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Presidential Platforms

ISSUES RELEVANT TO ARCHITECTS—REBUILDING OUR CITIES, PROTECTING THE ENVIRONMENT, AND funding affordable housing—have never been as important to a U.S. Presidential race as they are this year. As in the past, the American Institute of Architects is not endorsing a candidate. However, architects should pay particular attention to the parties' platforms this year, since future White House policies will play a significant role in shaping the profession. The following excerpts, compiled from the Democratic and Republican platforms, clarify each party's stand on five key issues that affect architects. Go to the polls on November 3; the choice is yours. —DEBORAH K. DIETSCH

Democratic Platform

Cities
Only a robust economy will revitalize our cities. . . . We support a stronger community development program and . . . assistance to cities that need it most. A national public works investment and infrastructure program will provide jobs and strengthen our cities, suburbs, rural communities, and country. We will encourage [investment in] inner city development and housing through . . . enterprise zones and incentives for private and public pension funds to invest in urban and rural projects. . . . We support and will enforce a revitalized Community Reinvestment Act that challenges banks to lend to entrepreneurs and development projects.

Energy
We will make our economy more efficient by using less energy, reducing our dependence on foreign oil, and producing less solid and toxic waste. We will adopt a coordinated transportation policy with a strong commitment to mass transit; encourage efficient alternative-fueled vehicles; increase our reliance on clean natural gas. [The party promotes] clean coal technology [and supports] investment in research and development of renewable energy sources. [We will] strengthen efforts to prevent air and water pollution, support incentives for domestic oil and gas operations, and push for revenue-neutral incentives that reward conservation, prevent pollution, and encourage recycling.

Environment
We will protect our old-growth forests, preserve critical habitats, and provide a genuine "no net loss" policy on wetlands. [We will] reduce our dependence on toxic chemicals; conserve the critical resources of soil, water, and air; oppose new offshore oil drilling and mineral exploration and production in our nation's many environmentally critical areas, and address ocean pollution by reducing oil and toxic waste spills at sea. We believe America's youth can serve its country well through a civilian conservation corps. We will clean up environmental horrors at federal facilities, insist that private polluters clean up their toxic and hazardous wastes, and vigorously prosecute environmental criminals. We will oppose Republican efforts to gut the Clean Air Act in the guise of competitiveness. We will reduce the volume of solid waste and encourage the use of recycled materials while discouraging excess packaging. We will actively support energy-efficiency, recycling, and pollution prevention strategies. . . . The U.S. must become a leader in the fight against global warming. We should join our European allies in agreeing to limit carbon dioxide emissions to 1990 levels by the year 2000. The U.S. must be a world leader in finding replacements for CFCs and other ozone-depleting substances.

Housing
We support homeownership for working families and will honor that commitment through policies that encourage affordable mortgage credit. We must also confront homelessness by renovating, preserving, and expanding the stock of affordable low-income housing. We support tenant management and ownership, so public housing residents can manage their own affairs and acquire property worth protecting.

The Arts
We believe in public support for the arts, including a National Endowment for the Arts that is free from political manipulation and firmly rooted in the First Amendment's freedom of expression guarantee.

Republican Platform

Cities
The Republican platform discusses "safe homes and streets" but does not specifically address cities as a separate issue. However, it encourages the "passage of federal enterprise zones. . . . for promoting growth in urban and rural America." The platform further states, "We will develop greenways of parks and open space in urban areas to further improve quality of life in cities."

Energy
We support incentives to encourage domestic investment for onshore and Outer Continental Shelf oil and gas exploration and development. . . . We encourage the use of natural gas for vehicles and electricity generation, and we advocate expanded research and development of natural gas technologies. . . . We support clean-coal technologies within standards required by the Clean Air Act. The party encourages the international transfer of coal-related technologies to boost exports for U.S. coal. . . . We endorse development of renewable energy sources and research on fuel cells, conservation, hydro, solar, hydrogen, and wind power as components of an overall plan for energy security and environmental quality. . . . We advocate development of nuclear power plants.

Environment
Economic growth generates the capital to pay for environmental gains. Private ownership and economic freedom are the best security against environmental degradation. . . . With regard to wetlands, following our principle that environmental protection be reasonable, land that is not truly wet should not be classified as a wetland. Protection of environmentally sensitive wetlands must not come at the price of disparaging landowners' property rights. The President's leadership has doubled spending for real wetlands and targeted one million acres for a wetlands reserve through his Farm Bill of 1990. . . . The domestic oil and gas industry saves us from total dependence on unreliable foreign imports. . . . We will [allow] access, under environmental safeguards, to the coastal plain of the Arctic National Wildlife Refuge, and selected areas of the Outer Continental Shelf. . . . We have . . . begun phase-out of substances that harm the ozone layer and launched a long-term campaign to expand and improve national parks, forest, and recreation areas, adding 1.5 million acres. We request $1.4 billion for 1993 for research on global climate change. We will legislatively overhaul the Superfund program to speed the clean-up of hazardous wastes.

Housing
We support conversion of public housing into homes owned by low-income Americans. [We advocate] tax credits for first-time home buyers and penalty-free IRA withdrawals, as well as tax preferences for mortgage revenue bonds and low-income housing. [We support] deductions for losses on personal residences, elimination of the capital gains tax on sale of a principal residence, and the repeal of rent-control laws. [The party is committed to] the states' efforts to lower property taxes.

The Arts
No artist has an inherent right to claim taxpayer support for his or her private vision of art if that vision mocks the moral and spiritual basis [of] our society. . . . A free market in art—with neither suppression or favoritism by government—is the best way to foster the cultural revival our country needs. ■

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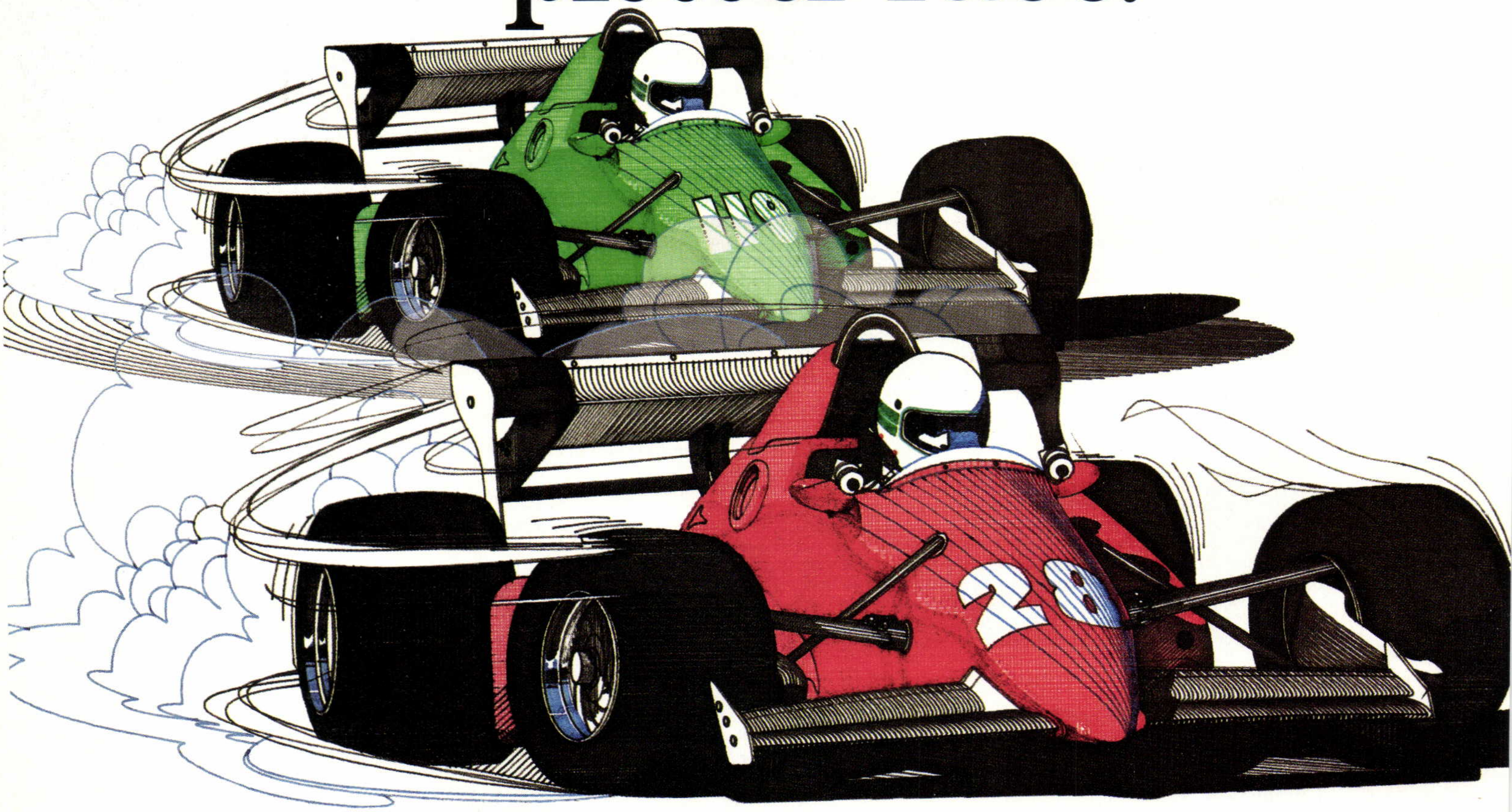

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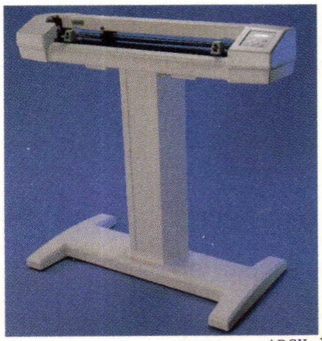

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ARCH 1092

Seattle Battle

Architects deserve to be provided with forthright coverage of issues, especially in ARCHITECTURE. But the August 1992 cover story (pages 56-65) just doesn't tell the unvarnished truth of the Seattle Art Museum. In fact, Venturi and Scott Brown's much-vaunted museum is really a third-rate design. Not only is the space planning poor, the circulation is pathetic. Esthetically, it is a building without grace, dignity, or comeliness. My native city deserved far, far better.

Jerry Gropp, AIA
Jerry Gropp Architect
Bellevue, Washington

I want to compliment your coverage of the new Seattle Art Museum by Venturi, Scott Brown and Associates. It's always enlightening to see coverage of a local project in the national media, but I would also like to add several comments for perspective.

Out-of-town writers always give themselves away by getting the names of well-known local landmarks wrong—it's the Pike Place Market, not the Pike's Place Market as your story says. Also, it would have been interesting if the article had delved into the psychology behind the museum's use of a Venturi napkin sketch as one of the most prominent displays in the museum, essentially putting it on par with the Ming Dynasty stone camels.

Finally, the article might have at least mentioned the loud public outcries and heavily publicized lawsuits about the project's alleged cost overruns. The general contractor has demanded compensation for change orders and damages equaling 50 percent of the project construction cost, and claims the building, as originally designed and detailed, was unbuildable.

J. Christopher Kirk, AIA
Dingfield Associates Limited
Seattle, Washington

Editor's note: We asked the Seattle Art Museum to explain this legal battle, but officials declined to comment due to the ongoing nature of the arbitration.

Forensic Inquiry

While reading "Wright Revamped," (August 1992, pages 34-41), my eye was caught by the credits given to the firms involved, especially the one mentioning "forensic engineers." Although I can deduce, with the help of a dictionary, how a forensic engineer might practice, could you in a future article address this specialty in more detail?

Dieter Thomas, AIA
Friel & Thomas
Redondo Beach, California

Editor's note: We explored building forensics in our May 1992 issue (page 100).

Concrete Compliance

I found "Concrete Block Prototypes" (July 1992, pages 98-101) interesting, but suspect the system as shown would not comply with the Uniform Building Code (UBC) requirements to resist stresses caused by seismic and wind forces if constructed in California.

UBC requires reinforcing bars be placed in both horizontal and vertical directions in walls and that they be "completely surrounded and bonded to masonry materials so they will work together as a homogeneous material." This is accomplished in concrete-block walls by placing horizontal bars in the bond-beam units and surrounding them with grout or mortar. It is difficult to understand how your featured system could achieve the advantages claimed for it.

Roland K. Kuehle
Roland K. Kuehle Architect
Walnut Creek, California

Editor's note: The prototypes developed by the National Concrete Masonry Association and outlined in the article can incorporate rebar to meet UBC requirements.

Corrections

Erik Marosi of LeMoyne Lapointe Magne in Montreal was a member of the McCord Museum design team (August 1992, pages 74-76). Len Allington photographed the Jackie Gleason Theater of the Performing Arts in Miami Beach (August 1992, page 87).

October 9-11: "The Future of the City," Young Architects Forum in San Francisco. Contact: Monica Williams, (202) 626-7445.

October 13: Submission deadline for the Boston Society of Architects' honor awards program. Contact: BSA, (617) 951-1433

October 15-17: "Cities Reclaim Their Edge," tenth annual Urban Waterfronts Conference in Washington, D.C. Contact: The Waterfront Center, (202) 337-0356.

October 15-17: Designer's Saturday at the International Design Center in New York. Contact: IDCNY, (718) 937-7474.

October 19-21: 1992 National AEC Expo at the Moscone Center in San Francisco. Contact: Susan Werlinich, (609) 987-9400.

October 19-30: "Architecture in the Public Realm," sponsored by AIA Central Arizona. Contact: AIACA, (602) 257-1924.

October 20-22: International Conference on Intelligent Buildings in Washington, D.C. Contact: Intelligent Buildings Institute Foundation, (202) 457-1988.

October 24-25: "Disaster Prevention, Response, & Recovery: Principles & Procedures for Protecting and Preserving Historic/Cultural Properties" in Cambridge. Contact: Susan E. Schur, (617) 227-8581.

October 28-30: Metalcon International 1992 at McCormick Place in Chicago. Contact: Claire Kilcoyne, (617) 965-0055.

October 30-31: Conference on the work of emerging Classical architects, in Alexandria, Virginia. Contact: Michael Lykoudis, (219) 239-6168.

October 31: Deadline for the 1992 Concrete Bridge Awards Competition, sponsored by the Portland Cement Association. Contact: Basile Rabbat, (708) 966-6200.

November 1: Deadline for submitting papers for presentation at the 14th International Making Cities Livable Conference. Contact: Susan Crowhurst, (408) 626-9080.

November 9-10: "Home/Work 92," a professional conference for interior designers, at the Merchandise Mart in Chicago. Contact: (800) 677-6278.

November 14: "Seismic Design for Georgia," Contact: Georgia Institute of Technology, (404) 894-2547.

IN JAPAN, ANDERSEN HELPS AN ARCHITE

"In designing this office building/ restaurant/showroom, we imported many Western ingredients," said architect Yuji Noga. "Andersen supplied us with the windows and engineering data. The wood interiors of their products worked well with the masonry structure."

And the engineering data? "Osaka city building codes are very strict," continued Noga. "Andersen Corporation's windloading and other performance data helped us install the three-story Andersen curtain walls securely and aesthetically."

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NEWS

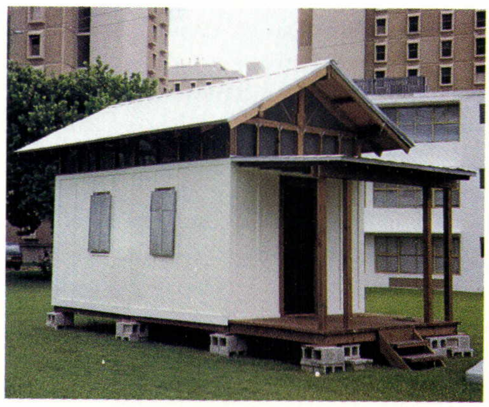
Czech Cubism • New York Plans • Chicago Developments • New American Green

Architects Steer Hurricane Recovery Efforts in Miami

SEVEN RECENT GRADUATES OF THE UNIVERSITY of Miami's school of architecture never thought that it would take a natural disaster to get their thesis project noticed. In the wake of Hurricane Andrew, while South Florida architects reexamine Dade County's building code and advise storm victims on reconstruction, these future architects are making news with a 10-by-16-foot wood-frame homeless shelter they designed and built last spring. Unlike the estimated 85,000 houses that buckled under the hurricane's 164-mile-per-hour winds, the shelter remained intact. Its durability inspired Joseph Minicozzi and Anthea Gianniotes, two of the structure's creators, to market the hut as emergency housing for storm victims, many of whom have refused to move to military-run tent cities. In the weeks since the hurricane, Minicozzi and a cast of supporters have appealed to the Federal Emergency Management Agency, AIA chapters, and architecture schools to donate materials or replicate the structures for use by Homestead and Florida City residents. The crew's hope is that after reconstruction such units will be adopted by the city as transitional housing for Miami's homeless population.

This shelter campaign is only one facet of Miami AIA's and the University of Miami's rebuilding effort, known as the Architecture Recovery Center. Since August 31, the center has referred the newly homeless to construction services through a hotline; launched longer-term planning and building code studies; undertaken projects aimed at restoring historic landmarks and gardens; and held public education forums to explain the rebuilding process. In addition to forming the Recovery Center, several Miami architects have been appointed to President Bush's We Will Rebuild task force.

In the weeks since the hurricane, experts have attributed building failures to shoddy construction and shortcuts, such as insufficiently secured hurricane straps and roofing tiles. Others point to lax codes and an understaffed inspection office during South Florida's 1980s building boom. Yet architects who conducted damage assessments immediately after the storm claim that they will not be able to determine exactly how structures failed until accurate wind-load data from the hurricane is available. Dade County's Board of Commissioners has already banned compressed strandboard sheathing and staples to secure roofing and siding materials. Coral Gables-based architect Edward Lewis, who is currently studying the South Florida building code, calls such changes a "Band-Aid approach" to weathering future natural disasters. The real issue is how architects can design building systems to prevent roof collapse and structural failure, Lewis asserts.



LANA PATRICIOS

Tin-roofed, balloon-framed homeless shelter (above) serves as emergency housing for migrant workers in southwestern Miami. Hurricane Andrew's casualties include a Dade County house (bottom left) that did not comply with code; SITE's 1979 Cutler Ridge Showroom (bottom center), now more fragmented than originally designed; and a prefabricated metal warehouse in Homestead (bottom right) that lost siding and insulation.

As some architects puzzle over how to develop new structural standards while keeping housing affordable, others are beginning to study the region's economic base and physical infrastructure with the hope of shaping better-designed neighborhoods. Among other initiatives, the We Will Rebuild task force will attempt to educate the public about how planning can improve communities.

While members of the profession may be convinced that Hurricane Andrew has ended the recession for local architects, Miami AIA President Robert Chisholm argues that it is difficult to predict what will happen over the next five years. "Right now, the key is for architects to take a higher profile in the community," he asserts. By increasing their visibility, Chisholm reasons, architects can take "serious, realistic, and pragmatic steps toward better planning, construction, and design."

—KAREN SALMON

For information on emergency homeless shelter, call (305) 284-5001. To volunteer services, call the American Institute of Architect's national headquarters: (202) 626-7437.

THOMAS E. LOW PHOTOS

DETAILS

Berlin has announced the results of a competition for two key sites on Potsdamer Platz: **Murphy/Jahn Architects** will design the Sony Corporation's European headquarters and **Renzo Piano** will design the Daimler-Benz headquarters. **Kohn Pedersen Fox** has been selected to design a resort hotel in Hainan, China, and is undertaking a master plan for downtown Philadelphia. Boston-based **Leers Weinzapfel Associates** has been commissioned to design a 95,000-square-foot district courthouse in Lawrence, Massachusetts. Philip Johnson's new firm, **Philip Johnson, Architect**, is currently designing a law school for the University of Houston, a chapel for the University of St. Thomas in Houston, an arts facility for Seton Hill College, a studio for his New Canaan, Connecticut, property, and an office building in Berlin. **Robert A.M. Stern** has been awarded two academic commissions: the Information Sciences Building at Stanford and a campus enhancement study for Georgetown University. Connecticut architect **Paul Bierman-Lytle** opened his own Manhattan store, Environmental Outfitters, which specializes in environmentally sound building products. The **Croxton Collaborative** of New York is designing the interiors of the 50,000-square-foot World Ace Country Club in Japan. Berkeley, California-based **ELS/Elbasani & Logan Architects** has been selected to design a theater for Holy Names College in Oakland. The team of **Lawrence W. Speck Associates** and **Page Southerland Page** of Austin, Texas, has been selected to design the 240,000-square-foot headquarters of Intermedics, a manufacturer of prosthetic limbs. New York State has commissioned **Hardy Holzman Pfeiffer Associates** to devise a renovation strategy for the New Amsterdam Theater, part of the 42nd Street redevelopment project (facing page). **Hugh Hardy** has been appointed to the 26-member National Council on the Arts, which oversees the National Endowment for the Arts. **William C. Miller**, former head of Kansas State University's architecture department, has been named dean of the Graduate School of Architecture at the University of Utah in Salt Lake City.

Czech Cubism in Philadelphia

HIDDEN FOR ALMOST 80 YEARS, A SCINTILlating offshoot in the history of Modern design regains the spotlight with the exhibition "Czech Cubism: Architecture and Design, 1910-1925." Displayed at Philadelphia's University of the Arts through December 4, the show chronicles how a group of young, avant-garde designers in Prague transferred the principles of Cubism from the canvases of Picasso and Braque to the three-dimensional forms of architecture, furniture, and the decorative arts. The movement's leading designers—virtual unknowns like Pavel Jának, Josef Gocár, and Josef Chochol—broke surfaces into faceted, crystalline shapes in order to embody Cubism's fragmentary perception of the world. Although these designers focused on issues of matter and spirit over construction and utility, their ethereal preoccupations nevertheless produced remarkable buildings, chairs, clocks, cabinets, and vases.

In 1911, progressive Czech architects, painters, sculptors, and theoreticians founded the Group of Plastic Artists. Three years later, they participated in an exhibition of the German Werkbund in Cologne, the first and, until now, the last big retrospective of their work outside Czechoslovakia. The new exhibition was organized by Prague's Museum of Decorative Arts and National Technical Museum, and Germany's Vitra Design Museum. The show's North American tour includes more than 100 sketches and objects and was organized by the Vitra Museum and the Canadian Centre for Architecture.

Like many Modern movements in the 20th century, Czech Cubism was less a butcher-knife break with the past than an attempt at radical rejuvenation. Furniture remained symmetrically composed, though reshaped into alien, angled forms. Designers produced elegant, aristocratic dressing tables and chaise longues of inlaid wood, leather, and gold leaf. Urbanistically, the group's architecture in Prague respected the city's Baroque and Gothic heritage. In fact, as the exhibition makes clear, Czech Cubists' romance with the triangle echoed the nation's indigenous gables as much as it alluded to the faceted forms of Cubist art.

Still, the thrust of Modernism, its urge to resonate with the spirit of the times, infuses Czech Cubism. In 1917, Pavel Jának, the movement's theoretician, proposed a memorial to the victims of war that rejected architecture's traditional emphasis on heavy, earthbound masses for a floating medley of beams, slabs, and half-arches. In the vein of Wright, Mies van der Rohe, and Oud, Jának dematerialized form to express the new architecture's airborne sensibility. "More beautiful than a real castle," he wrote in 1912, "is a castle made of wind."

—DONALD ALBRECHT

Donald Albrecht is a New York-based curator.

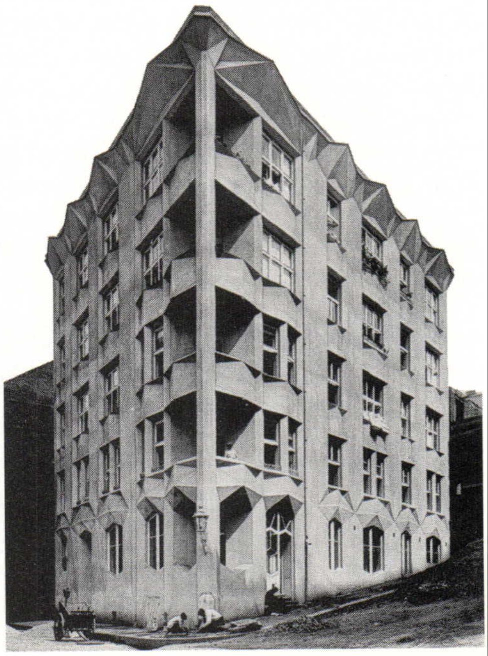
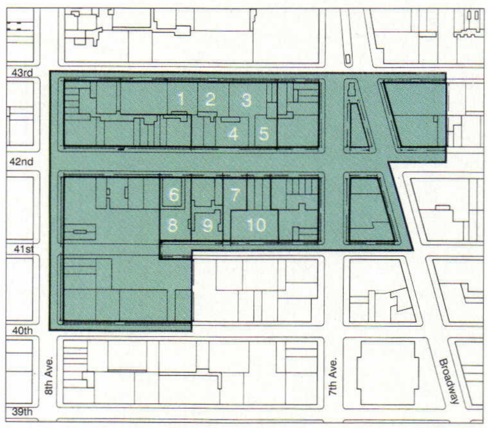


Exhibit includes photographs of a house designed by Pavel Jának (above) and an apartment building by Josef Chochol (right).

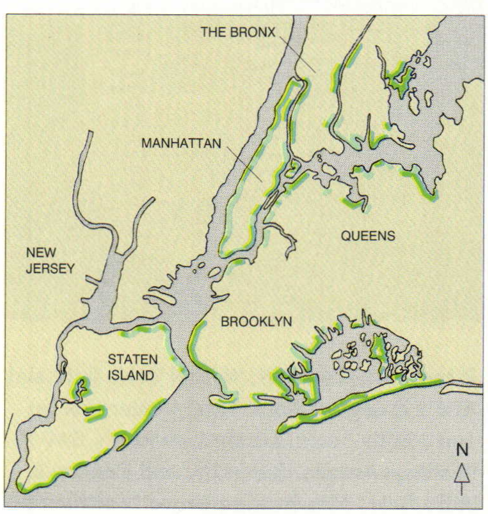
New Plans for New York

WOLFGANG HOYT PHOTOS

A team led by Robert Stern Architects will spur commercial activity (above) and revitalize 42nd Street's theaters (below). Waterfront plan (bottom) will create new parkland.



1 SELWYN THEATER
2 APOLLO THEATER
3 LYRIC THEATER
4 TIMES SQUARE THEATER
5 VICTORY THEATER
6 EMPIRE THEATER
7 CANDLER BUILDING
8 LIBERTY THEATER
9 HARRIS THEATER
10 NEW AMSTERDAM THEATER



PUBLIC WATERFRONT: EXISTING PROPOSED

IN THE BOOM YEARS of the 1980s, New York City developers paid little heed to city planners and civic organizations. But two city-backed strategies unveiled recently—an alternative to the gargantuan Times Square Center and a Comprehensive Waterfront Plan—indicate that developers will be taking a more integrated approach to planning new projects, especially in terms of building scale and community cooperation.

The new waterfront plan offers both a "major change in zoning tools" and a "long-term vision" for New York City's 578 miles of waterfront, according to Director of City Planning Richard Schaffer. The plan proposes to rezone some 60 sites to encourage development of between 50,000 and 75,000 new apartment units, with new mandates creating visual and pedestrian access to the water. The plan also preserves the 30 percent of coastal areas already under protection as wetlands, and it creates an "emerald necklace" of park land around Manhattan, with assorted jewels scattered among the other four boroughs.

The proposed rezoning will jump-start manufacturing and encourage the rebuilding of transportation links crucial to any resurgent waterfront industry. The plan has been praised by politicians, community organizers, and architects for seeking consensus without sinking to the lowest common denominator. But citizens' groups and developers alike will no doubt find plenty of soft spots in the report at public hearings that begin this month, particularly in areas where adoption of the plan ignores or counters community wishes. As for cost, city planners hope to proceed piecemeal over the long haul, which Schaffer describes as 20 to 30 years.

If the waterfront is Manhattan's necklace, then a renascent Times Square could be its rhinestone clasp—or the knot in its noose. With all but two of its marquees dark, 42nd Street between Broadway and Eighth Avenue awaits reworking by its newly appointed design team, led by Robert A.M. Stern Architects, with associate architects Haverson/Rockwell, lighting designers Jules Fisher and Paul Marantz, and the graphic design firm of M & Co. The previous plan, called Times Square Center, envisioned 4.1 million square feet of office space in four giant towers designed by Philip Johnson and John Burgee, located at the heart of the district. It has been placed on indefinite hold through an agreement among New York City, New York State Urban Development Corporation (UDC) and the developers, Park Tower Realty and Prudential Insurance.

In 1988, Stern prepared a study for the developers and the UDC on building conditions at five theaters on the strip, which has "the largest cluster of theaters on any two blocks in the world," according to the architect. He adds that the 11-year struggle by developers to evict tenants and clear the street of sleaze has created "a street that even the vitality of vice has disappeared from."

So what does Stern plan to do about it? Noting that "everyone has a different idea of what 42nd Street once was," the architect says he will "try not to plan, but to design and orchestrate" the block fronts, playing both producer and director. The immediate task is to address the Times Square Center towers at the eastern edge of the site, where the developers have agreed to finance "interim" buildings that will generate income until the office market opens up.

Stern and his team will seek a mix of restaurants and retail for those sites as well as several empty sites along 42nd Street. One pitfall the team will try to avoid is showcasing national retail chains in favor of individual entrepreneurs, who will be more at home in 42nd Street's 18-hour shopping environment, according to Stern. The design team is being pressed by UDC and the developers to come up with a proposal by January 1993.

—PETER SLATIN

Peter Slatin is a New York-based writer.

Chicago Development Moves Out of the Loop

CHICAGO'S BROAD SHOULDERS ARE SLUMPING. After the biggest building boom in the city's history, there isn't a single construction crane on the downtown skyline. Despite the apparent lack of activity, however, significant undercurrents are reshaping America's architectural capital.

Construction is winding up on the last stores and office towers conceived in the 1980s. Mayor Richard Daley is gambling that he can bring casinos to the shores of Lake Michigan. And the suburbs ringing the city are flexing their newfound economic clout, especially after Chicago-based Sears, Roebuck & Company relocated thousands of its employees to a new suburban complex called Prairie Stone.

Little, if any, of the new architecture appears likely to measure up to the considerable legacy of Sullivan, Wright, and Mies. Indeed, less than a year before the American Institute of Architects convenes in Chicago during the centennial of the World's Columbian Exposition, the building bust has engendered pervasive gloom, especially in a freewheeling city where the real height limit is determined by the Federal Aviation Administration, not planners at city hall. Whole blocks of the Loop cleared for new towers sit empty, including Block 37, for which the 1872 McCarthy Building was stripped of city landmark status and destroyed to make way for a still unbuilt office-retail complex. The recession has temporarily done in Cesar Pelli's needlelike, 125-story tower, which was to have supplanted the 110-story Sears Tower in the "world's tallest" derby. The drought has also banished Helmut Jahn, Adrian Smith of Skidmore Owings and Merrill, and the rest of the sky kings of the 1980s to foreign shores in search of megaprojects to keep their shrunken practices alive. If it weren't for these overseas jobs, says one top designer, "we'd all be driving taxis."

