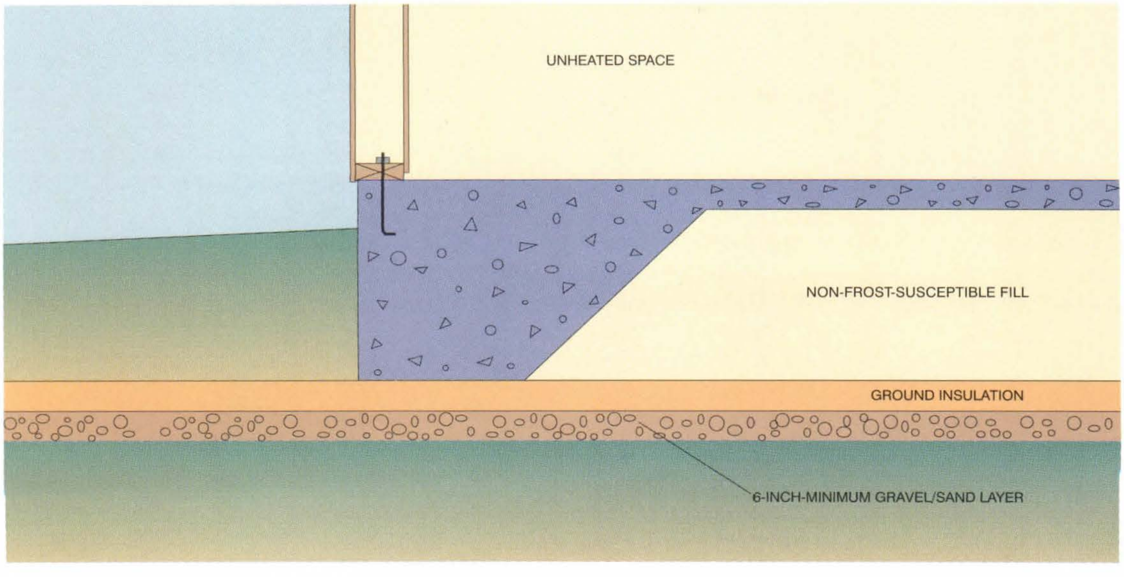
Crandall is currently monitoring an FPSF demonstration house that was built in July 1993 in Alaska directly from the design guide published in the HUD research report. The engineer plans to interview the occupants of the Alaska house, as well as occupants of the other demonstration models, to find out how livable they prove. After one and then two years, Crandall also will excavate samples of the insulation around the shallow foundation to analyze its R-value after long-term service. He hopes that the data from this project, the second winter data from the previous demonstration houses, and product evaluation research now underway at NAHB will bring acceptance to the FPSF technology as results emerge over the next year.

All that remains to do now is to wait out the coming winter. If, in the advanced phases of this ongoing project, the frost-protected shallow foundations support their previous claims of cost-effectiveness and energy efficiency, there may be changes to the various building codes warranted by these latest studies. In that case, it will send designers back to the drawing boards to develop new standards for FPSF technology.—*Sam Kirby*

Sam Kirby is an architectural designer and freelance writer based in New Haven, *Connecticut.*

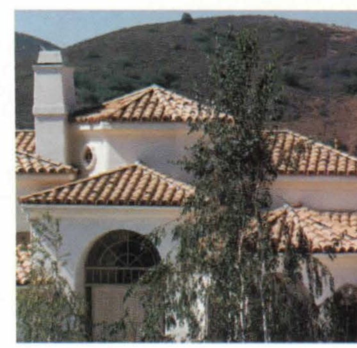






TOP LEFT: Shallow foundations under unheated spaces are insulated according to three methods. One way is to place insulation directly under slab and along interior surface of stem wall.
CENTER LEFT: Another method is to install insulation in sections directly underneath a monolithic slab.
BOTTOM LEFT: In the third method, insulation is placed as a single plane beneath a monolithic slab. Dead space between insulation and slab is filled with a frost-proof material.

Clay roof tile systems evoke regional design preferences.



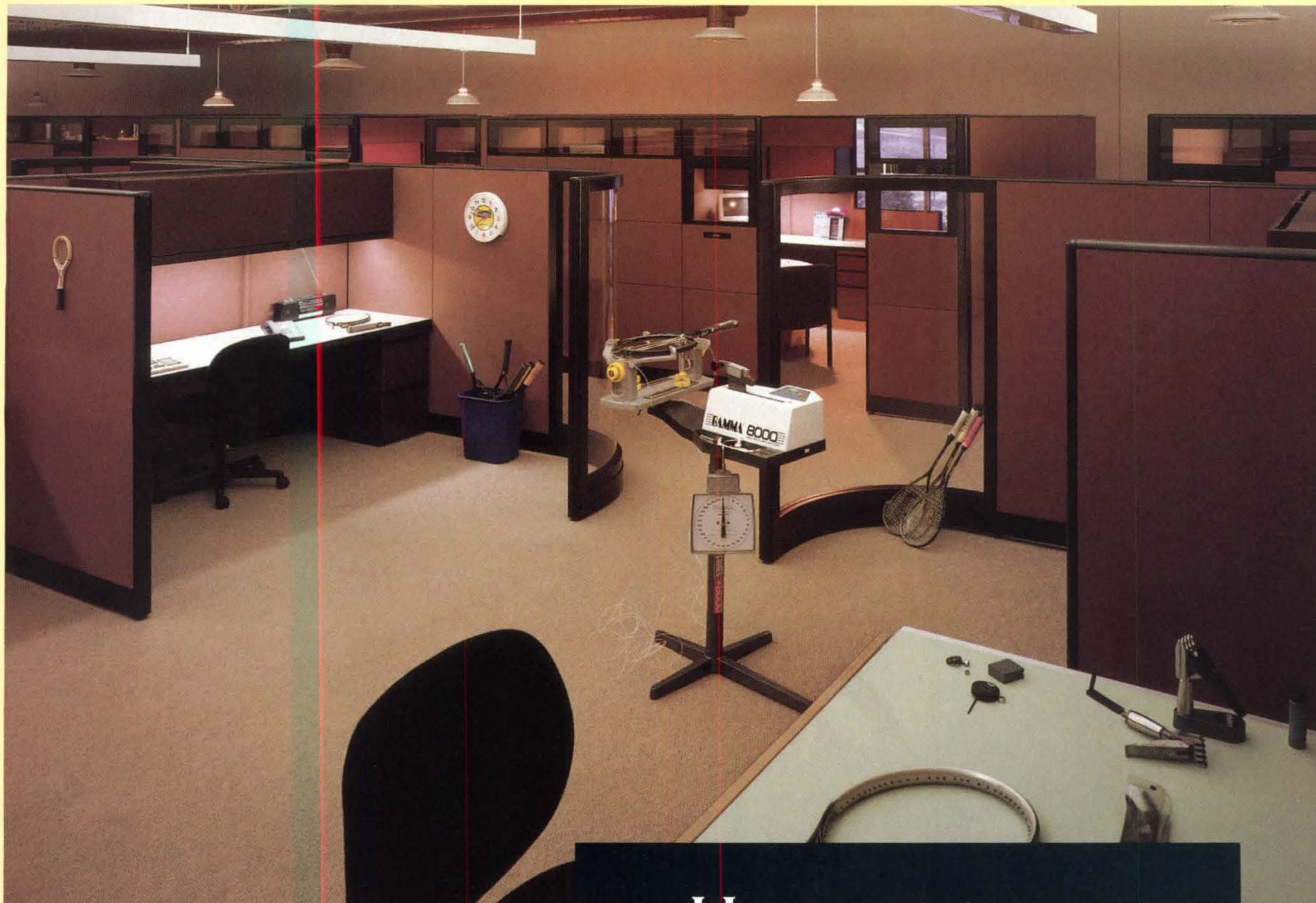
TOP: Gladding McBean in Lincoln, California, is one of the few companies in the country that manufactures and distributes architectural terra-cotta clay products, including six styles of clay roof tiles. The roof of the Folsom Civic Center in Folsom, California, for example, is clad in the company's S tile, which measures $13^1/4$ by 20 inches. Gladding McBean's S tile engages 75 pieces of tile per 100 square feet and is available in red or in a variegated color tile. The Folsom Civic Center features the company's Piazza terra-cotta paving as well. Gladding McBean also manufactures clay sewer pipe, wall tile, and terra-cotta ornaments.
Circle 401 on information card.