Yet in some quarters, there is relief, mingled with the sense that it was high time for a pause in the high-rise orgy. Despite the brilliant achievement of Kohn Pedersen Fox's curving 333 West Wacker Drive and SOM's superbly crafted AT&T tower, much of the output of the Postmodern 1980s was downright mediocre. From KPF's overwrought 311 South Wacker Drive to Loebl Schlossman & Hackl's under-detailed Two Prudential Plaza (an unabashed knock-off of Jahn), the skyline is now studded with work that makes one yearn for the structural bravura of the John Hancock Center. New structures that represent the last gasps of the construction binge—including Ricardo Bofill's pallid 77 W. Wacker Drive, KPF's hyperactive Chicago Title & Trust Center, and Lucien Lagrange & Associates' historicist 840 N. Michigan Avenue—offer little evidence that the boom will go out with an esthetic bang.

If outsiders moved in during the 1980s to snap up major commissions that once went exclusively to Chicago firms, the 1990s are shaping up as a time to focus on smaller, socially relevant projects while the public sector and cash-rich companies hire a select few firms to carry out megajobs. Among the small jobs: nine moderately priced townhouses designed by a variety of architects for Chicago's first "Parade of Homes," held in a gentrifying South Side black neighborhood called the Gap. Among the megajobs: the ongoing $150 million restoration of Navy Pier by Benjamin Thompson & Associates (ARCHITECTURE, March 1992) and a $2 bil-

Ricardo Bofill's 77 W. Wacker Drive (left) and KPF's Chicago Title & Trust Center (above) end 1980s boom. Lucien Lagrange's 840 N. Michigan Avenue. (top right) and Perkins & Will's Sears Merchandise Group headquarters (bottom right) symbolize decentralization.

lion casino complex for downtown Chicago proposed by three casino companies and embraced by Mayor Daley. If the gambling complex is ever built, it won't be learning from Las Vegas. The politically astute SOM, selected as concept planner for the job, is promising an urbane blend of Chicago-style buildings, rather than a Venturi, Scott Brown-inspired commercial strip.

For preservationists, the news from Chicago is mixed. The Loop's unparalleled assemblage of 19th-century skyscrapers emerged without major structural damage after an underground flood in April threatened their shallow foundations. Booth/Hansen & Associates is restoring the main entrance of Adler & Sullivan's Auditorium Theater. But Burnham and Root's century-old Reliance Building remains encrusted with dirt, some of its Chicago-style windows boarded up, after a plan to sell it to New York-based AFS Intercultural Programs fell through. The city recently solicited proposals from developer teams to restore the desolate building, which currently houses just a handful of tenants.

None of the Loop's woes can be understood without recognizing the decentralization that is reshaping the Chicago region. From the parade of hulking mixed-use projects on North Michigan Avenue, which now rivals the Loop as a second downtown, to the exodus of stores and offices to so-called edge cities like Oak Brook, the move is definitely away from the center.

The most dramatic addition to North Michigan, the 68,000-square-foot Nike Town, is at once a crowd-pleasing tourist destination and the latest symbol of how the once-graceful boulevard has degenerated into a semblance of a suburban shopping mall. Part museum, part theater, part athletic supply store, Nike Town occupies one third of a former Saks Fifth Avenue store, reshaped by Gordon Thompson, Nike's director of design. The revamped exterior of the Saks building has been marred by aluminum reliefs, jazzy signage, and fabric banners. This attention-getting, "Just Do It" architecture shows little respect for its urban context.

If North Michigan Avenue represents the suburbanization of the city, then new office complexes like the Sears Merchandise Group headquarters by Perkins & Will, located in the suburb of Hoffman Estates, symbolize the urbanization of suburbia. Eventually to be populated by 5,000 employees who once worked in Sears Tower, the new Sears group headquarters is a potent symbol of the vast sprawl that has transformed Chicago from the classic American metropolis to a weakened giant—one of several economic centers in a region it once dominated. Today, the broad shoulders of economic growth reside in Chicago's sprawling suburbs, which now boast more than 60 percent of the jobs in the metropolitan area, up from the 45 percent of 20 years ago. Even when prosperity returns, the fabled Metropolis of the Midway will never be the same.

—BLAIR KAMIN

Blair Kamin writes for the Chicago Tribune.

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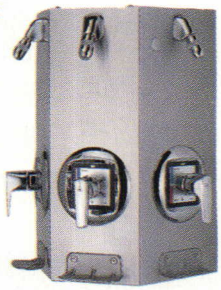

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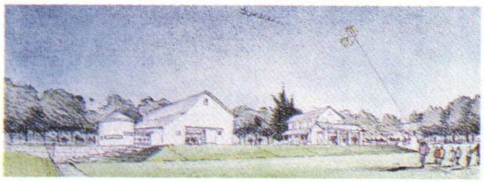
Weiss/Manfredi Wins Illinois Competition

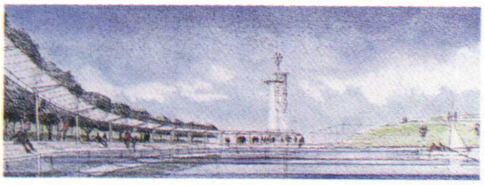
WEISS/MANFREDI ARCHITECTS OF NEW YORK CITY WAS SELECTED through a national competition, held this spring, to design a 20-acre public park for Olympia Fields, Illinois, a commuter town 40 miles south of Chicago. According to Mary Colmar, director of the park district that sponsored the competition for a "New American Green," the community of 4,200 sought an innovative public gathering place for a site on the township's southeast corner, now occupied by a recreation area and a nursery.

Marion Weiss and Michael Manfredi complied with this request by designing a scheme that steers clear of European precedents, relying instead upon big, simple geometries that are characteristic of the Midwestern landscape. Invoking the region's rural heritage, the architects linked an existing baseball diamond, tennis courts, and playground on the western edge of the site with an 1890 homestead to the east through a series of stepped meadows and walkways that emulate irrigation channels. The meadows are set below grade and lined with trees along their northern and southern edges to obscure street views and create an amphitheater effect. The main pedestrian path on the park's northern edge, which is lined with new pavilions housing antiquated farm equipment, connects a new pond with the homestead. Two barns and a farmhouse at the park's eastern entrance will be converted to community meeting rooms, a concession area, and offices for the parks department, while providing a backdrop for outdoor concerts and events.

Colmar served on the jury with Ralph Johnson of Perkins & Will; M. Brigid Sullivan, head of the Milwaukee parks system; Grady Clay, author and urban design critic; and Donald Ransford, president of the Olympia Fields Park District Board. Construction of the new park is expected to begin in 1994. ■

—KAREN SALMON





Bird's-eye view of Weiss/Manfredi's winning scheme for a New American Green reveals stepped prairie meadows, pathways, and spaces for recreational activities such as tennis and baseball. A pedestrian "channel" connects new tower with existing farm buildings (center), which house community rooms. Pergola (left) bordering new pond leads to park's northern entrance.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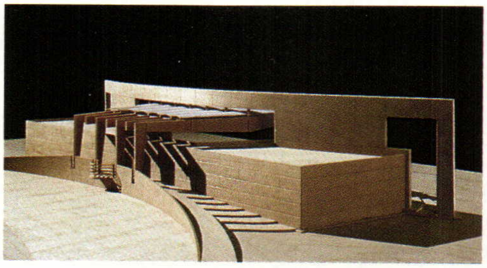
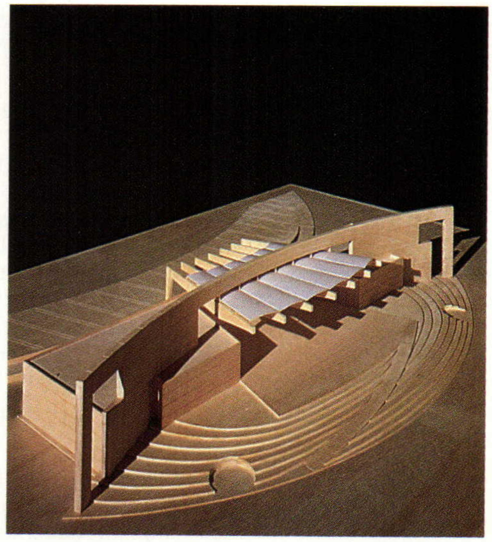
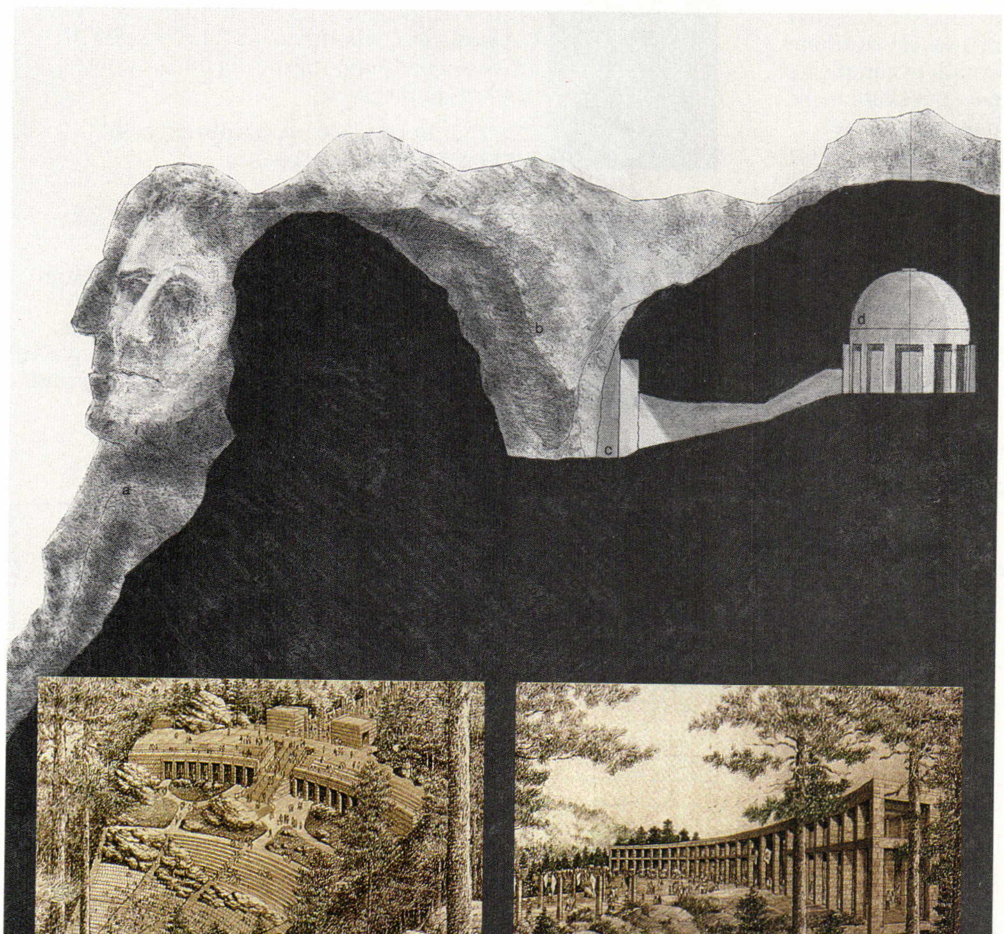
Park Structures

Warner Park Stage Pavilion
Woodland Hills, California
Jeffrey M. Kalban & Associates

FOR A PUBLIC PARK ON A CITY BLOCK IN THE burgeoning Woodland Hills business district 15 miles west of downtown Los Angeles, local architect Jeffrey Kalban & Associates designed an outdoor theater for free evening concerts and children's performances. Located on the park's northern edge, the pavilion will comprise two performance areas separated by a curved, stucco-clad wall. Kalban designed the 30-foot-high wall as a continuation of the circular lawn seating area and to mask two adjacent flat-roofed structures housing dressing rooms, storage space, and public amenities. He provided openings in the wall at its center and both edges to allow views of Warner Park beyond. To the south of the wall, the architect extended a translucent vinyl canopy supported by suspended steel beams over the 4-foot-high main stage (right). A secondary stage to the north, flanked by four tapered steel columns (above), will address a concrete plaza and is intended for lunchtime events. Construction of the $1 million project will be completed in February 1993. —K.S.





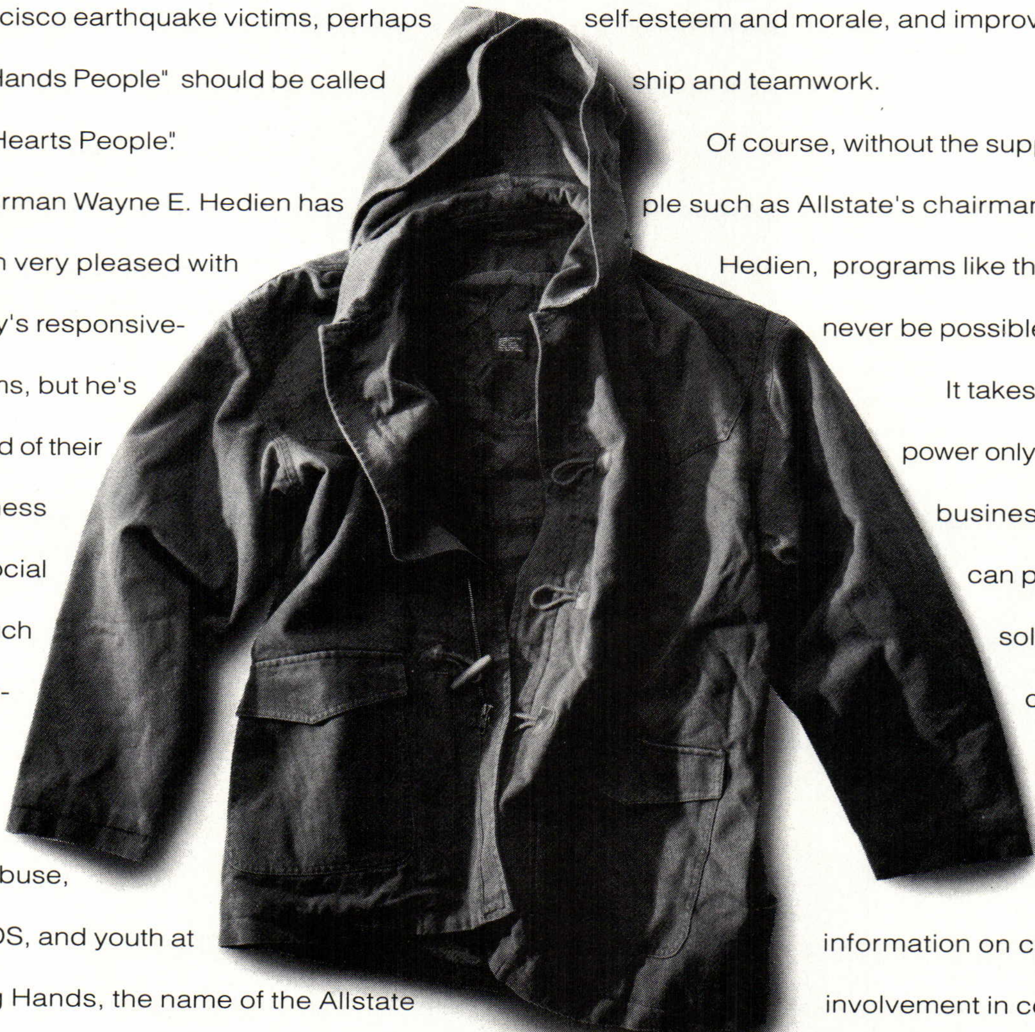


Mount Rushmore National Memorial
Keystone, South Dakota
Anderson Mason Dale, Architects

To accommodate an increase in visitors at Mount Rushmore, the National Park Service commissioned Denver-based Anderson Mason Dale to develop a long-term master plan for the park and design new visitors' facilities and administrative structures. The architects proposed a series of stepped terraces (left) with symmetrical buildings housing exhibition spaces, concessions, and support functions. The paired structures are intended to frame a strong processional approach with views to the mountain's stone carvings of George Washington, Thomas Jefferson, Abraham Lincoln, and Theodore Roosevelt. To reduce the structures' apparent mass, the architects set the stone buildings into the hillside behind a grand colonnade (right inset). In addition to these buildings, Anderson Mason Dale suggested an archival Hall of Records chamber carved within the mountain (left). Set at the terminus of an existing tunnel, the chamber would comprise a domed rotunda surrounded by rectangular niches with removable blocks to hold presidential documentation, beginning with that of the Bush Administration. Park buildings will begin construction later this year; the Hall of Records awaits federal approval. —L.N.

On October 17th, 1989, Allstate Insurance gave away free coverage to thousands.

In light of employee efforts to collect and distribute clothing, canned food, and bottled water for San Francisco earthquake victims, perhaps "The Good Hands People" should be called "The Good Hearts People".



Chairman Wayne E. Hedien has always been very pleased with his company's responsiveness to claims, but he's equally proud of their responsiveness to serious social problems, such as homelessness, teen pregnancy, substance abuse, illiteracy, AIDS, and youth at risk. Helping Hands, the name of the Allstate employee volunteer program, works by matching the talents of employee volunteers with the specific needs of the community.

It's this kind of corporate activism the Points of Light Foundation would like to promote. The Foundation is a non-profit, non-partisan organization founded in 1990 to encourage community service. Like Allstate Insurance, we are committed to solving social problems on a local level — with innovative solutions.

And although employees often give time to these social programs during business hours, companies have reported only positive effects on their businesses, such as enhanced employee self-esteem and morale, and improved leadership and teamwork.

Of course, without the support of people such as Allstate's chairman Wayne E. Hedien, programs like these would never be possible.

It takes the kind of power only our nation's business leaders can provide to solve serious community problems.

For more in-depth information on corporate involvement in community service, contact the Points of Light Foundation at 1-800-888-7700.

But please call soon. Because the involvement of businesses like yours could be the only insurance we have for a better America.

POINTS OF LIGHT FOUNDATION

Ad Council

AIA Inaugurates Interior Architecture Awards

AIA UPDATE AT ITS CONVENTION IN JUNE, the AIA unveiled its first design honors for interior architecture. The jury, comprising Patricia Conway, dean of the University of Pennsylvania's Graduate School of Fine Arts; color consultant Tina Beebe; and architects Thom Mayne, Paul Florian, and Charles Gwathmey, recognized boldly designed interiors and sensitive renovations. They admired the cool serenity of Steven Holl's corporate spaces and the stark complexity of two offices by Eric Owen Moss. A minimal loft by Tod Williams, Billie Tsien and Associates and Ellerbe Becket's Deloitte & Touche offices were cited for their powerful use of materials. The jury lauded two subtler projects: the renovation of Houston's Museum of Fine Arts and the restoration of Detroit's symphony hall. Tigerman McCurry earned praise for turning an American Standard showroom into a provocative, futuristic setting. ■

TOM BONNER

8522 National
Culver City, California
Eric Owen Moss Architects

TOM BONNER

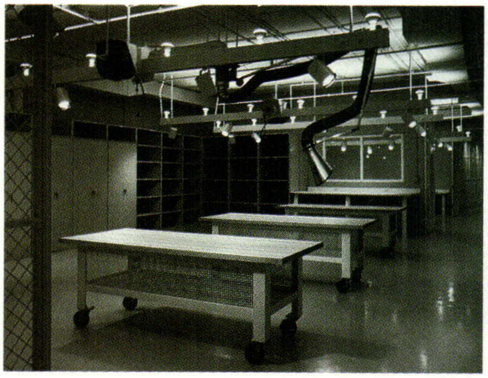
Gary Group
Culver City, California
Eric Owen Moss Architects

D.E. Shaw & Company Office and Trading Area
New York City
Steven Holl Architects

Deloitte & Touche Headquarters
Wilton, Connecticut
Ellerbe Becket, Architect

TIMOTHY HURSLEY

American Standard Showplace
Long Island City, New York
Tigerman McCurry, Architect



Museum of Fine Arts Lobby/Art Storage
Houston, Texas
Pope Sherman Architects

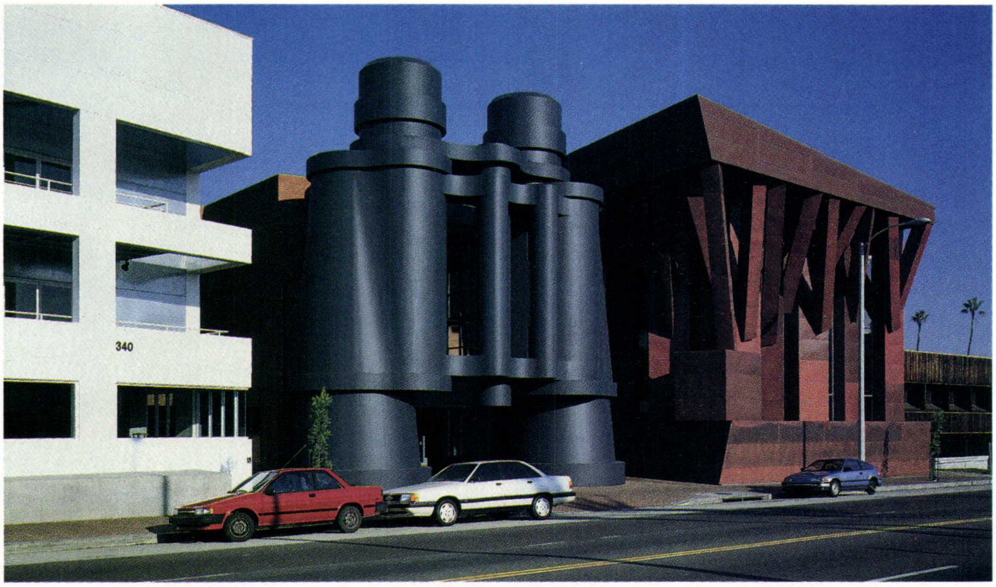
Detroit Symphony Orchestra Hall
Detroit, Michigan
Richard C. Frank and Diehl & Diehl Architects

PETER PAIGE

Living/Working Loft
New York City
Tod Williams, Billie Tsien and Associates, Architects

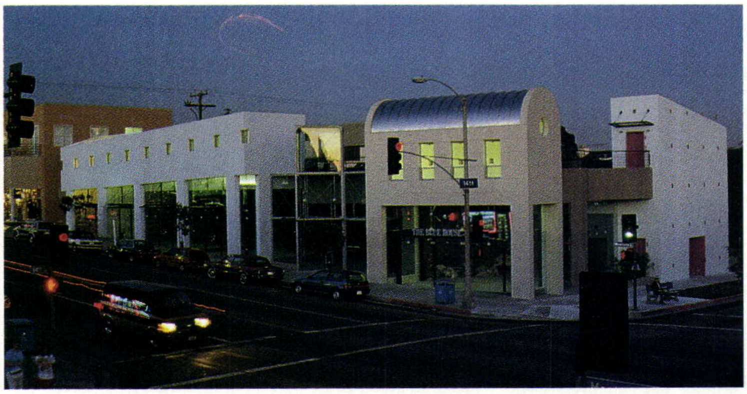
California Council Honors Angelino Diversity

FROM 300 ENTRIES, SEASONED JURORS MICHAEL Graves, Hugh Newell Jacobsen, and Terry Sargent selected eight Southern California projects to receive this year's California Council AIA's annual design awards. The broad array of structures represents the acontextual nature of Los Angeles, a city where, according to Jacobsen, "every building is on its own." He explained that the jury steered clear of projects displaying token Deconstructivism, and instead awarded submissions that demonstrate a solid plan and a clean esthetic. The Salick Health Care Corporate Headquarters by Morphosis Architects, for example, was honored as "the best of the shrapnel school . . . a Deconstructivist building that is not sculpture." The jurors also lauded Frank Gehry's tightly controlled advertising agency headquarters, complete with Claes Oldenburg binoculars, near Venice Beach. They cited Buzz Yudell's house in the Malibu hills for its vernacular sensibilities and site plan, and applauded the steel-panel-clad headquarters of the Los Angeles Department of Water & Power as an honest expression of a large utility company. A public parking structure and two corner-sited retail complexes, the Montana Collection and 460 North Cañon Drive, were praised for animating the streetscape. The jury also honored the $8 million restoration of Hollywood's flamboyant 1926 El Capitan Theatre,a preservation project by Fields & Devereaux Architects.

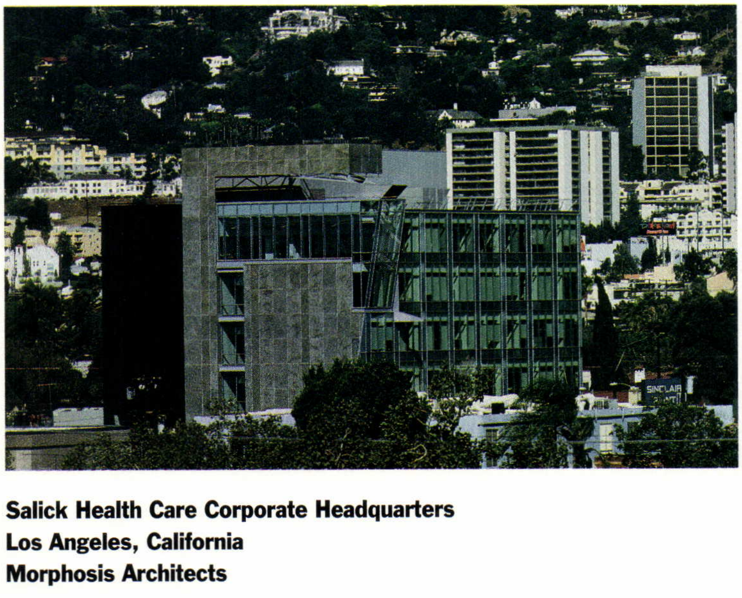


GRANT MUDFORD

Chiat/Day/Mojo Building
Venice, California
Frank O. Gehry & Associates, Architect



Montana Collection
Santa Monica, California
Kanner Architects

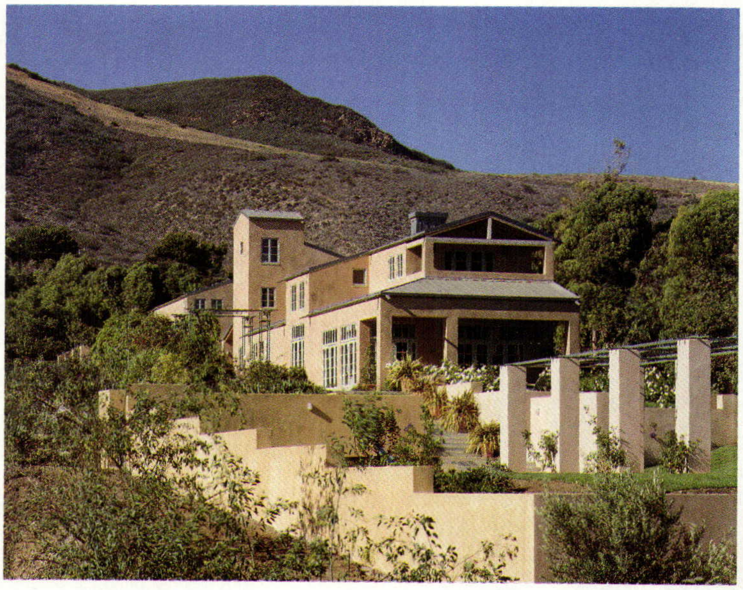


TOM BONNER

Salick Health Care Corporate Headquarters
Los Angeles, California
Morphosis Architects

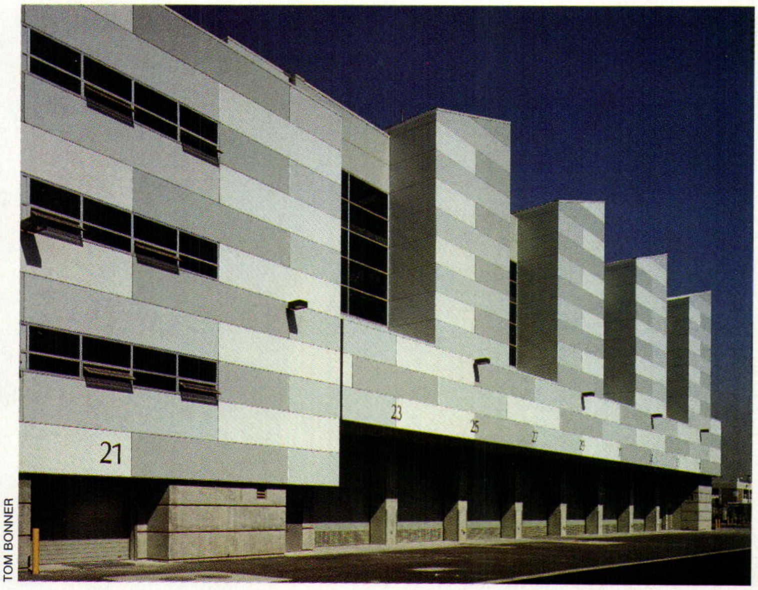
DAVID GLOMB

460 North Cañon Drive
Beverly Hills, California
Rockefeller/Hricak Architects



TIMOTHY HURSLEY

Yudell/Beebe House
Malibu, California
Buzz Yudell, Architect



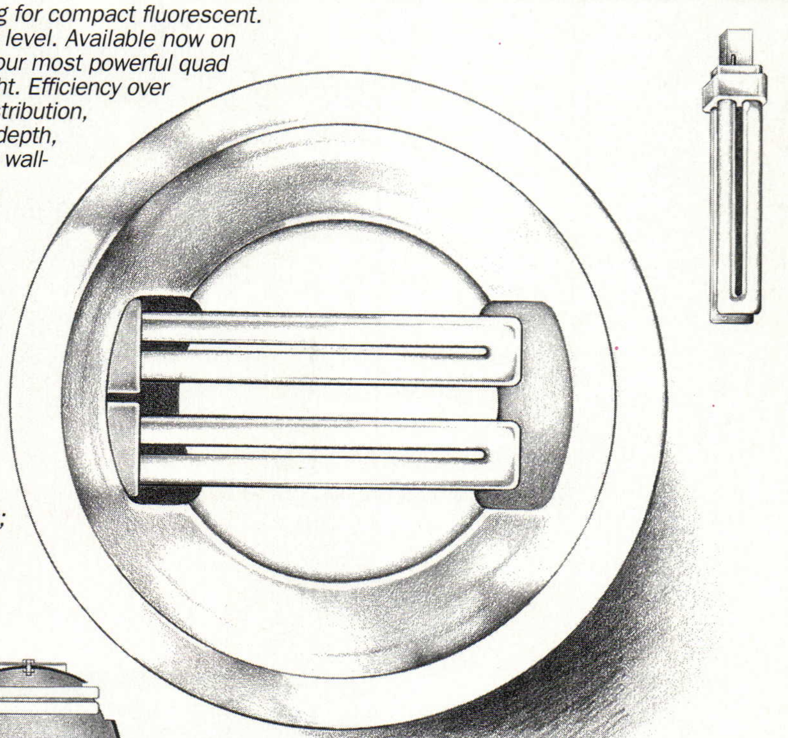
TOM BONNER

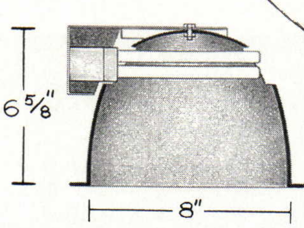
Department of Water & Power Central District Headquarters
Los Angeles, California
Clements & Clements, Benito A. Sinclair & Associates, and
Barton Phelps & Associates, Architects