ABOVE: Ludowici-Celadon, a subsidiary of CertainTeed Corporation, offers a one-piece barrel clay roof tile. Spanish Mediterranean Blue tile is manufactured for residential and commercial structures. Installation of the tiles requires a minimum pitch of a 4-inch rise, the vertical distance from the eaves line to the ridge, in a 12-inch run, the horizontal distance from the eaves to a point directly under the ridge. A full range of fittings is available. The incombustible tiles are created from southeastern Ohio shale and clays. They are fired to resist harsh climates and fading and have a low moisture-absorption rate. Tiles are available unglazed, or in standard or custom glazed colors. The Spanish tile carries a 50-year limited warranty.
Circle 402 on information card.

ABOVE: Weathered ash clay tiles are offered by Monier as an alternative to cedar shakes. They combine the fire safety, durability, and versatility of clay roof tiles. Monier's clay shakes comprise random patterns and coarse textures that emulate brushed and smooth surfaces, with natural color variations. The tiles are available in 10 colors, which were developed based on regional preferences. Accessory tile, trim, fitting, and attic ventilation products are available to complement the roof tiles. Each tile measures $16\ ^1/2$ inches by 13 inches and has a 3-inch minimum headlap. Ninety field tiles are required to cover 100 square feet.
Circle 403 on information card.

ABOVE: United States Tile, a division of BORAL Industries, manufactures clay roof tiles, including the S tile, shingle tile, two-piece mission tile, and claylite lines. The company's clay S tiles comprise a single-piece tile combining the top and the pan within the design. Eighty-eight units weighing approximately 900 pounds will cover 100 square feet. The tiles are spaced on 11-inch centers with the exposed tile measuring up to 15 inches. S tiles have a Class A fire rating and are designed to resist extreme temperatures, decay, and erosion. Cover, pan, ridge, hip tile, closure tile, and accessories are available for United States Tile's clay roofing systems. Six colors are available; the S tiles are offered in seven color blends as well as five glazed colors.
Circle 404 on information card.

Gamma Sports' Research and Development Department



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Laminated strand lumber

Trus Joist MacMillan has engineered its TimberStrand laminated strand lumber (LSL) 1.2E Light-Duty Header to fight soaring lumber costs. TimberStrand LSL is designed to eliminate the twisting, shrinkage, and waste that normally accompany solid-sawn joists. The laminated strand lumber is engineered by bonding aspen strands up to 12 inches long with a high-performance adhesive that is steam-injected to strengthen and solidify the wood. TimberStrand is available as floor joists, which can be easily installed as roof rafters (left) since the joists are lightweight, feature prestamped holes for wiring, and come in precut lengths. Silent Floor joists' light-duty residential headers are reported to be less labor-intensive and more cost-efficient to install than conventional members.
Circle 405 on information card.

Clay roof tiles

Maruhachi Ceramics of America (MCA) has been manufacturing roof tiles for more than 80 years and recently incorporated computerized production to offer a wide variety of glazes and flashed colors for the company's five standard styles of roof tiles. MCA's clay roof tiles include one-piece, mission-style natural and flashed tile; two-piece, mission natural and flashed tiles; a glazed oriental tile; glazed flat style; and tapered turret tile for cone, radius shaped, or circular roofs. MCA's standard colors, which range from red to green, are produced by applying the glaze prior to firing to create a ceramic finish.
Circle 406 on information card.

Decorative clay tile

Ceramica Decorativa, a Spanish tile manufacturer, offers a series of stone and clay tiles that emulates the richness of natural stone. The Anticato series (above) includes terra-cotta pavers that are hand-molded and measure 4 inches by 4 inches and are available in several color selections and mesh-mounted strips. The company also manufactures an Anticato mosaic design, incorporating glazed and unglazed hand-polished tiles in numerous shapes and sizes.
Circle 407 on information card.

Pressed tin

Chelsea Decorative Metal Company specializes in pressed-tin ceilings and cornices. The company's products are manufactured from tin-plated steel to retain paint and resist rust. Twenty panel designs and 11 cornices are available, as well as lay-in tiles for suspended ceilings, in styles ranging from Victorian to Art Deco. All ceiling panels and cornices are shipped primed for oil-based paint.
Circle 408 on information card.

Flat roof tiles

Huguenot Fenal, a French manufacturer of clay roof tiles, offers Valoise Tuile Terroise, a flat interlocking clay roof tile system, available through the Northern Roof Tile Sales Company, located in Millgrove, Ontario. The tile measures $1^1/_4$ inches thick with head and side channels to repel moisture. The company's Valoise tile is available in burnt orange, brown, and slate gray, plus custom-blended colors. A minimum of a 30 degree roof pitch is required for installation.
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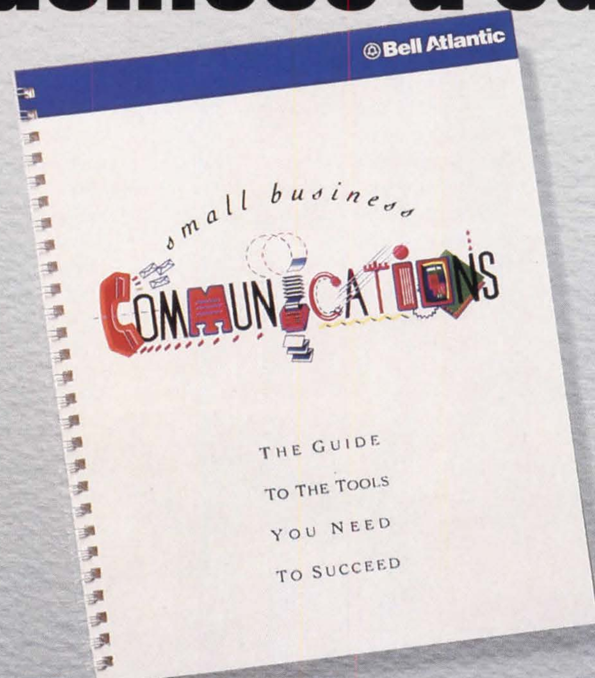

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Rustic ceramic tiles

Edilcoughi, an Italian tile manufacturer, offers a rustic ceramic tile (above) for heavy-traffic residential and commercial installations. The company's 12-by-12-inch tiles are manufactured to appear weathered. Its unglazed terra-cotta tile is pitted and marked and measures 4 by 4 inches. Ceramic tile borders are available and are preset on a mesh backing to appear broken or as a mosaic design. Border scolling incorporates a floral design with vines and leaves.
Circle 410 on information card.

Unglazed floor tile

Almar, a Venezuelan manufacturer of clay roof tiles, introduced a terra-cotta floor tile this spring at the International Tile & Stone Exposition in Miami Beach, Florida. Intergres is an unglazed clay floor tile, purported to have twice the strength and abrasion resistance of standard clay floor tile, with less than a 3 percent porosity. The tiles are best suited for use in high-traffic residential and commercial spaces. The Intergres tile is available in a 12-by-12-inch paver, three colors, and two tread types.
Circle 411 on information card.

Clay tile resource

Roanoke, Texas-based TileSearch offers a computerized listing of both manufacturers and distributors of salvaged roof tile and slate. This system aids architects in matching the manufacturer, color, age, and texture of desired tiles for new construction, restoration, and preservation projects. TileSearch buys and sells salvaged tiles and has a consignment program.
Circle 412 on information card.