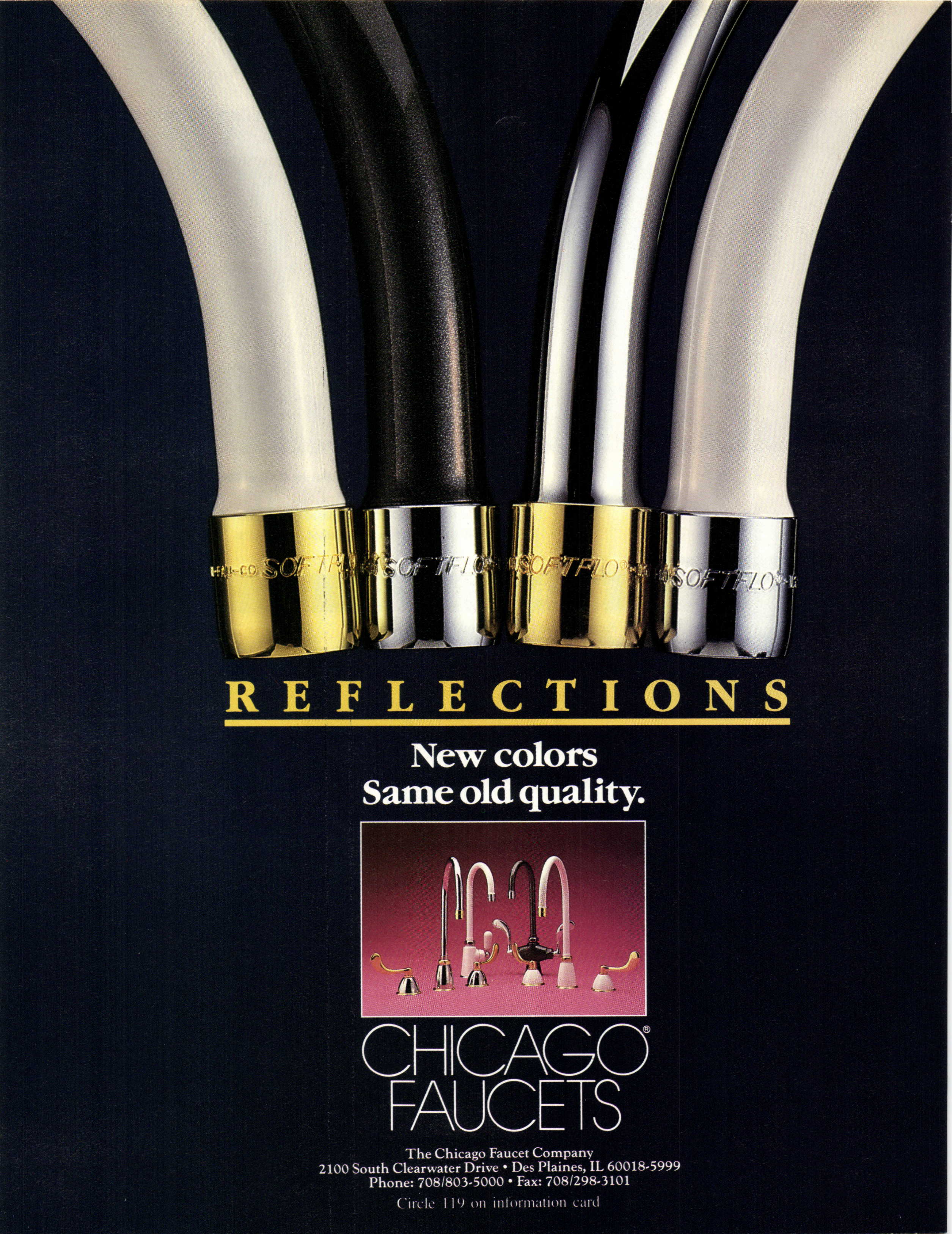
Civic Center Library Parking Structure
Santa Ana, California
IBI Group and L. Paul Zajfen, Architects

MICHAEL ARDEN

El Capitan Theatre
Hollywood, California
Fields & Devereaux Architects



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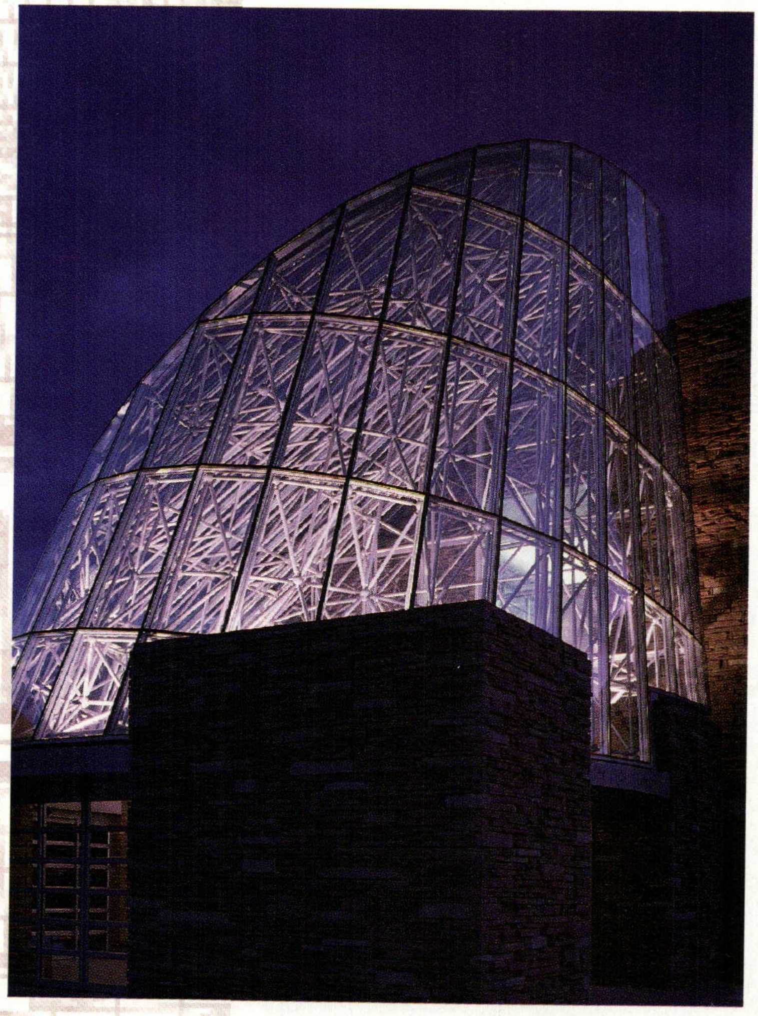
Structure & Light

LOUIS KAHN'S DICTUM, "STRUCTURE IS THE giver of light," expresses the theme of this issue, which explores the interplay of these essential ingredients of architecture. We begin with the Boulder Public Library, designed by local architects Midyette/Seieroe/Hartronft to integrate structural systems with lighting strategies, creating a glass-clad entrance pavilion (below) and stepped clerestories to brighten reading rooms. In the Pacific Northwest, where natural light is a premium, Miller/Hull Partnership assembled customized steel I-beams and trusses to screen a cafeteria's large expanses of glass, while still admitting precious daylight. In sunny Austin, Texas, Lawrence W. Speck successfully integrated vernacular and Australian-style porches to mitigate the heat of sunlight, reducing cooling loads in an unusually energy-efficient, site-sensitive convention center.

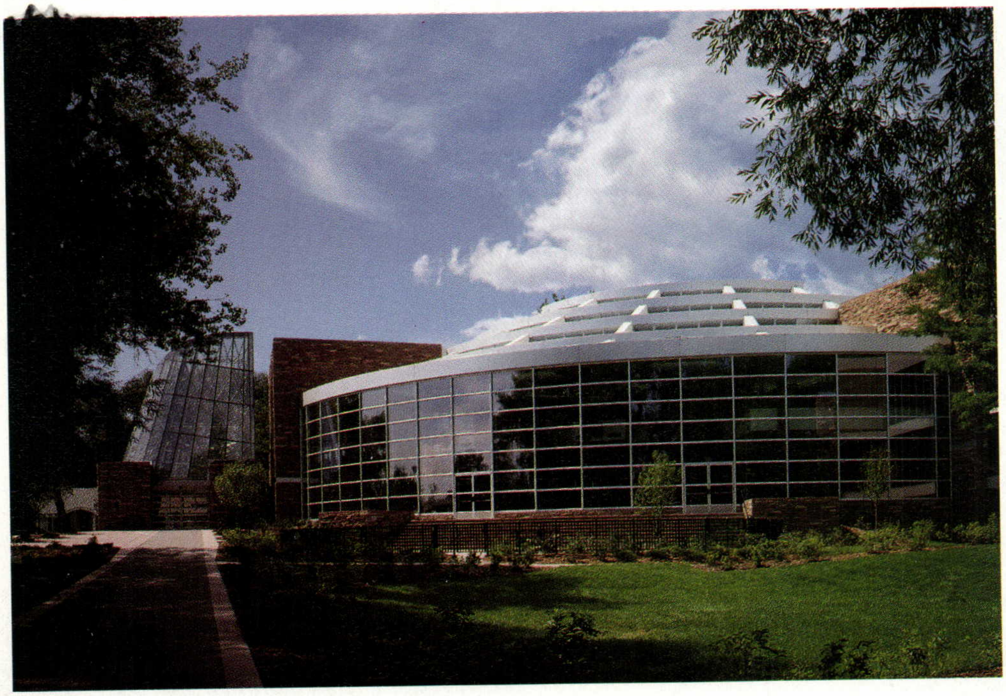
Structural systems that impart a strong identity, such as Hammel Green and Abrahamson's amphitheater at the Minnesota Zoo, are also featured. Designed to shelter a popular show featuring birds of prey, the outdoor theater's translucent fiberglass canopies appropriately allude to a bird in flight. We further emphasize the integration of architecture and engineering by featuring Bartholomew Associates' Auburn Transmitter building near Raleigh, North Carolina, which successfully incorporates the steel components of a 2,000-foot-high TV and radio transmission tower into a prototypical building.

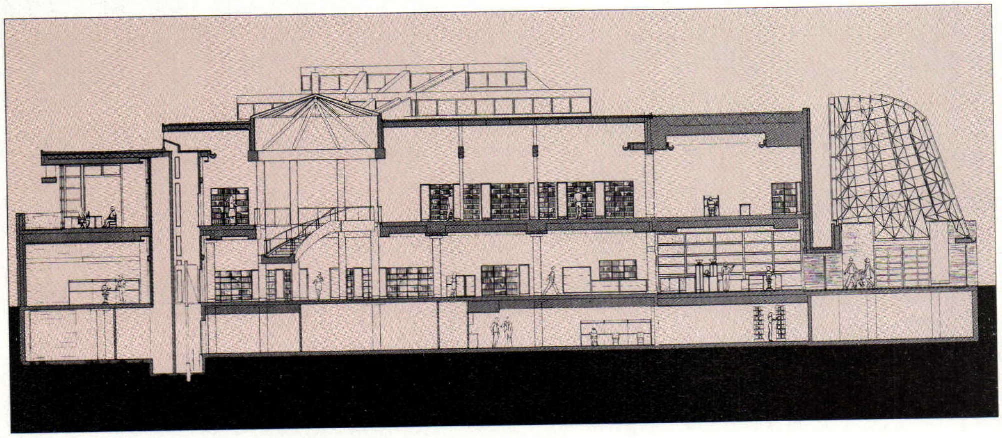
In addition to glass and metal, we also examine the structural possibilities of stone and concrete. For an abbey near Dallas, local architect Gary Cunningham designed an old-fashioned, loadbearing stone church with a timber roof that appears to float above its rough-hewn limestone walls. Outside Fort Worth, Eugene Aubry capitalized on the verticality of an airport control tower, designing a 158-foot-tall, limestone-clad concrete shaft and Teflon-paneled cone that creates a powerful, minimalist symbol.

Addressing the more technical aspects of integrating structure and light, our technology section examines the way building form encourages daylighting in an airport, a community healthcare center, and a solar energy research facility. And a technology portfolio on concrete further explores that material's structural challenges and technical innovations: the benefits of lightweight, autoclaved concrete; the subtleties of admixtures; and the precision of poured-in-place designs.



Boulder Public Library entrance pavilion
Midyette/Seieroe/Hartronft, Architects





SOUTH-NORTH SECTION

tial neighborhoods. Anchoring the aluminum and glass upper story in a richly textured base of rough, rose- and buff-colored Colorado sandstone with deep mortar joints, they echoed nearby civic buildings and imbued the library with a weighty presence that matches its public role. On the side that faces a residential neigh-borhood, Midyette/Seieroe/Hartronft achieved a low, horizontal composition that is in tune with the domestic scale.

With the 1961 and 1974 wings of the existing library undergoing renovation, the addition had to establish its own entrance. To address patrons arriving via footbridge across Boulder Creek to the north, from a new parking lot to the east, and from a residential area to the south, the architects created an omnidirectional entrance pavilion, surmounted by a transparent, severed cone constructed of a space frame enclosed by a shroud of glass. This bold conical form mimics Boulder's five Flatirons, bare rock outcroppings visible in the distance, earning it the nickname "the Sixth Flatiron." Its flat glass panels in aluminum frames are bolted to a space frame of tubular struts anchored to stone pylons, giving the cone a faceted quality. The space frame's 838 struts and 242 spherical hubs are custom-made and the structure was prefabricated, delivered, and assembled in three days.

The 53,585-square-foot, two-story addition expands the existing, undistinguished concrete library by 140 percent, but only increases energy consumption by 40 percent. Analyzing the existing library's energy use, Midyette/Seieroe/Hartronft discovered that electric lighting made up 54.6 percent of annual energy expenses, while cooling accounted for 15.5 percent. These two loads are linked, since cooling must offset lamp-generated heat.

By carefully increasing daylighting to substancially reduce the need for electric lighting, the architects found they could avoid mammoth energy costs. Instead of relying primarily on energy-consuming skylights, the architects designed the addition to admit daylight through vertical glazing, much of it oriented toward the northeast. Skylights, as the architects point out, tend to overlight during the summer—increasing cooling requirements—and underlight during the winter, increasing the need for electricity.

Native sandstone (top left and facing page) anchors aluminum and glass curtain wall (left center). Reference and children's areas on first floor lead to spiral stair (section, left, and plans, facing page). Glass-clad space frame (preceding pages) crowns entrance.

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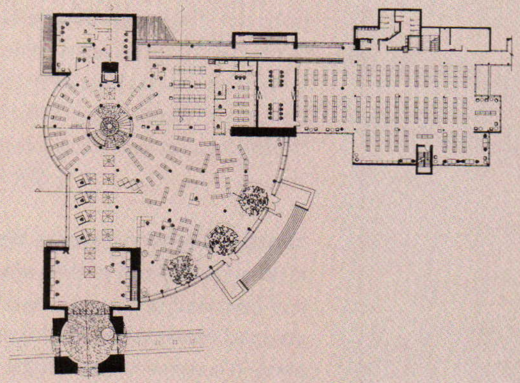
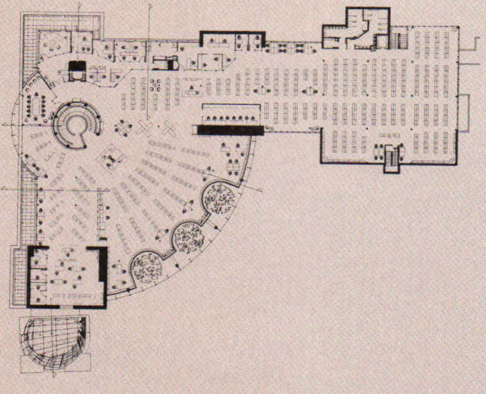


FIRST FLOOR



SECOND FLOOR

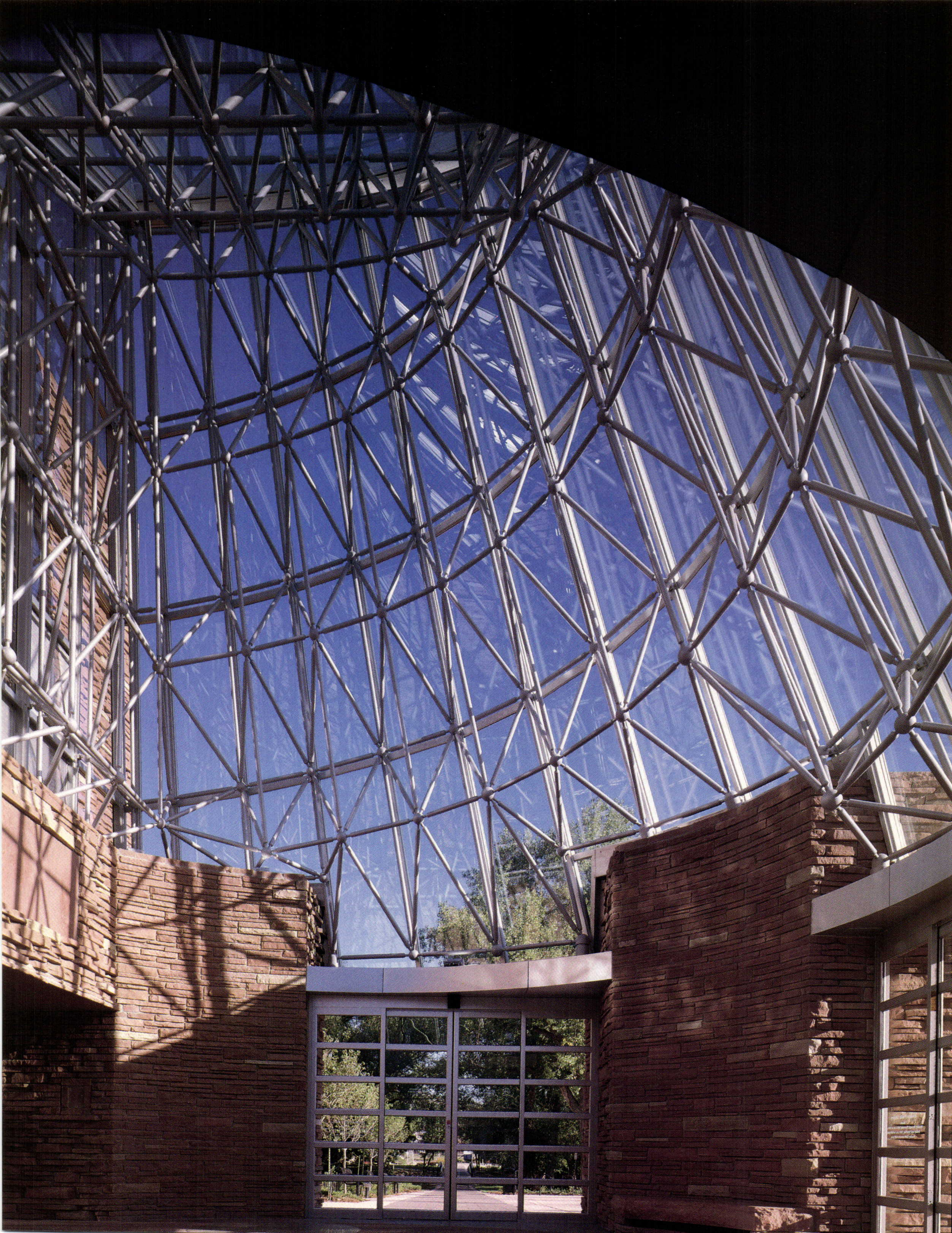
The even, indirect lighting that infuses the new library is achieved through a series of light trays incorporated into stepped, curved clerestories over the main reading room on the second floor. The clerestories are built into sloped, 95-foot-long welded steel pipe trusses that span from poured-in-place concrete columns surrounding the circular stair to rows of columns at the building's periphery, allowing for a virtually column-free interior. The stepped clerestory trays overlap so that sunlight reflects off the exterior white roof membrane and onto the acoustical tile ceiling inside the library, then down into the interior of the reading room. Bouncing the light twice reduces its intensity and blends it with light admitted through vertical glass walls. In conjunction with deep overhangs, the trays extend to the south just far enough to bar direct sunlight during the summer, allowing intermittent direct light during the winter, when the sun is lower in the sky.

Direct sunlight is admitted only through the glass cone and skylights over the circular staircase and north perimeter. Midyette compares the mixture of varied daylight in the library to a sense of the outdoors, where one might pass from bright daylight to the shade of a tree to reflected sunlight. The modulated, indirect quality of natural light is replicated at night with artificial light, which shines from fixtures beneath each tray and reflects off the stepped ceiling. Respectful of Boulder's ecominded citizens, the architects selected materials for their "green" attributes. They specified nonoxidizing roof materials to prevent toxic runoff into Boulder Creek, filtered rainwater from the parking lot through a system of catch basins to divert hydrocarbons away from the creek, and installed an evaporative cooling system that utilizes no ozone-depleting chlorofluorocarbons.

Sensitive siting, a contextual profile, and energy-saving systems make Boulder's new library a prototype space for public buildings. Its naturally illuminated interior, a departure from the library stereotype of dark inner sanctums filled with musty volumes, is a fitting metaphor for the new ways libraries are storing and disseminating information: through computers, on beams of light. ■

—MICHAEL J. CROSBIE

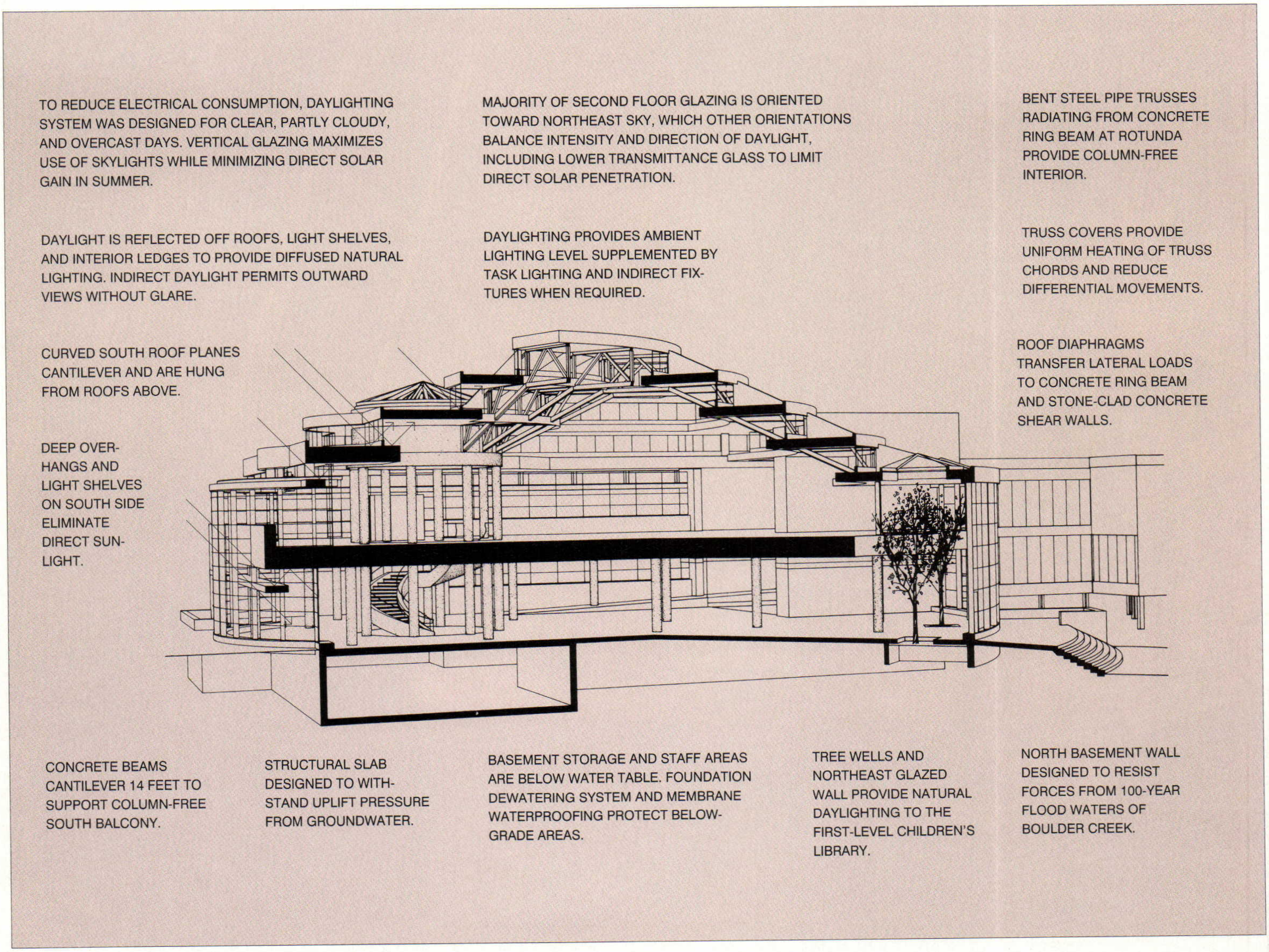
Varied daylighting includes direct light over main concrete and granite staircase (top left) and balanced light on second floor through stepped clerestories (bottom left). Entrance pavilion's space frame (facing page) supports independent aluminum-framed glazing system.



Stepped light shelves over main reading room (facing page and drawing, below) are supported by welded pipe trusses that span concrete columns. The indirect lighting from these clerestories is balanced by light through vertical glazing on curved window wall (left) and skylights over ficus trees in children's reading area.

BOULDER PUBLIC LIBRARY
BOULDER, COLORADO

ARCHITECT: Midyette/Seieroe/Hartronft, Boulder, Colorado—J Nold Midyette, Vernon M. Seieroe, J. Erik Hartronft (design team)
ASSOCIATE ARCHITECT: Eugene Aubry
LANDSCAPE ARCHITECT: Gage Davis International/Terrasan
ENGINEERS: JVA, Inc. (structural); Engineering Economics (mechanical/electrical)
CONTRACTOR: Pinkard Construction Company
COST: $9.5 million—$116/square foot
PHOTOGRAPHER: Andrew Kramer



SECTION PERSPECTIVE

Nestled into a knoll along a lake (top), the curving amphitheater wraps a grassy stage (facing page, bottom and site plan). Three pairs of steel canopies are set on concrete bases (right) to compensate for the natural slope of the land (facing page, section).

Weesner Family Amphitheater
Apple Valley, Minnesota
Hammel Green and Abrahamson, Architects

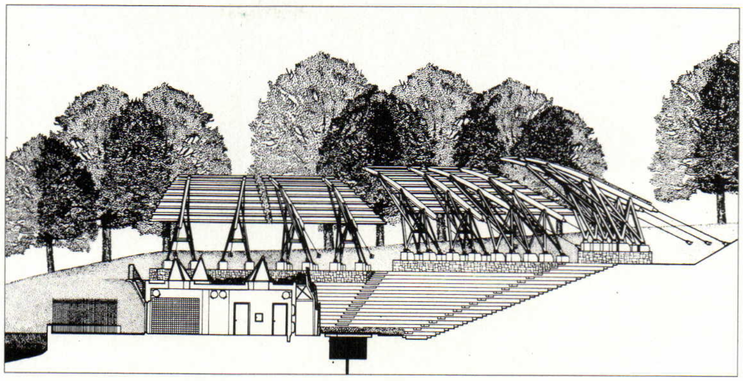
Poised for Flight

SINCE THE 1960S, URBAN ZOOS HAVE EVOLVed from rows of crowded cages to more natural habitats in lush landscapes. But to simulate wilderness surroundings and still confine the animals on display, architects of zoos are required to incorporate the "Gunnite factor," according to architect Bill Blanski of Hammel Green and Abrahamson. "To create the illusion of a real habitat," explains Blanski, "artificial elements included in the exhibitions are made to look natural." But often the primary function of these contrived insertions, which include concrete formed to look like rocks and trees, is to make a zoo more palatable to the human eye, rather than nurturing to animals.

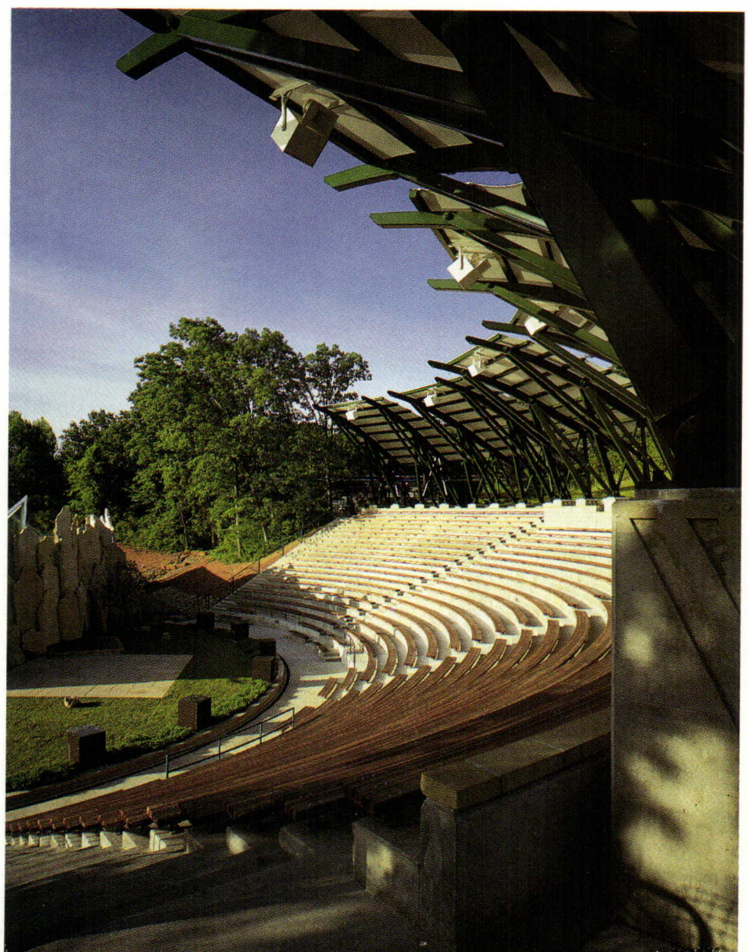
A more successful response to the duality of manmade and natural elements is the Weesner Family Amphitheater, the latest addition to the 15-year-old Minnesota Zoological Park, a 465-acre complex located 14 miles south of downtown Minneapolis. The 1,500-seat outdoor theater was designed to stage a popular bird show that stars hawks, falcons, eagles, roadrunners, and macaws.