Recycled clay tile

Antique French (above) is a line of terra-cotta floor tiles offered through New York City-based Elon. These reclaimed terra-cotta tiles are removed from French houses dating from the 18th and 19th centuries. Colors range from golden to sienna tones with streaking that softens the hues. Elon's Antique tile has natural imperfections, cracks, and weathered surfaces and varies in size and thickness. Elon provides a terra-cotta tile finish and a floor-preserving acrylic finish.
Circle 413 on information card.

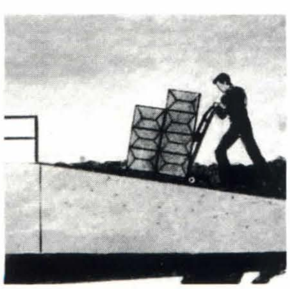
Restored woodwork

Olek Lebjzon & Company offers restoration and installation of woodwork, antique floors, and paneling for both commercial and residential architecture. Restoration services include marquetry of wood, ivory, and brass; hand turning; carving, gilding; imitation graining; antique painting; and French polishing. The firm maintains a staff of more than 25 craftspeople and has worked in commercial restorations since 1950.
Circle 414 on information card

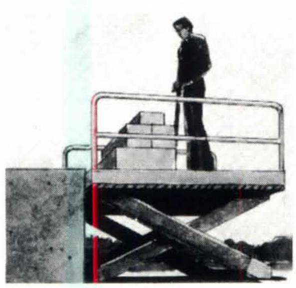
Daylighting system

The daylighting system from the SunPipe Company channels sunlight from a clear acrylic dome on the rooftop through a 13- or 21-inch aluminum pipe with a highly reflective interior. Light is channeled to a second opaque dome located on the interior ceiling, which diffuses the sunlight. SunPipe is purported to be impervious to condensation, and the controlled light reduces hot spots that cause premature fading of furnishings.
Circle 415 on information card.

Annual Index



The hard way



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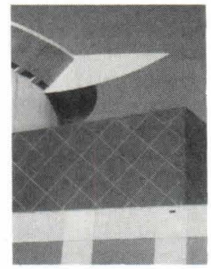
Picture This!
Your Photo, Your Fame, Your Prize Money. It's A Snap.

The 1994 National AIA Architectural Photography Competition. Deadline for Entries: March 1, 1994.


Wing Tip
by Eduardo N. Lamus, AIA

Capture on 35mm slide film a representation of the global variety of architecture and design excellence in our environment. That's the first step to gaining national recognition and winning prize money for your award-winning photographic creativity.

The 1994 National AIA Architectural Photography Competition is open only to individual AIA members, Interns, and Associate members of the AIA, and student members of the AIA, in good standing. Professional protographers who are members of the AIA and/or any of its components are not eligible. Slides submitted by ineligible individuals will be returned. (See 10 below.)

The 14 winning entries will be displayed at the 1994 AIA Convention in Los Angeles; the photographs used in the AIA ARCHITECTURE 1996 Calendar will be selected from all of the entries. The Competition is organized by AIA St. Louis.

$2,500 IN PRIZE MONEY

The top entries will be awarded $2,500 in prizes at the 1994 AIA Convention; no entry can win more than one cash award. The subject for the Louise Bethune Award must be located in the United States.

First Place	$1,000
Second Place	$ 700
Third Place	$ 300
Louise Bethune Award	$ 500

Check the Conditions of Entry below and then use the form to enter your slides; photocopy the form for additional submissions. Enter as often as you want. Each $20 entry fee entitles you to enter up to five slides. Hurry, there's not much time left.