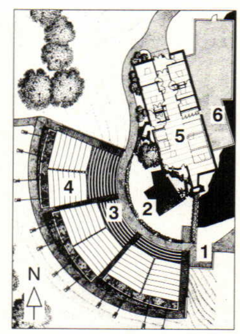
Landscape architect Tom Oslund deftly sited the amphitheater and its 2,800-square-foot support building on a steep, lakeside knoll to take advantage of the existing topography. Rather than camouflage this ensemble as a literal imitation of natural forms, HGA chose to symbolize the amphitheater's connection to nature through materials sympathetic to the site and steel-supported canopies that unmistakably suggest the wings of birds in flight.

The architects arranged three pairs of canopies around the perimeter of the steeply raked seating bowl. Inspired by the hollow skeleton of a bird, they fashioned standard 4-by-4, 4-by-6, and 4-by-8-inch hollow steel tubes into 24-foot-tall buttresses that support the six canopies. These steel trusses are attached with threaded 3-inch rods and bolts,



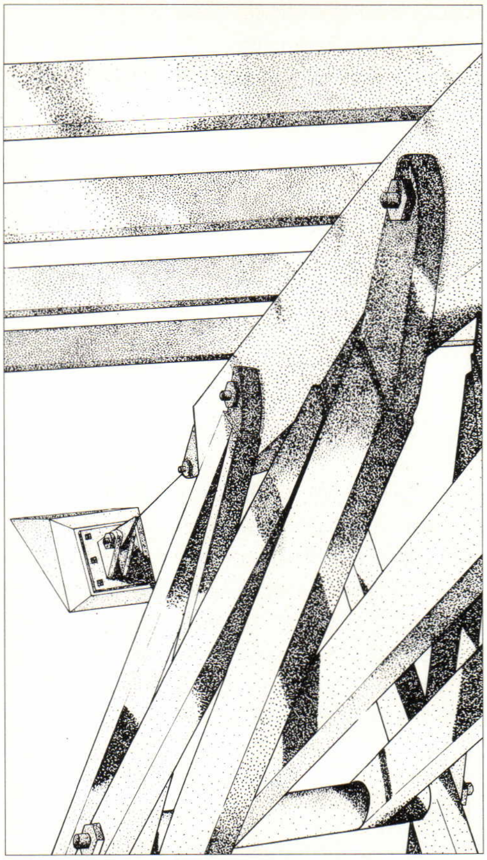
EAST-WEST SECTION



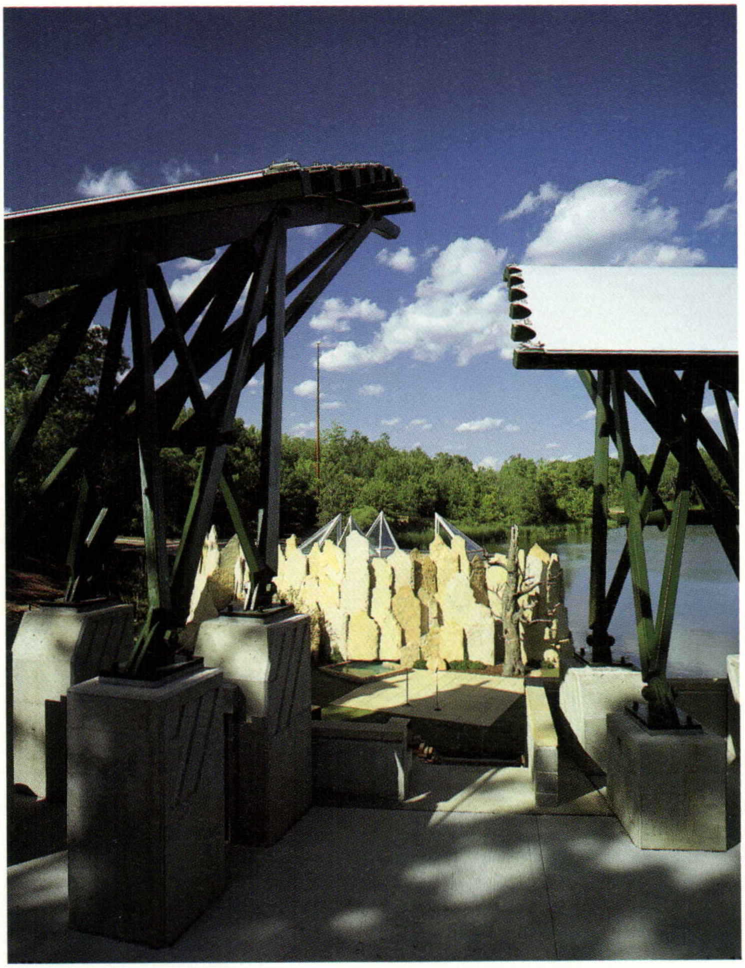


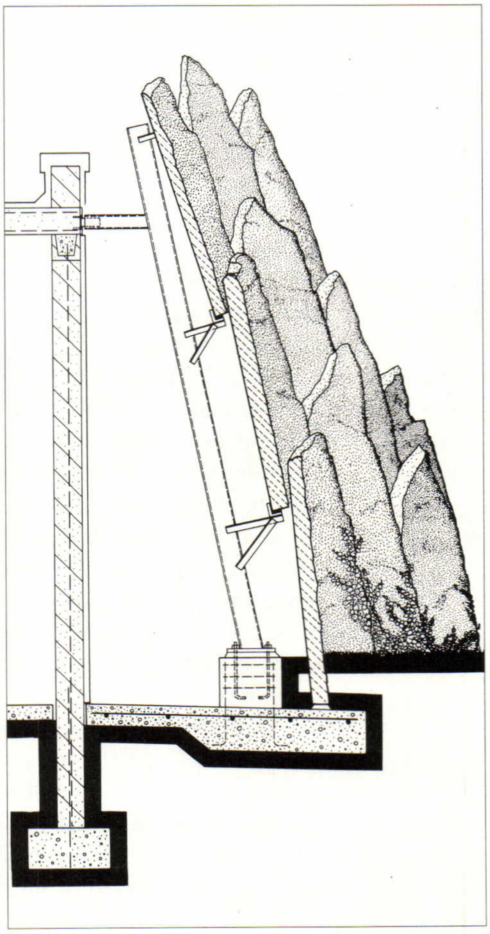
SITE PLAN

1 MAIN APPROACH
2 STAGE
3 SEATING
4 CANOPY
5 SUPPORT BUILDING
6 OUTDOOR BIRD HOLDING



CANOPY DETAIL





STONE SCREEN WALL SECTION

Canopy is supported by pin-connected steel trusses (top right and top drawing). Limestone panels (right) are supported by steel angles (bottom drawing). Horizontal slats (elevation, facing page) brace tensioned fiberglass membranes (facing page, bottom).

creating a hinge. To give the canopies a unique curve but avoid the expense of custom-fabricated girders, the architects chiseled and switch-welded standard 8-by-16-inch steel tubing to form the two main structural struts, which support nine 6-by-6-inch horizontal slats under each translucent Teflon-coated fiberglass membrane. Each canopy is post-tensioned to counterbalance the overhang with two cables anchored to the ground in concrete footings. To bear the static load of the canopy's cantilever, each anchorage is braced with a spread-footing foundation that measures 7 by 11 feet and is submerged at least 6 feet below grade.

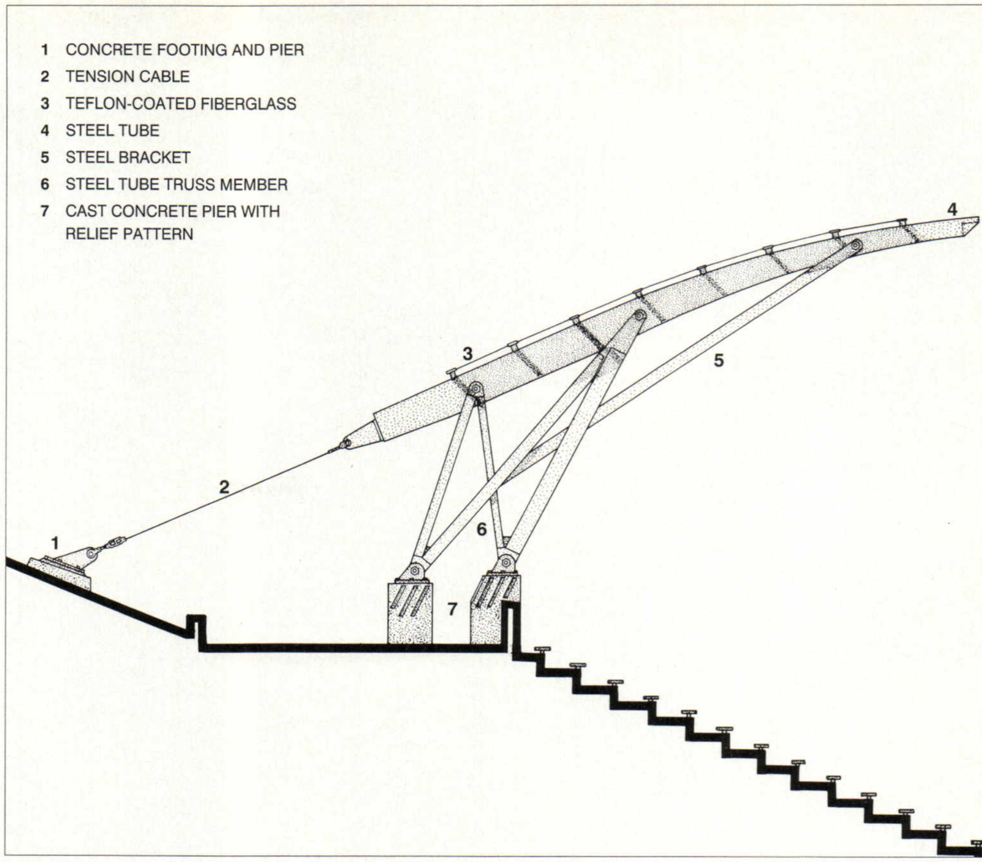
At the southwest corner of the support building, HGA designed a wall of indigenous Mankato-Kasota limestone that serves as a backdrop to the stage. "Rather than create a faux stage set for the grassy performance area," recalls Blanski, "we chose to arrange natural stone in a very unnatural way." The massive limestone panels are not custom-hewed, but leftover end pieces from a local quarry. When the randomly sized stones arrived on site, the architects developed a structural system of standard 6-by-6-inch galvanized tubes and steel angles to support the irregular panels. They created a space between the rock wall and the building that functions as a holding area during performances, and arranged the panels to allow the birds to crawl through the gaps for stage entrances and exits.

At a time when the mission of zoos is changing from merely exhibiting animals to educating the public about environmental conservation, the Weesner Family Amphitheater stands as a model for other zoos. HGA's structure exceeds the clichés of re-created habitats, demonstrating how a strong architectural statement can complement a powerful natural setting. ■

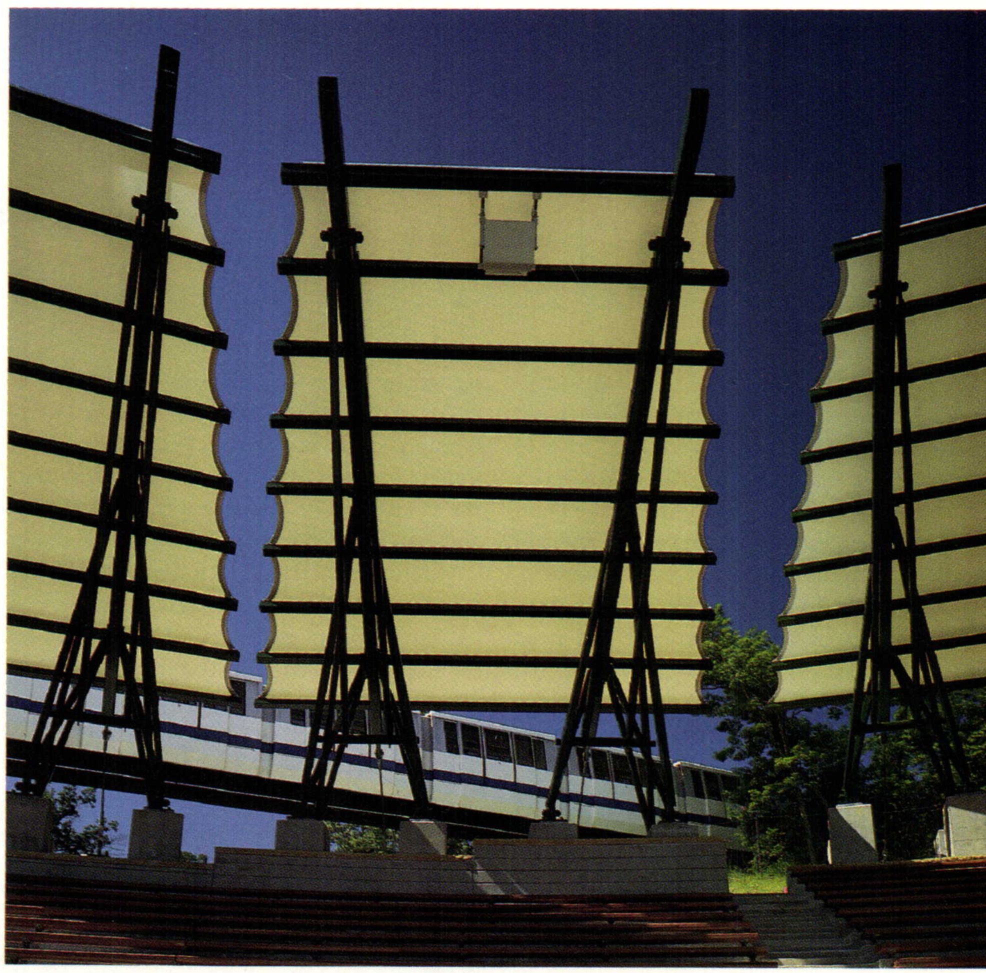
—LYNN NESMITH

WEESNER FAMILY AMPHITHEATER
APPLE VALLEY, MINNESOTA

CLIENT: Minnesota Zoological Garden
ARCHITECT: Hammel Green and Abrahamson, Minneapolis, Minnesota—Loren Ahles (principal-in-charge); Bill Blanski (design architect); Gary Reetz (project manager); Jim Butler (project architect); Kathy Ryan, Randy Lueth, Tadd Kruen, Mark Bengstorm (design team); Tom Oslund (landscape architect); Tony Staeger (structural engineer); Tim Anderson (mechanical engineer); Debra Coggin (electrical engineer); John Moreira (civil engineer)
CONSULTANTS: Kvernstoen & Kell (acoustics)
GENERAL CONTRACTOR: Arkay Construction
COST: $2.3 million
PHOTOGRAPHER: George Heinrich

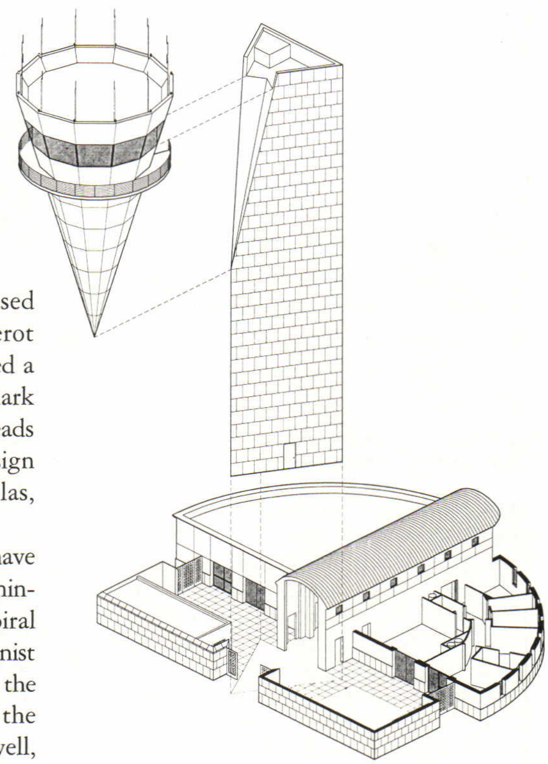


CANOPY ELEVATION



Alliance International Airport Control Tower
Aubry Architects/PGAL Architects
Fort Worth, Texas

Basic Geometry



ROSS PEROT BOWED OUT OF THE PRESIDENTIAL race saying that he was an engineer, not a politician, and that he needed to get back to work. One of his projects is Alliance Airport, 15 miles north of Fort Worth, where the Perot Group has purchased 17,000 acres of land and covered it with runways, airplane hangars, factories, and warehouses. Once rolling prairie interrupted occasionally by clumps of oak and pecan trees, Allianpce could eventually become the largest industrial airport and wholesale distribution center in the West. Here, aerospace companies can locate beside a taxiway, fly in parts, assemble them, and send them off as aircraft. Nearby sit warehouses and light manufacturing facilities, all connected to freeways and rail lines in a gigantic web of entrepreneurship.

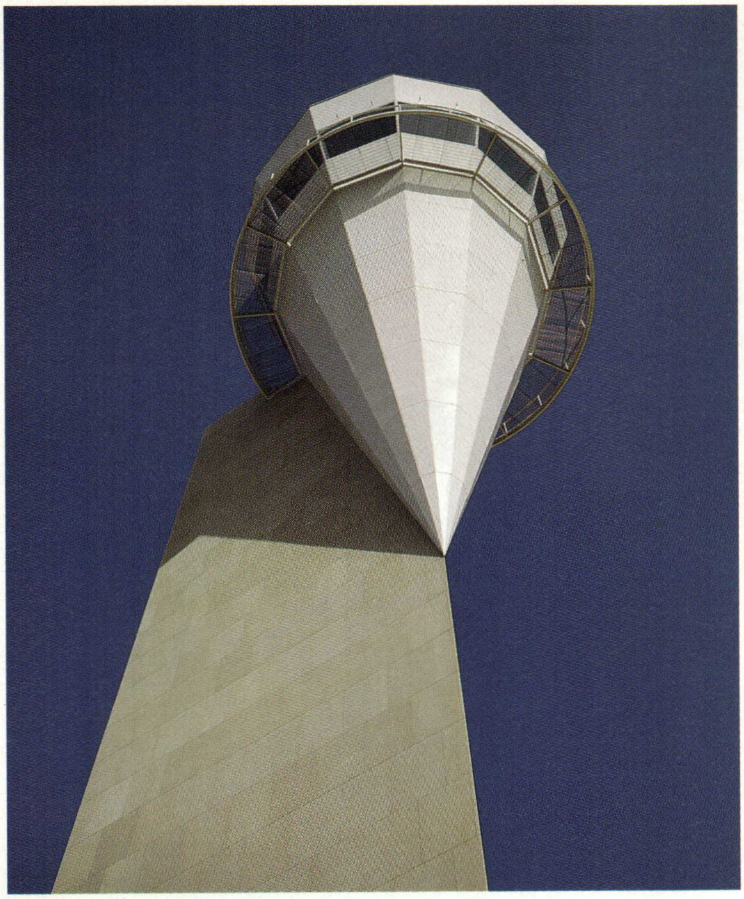
And at the center of this development stands a sleek, futuristic control tower designed by Eugene Aubry of Houston-based PGAL Architects. The clients—the Perot Group and the city of Fort Worth—wanted a symbol for their new venture that would mark the landscape and also grace their letterheads and brochures. So they held a private design competition that also included HOK-Dallas, SOM-San Francisco, and Helmut Jahn.

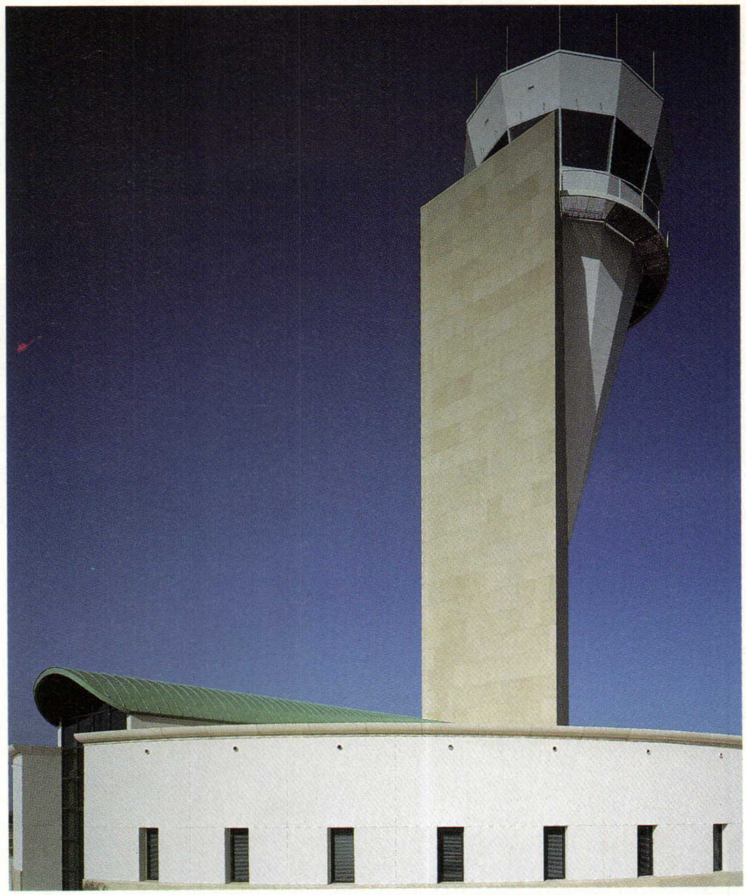
Aubry's winning design, which would have sat atop a proposed 40,000-square-foot administration building, featured an inclined spiral similar to Vladimir Tatlin's famous Communist Third International monument. But when the administration building was scrapped, the tower design went too, which is just as well, since superpatriot Ross Perot would probably have balked at having one of Communism's most famous architectural symbols as his logo.

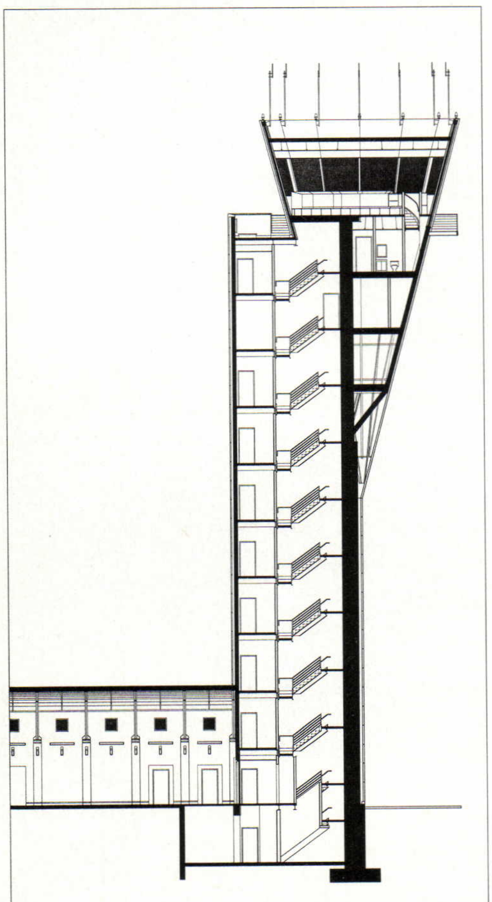
Aubry then produced a 158-foot-high

Tower's geometric forms (above and facing page) produce varied facades. Lobby (top right) is punctuated by arching steel trusses.


Airport Traffic
Control Tower







TOWER SECTION

minimalist sculpture—a triangular shaft topped by a gleaming white cone projecting from its eastern edge—with a 4,675-square-foot, semicircular office building at its base. The concrete shaft, clad in Texas limestone, houses all the mechanical equipment for the tower, while the sensitive microwave dishes are tucked into the Teflon-sheathed cone, through which electronic signals pass unimpeded. Such a skin is common on radar domes, but has never been used on a control tower.

Aubry says his goal was to create an austere piece that "didn't have a lot of junk hanging off the side." Control towers are often festooned with antennae and satellite dishes that make them look more like Rube Goldberg sculptures than models of aerodynamic engineering. Aubry, who didn't want even a catwalk on his, manipulated the tower's basic geometric forms—triangle, circle, cone—so that the structure appears dramatically different from various angles.

The office building, housing the Federal Aviation Administration, is more problematic. The Perot Group insisted on a Texas look and Texas materials. So beneath the slender tower with its high-tech cab sits a semicircle of Texas limestone and stucco, with deep narrow windows and a rolled cornice: Ye Olde San Antonio meets the Space Age. Inside, the building is divided by a tall lobby with a vaulted metal roof and chapel-like proportions. In this semi-ecclesiastical composition, the control tower becomes a campanile and the atrium a nave in which one is tempted to genuflect before heading for the elevators.

Aubry admits to getting a bit carried away in the lobby, though he points out that the office building may eventually be connected by covered walkway to another directly across the street. This future arrangement might make the vaulted lobby seem less eccentric, though not necessarily more compelling. But the tower itself is bold, memorable, and dramatic on a landscape where a little height goes a long way, offering an appropriate symbol for Perot's lofty aspirations.

—DAVID DILLON

ALLIANCE INTERNATIONAL AIRPORT CONTROL TOWER FORT WORTH, TEXAS

CLIENT: City of Fort Worth
ARCHITECTS: Aubry Architects, Anna Maria Island, Florida; PGAL Architects, Houston—Eugene E. Aubry (director of design); Randy A. Park (project architect)
PRODUCTION ARCHITECT: Leo Daly, Omaha, Nebraska
LANDSCAPE ARCHITECT: Albert Halff
ENGINEERS: Leo A. Daly (structural/mechanical/electrical); Albert Halff (civil)
CONSULTANTS: T. Kondos Associates (lighting)
GENERAL CONTRACTOR: Cadenhead Construction
PHOTOGRAPHER: Timothy Hursley/Arkansas Office

Concrete tower's cone (right and facing page, left) is sheathed in Teflon-coated fiberglass panels that do not interfere with electronic signals. Shaft (facing page, right) contains elevators and mechanical equipment, while base houses offices (section, facing page).

Auburn Transmitter Building
Wake County, North Carolina
Bartholomew Associates

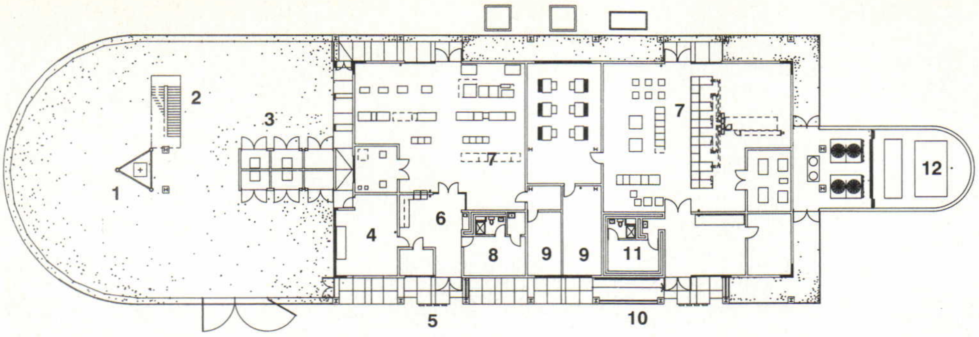
New Wavelength

THIS PAST SUMMER, THE HOTTEST ITEM AT New York's Urban Center Books was a slim paperback volume devoted not to architecture, but to the iconography of commonplace TV and radio transmission towers. Written by architect Michele Bertomen and her students at the New York Institute of Technology, *Transmission Towers on the Long Island Expressway: A Study of the Language of Form* details the authors' fascination with 19 Eiffelesque communications citadels that mark the route between Manhattan and the institute's Central Islip campus. Bertomen compares the towers, "a widely accessible network of communication and transportation" to Roman aqueducts, and presents the intriguing notion that these ubiquitous objects symbolize our collective existence at the end of the 20th century. So successful was the book that it spawned an exhibition at the Urban Center of the writers' delicate tower drawings, praised by The *New York Times* for its "sweeping megalopolitan vision."

In faraway Auburn, North Carolina, Bartholomew Associates has designed a rural TV transmitter building that is anything but megalopolitan, yet its architects have been similarly inspired by the structure and form of these prosaic towers. Acknowledging that his building, sited "ankle-deep in rattlesnakes" on a secluded hilltop, is unlikely to be seen by the public, Principal Norman Bartholomew nevertheless borrowed the transmission towers' vocabulary to enliven a mundane structure. For the first time, an architect has used the functional components of a transmission tower—hot-dipped galvanized steel, a sheltering "ice bridge," and steel grating—to construct a building that, though humble, is safer and more economical than its boxlike predecessors.

Until now, conventional transmitter buildings, housing the delicate electronic and computer equipment that sends images across the air waves, have been concrete boxes as universal

Custom-designed ice bridge (top photo and facing page) links transmission tower (above) to transmitter building, and extends to create a gabled roof. Walls are colored concrete; glass block admits light into transmitter rooms.



BUILDING PLAN

1 TRANSMISSION TOWER
2 TOWER STAIR
3 TWO-WAY ROOMS
4 GARAGE
5 LOADING DOCK
6 SHOP
7 TRANSMITTER ROOM
8 OFFICE
9 GENERATOR ROOM
10 RAMP
11 FEMA SHELTER
12 FUEL CONTAINMENT

Steel grating protects equipment platforms along tower (left, center of photo), and clads pitched roof over ice bridge (left) and canopy that shields parking lot (facing page). Steel columns and beams support roof trusses (left and facing page). Roof assembly comprises a 210-foot-long box truss with pitched Pratt truss halves bolted to its sides (section).

and unexceptional as their adjacent towers. Built to withstand falling ice, the transmitter building of the local television and radio station WPTF near Raleigh was nevertheless crushed to concrete crumbs when its 2,000-foot-tall transmission tower collapsed after a December ice storm in 1989. WRAL-TV's nearby tower also plummeted, so severely damaging the station's transmitter building that it could not be repaired.

With the effects of ice build-up foremost in their minds, the managers of the two commercial stations enlisted Bartholomew Associates to design a duplex transmitter building that would share a specially constructed megatower designed to withstand the heaviest ice loads. The architects' primary innovation was to integrate a custom-designed "ice bridge"—a steel-grate-covered bridge for protecting radio and TV transmission lines—as part of the architecture.