CONDITIONS OF ENTRY

1. Only 2″×2″ 35mm color slides may be entered.
2. Entries must have been exposed by and be owned by the entrant.
3. Images previously published and/or pending publication or cash winning images in previous National AIA Photography Competitions are not eligible.
4. **Entry fee is $20.00. Entrants may submit up to five (5) slides for each $20.00 entry fee. Entrants may enter as many times as desired.**
5. The entry fee is non-refundable and must accompany the slides entered.
6. The subject matter must have an architectural theme or must contain some element of the man-built environment. Photographic interpretation of the subject matter is the issue, not the architecture.
7. Slides that do not fit in a standard slide carousel will not be judged. **Please do not send glass mounted slides.**
8. Entrants grant permission to the AIA to reproduce slides for exhibitions, AIA publications, and for promotional purposes. All reproductions will become the property of the AIA.
9. The decision of the judges is final on all matters relating to the Competition.
10. Great care will be taken with all slides submitted, but no responsibility for loss or damage during transit or any phase of the Competition will be assumed by AIA St. Louis or the National AIA.
11. Clearly mark each slide with the following:
    a. Entrant's name
    b. Slide title
    c. Slide identification (A, B, C, D, E) as listed on entry form
12. **Entries must be postmarked by March 1, 1994** and include:
    a. Completed Entry Form
    b. Entry Fee (check or money order) made payable to: AIA St. Louis Photography Competition
    c. Adequately sized self-addressed envelope with proper postage for return of slides (Do not use pre-dated postage from postage machines)
13. Mail entries to:
    AIA St. Louis
    911 Washington Ave., #225
    St. Louis, Missouri 63101-1203
14. Submission of slides implies entrant's acceptance of all the above conditions.
15. Void where prohibited by law.
16. Questions? Call AIA St. Louis at 314-231-4252.

ENTRY FORM

Please print or type all information AIA Member No. ____________
☐ Member ☐ Intern ☐ Associate ☐ Student

CHAPTER AFFILIATION ____________ ( ) CHAPTER PHONE ____________

NAME ____________ ( ) HOME PHONE ____________

ADDRESS ____________ CITY, STATE, ZIP ____________

( ) FIRM OR SCHOOL PHONE (IF STUDENT) ____________

ARCHITECTURAL SCHOOL (IF STUDENT) ____________ NAME OF DEAN ____________

Enclosed is $__________ for __________ slides, and a return envelope with proper postage.

SLIDES

	Title	City and State/Country	Original or Duplicate
A.			
B.			
C.			
D.			
E.			

Mail to: AIA St. Louis, 911 Washington Ave., #225, St. Louis, MO 63101-1203

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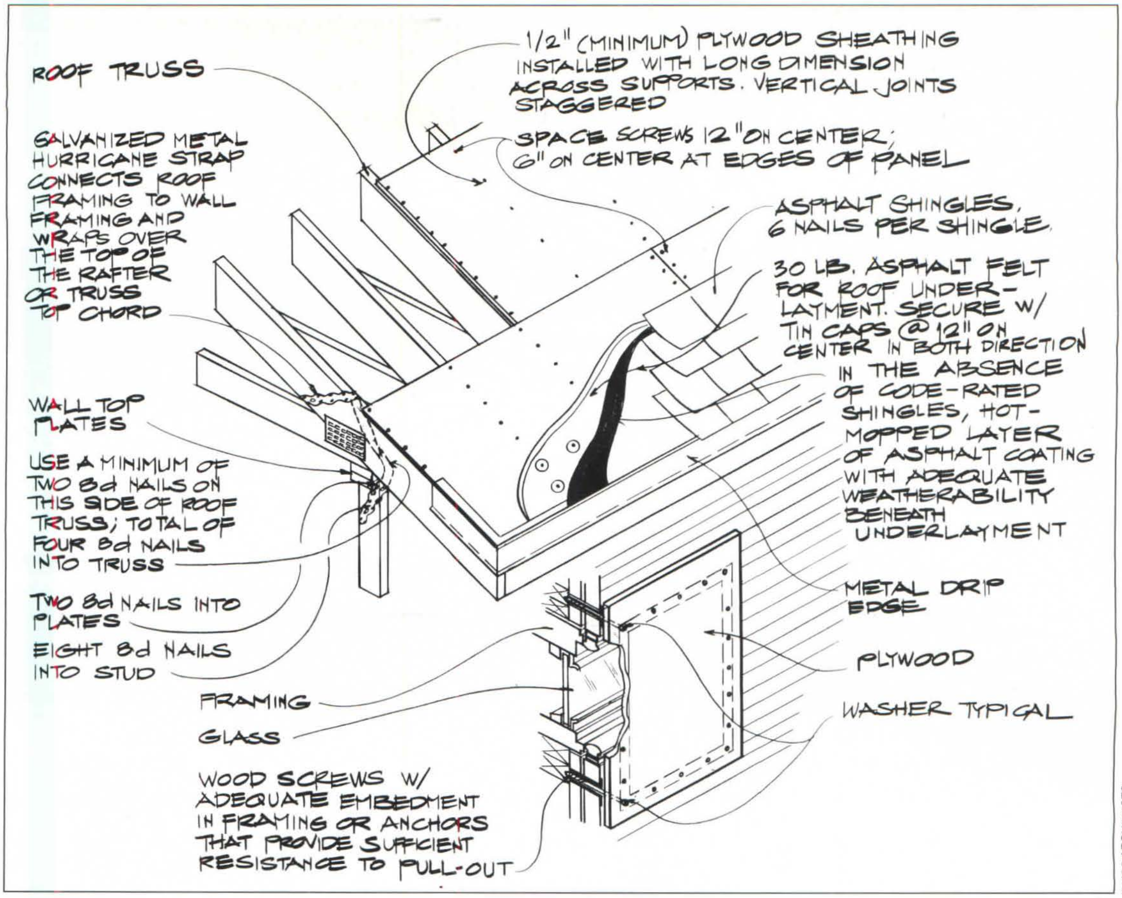
No excuses after this information exchange