Although toppling TV towers are a rare occurrence, falling ice is quite common, leading tower designers to develop protection for transmission lines where they are most vulnerable—running from tower to transmitter building. "When basketball-sized pieces of ice hit the ice bridge, they break up," explains Robert B. Butler, former manager of WPTF. "That's a lot better than slicing your lines and taking you off the air." In conventional transmitter buildings, the lines emerge from the building and are carried horizontally in this protective bridge, about 20 feet off the ground, before they travel up the tower. That vulnerable span from building to tower is required because of the difference in expansion coefficients between the steel of the tower and the copper or aluminum of the transmission lines. Were the lines to rise directly up the tower from the fixed point where they emerge from the building, varying rates of expansion and contraction would cause the lines to snap. The span between tower and building allows the lines to flex.

Inventively placing their transmitter building underneath the ice bridge, Bartholomew Associates utilized a feature of transmission tower engineering to protect not only the transmission lines, but the building and its equipment as well. "Our ice bridge also supports the building roof, a suspended metal deck," explains Bartholomew Associates' Thomas

Crowder, who designed the novel structure. Crowder created a box truss that spans the 160-foot length of the building; it carries the roof deck plus 32 custom-designed "ice trusses" that frame into its sides and rest atop spandrel beams, supported by steel columns at the building's perimeter.

The industrial vocabulary of the tower was extended throughout the building. The architects applied steel grating over the trusses to create a giant, pitched-roof ice bridge that deflects falling ice away from the building below. They enclosed the rectangular volume with scored concrete block and glass block panels that admit light into transmitter rooms.

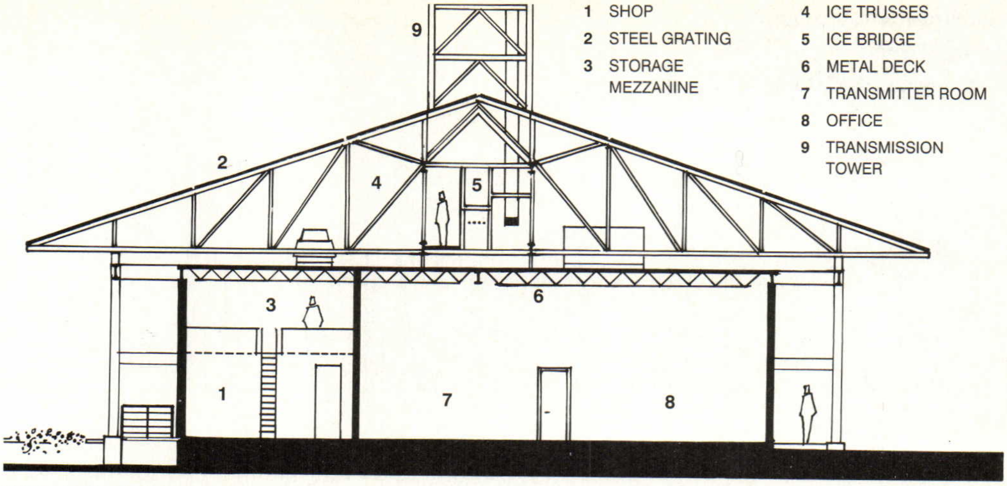
Inside, the two TV stations are completely separated for security purposes. Entrances give way to offices; a storage mezzanine; a small, if anachronistic, fall-out shelter recommended by the FCC; and open transmitter rooms. Suspending the roof from the custom-designed protective bridge permitted unencumbered spaces in these rooms, which in conventional stations may be marred by interior columns. The wide-open floor areas afford maximum flexibility, soon to be an important requirement for TV stations across the country. Within the next five years, the FCC will approve high-definition television; stations that hope to compete will have no choice but to accommodate new transmitters.

If Bartholomew Associates hasn't crafted its metalwork to the customized heights of High-Tech exactitude, the architects' fresh approach nevertheless reflects the need for creative thinking among those who design for an ever-changing industry. While Bertomen, in the best Venturi tradition, gave intellectual popularity to unnoticed elements in the landscape, the North Carolina architects have carried the charm of the commonplace towers a step further. Housing ephemeral sound and picture waves in a structure of permanence and stability, Bartholomew Associates has also turned engineering into architecture, elevating a utilitarian shack to an inventive building.

—HEIDI LANDECKER

AUBURN TRANSMITTER
WAKE COUNTY, NORTH CAROLINA

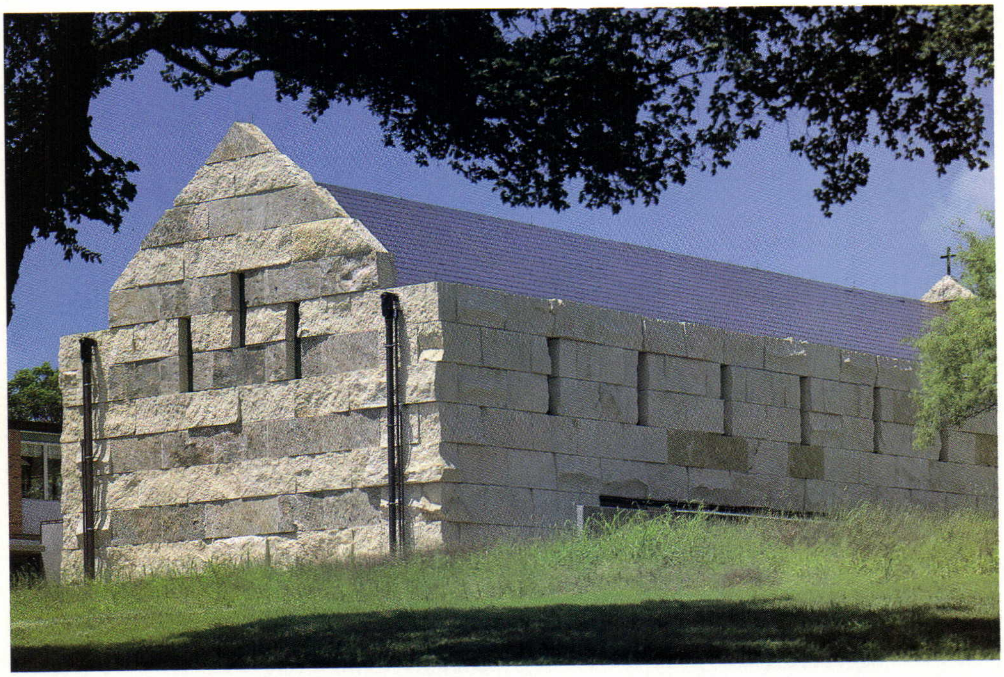
CLIENT: Capitol Broadcasting Company and Durham Life Broadcasting
ARCHITECT: Bartholomew Associates, Raleigh, North Carolina—Norman E. Bartholomew (principal-in-charge); Thomas G. Crowder (project manager/designer); William G. Spencer (job captain)
ENGINEERS: Lysaght & Associates (structural); RMA (mechanical/electrical);
GENERAL CONTRACTOR: A & M Construction
COST: Withheld at owner's request.
PHOTOGRAPHY: Artech/Jim Sink



WEST-EAST SECTION

Cistercian Abbey Church
Irving, Texas
Cunningham Architects

Stone Revival



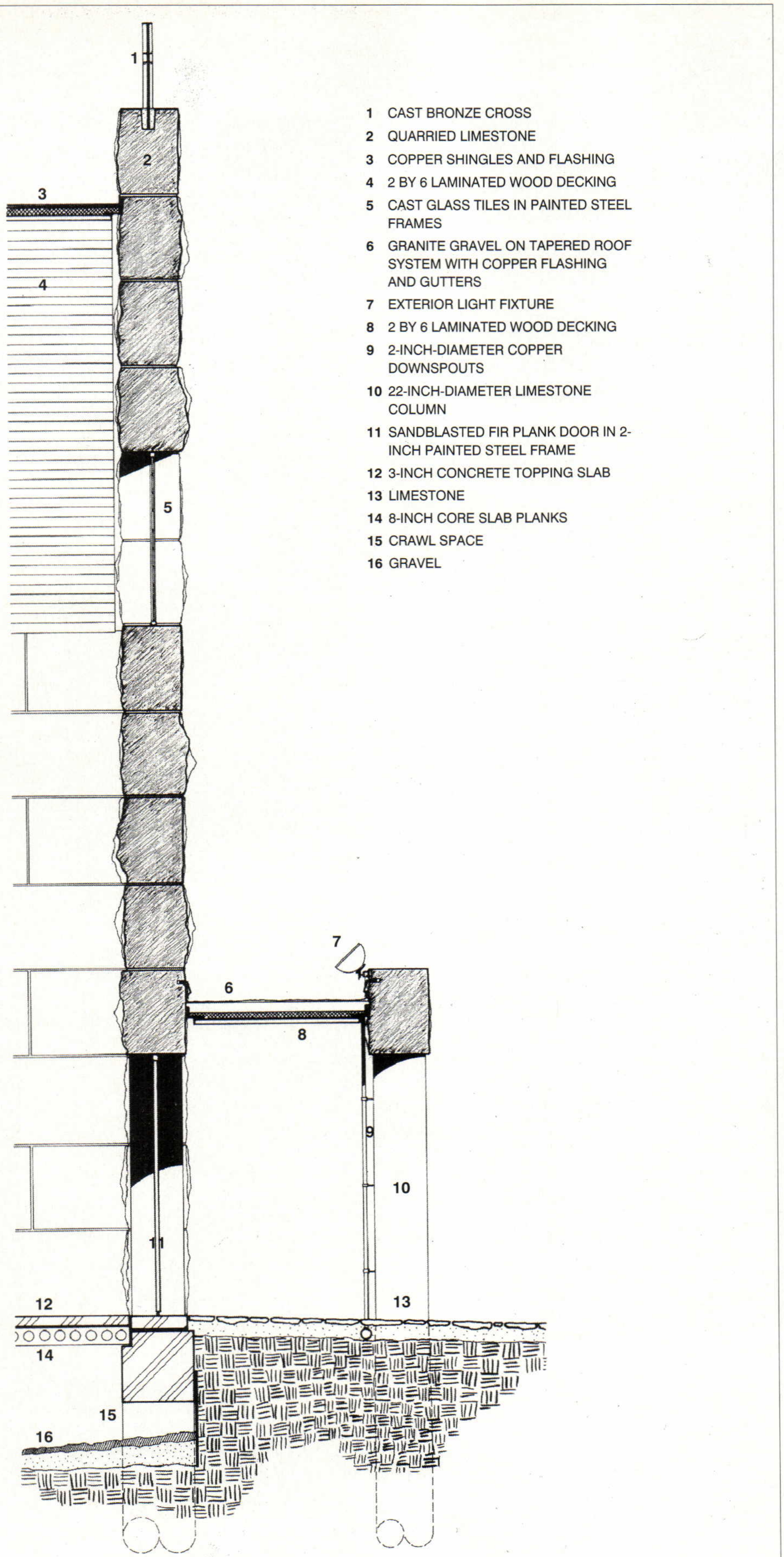
BLACKMONWINTERS

ARRIVING ON A FOGGY MORNING IN THE Hungarian community of Bélapátfalva, architect Gary Cunningham of Dallas and his client, Father Denis Farkasfalvy, discovered a mysterious Romanesque stone church sited against a hill. For architect and abbot, the humble structure embodied the reclusive underpinnings of the Cistercian order, a Catholic sect formed in 1098. Returning to Texas, Cunningham Architects designed a simple, rough-cut limestone chapel that evokes the Hungarian church and the austere, 900-year-old structures that mark the order's medieval origins. Explains Cunningham, "We wanted to build a church that would literally last for the next 900 years."

Cunningham's exploration of structure and light underscores the symbolic presence of his new church within the Texan abbey. Founded in 1957, the Dallas Cistercian Abbey lacked a central building that signaled "a home for a religious community," according to Father Denis. The church replaces a low-ceilinged, temporary chapel and creates a focal point for the campus of the Cistercian Preparatory School (from which Cunningham graduated in 1972), located just over a hill that flanks the church. Visible from the Dallas-Fort Worth thoroughfare that abuts the property, the church elevates the abbey from a name signposted along the highway to a permanent place for religious worship and study.

To capture the Cistercians' austerity and rigor, Cunningham returned to a traditional—and now unusual—structural system: loadbearing stone. He constructed the walls of the church with 427 limestone blocks, each measuring 2 by 3 by 6 feet and weighing $2\frac{1}{2}$ tons. Stones were cut out of the ground four courses

Cunningham stacked 2-by-3-by-6-foot unreinforced loadbearing limestone blocks to enclose the church, grouping darker stones in bands on the east (top left) and west (facing page) facades. Glazed 1-by-6-foot slots punctuate the north (left) and south faces.



SECTION THROUGH WEST WALL AND PORTICO

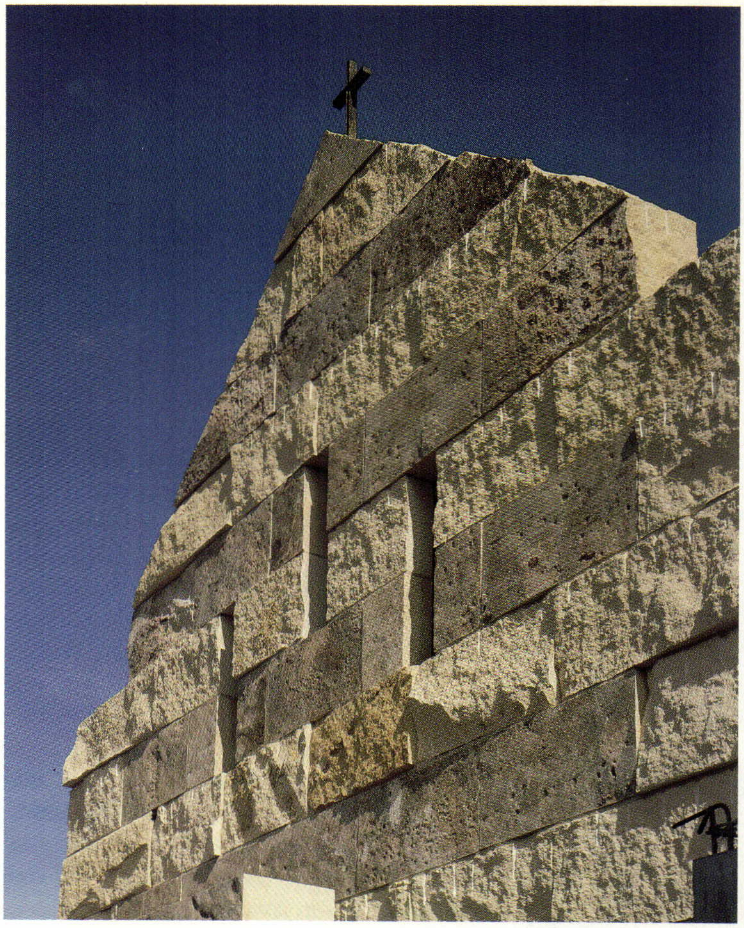
at a time, and individual stones were split off at the quarry and carried directly to the site, eliminating costly finish work and preserving their primal cragginess. Each cut yielded one surface block with its face darkened and smoothed by the elements. Cunningham grouped these darker blocks to form horizontal bands on the front and rear facades, and turned eight stones on a lathe to create the columns that support the ceremonial entry canopy.

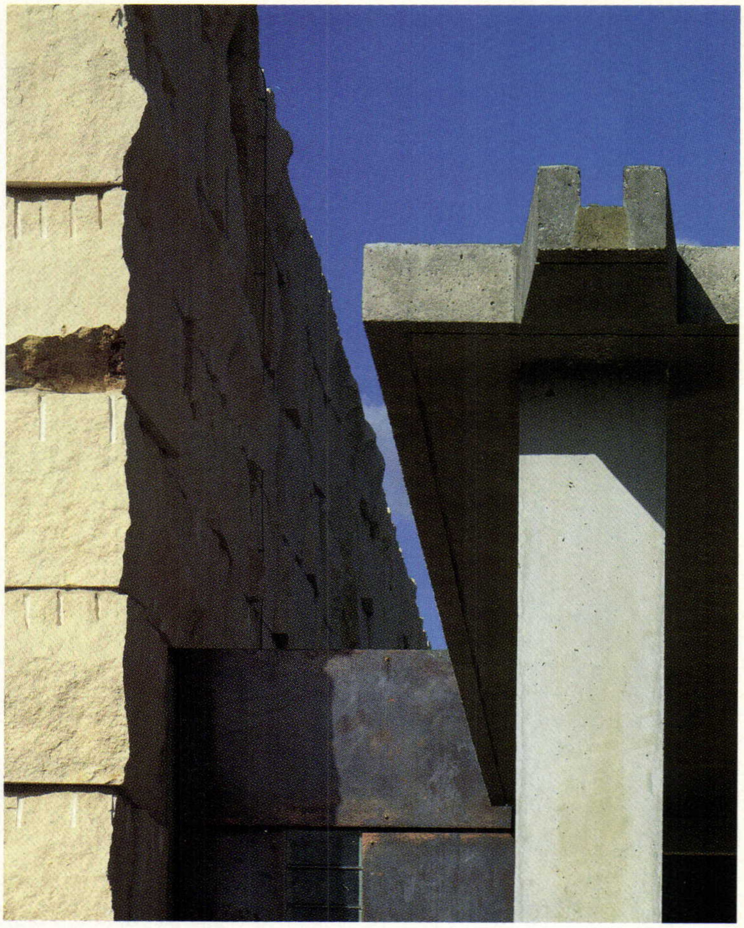
Cunningham worked with the owner of the nearby quarry to devise a system for erecting the walls. One-inch-thick, Type-S mortar that matches the stones' 2,000-psi compressive strength transfers the building load to concrete columns on the perimeter and to the foundation, without requiring steel reinforcement. The mortar thickness also offsets unavoidable variations in size of the rough-cut, unprocessed stones. Finding seasoned masons to build the loadbearing stone church, however, proved impossible. Instead, Cunningham, engineers, and a stone contractor trained a team of brick masons to lay the massive blocks. Working with masonry units 14 times larger than those they were accustomed to, the masons accomplished in two months a job that was budgeted for four.

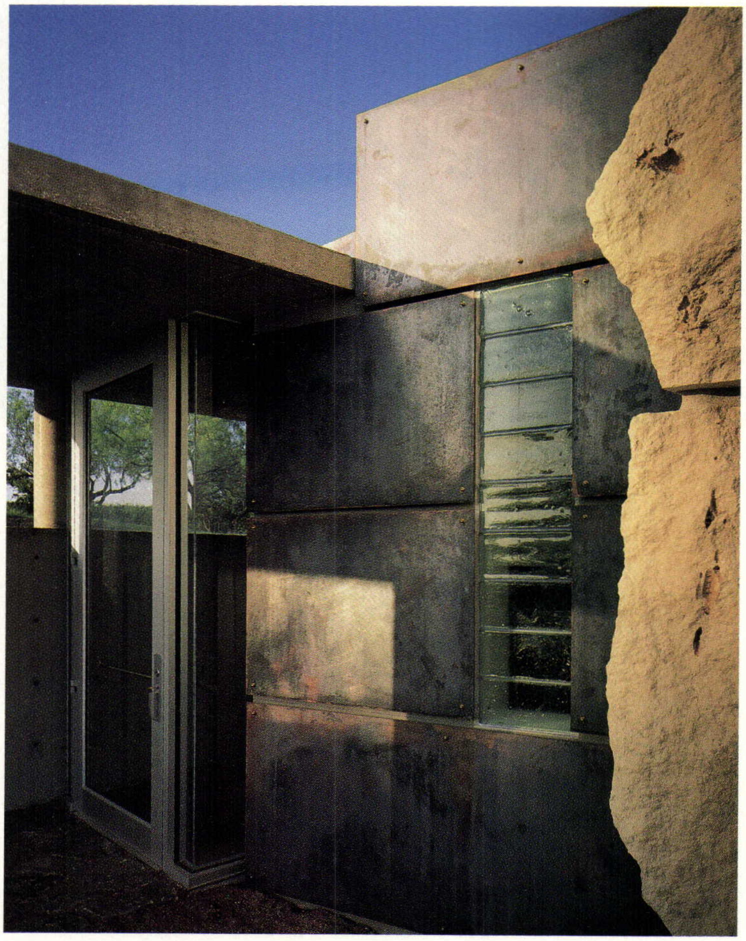
Inside, the side walls rest on "fingers of man," smooth, square, concrete columns that express modern structural technology and symbolize the public's presence at the ground level. These columns separate nave from side aisles with a 12-foot rhythm recalling the order's medieval origins. Steel brackets are embedded along the tops of these stone walls, positioned above alternate columns, and steadied by a threadlike steel rod in tension. Together, the tie rods and brackets form a stable roof structure like a truss. Notes Cunningham, "By keeping the roof load as a wholly compressive force, the unreinforced stone walls aren't under tension, and so remain structurally sound."

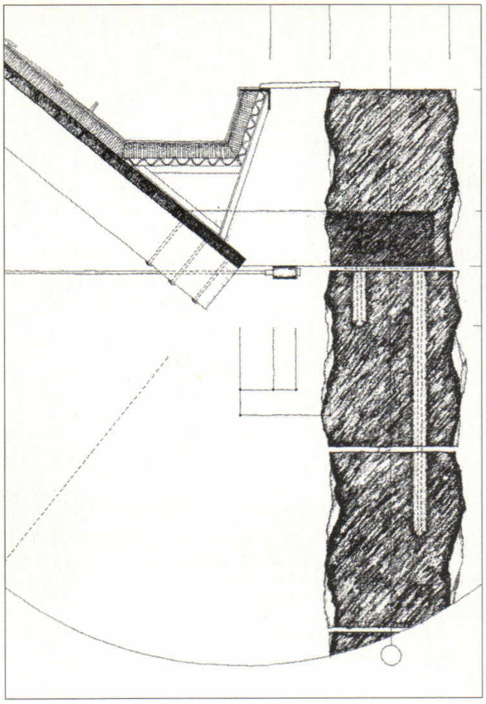
A foil to the walls' permanence, the vaulted wooden ceiling and roof structure exist as a temporal element, intended to be replaced every century in the manner of ancient structures. Cunningham describes the roof as an "extrusion" from end to end, whose length expanded and contracted through design. It is separated from the side walls to allow daylight to spill down the clerestory, creating the illusion that the roof floats above the 56-by-120-

Slots of cut glass mark gable (facing page, top left). Concrete scuppers (facing page, top right) enliven covered walkway. Stone columns support lintel of portico (facing page, bottom left). North entrance is covered with steel panels (facing page, lower right).

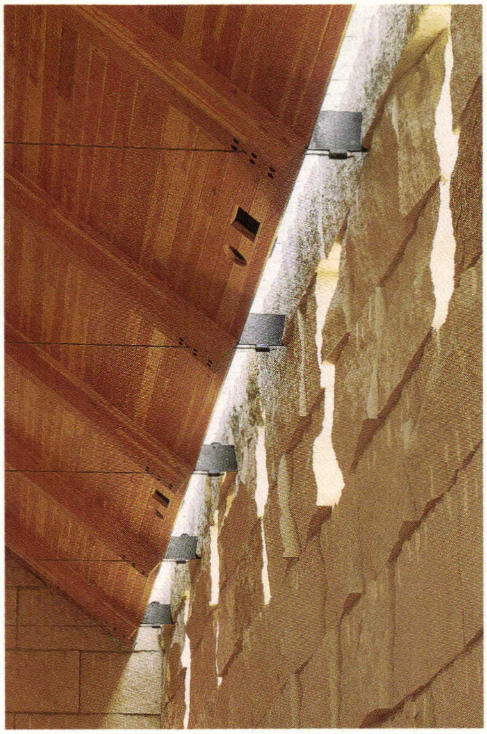


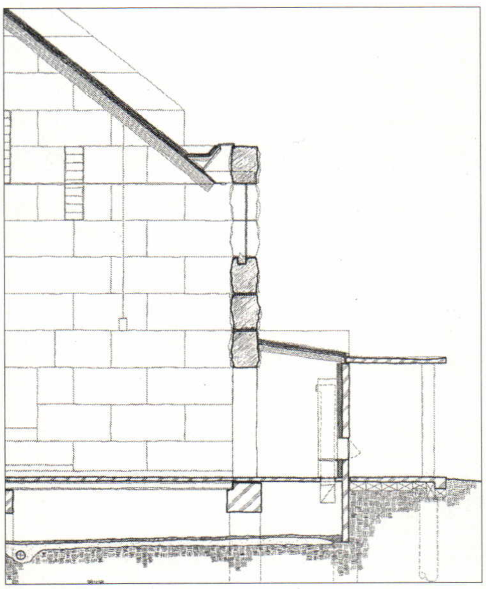




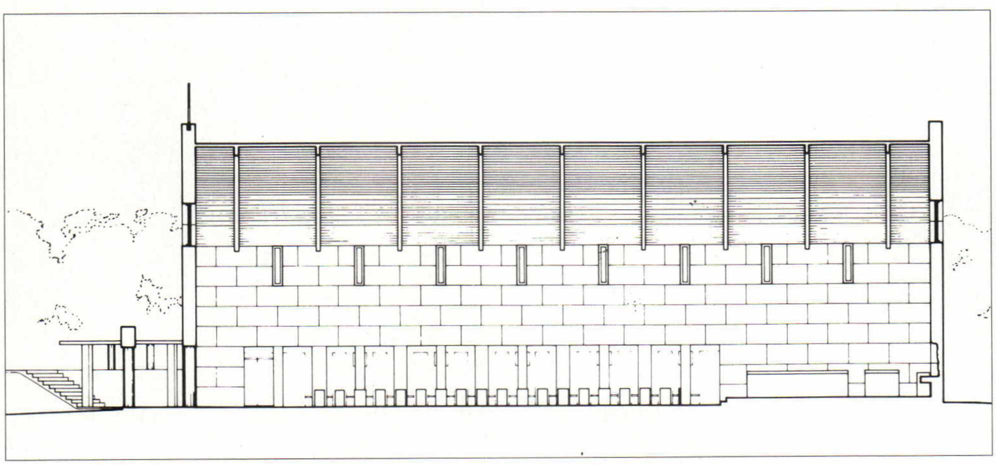


SECTION AT SKYLIGHT





SOUTH WALL SECTION



WEST-EAST SECTION

foot interior. So impressive is this light that slot windows beneath each ceiling bay and on the front and back walls are nearly lost. Artificial light emanates from ordinary, wire-mesh downlights dropped from the ceiling.

Acoustically, the nave is a live space, with its sound-reflecting hard surfaces that include stone walls, concrete floors, and wooden pews. Side-aisle cavities provide just enough baffle to make speech distinguishable. The aisles also break down the church's exterior mass and grant the main stone volume a more soaring elevation, despite zoning restrictions that dictated a squat structure.

For Cunningham, the Cistercian church is the latest of his controlled invocations of structural expression, a visceral response to complex design problems. Refined through collaboration with structural engineer James Smith, who has handled Cunningham's most challenging details and systems, and architects Russell Buchanan and Sharon Odum, projects such as the church and the Addison Conference and Theatre Centre (ARCHITECTURE, August 1992, pages 42-49) show a maturation of the architect's materially honest esthetic. Throughout construction, Cunningham maintains the idealistic notion that God is in the site visit. Each day he spends hours inspecting and often participating—in concrete pours, stone erection, and glass installation. A romantic vision of practice, Cunningham's involvement is also a practical way of achieving structural and technological refinements without losing the tactile, emotional, and, in this case, spiritual, qualities of architecture. ■

—RAY DON TILLEY

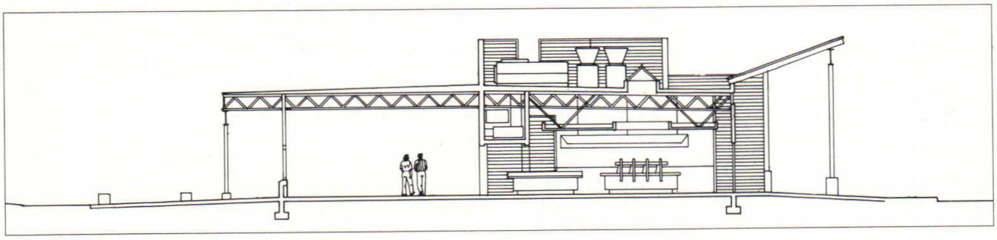
Steel brackets separate wall section from roof (top section). Skylights (top left) admit light above birch pews and concrete columns (center section, left photo, and facing page). Concrete columns along aisles (bottom section) complete the cloister.

CISTERCIAN ABBEY CHURCH
IRVING, TEXAS

ARCHITECT: Cunningham Architects, Dallas, Texas—Gary Cunningham, Russell Buchanan, Chris Fultz, Frank Gomillion (design team)
LANDSCAPE ARCHITECT: Cunningham Architects
ENGINEERS: James Smith (structural); MEP Systems (mechanical/electrical)
CONSULTANTS: Pam Wilson (lighting); WJHW-Jim Johnson (acoustics); Dean Nottestad (graphics); David Sines (metalwork); Billy Hassel (tabernacle doors); Vaughn Shadle, David Cavapethan, Russell Buchanan, Craig Knebel, Bill Lutter, Kevin Skillern (craftsmen)
GENERAL CONTRACTOR: Andres Construction
COST: \$1.4 million—\$200/square foot
PHOTOGRAPHER: James F. Wilson, except as noted

Boeing Cafeteria 9-12
Tukwila, Washington
Miller/Hull Partnership

Structural Shade



WEST-EAST SECTION

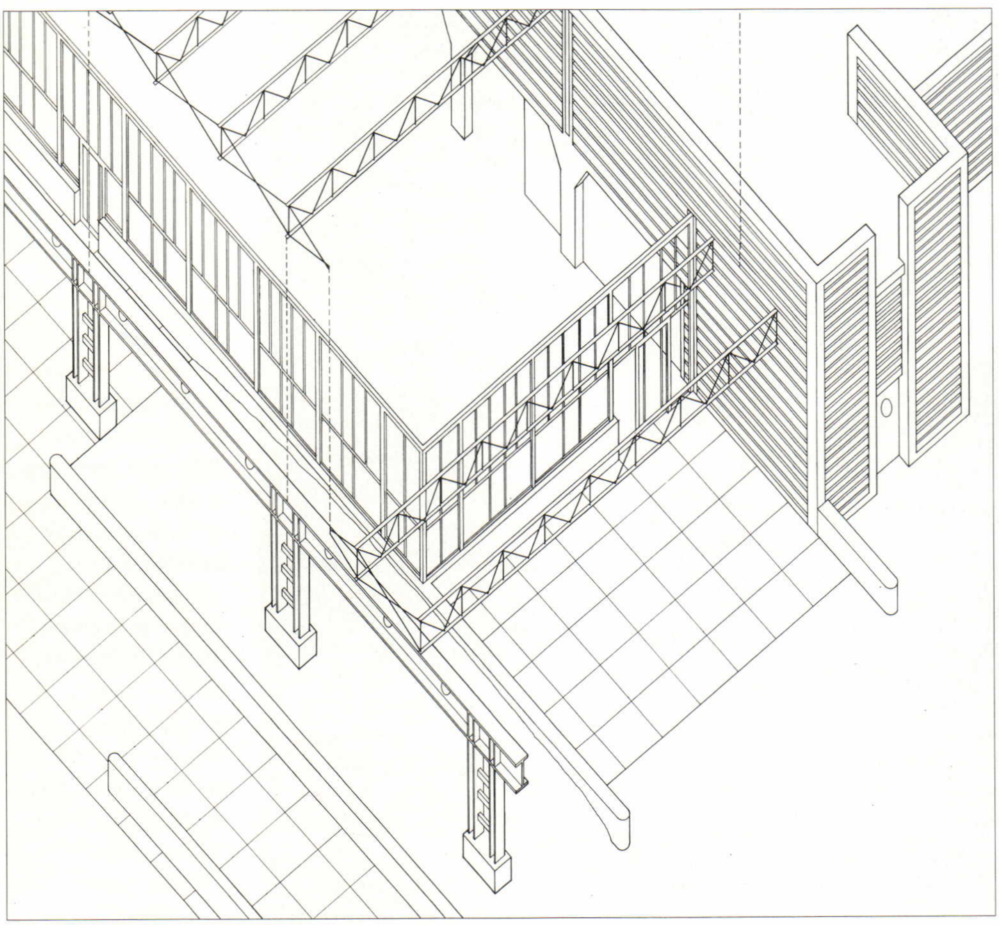
RAINY, GRAY SEATTLE IS NOT KNOWN FOR its fierce, penetrating daylight. Nevertheless, Northwest architects, like architects everywhere, must devise ways to control direct sunlight and its accompanying heat, glare, and reflectance in their buildings. Seattle-based Miller/Hull Partnership has completed a freestanding cafeteria for the Boeing Company in Tukwila, just south of Seattle, in which partner Robert Hull resolves this problem structurally rather than through the application of extraneous elements such as tinted glass or window shades.

Boeing's directive to Miller/Hull was to create a 10,000-square-foot, low-cost building on the banks of the Duwamish River. The simultaneous development of a landscaped park along the heavily industrialized eastern bank of the river determined the orientation of Boeing Cafeteria 9-12 and enriched the possibilities of integrating the structure into its reclaimed pastoral setting. Many of the cafeteria's patrons work in a secure, windowless office building nearby, so Hull's design incorporated large expanses of glass as relief from artificially lit work spaces. But the cafeteria's glassy, west-facing elevation also posed the potential problem of blinding glare and heat late in the day, demanding a means of controlling this sunlight.

Hull began with a concept used in previous projects, the separation of the structure into two distinct volumes: in this case, a windowless core to the east and a glazed box to the west. The cafeteria is entered through the core, which contains back-of-the-house facilities and a servery. Finished in horizontally corrugated metal, this solid wing relates visually and texturally to the surrounding industrial buildings, hangars, research centers, and radar test facilities.

It is in the western section of the building, a steel-framed dining pavilion glazed on three sides, that structural elements skillfully

Glassy facade of Boeing Cafeteria 9-12 with steel sun screen of I-beams and columns (left and facing page, top) encloses 3,900-square-foot dining room (facing page, center). Section (facing page, bottom) reveals entry, servery, and dining room. Steel beams support entrance canopy (top left).



control daylight. While this volume is constructed of straightforward, off-the-shelf industrial materials, its delicate tracery of white-painted steel and clear glass expresses a lightness that contrasts with the east-facing core, evoking a late-19th-century glass and cast-iron conservatory.

The infusion of daylight is controlled by a series of simple structural devices. Overhangs are created by a projecting roof, which extends 8 feet beyond the glass walls. This roof is constructed of a single-ply membrane of modified bitumen over rigid insulation, which rests atop steel decking. Perforated for interim acoustic control, the steel decking is supported by bar-joist steel trusses. On the long, western side of the rectangular structure, Hull bolted the lower flanges of the overhanging trusses to the upper flange of a horizontal, custom-punched I-beam that serves as a sun screen; he added cross-braces between the girder and roof trusses for additional strength. The girder—which enhances the cafeteria's conservatorylike appearance—rests atop a row of paired wide-flange steel columns, linked with nonstructural horizontal bars that add to the laciness of the overall effect and help block direct sunlight. In the upper sections of the glass dining-room walls, Hull applied steel mullions to subdivide large expanses of glass into grids of smaller panes, enhancing the transparency of the building. His belief is that this method of breaking up reflected images on glass surfaces diminishes their distracting effect, making observers less conscious of the glass.

Essentially industrial like its Boeing neighbors, Cafeteria 9-12 nevertheless expresses a remarkable delicacy, considering its low-cost functionalism. Its only extravagance is an abundance of glass. Potential heat and glare problems have been creatively mitigated in the best Modern tradition—by the rational deployment of structural elements. ■

—JUSTIN HENDERSON

Justin Henderson is a Seattle-based writer.

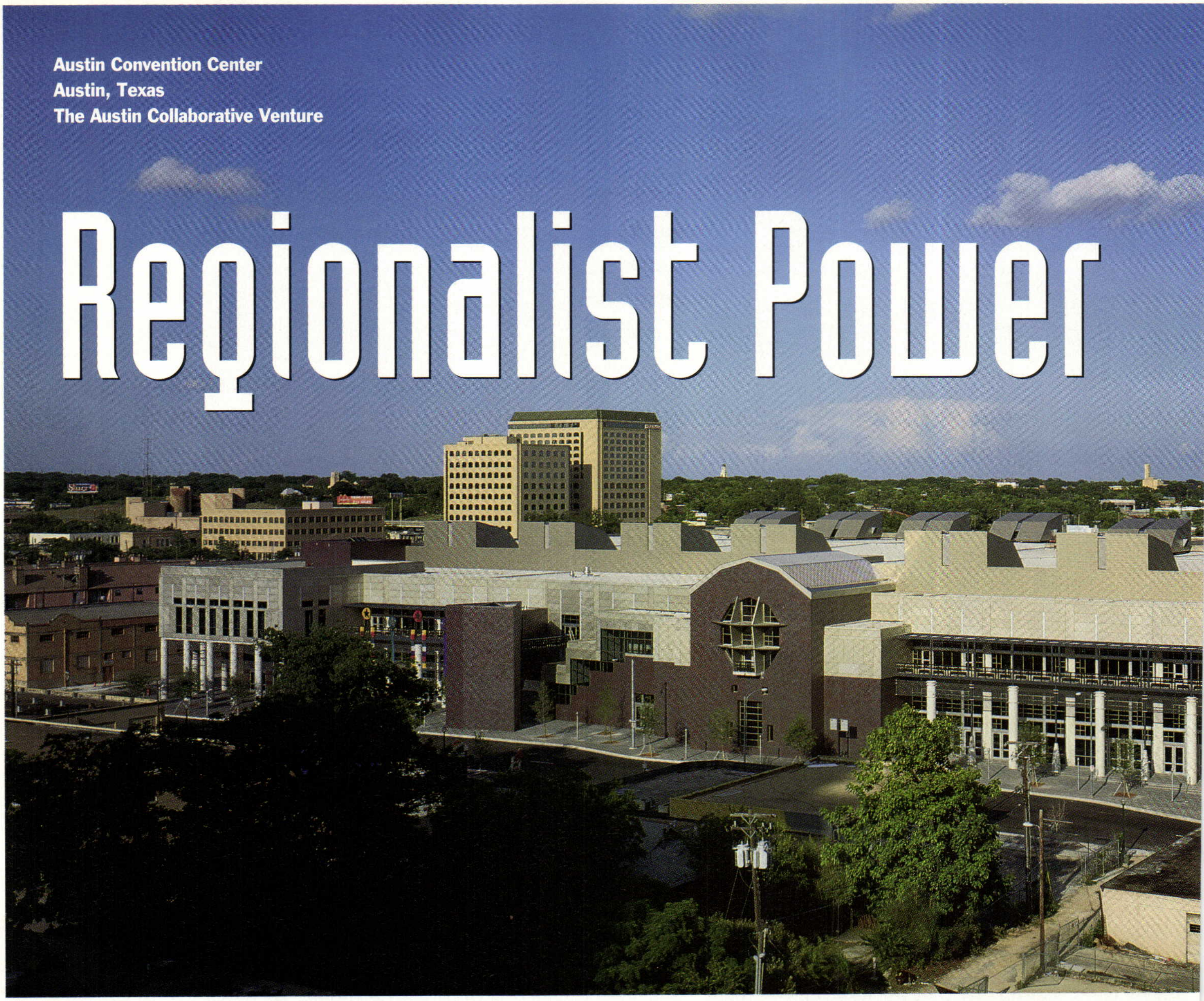
BOEING CAFETERIA 9-12
TUKWILA, WASHINGTON

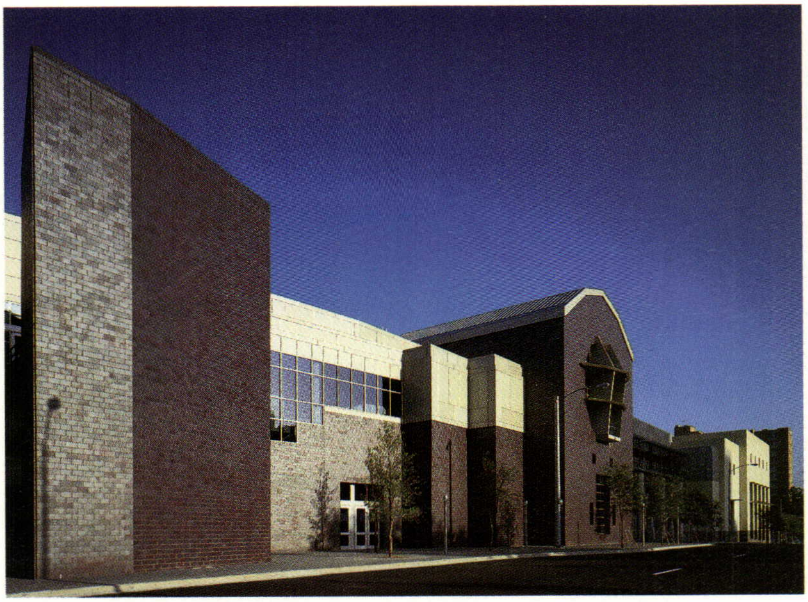
ARCHITECT: Miller/Hull Partnership, Seattle—Robert Hull (principal-in-charge of design); Norman Strong (principal-in-charge of production); Lisa Kirkendall, Steve Tatge (project architects)
LANDSCAPE ARCHITECT: Bruce Dees and Associates
ENGINEERS: KPFF Engineers (structural/civil); D. W. Thomson Consultants (mechanical); Spraling Company (electrical)
GENERAL CONTRACTOR: Ferguson Construction
COST: \$2.5 million—\$120/square foot
PHOTOGRAPHER: Strode Eckert Photographics

Steel decking is anchored to standard bar joists that are supported by customized I-beam (facing page, top and bottom). Different corrugations create contrast on metal-clad service core (top right). Overhanging roof (top left and bottom), paired columns, and punched I-beam (left) screen daylight.

Austin Convention Center
Austin, Texas
The Austin Collaborative Venture

Regionalist Power





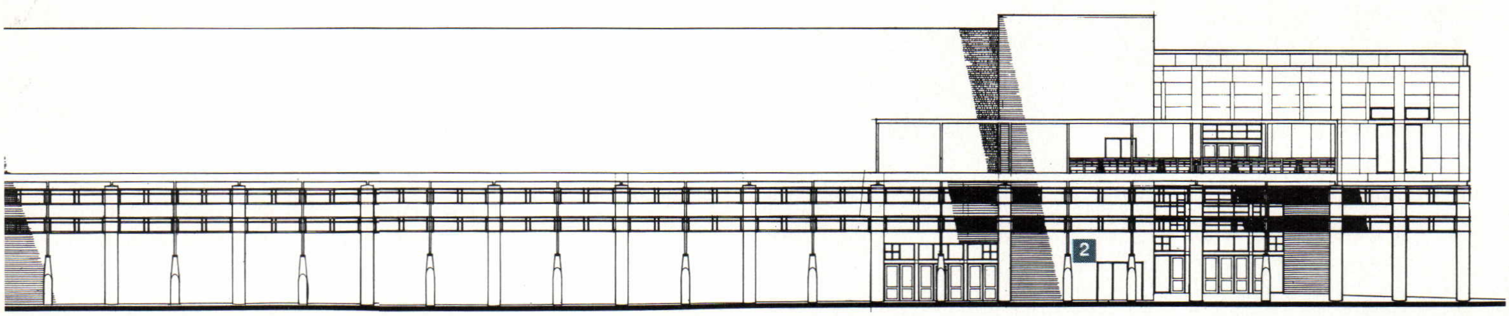
Austin Convention Center's energy savings are achieved through a variety of strategies. Deep porches and aluminum fins on west facade (facing page, top and bottom left) block sun during hottest hours, then admit late-afternoon light. South facade (left and facing page, bottom right) includes deep entrance overhang, screening all but indirect light.

AFTER NEARLY TWO DECADES LECTURING, writing, and building his way to prominence as a Texas regionalist, architect Lawrence W. Speck has finally been awarded the opportunity to implement his site-sensitive ideas in a civic building. The 400,000-square-foot Austin Convention Center, which opened in July, proves the power of Speck's regionalist sensibilities, even for a building type as rigidly formulaic as a convention center. Such "dumb barns," as the 43-year-old Austin-based architect calls them, are usually measured by their economic success and structural innovation, rather than by design ingenuity. Speck, however, led The Austin Collaborative Venture, a team of architects and engineers awarded the commission in 1989, to rein in the imposing energy and lighting needs of the convention center, seamlessly blending energy-saving mechanical systems, shading devices, and solar collectors with an eclectic palette of local limestone, brick, metal panels, and steel.

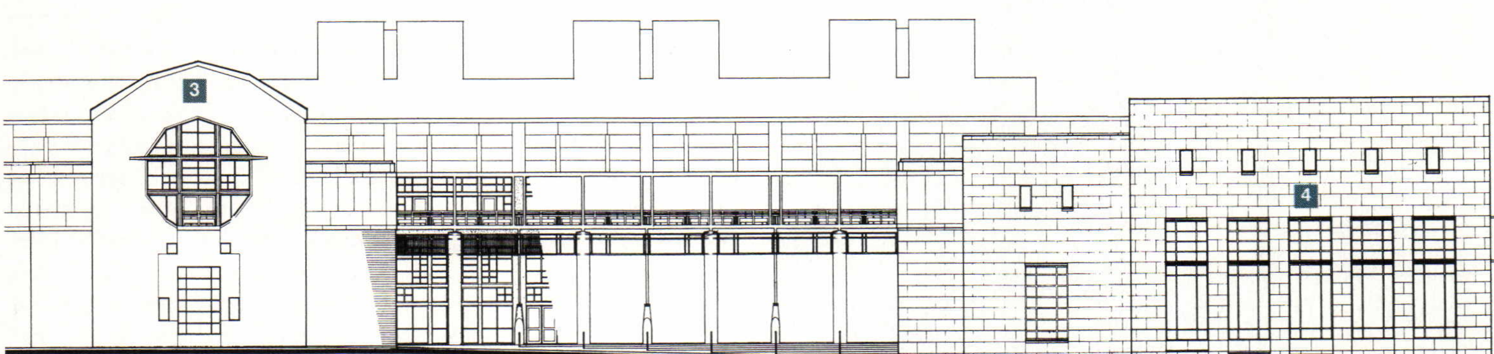
Transforming a site in downtown Austin, the convention center continues a 1980s trend of replacing prewar, light-industrial warehouses with hotels and office buildings. The center's south and west facades respond to these new buildings, and portend the hoped-for revitalization of the area once the recession ends. Colonnades and trees on the west side direct a visitor toward Sixth Street, a strip lined by music clubs, restaurants, and shops only three blocks to the north. The windowless north elevation faces existing warehouses, which will be replaced by the center's planned expansion in the late 1990s. To the east, the perimeter follows the meandering contours of Waller Creek.

Although the convention center's four facades are distinctly different from one another, they are united by their shading strategies, generous porches, and colonnades derived from indigenous architecture. Texas native Speck, a graduate of Princeton, approached the center like his residential work, emphasizing site-sensitive principles that guided 19th-century Texas architects. "Porches are a strong presence in both public and residential buildings from the period," explains Speck, "and materials are treated traditionally. Our limestone, for instance, was given the thickness,

SOUTH ELEVATION



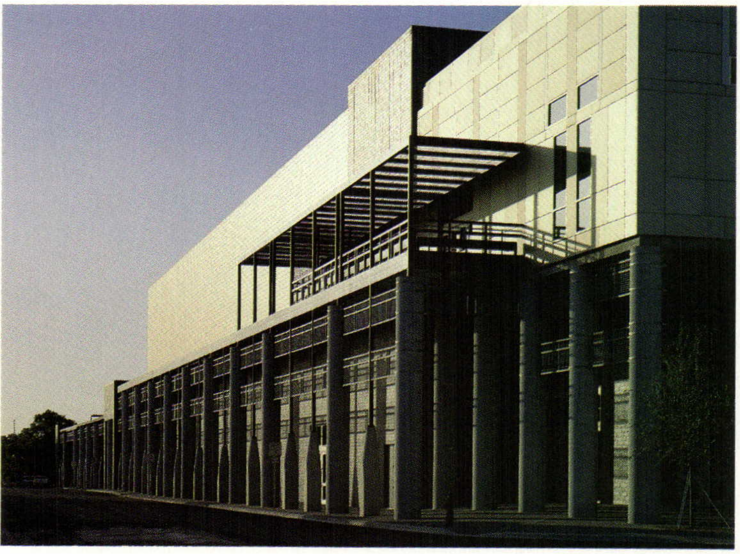
NORTH ELEVATION



WEST ELEVATION

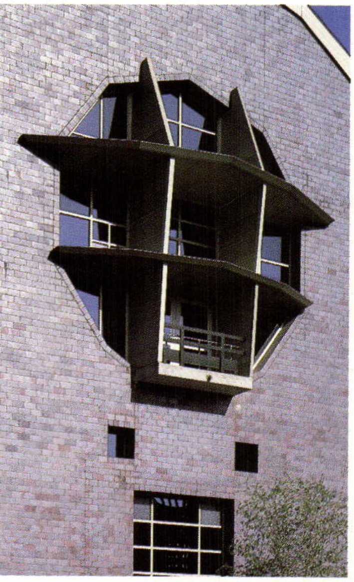
1. SHADED PORCH AND CANOPY AT MAIN (SOUTH) ENTRY

1. Glass-topped steel canopy along south facade cools arriving visitors, while fused wire-and-steel grillwork blocks sunlight and maintains visual transparency. Rotunda clerestory and punched openings create light patterns.

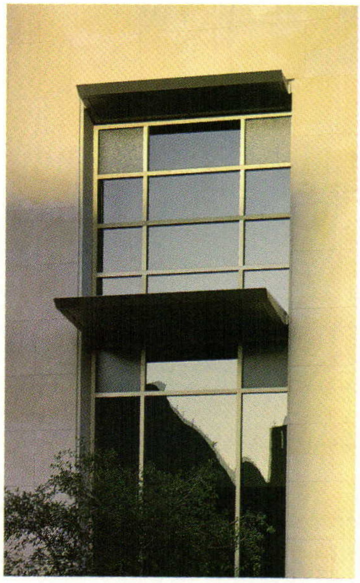


2. NORTH PORCH TRANSITIONAL PASSIVE COOLING

2. North elevation is shielded by wrap-around porch of wire and steel grillwork resting on concrete and steel columns. Common in Australia, such porches create a temperate zone between hot outdoors and chilled inside air, reducing cooling needs.



3. WEST ELEVATION WINDOW FINS



4. WEST ELEVATION LIGHT WELLS

3. Nine-sided window is shielded by 6½-foot-deep aluminum-clad fins that shade reception hall and allow late-afternoon sun to enliven the interior.

4. Eight-foot-deep and 3-foot-deep aluminum light shelves project from south- and west-facing windows (left), directing light inside.

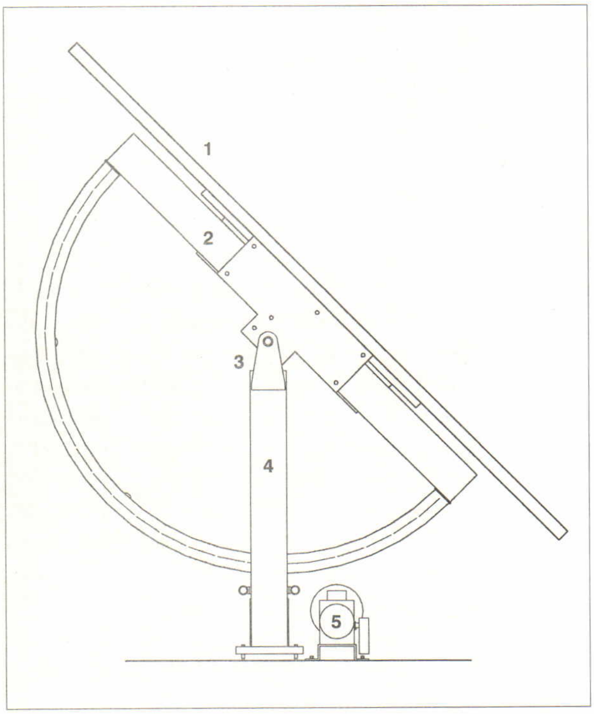
massiveness, and solidity that it has in early Texas buildings." Speck also incorporated standing-seam metal roofs, prevalent in the area's farmhouses and early commercial buildings, reinterpreting them as metal panel and shingle systems. And rather than decorate the convention center with column capitals, cornices, and other un-Texan appliqué, the architect created compositions of contrasting materials and simple geometric forms.

Updating the notion of a 19th-century Texas veranda, Speck and his team devised three variations of a delicate, gridded wire and steel grill. The wire is electrolytically fused across carefully spaced parallel steel blades to create a semitransparent grid. Mounted in horizontal and vertical combinations, the gridded grills block the sun's rays during the hottest period of the day without casting deep shadows or darkening the building interior. The energy-efficient results are large porches that create the ambience of comfortable outdoor rooms and give the exterior a more human-scaled massing.

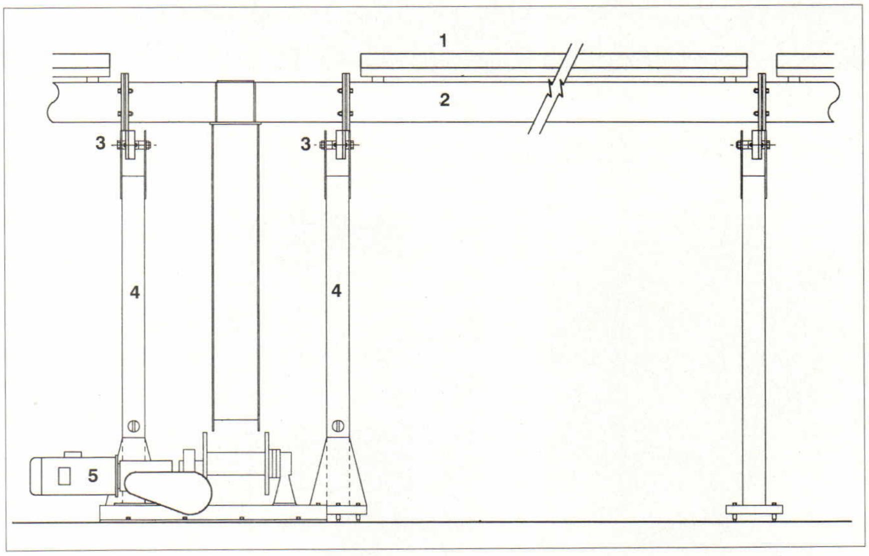
"Through careful calculations of the minimum and maximum angles at which the sun tracks through the sky," points out Speck, "we could ensure that direct sun enters the building only where and when we want it to." In midwinter, the sun in Austin reaches 32 degrees above the horizon. As a result, the south porch sun screens project outward and downward to block light even at this minimum angle. On the east and west facades, screens, light shelves, and fins are less severely tilted, admitting light in the lower angles, but blocking out direct rays at the 82-degree maximum angle at midsummer.

Other shading devices are derived from similar precedents half a world away. Speck once worked for a year in Australia where, in a climate similar to that of Texas, early houses featured full wraparound porches, providing an intermediate zone around the house that acts like insulation, making interiors less difficult to cool. "Porches create a little microclimate, a transition area, between hot and humid ambient conditions and the cool, controlled interior of the building," explains Speck, whose borrowing of Australian models is evident in the north elevation of the Austin Convention Center. "The differential for cooling that the mechanical system fights to achieve is then between 90 and 78 degrees, instead of 105 and 78 degrees."

Active solar technology, at the request of Austin's forward-thinking city council, complements the convention center's passive sun screens. Mounted on motorized pivots and

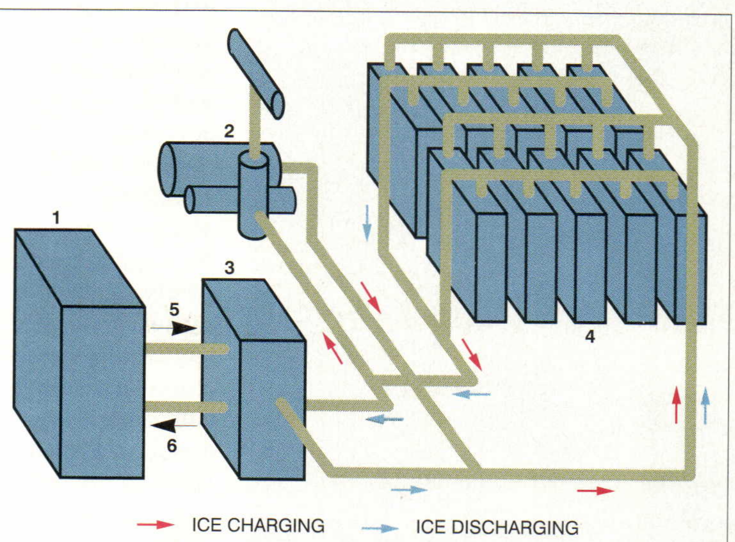


SOLAR PANEL – SECTION DETAIL



EAST ELEVATION AT SOLAR PANEL INSTALLATION

1 SOLAR PANEL
2 GALVANIZED STEEL BEAM
3 PIVOTING ARM
4 GALVANIZED TUBE-STEEL PEDESTAL
5 TILT CONTROL MOTOR



SCHEMATIC DIAGRAM OF ICE STORAGE SYSTEM

COOLING LOAD
CHILLER
PLATE AND FRAME HEAT EXCHANGER
ICE STORAGE HEAT EXCHANGER
5 CHILLED WATER RETURN
6 CHILLED WATER SUPPLY

Motorized solar panels (facing page, top and bottom) track the sun and contribute as much as 10 percent of the center's electricity. Ice storage system (above left) circulates water in a daily freeze-thaw cycle. Water is frozen in a pressurized, closed-loop system immersed in water (left), shifting energy consumed for ice production to off-peak, nighttime hours and cutting daytime consumption by at least 18 percent.

pedestals atop the northeastern corner's service bay, a linear array of solar panels tracks the east-west path of the sun throughout the day. The electricity generated by photovoltaic cells within the panels is fed directly through conduit into the building's central plant. Solar-produced electricity's share of the convention center's energy is usually minimal, although on sunny days of low occupancy, the sun can meet as much as 10 percent of daily lighting and cooling requirements. More significant than its cost and energy savings, the panels demonstrate that solar energy can supplement a vast, energy-consuming building. Glistening in the sun when viewed from Austin's elevated central freeway, the panels boldly announce the building's energy conservation program to the entire community.

The convention center's most creative energy solution is surprisingly hidden in the mechanical plenum above the exhibition and meeting spaces. An ice storage system, in which water is frozen and thawed with high-tech efficiency, shifts the timing of the building's peak energy consumption to less expensive nighttime hours. The system freezes water in a series of closed-loop pressure vessels that are immersed in water; this ice then cools water circulating through a conventional chiller, which handles each morning's air-conditioning load. As the ice is exhausted, the conventional cooling system gradually takes over and carries on through the day, until the water can be frozen again.

Although the ice-storage system consumes 25 percent more power than a conventional chiller, it is both more cost-effective and more energy efficient. Normally, only 32 percent of the building's energy would be used in off-peak nighttime hours, when the city's demand for air-conditioning is minimal, and its rates for electricity are lowest. Ice storage raises the off-peak load to 60 percent of the total, thus boosting operating savings. Moreover, this nighttime power is generated by the municipal power plant simply to keep its generators operating, and creates a surplus above actual demand. So, although more power is required to run the ice storage system, it permits more than half the convention center's energy needs to be met by surplus power that would otherwise be wasted.

As remarkable as its energy-focused technologies may be, the convention center's most distinctive element is daylight, modulated throughout the public spaces at the building's perimeter. The architects amplified the minimalist shading of porches and sun screens with low-E glass to allow for sensible use of daylight as primary lighting. In the morning, light spills in through east window-walls and again in the evening through west-facing, glassy curtain walls. During the more intense midday, as the sun moves over the south facade, only indirect light bounces off concrete pavers and limestone walls into the airy southern corridor, ensuring daylight without compromising energy efficiency.

To enliven the interiors, the architects allowed direct sunlight to filter in through the high clerestory of the rotunda at the southeast corner and pour into the tall, vertical windows of the reception room at the southwestern edge. The bright interiors of these major public spaces form reference points within the cavernous building, reinforcing their prominence and orienting the visitor. The rotunda is particularly animated in bright sun; its radial steel roof trusses virtually dance in the light.