CMSS ARCHITECTS

Wood Doors

CSI Section 08200

Preventing warpage

Several manufacturers warrant their solid-core wood doors against warping, bowing, and delamination for the life of an installation. However, these warranties are accompanied by certain exceptions. Warpage usually stems from extreme changes in temperature and humidity or improper finishings. During construction administration, contractors should be reminded of the following manufacturers' requirements for storing, handling, and finishing.

Doors should be stored flat on a level surface in a dry, well-ventilated space. Do not store them on-site where taping and finishing of gypsum wallboard work is in progress. If stored more than a week, all edges must be sealed. Doors should also not be subjected to extremes of heat, dryness, or humidity, or to sudden changes in these conditions. Relative humidity should not be less than 30 percent or greater than 60 percent.

Seal all edges immediately after fitting, including areas routed for concealed closers and other hardware or cutouts. Immediately after fitting and before hanging, the entire door (including all of the edges) should be finished, preferably while it is laid in a horizontal position.

Water-based paints or adhesives should not be used unless an oil-based prime coat is first applied.

Problems can also occur if temperature or humidity differ on each side of the door. Warpage may happen on doors separating air-conditioned and non-air-conditioned spaces or two different air-conditioning zones. Veneer thickness and/or applied finishes may differ on each face, such as vinyl on one face and paint or varnish on the opposite face, causing additional problems. Doors may not be properly hung or hinges not properly sized, leading to warpage.

It is the responsibility of the entire project team to be aware of these potential problems and to make sure that contract documents and manufacturers' instructions are followed to keep warpage to a minimum.

Bill McCluskey, AIA
Gensler and Associates
San Francisco, California

Moisture Protection

CSI Section 07000

Roofs for wind resistance

Architects designing houses in high wind areas should consider incorporating an "area of refuge"—designed to a greater wind resistance standard—into the house and located away from external openings.

Furthermore, the roof structure (above) should be anchored to the top plate of the wall with hurricane straps. Roof and wall sheathing should be attached with screws instead of nails, since screws have a higher withdrawal load. Thirty-pound asphalt felt should be specified for roof underlayment and attached with tin caps to improve its anchorage to the roof sheathing. The gable end and eave edge of the asphalt shingles should be supported on a metal drip edge. The starter course should be attached to the drip edge and adhered to the first course with plastic roof cement to improve shingles' resistance to wind uplift.

David L. May, Jr., AIA
CMSS Architects
Virginia Beach, Virginia