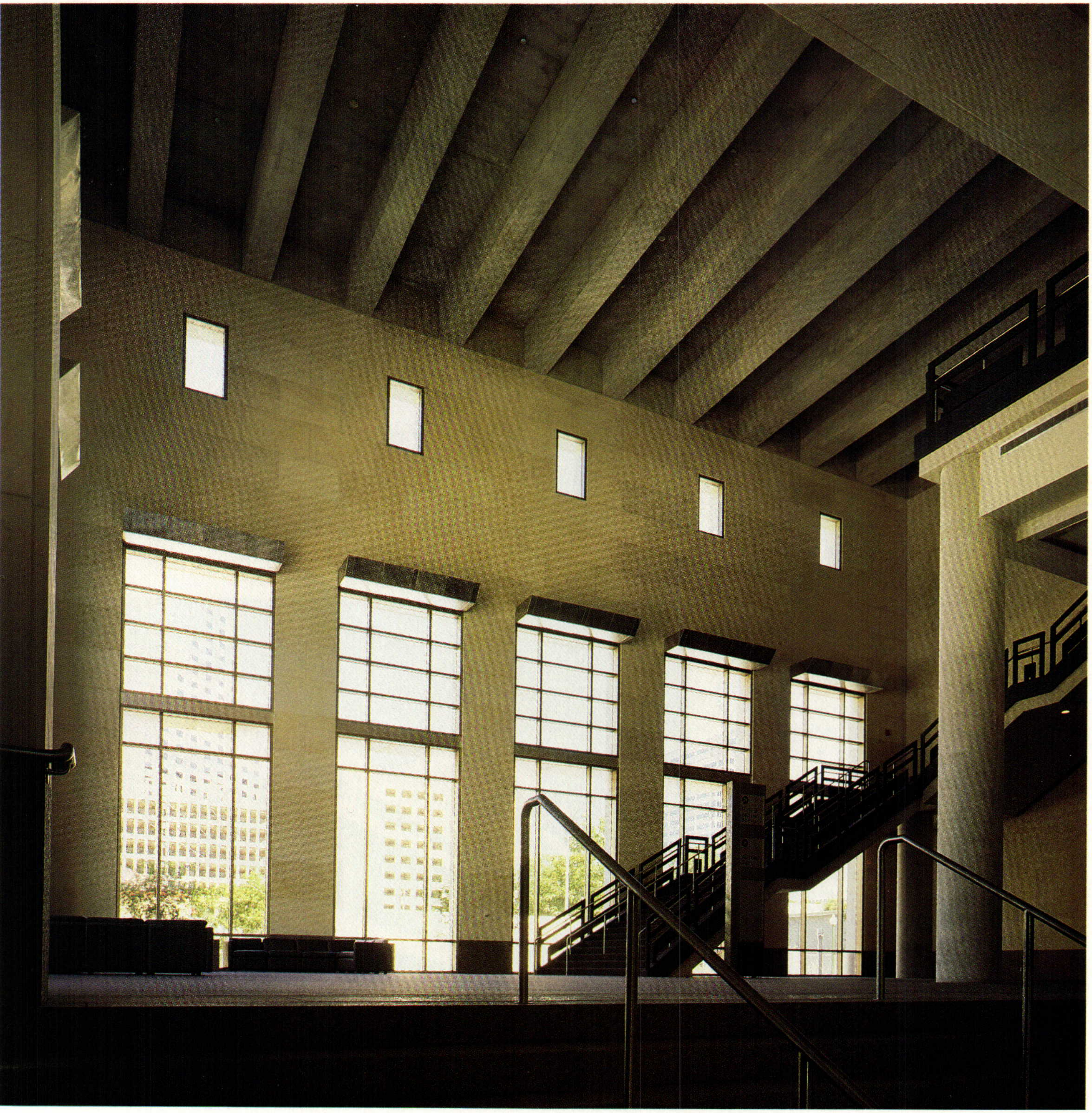
Expressing a local spirit through clearly contemporary means, the Austin Convention Center sets a precedent for huge, publicly funded buildings in urban settings. Speck's regionalist sensitivity and skillful integration of energy-saving devices throughout the structure clearly demonstrate how wisely taxpayers' money has been spent. In an era of increasing resource awareness and consumer scrutiny, the Austin Convention Center is a model of civic responsibility from which other American cities could learn a great deal. ■

—RAY DON TILLEY

AUSTIN CONVENTION CENTER
AUSTIN, TEXAS

CLIENT: City of Austin
ARCHITECTS: The Austin Collaborative Venture, Austin, Texas—Page Southerland Page (architect of record); Lawrence W. Speck Associates; Villalva-Cotera-Kolar; Ellerbe Becket; Johnson, Johnson & Roy; Wilbur Smith Associates—Matthew F. Kreisle III (principal-in-charge); Charles L. Tilley (project manager); Lawrence W. Speck (design lead); Arturo Arredondo, Tom Frank Golson, M. Hamilton Frederick, Alfred Godfrey; Eve Persons, Andrew Baer, Scott Jordan-Denny (design team)
LANDSCAPE ARCHITECT: Johnson, Johnson & Roy
INTERIORS: Lawrence W. Speck Associates/Page Southerland Page
ENGINEERS: Ellerbe Becket (structural/mechanical/electrical); Page Southerland Page (mechanical/electrical/civil)
CONSULTANTS: Boner Associates; Jack Evans & Associates (acoustical); Rolf Jensen & Associates (fire protection); H. G. Rice & Company (food service); William Caruso & Assoc. (food service programming) OTM Engineering (communications)
GENERAL CONTRACTOR: SAE Spaw-Glass
PROGRAM MANAGER: Gilbane Building Company
COST: $50.4 million—$123/square foot
PHOTOGRAPHER: BlackmonWinters

Daylight enters reception hall with ceremonial staircase (facing page) through low-E glass, contained within 18-foot-high anodized aluminum frames, which are capped with light shelves. From clerestory atop limestone-clad rotunda (top left), sunlight filters through a 42-foot-diameter steel radial truss. Indirect sunlight, modulated by sunshades and porch recesses, fills south corridor (left and section, facing page) leading from rotunda.



WEST - EAST SECTION

The Pilkington Wall Structural Glazing System

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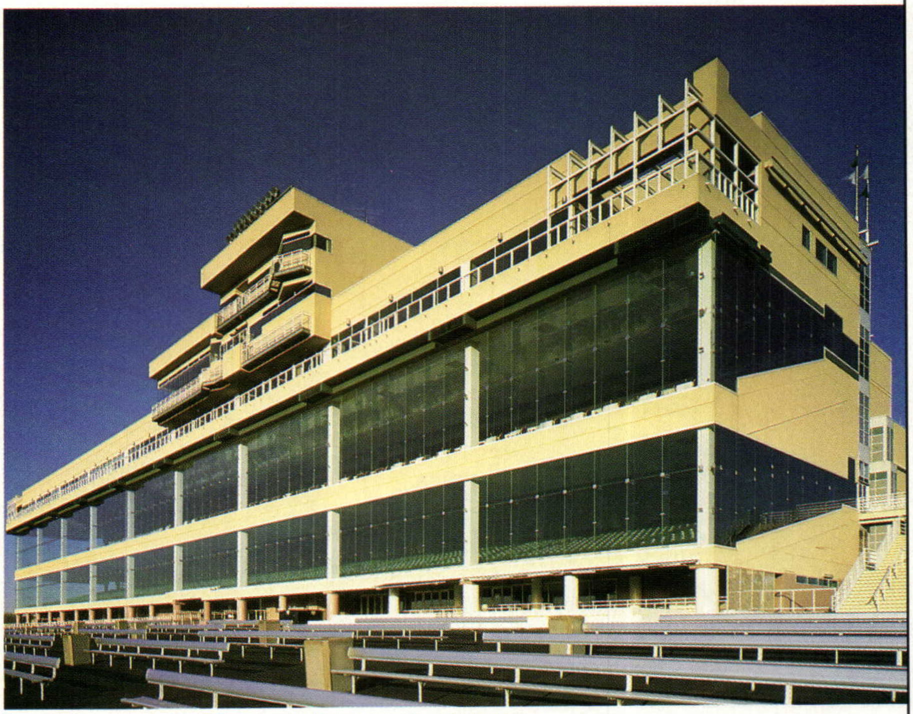
PILKINGTON

Project: USAA Financial Center, San Antonio, Texas
Architect: Harwood K. Smith & Partners
Product: Single Planar



Project: Remington Park Racetrack, Oklahoma City, Oklahoma
Architect: Ewing Cole Cherry Parsky
Product: Patch Plate System

FOR FURTHER INFORMATION CONTACT:

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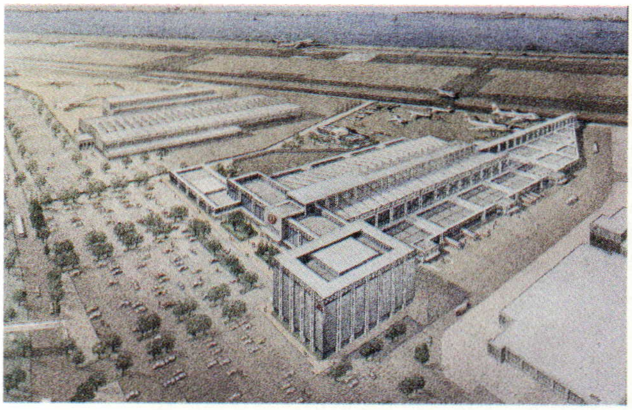
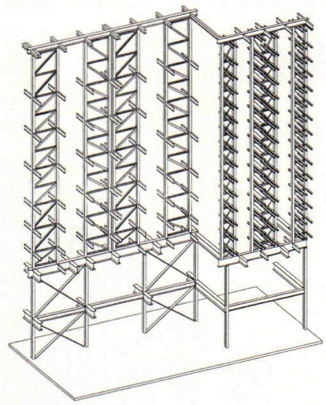




Airport complex (left) includes maintenance facilities, aviation terminal, and freight rack (right).

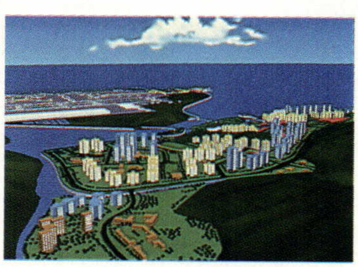
Built-in Storage System for Airport Cargo

THE NEW YORK OFFICE OF HOK IS CURRENTLY incorporating a sophisticated material handling system into the architecture of a new air cargo facility for Japan Airlines (JAL) at Kennedy International Airport in New York. The project is part of a larger renovation and expansion of a 1950s building vacated in 1986 by Pan Am. HOK worked with New York-based Weidlinger Associates to develop the structural frame of the 270,000-square-foot cargo facility. Thornton Tomasetti is responsible for engineering the rest of the 850,000-square-foot complex (above left).

The architects initially considered a conventional structure to house the highly automated system, which was designed by the German manufacturing company Carl Schenk, and consists of a network of conveyors, vehicles, and cranes. This system navigates freight containers to appropriate positions within a 95-by-450-by-115-foot storage rack (section, above right). After further investigation, however, HOK proposed an integrated system in which the storage framework doubles as the building structure. Coordinating with HOK and Schenk, Weidlinger detailed the rack, which is built of steel tubes and wide-flange sections, to accommodate standard deflections due to roof loads, lateral forces, and temperature, without compromising the precision required by the computerized operation. This approach reduced structural costs by 20 percent, or $8 million. The first phase of the new complex is scheduled to be completed by December 1993.

Computer Guides Airport Construction

When completed in 1997, Hong Kong's multibillion dollar international airport will be the world's largest—capable of handling up to 35 million passengers annually. With landfill, the airport will triple the size of an offshore island (inset). The complex was designed by the Mott Consortium, a joint venture of architects Foster Associates and engineers Ove Arup & Partners. All contract documents for the terminal and an adjacent housing complex for 20,000 people—ranging from site preparation to civil engineering and architectural drawings—will be produced on compatible computer systems by Intergraph. A central database will coordinate the many design disciplines involved in the project and their estimated 10,000 drawings.



Practice Institute Tests Education Alternatives

AIA UPDATE From July 31 through August 4, faculty members from 15 schools of architecture across the U.S. and Canada assembled at St. Johns College in Santa Fe, New Mexico, for a workshop aimed at revolutionizing architecture education. Jointly sponsored by the AIA, the Association of Collegiate Schools of Architecture (ACSA), and CNA Insurance Company, the first annual Professional Practice Summer Institute sought ways to integrate practice issues into design studio courses.

AIA President W. Cecil Steward opened with a warning that the profession is gradually losing ground within the building industry, and that architects must become more involved with practice concerns. Dana Cuff, author of *Architecture: The Story of Practice*, stressed that many of today's commissions involve community design, zoning, finance, and planning boards and councils that require sensitive treatment by the architect.

Small-group sessions explored alternative teaching methods and discussed courses at Boston's Wentworth Institute of Technology, Georgia Tech, and the University of Michigan that integrate practice and design. Dale Ellickson, senior director of the AIA Documents Program, conducted a session on negotiation techniques according to the theories of Roger Fisher, author of *Getting to Yes*. CNA's Ava Abramowitz staged a mock arbitration session, in which an architect attempted to obtain disputed fees from a client.

Each school sent one practice and one design-studio faculty member. The pairs formed teams with other schools for the purpose of jointly developing model studio projects to prepare students for dealing with architectural practice. The upcoming academic year will see many of these methods in place.

In 1993, the second annual Professional Practice Summer Institute will build on this workshop and involve more schools. ■

—JOSEPH BILELLO AND BARRY YATT

Joseph Bilello is director of AIA education programs. Barry Yatt is an assistant professor at Catholic University.

Designing for Daylight

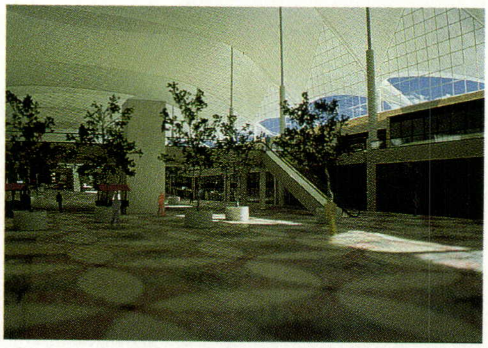
How building form influences natural lighting strategies.

WHITE-COLLAR EMPLOYEES CONSISTENTLY rank access to a window and daylight as the top two desired workplace amenities. But direct sunlight is not without its problems, challenging architects to create designs that prevent glare on now-ubiquitous video display terminals (ARCHITECTURE, June 1992, pages 110-113). As a result, such advancements as photocells, automatically dimming fixtures, daylight-tracking solar panels, and improved glazings are becoming increasingly common for controlling daylight in offices. Successful naturally lit interiors, however, do not require such sophisticated illumination features, and can depend instead on the fundamental massing and articulation of a building envelope.

The most effective and economical daylighting system utilizes light reflected from the sky, rather than that which emanates directly from the sun. Effective on both clear and overcast days, light from the sky is preferable to direct sunlight because it exhibits fewer extreme variations as a result of the changing angle of the sun and passing clouds.

Optimal natural illumination is not confined to any one specific building form, although Steve Ternoey, architect and founder of the Boulder-based daylighting consulting firm LightForms, prefers a "wedding cake" profile of terraced roofs with north or south-facing clerestory windows, such as that of the Boulder Public Library (pages 46-53) and the National Energy Renewal Laboratory's new research headquarters in Golden, Colorado.

Such stepped volumes and overhangs control the angle of direct sunlight entering clerestories in both summer and winter, so that most light is initially reflected off the roof. Serving as a light shelf, the roof redirects sunlight and sky light upward through the clerestories and onto the ceiling for indirect illumination. This method of washing walls and ceilings with natural light reduces sharp contrasts between these interior surfaces and otherwise brighter glazed openings. East and west exposures should also be glazed with clerestories and windows, balancing light from extensive south-facing windows. Sunlight



Denver International Airport, now under construction, will be daylit through a translucent membrane of woven fiberglass (top) over the terminal's 900-by-210-foot great hall (center). The canopy will permit 10 percent of available daylight to penetrate the envelope and eliminate the need for artificial lighting even on an overcast winter day. The small mass of the fabric decreases the amount of solar heat absorbed by the roof, reducing cooling requirements. Clerestories shaded by fabric canopies at the perimeter of the terminal introduce daylight within the ticketing area (above) and balance diffused light from the roof.

from the south, where the angle of the sun varies less throughout the day, can be controlled by permanent, vertically and horizontally oriented features such as overhangs, light shelves, and fins. East- and west-facing windows, however, generally need movable shades, screens, or louvers to adjust to shifting light conditions.

Determining optimal building forms and glazed apertures for daylighting is possible through computer modeling, but due to the complex design variables that contribute to actual natural illumination levels, calculations are still limited in their effectiveness. Scale models, familiar design tools for architects, are still the most effective means of analyzing natural light. Models are also the best way to convince clients that the proposed daylighting strategies will provide the level of illumination they desire.

"The choice of whether or not to incorporate daylighting into a building is often an all-or-nothing proposition," asserts Ternoey. "There is very little room for compromise." When daylighting is fully implemented through consideration of the building's orientation, form, and finishes, an electric lighting system may be designed for solely nighttime use. Otherwise, a sophisticated and costly lighting control system is necessary to balance a building that depends on both natural and artificial illumination.

But the saving grace of even a partially daylit building is its potential financial benefits. These include both reduced lighting and cooling costs, since artificial lights generate heat, for which air-conditioning systems inevitably compensate. "Daylighting is a highly visible energy-conserving measure," notes Ternoey. "Plus, daylight creates a more humane environment." As seen in the design of a facility for the mentally ill in Frederick, Maryland (page 91), daylighting offers many psychological benefits to healthcare patients. And for any building type, natural illumination adds an intangible value by putting occupants in touch with changes in the time of day and season. ■

—MARC S. HARRIMAN

Solar Energy Research Facility
Golden, Colorado
Anderson DeBartelo Pan, Architects

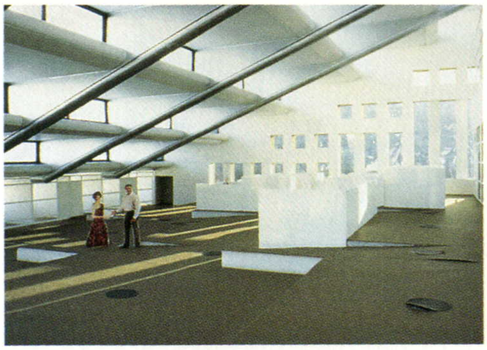
WHEN COMPLETED NEXT YEAR, THE NATIONal Renewable Energy Laboratory's solar research headquarters will demonstrate the philosophy of the agency by relying on daylight as the building's principle source of illumination. On clear or even overcast days, the facility's open-plan offices will only require artificial ambient lighting for one hour after sunrise and one hour before sunset. Phoenix-based architects Anderson DeBartelo Pan achieved this high level of daylighting without any experimental technologies, relying instead on the design of the building itself.

The architects initially conceived the terraced profile of the 116,000-square-foot structure as a response to its site, a sloping hillside below a mesa on the outskirts of Golden, Colorado. Aluminum-clad trusses form the diagonal framework that supports each of the office wing's horizontal tiers, providing a 95-foot clear span and leaving each 10,000-square-foot floor unobstructed by columns for maximum daylight penetration.

With the assistance of Boulder-based daylighting consultant Steve Ternoey, the southeastern exposure of each terraced block was fine-tuned to provide office interiors with optimal year-round daylighting. Within the interior, variances in daylighting conditions were plotted to accommodate circulation and work zones—more light for paper-oriented tasks, less for computer workstations.

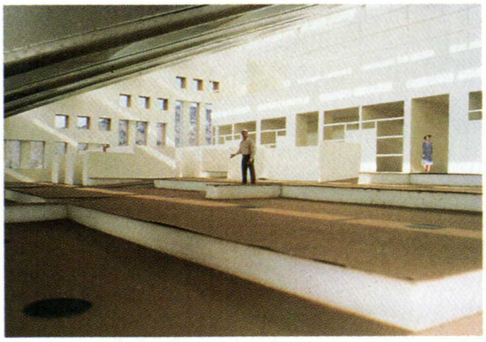
The aluminum-clad trusses and roof tiers shield sunlight from directly entering the building shell during spring, summer, and fall. Each terrace overhangs the level below, forcing sunlight to reflect off a rooftop before passing through clerestory windows. Light emitted through the clerestory then strikes the white-painted ceiling and the northern wall of the offices, diffusing it throughout the open plan. To control glare, the architects specified glazings with six different levels of light transmittance; each type of glass corresponds to a different orientation.

Upward-oriented light trays in the ceiling will house compact fluorescent lamps to provide supplemental indirect lighting in the evening. Illumination for individual workstations is further controlled by 5-foot, 9-inch-high partitions, which allow only reflected light to enter from above. Each workstation will also be equipped with a retractable fabric canopy that can be adjusted to compensate for fluctuating daylight.



CLEAR

OVERCAST



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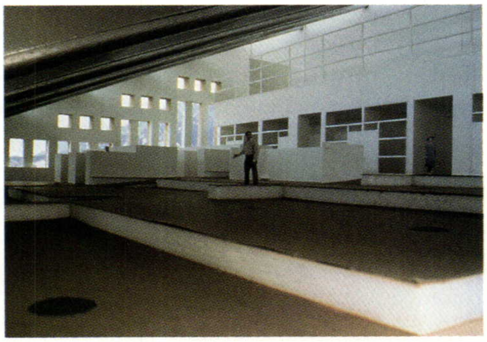

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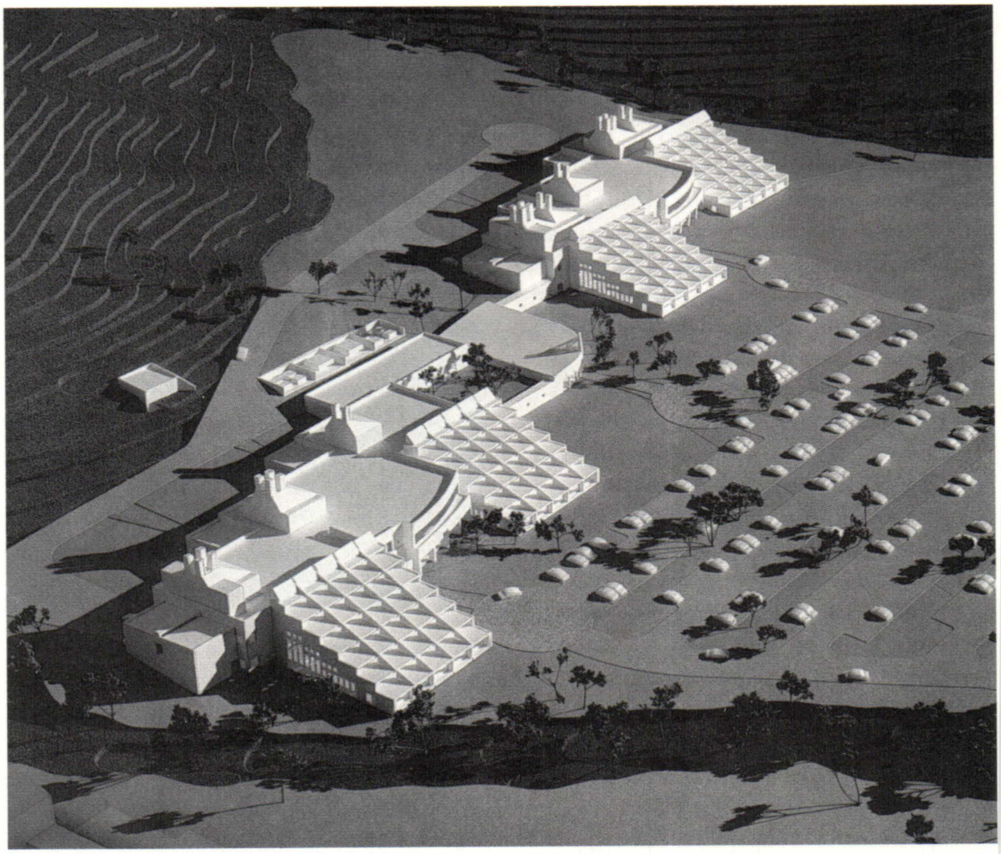
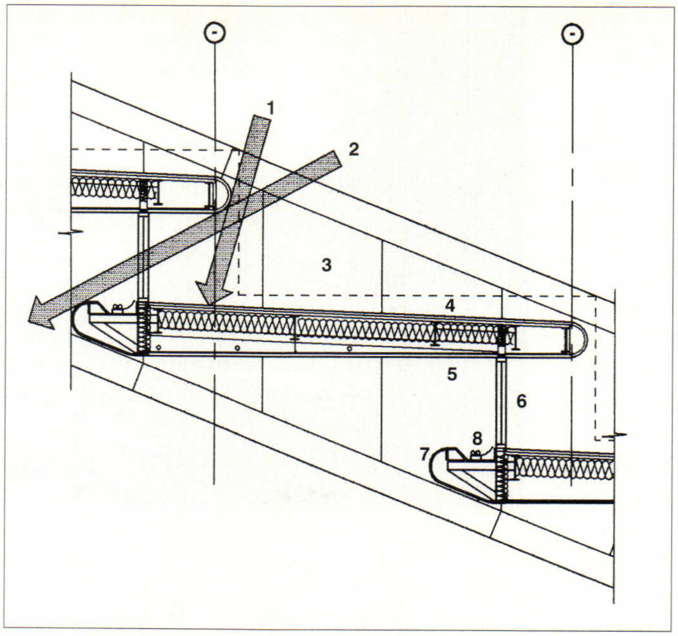


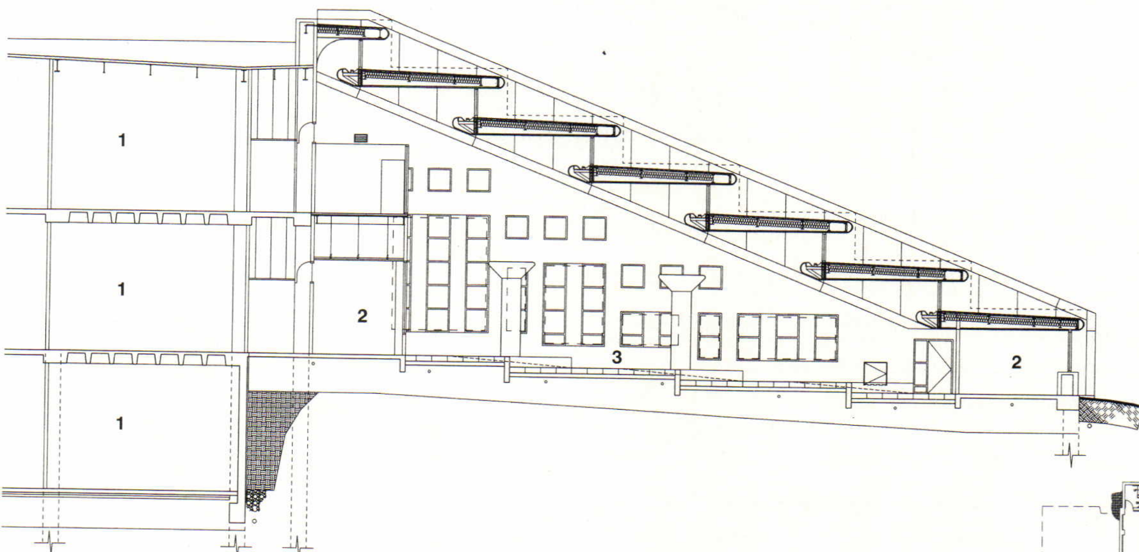
The National Renewable Energy Laboratory's new research headquarters (above) will be a model example of daylighting principles applied to a computer-intensive office. Terraces supported by diagonal trusses control daylight entering clerestories to illuminate partitioned workstations (top left and right). Daylighting models determined illumination levels during clear and overcast days (center left and right), so that each of the four, 10,000-square-foot, terraced office modules (above) will depend solely on natural light during daytime hours. The building will be completed next fall.

Each tier of office blocks (section, below) has an overhang that allows a hint of sunlight to enter through clerestories in winter. The rest of the year, sunlight strikes the rooftop at a higher angle (detail, right) and is redirected through the clerestory to wash the ceiling with light and reflect down to workstations. Indirect fluorescent lamps light the spaces in the evening. Offices are divided according to daylighting needs for specific tasks. Computer-intensive workstations are at the south end of the building and paper tasks at the north end (plan, bottom).

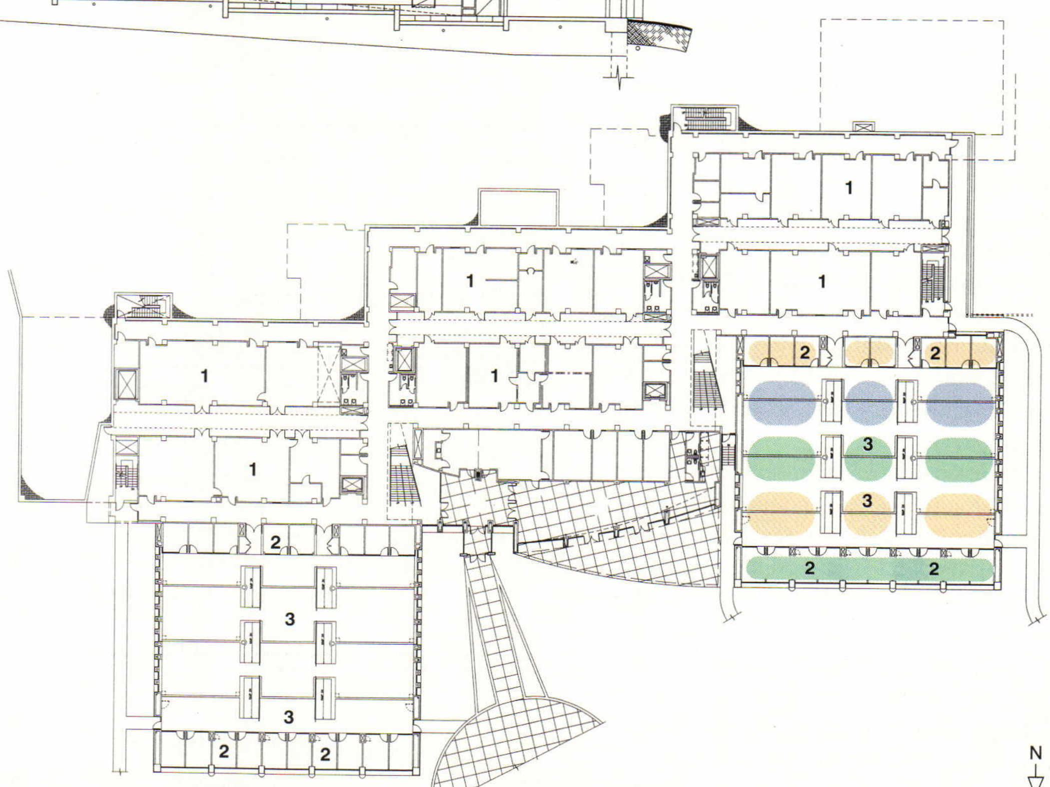


CLERESTORY DETAIL

1 SUMMER SUN ANGLE
2 WINTER SUN ANGLE
3 METAL-CLAD TRUSS
4 METAL PANEL ROOF SYSTEM
5 ACOUSTIC CEILING TILE
6 INSULATED GLASS
7 FIBERGLASS-REINFORCED GYPSUM-BOARD LIGHT SHELF
8 RECESSED FLUORESCENT LAMP



NORTH-SOUTH SECTION



1 LABORATORY
2 PRIVATE OFFICE
3 OPEN OFFICE
4 LOBBY
5 DINING AREA

COMPUTER TASKS
PAPER TASKS
COMPUTER AND PAPER TASKS

FIRST FLOOR PLAN

Way Station
Frederick, Maryland
Ensar Group, Architects

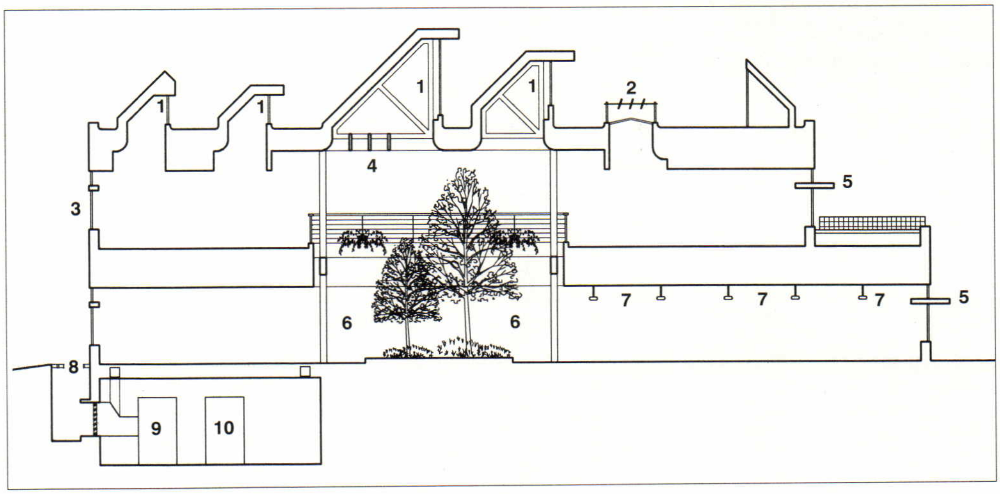
IN ADDITION TO CONSERVING ENERGY, FREDerick, Maryland's Way Station—a community-based healthcare organization for the mentally ill—sought a noninstitutional environment that would blend the therapeutic benefits of daylight with natural, nontoxic materials and furnishings. Since many of the patients suffer from impaired spatial perception, the Ensar Group combined light shelves, daylight tracking devices, light scoops, and skylights for easy orientation within the 30,000-square-foot facility. Circulation, gathering places, and offices are organized around a central, two-story court that extends nearly the full width of the building.

To increase daylight within the facility's open plan, design principal Gregory Franta projected south-facing light monitors above the roof to capture and redirect sunlight into the court's second-floor walkways and interior gardens. He suspended horizontal fabric banners below the ceiling to diffuse sunlight from the light wells. On skylights over the office workstations, the architect installed three soluminaires, solar-powered daylight-tracking devices that extend the hours of illumination by automatically adjusting reflectors during the course of a day. He kept interior partitions to a minimum, and glazed them to further infuse perimeter office areas with natural light.

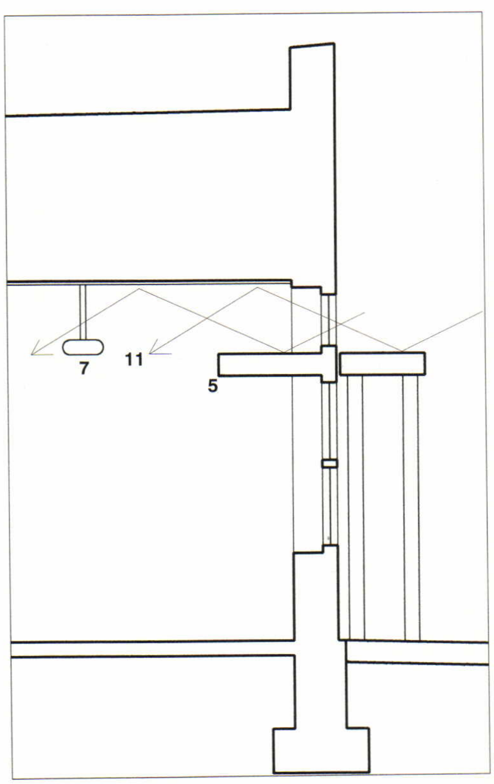
Franta also introduced daylight through south-oriented clerestories above office windows, where light reflects off shelves and onto the ceiling (bottom section) to reach deeper into the building. Exterior portions of the shelves reduce heat gain and glare by shading glazed openings from warm direct sunlight. At the exterior, high-performance windows vary light transmittance levels according to their orientation. Daylight also powers passive-solar water heaters located in the south-facing greenhouse.

Franta produced indirect artificial illumination through pendant-mounted fluorescent fixtures that adjust by automatic dimmers to varying daylight levels. Along with an ice-storage system that efficiently cools the building, such conservation measures decrease energy consumption to a third of that required by a commercial building of comparable size. Such reduced utility bills mean that Way Station will recover the cost of the newly installed energy-conserving systems within 5 to 10 years.

HARRIET WISE



NORTH-SOUTH SECTION



OFFICE WALL SECTION

1 SOUTH- FACING MONITOR
2 SOLUMINAIRE DAYLIGHT TRACKING SYSTEM
3 HIGH-PERFORMANCE GLAZING
4 LIGHT-DIFFUSING BANNERS
5 LIGHT SHELF
6 LIGHT COURT
7 INDIRECT LIGHTING FIXTURES
8 FRESH AIR INTAKE
9 ICE TANK
10 CHILLER
11 REFLECTED SUNLIGHT

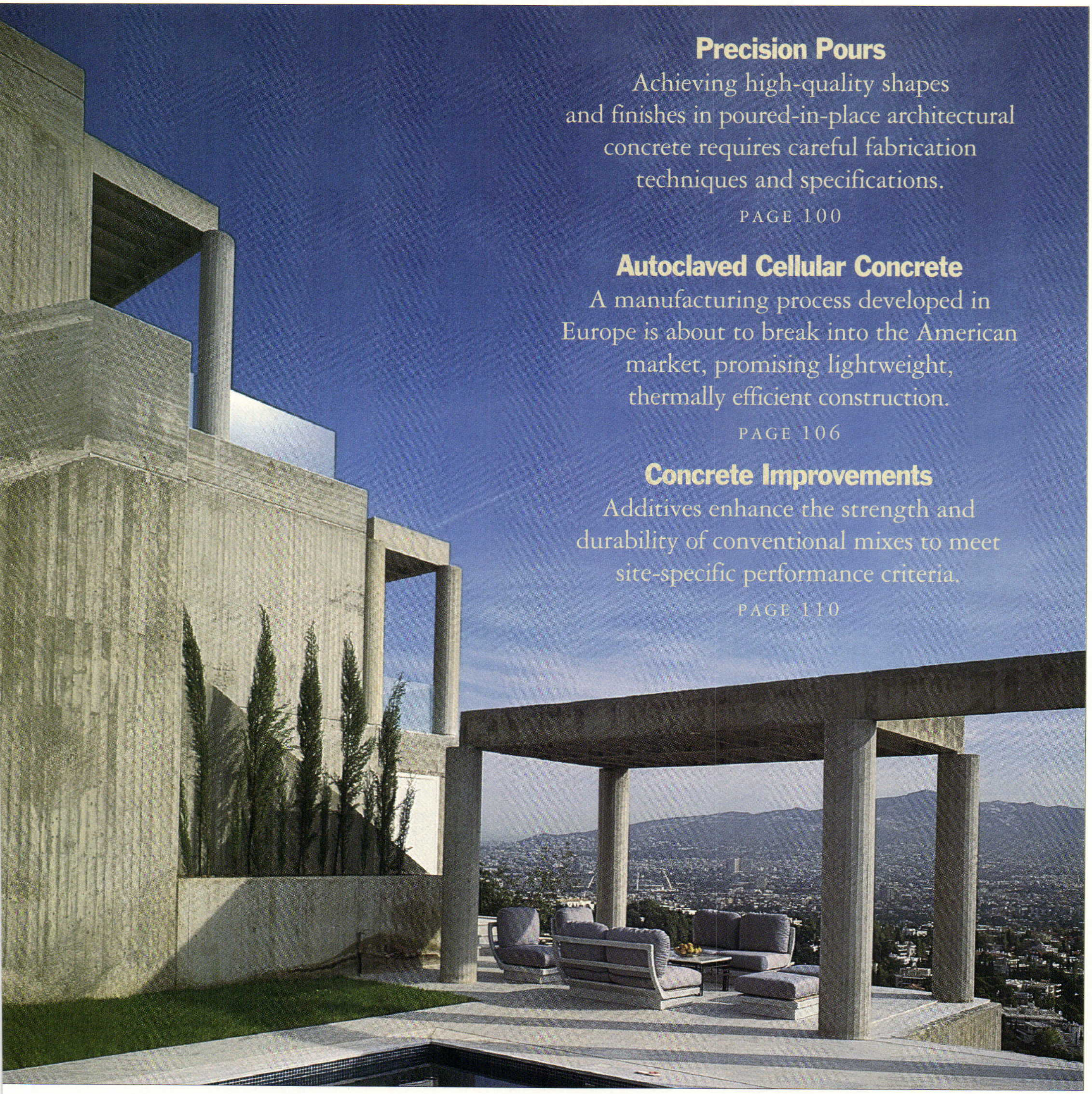
South elevation light shelves (top) direct daylight (bottom section) into offices. Daylight also enters through roof monitors (section above) into two-story central court (facing page, top left) where it filters through glazed interior partitions (facing page, top right) and is diffused by overhead banners (facing page, bottom left). Skylights illuminate workstations (facing page, bottom right).




ARCHITECTURE

Concrete

TECHNOLOGY PORTFOLIO



Precision Pours

Achieving high-quality shapes and finishes in poured-in-place architectural concrete requires careful fabrication techniques and specifications.

PAGE 100

Autoclaved Cellular Concrete

A manufacturing process developed in Europe is about to break into the American market, promising lightweight, thermally efficient construction.

PAGE 106

Concrete Improvements

Additives enhance the strength and durability of conventional mixes to meet site-specific performance criteria.

PAGE 110

EMPLE HOUSE, ATHENS, GREECE, BY HUGH NEWELL JACOBSEN

Precision Pours

Cast-in-place concrete requires exacting specifications and site coordination.

ARCHITECTURAL CONCRETE CAN SPARK THE imagination like no other building material. It can be molded into virtually any shape, assume any color, sport any texture. But to successfully exercise such creativity, an architect must understand and participate in the construction process to a greater extent than any other method of assembly.

Several factors make this attention necessary. Unlike other envelope systems, architectural concrete is fabricated in the field according to subjective standards. And, unlike its structural counterpart, architectural concrete is left exposed, so any imperfections that develop during the pour remain on view. For architects seeking a perfectly consistent, high-quality surface, the material presents an enormous challenge. "You either get it right or tear it down," notes architect Don Weinreich of James Stewart Polshek & Partners in New York. "You can't patch it, clean it, or touch it up."

An architect must keep in mind a vast number of conditions— from concrete mix and pouring techniques to scheduling—to facilitate the construction process. Aggregate size, for example, should be selected for compatibility with the formwork's complexity, since a contractor may have difficulty blending a batch of concrete mixed with larger stones in areas that are hard to reach. And reveals must be placed to accommodate cold joints that inevitably occur when a contractor completes a pour.

Through detailed specifications and continual discussion, an architect must make the desired quality clear to the contractor, who is likely to be more accustomed to working with structural concrete. In terms of visual effect, architectural concrete has stricter requirements. Pours must be smaller than is required for general concrete work, and forms must be designed for tightness to prevent discoloration and voids caused by leaks.

Acknowledging the precision required for architectural concrete, Weinreich notes, "It gets to the point where you ask contractors to submit schedules of how long it's going to take the trucks to get from the plant to the site, and how they are going to mix the sand." Such specificity enters the means and methods realm of construction that most architects try to avoid for liability reasons.

But Reginald D. Hough, a New York building technology consultant who developed the architectural concrete specifications for I.M. Pei & Partners' East Wing of the National Gallery of Art in Washington, D.C., counters that the best way to avoid a lawsuit is to deliver a quality product in reasonable time. He insists that this goal can only be achieved if the architect gets involved in the means and methods, because that is when the concrete takes shape. Hough, however, warns professionals not to overstep their bounds. Any ideas offered by the practitioner should be documented as suggestions, he cautions, always underscoring the fact that the contractor is still responsible for the final method employed.

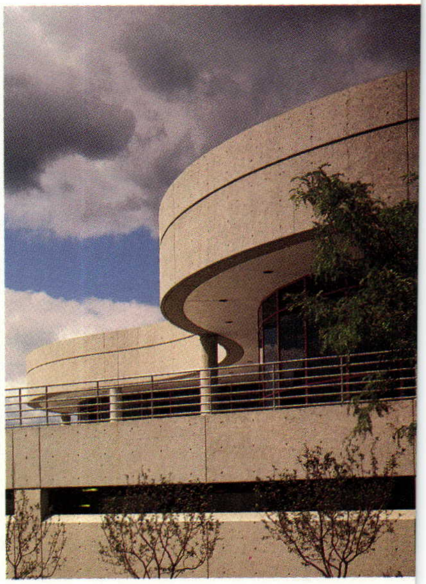
But detailed specifications, drawings, and discussion alone will not ensure a satisfactory finish. To establish the quality sought by the architect, the contractor must build a mock-up that incorporates all specified components and processes as soon as the contract is awarded, even though the concrete work may not begin for several months. Site visits, of course, are critical for a material fabricated in the field. Chicago architect Bertrand Goldberg, who designed Marina City and other concrete landmarks, estimates that architectural concrete requires four times the amount of field work of other building systems. It must be made clear to the owner that if architectural concrete is going to be specified, the architect must be involved during construction and adequate fees must be allocated for that purpose.

Given the demands of time, money, and detail, it's no wonder that new buildings wholly constructed of architectural concrete are uncommon. But, as the following portfolio reveals, given the right site, contractor, and building program, architects willing to meet the challenges of this demanding material are shaping their dreams into concrete realities.

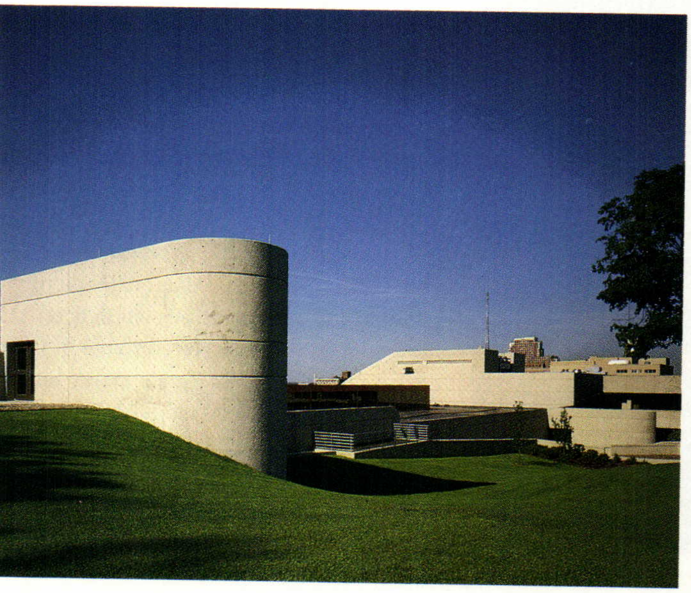
—NANCY B. SOLOMON

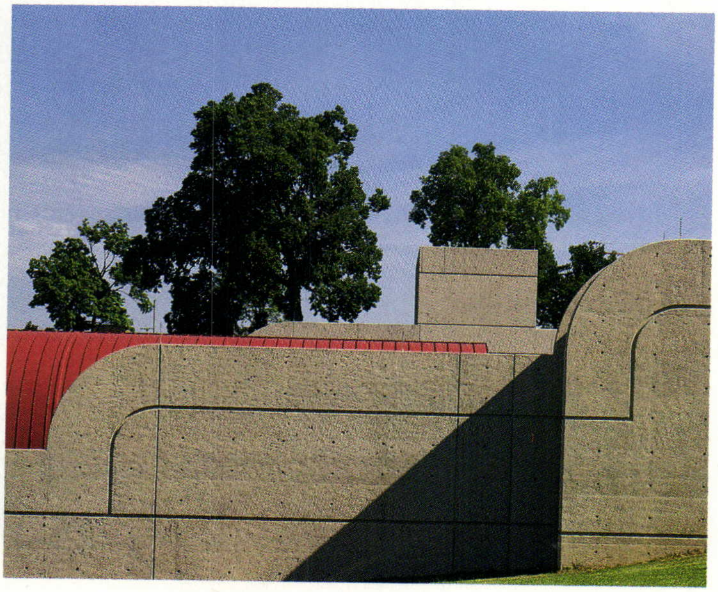
Applied Technology Center
Grand Rapids, Michigan
Perkins & Will and
WBDC Group, Architects

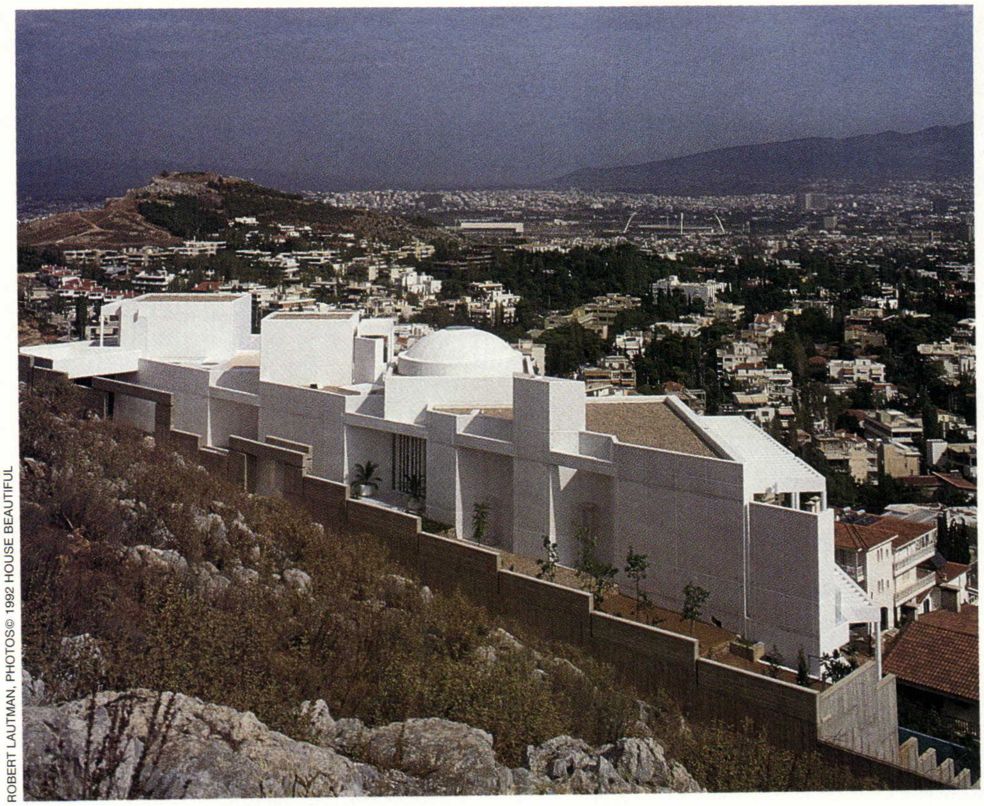
PRIMARILY FOR CONTEXTUAL REASONS, Perkins & Will and the WBDC Group chose architectural concrete for their recently completed Applied Technology Center. The 190,000-square-foot building, funded by Grand Rapids Community College and Ferris State University, joins three cast-in-place structures, also designed by Perkins & Will, on the community college's urban campus. The architects specified limestone aggregate to match the center's neighbors and air-entrainment to minimize spalling within a standard mix of 4,000 psi concrete. The resulting material was poured into metal forms to ensure a smooth appearance. Forms for rounded features, such as a cylindrical atrium (facing page, top), undulated fascia (below), curved staircase (facing page, bottom left), and scalloped corners (facing page, bottom right), wer bent in the shop to establish precise arcs Exterior surfaces were sandblasted to expose the white aggregate, and tie holes were plugged with black plastic inserts.



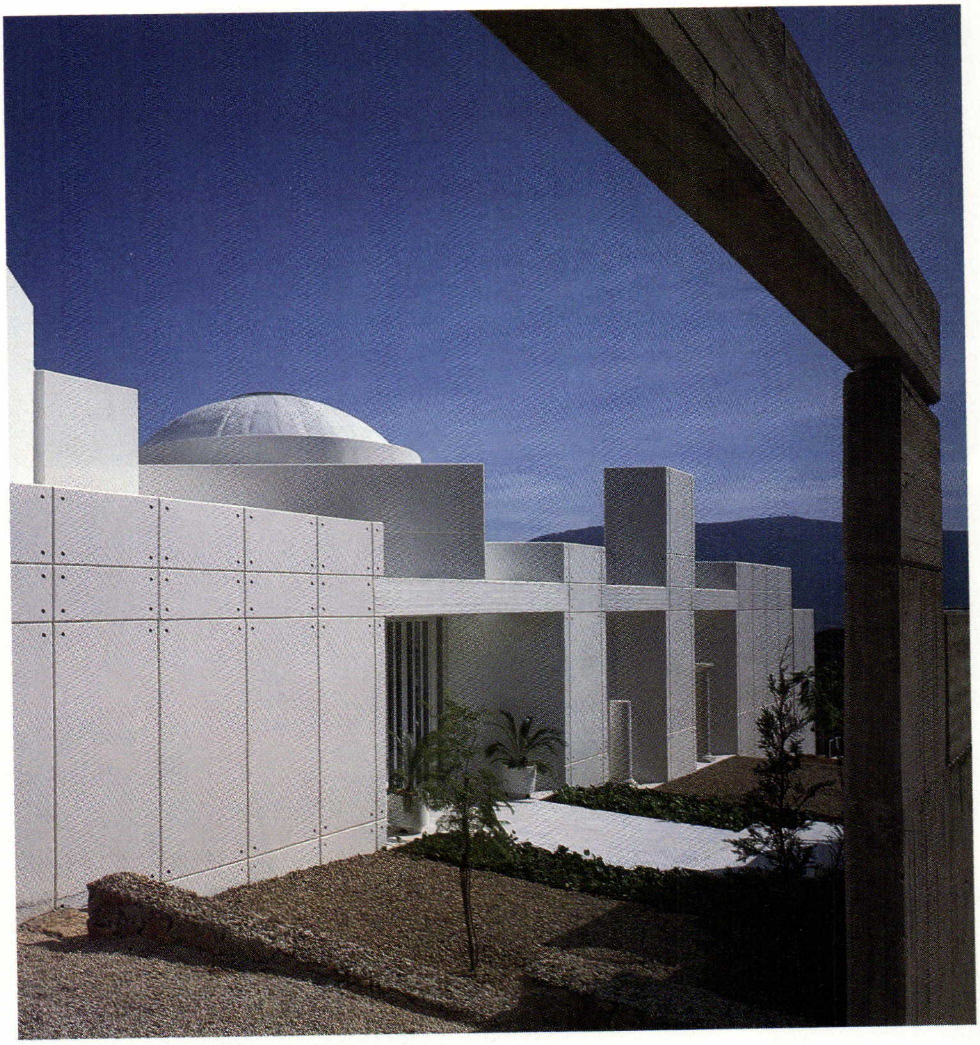

APPLIED TECHNOLOGY CENTER







ROBERT LAUTMAN, PHOTOS© 1992 HOUSE BEAUTIFUL



VILLAGE HOUSE

Private Residences
Athens, Greece
Hugh Newell Jacobsen and
Andreas Simeon, Architects

WASHINGTON, D.C.-BASED HUGH NEWELL Jacobsen believes that the world's finest examples of concrete are found in Greece. "The Greeks make concrete like cookies—they add a little more here, a little bit there—yet what they build can withstand an earthquake." With raw materials and skilled labor readily available, Jacobsen sculpted a pair of houses, set 200 feet apart in an old rock quarry atop an Athens hillside, from cast-in-place reinforced concrete. The architect was challenged to develop two distinct identities for the adjacent structures from the same basic batter—a standard concrete mixed from local sand and aggregate. Jacobsen modeled one (left) after a traditional Greek village and the other (facing page) after the Temple of Knossos. The two houses are connected by 8-inch-thick concrete garden walls (bottom left) that enclose their front and back yards. These walls were board-formed with unsanded planks of pine to express the concrete's rawness.

The five-level village house features large spans and cantilevered construction. Concrete was poured into oiled plywood forms and then vibrated thoroughly. No patching was required before the exterior was painted white, in keeping with local custom. The smooth surface is scored with horizontal and vertical reveals, and punctuated by tie holes (bottom left) that cast deep purple shadows in the Mediterranean sun. Coarse beams, formed with boards of unsanded pine, span exterior wall planes (top left).

The seven-level temple house, towering about 60 feet above its neighbor, relies on post-and-beam construction (facing page, top). A smooth, patterned surface was imprinted on the exterior walls by pouring concrete into formwork of finished, tongue-and-groove oak flooring. The forms were oriented to indicate structure and function: striations run vertically at walls, horizontally at floor slabs, and diagonally along stairs. Columns shaped by cylinders of mitered 2 by 4s recall fluted shafts of Classical Greek architecture (facing page, bottom). In contrast to its neighbor, this house remains unpainted. Jacobsen insisted that the contractor stockpile enough aggregate, sand, and cement before building began so that the natural finish would remain consistent in color throughout construction.

EMPLE HOUSE

VOLQUARTS PHOTOS

KENNETH L. MOFFETT ELEMENTARY SCHOOL

Schools and Library
Southern California
Ralph Allen & Partners, Architect

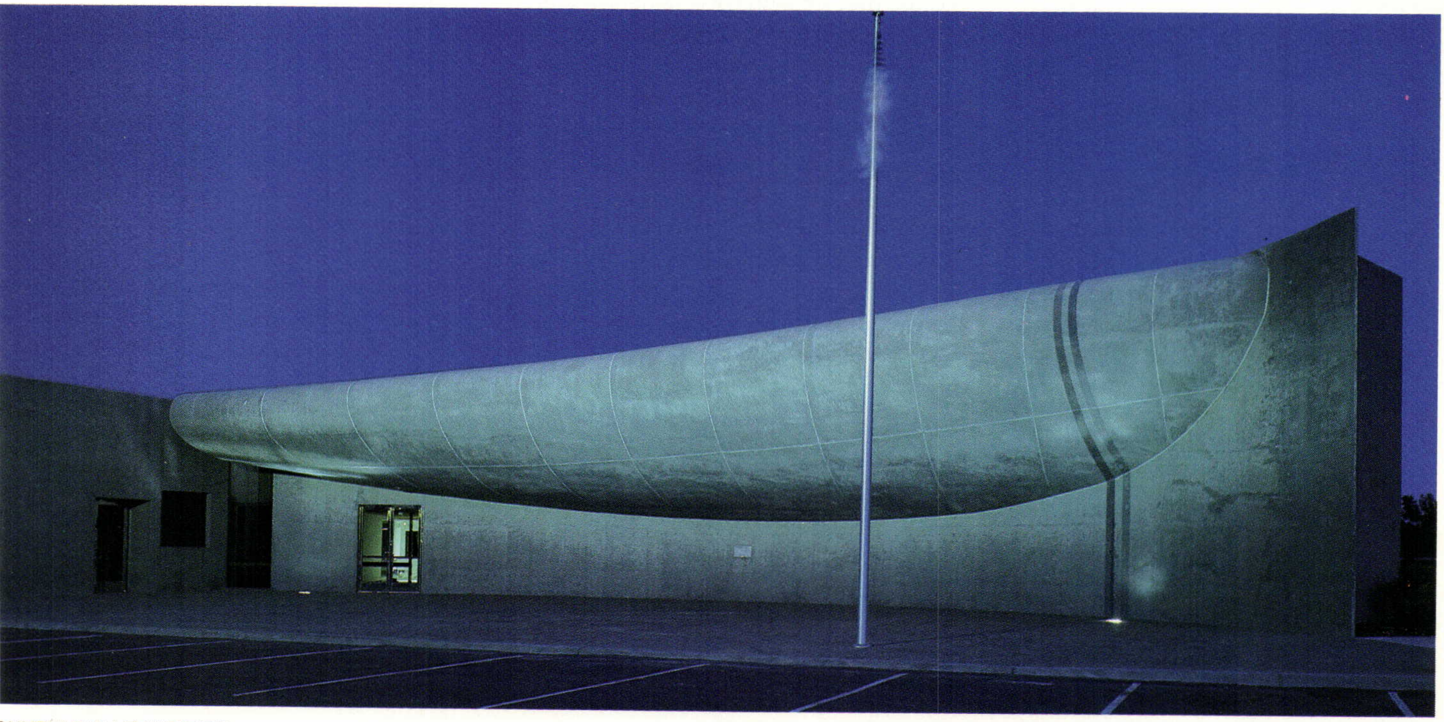
RALPH ALLEN & PARTNERS, A 27-YEAR-OLD firm in Santa Ana, California, has long relied on architectural concrete to realize bold geometries and fulfill site and program requirements. The Kenneth L. Moffett Elementary School in Lennox, California, presented the architects with a site near Los Angeles International Airport, two freeways, and an area plagued by street gangs. They created a haven from noise and crime by nestling a 55,000-square-foot, cast-in-place concrete structure into the landscape (left).

With standard plywood formwork and 4,000 psi concrete, the architects created strong geometries at strategic points. They covered an entrance with a canopy of intersecting concrete panels (top), curved the housing for mechanical equipment, and extended the material into the playground as sculptural elements (center). A "sack finish" was achieved by troweling a sand-and-cement mix onto the concrete after the forms were removed, and then rubbing the surface with burlap to smooth imperfections. The roof structure, a triangulated waffle slab, remains exposed in the interior lobby (bottom).

Parking requirements above the 158,000-square-foot Century High School in Santa Ana, California, dictated a cast-in-place structure. But it was the curved seating of the theater that inspired the building's undulated facade (facing page, top). Seeking a sleek look, the architects specified fiberglass tie rods which, when cut flush with the wall, are barely discernible. A bushhammer finish, which fractures about an 1/8-inch of the skin, softens the edges, and plywood form seams read as vertical and horizontal lines, humanizing the wall's imposing scale.

Most of the exterior walls in the 15,000-square-foot Fountain Valley Library in Orange County, California (facing page, bottom), were poured in situ with standard 3,000 psi concrete. But the architects recognized that even this versatile material had its limits: "The sculptural entry canopy would have been too heavy and the formwork too expensive if cast in place," admits partner Thomas R. Nusbickel. To maintain the concrete esthetic, the firm opted for a factory-prepared cement plaster mix troweled over wood lathe. Both the curved canopy and cast-in-place wall below were sacked to eliminate variations. The plaster veneer required frequent control joints to prevent cracking.

CENTURY HIGH SCHOOL



OUNTAIN VALLEY LIBRARY

Autoclaved Cellular Concrete

A conservation-oriented product struggles for U.S. acceptance.

WITH MORE CLIENTS DEMANDING ENVIRONMENTALLY sensitive materials, architects might well consider a lightweight, thermally efficient type of concrete that has been a staple of European construction for 50 years. Called autoclaved cellular concrete (ACC), the material can be mixed with fly ash, a by-product of coal combustion. Although not yet available in the U.S., ACC production is being planned by North American Cellular Concrete, a Chantilly, Virginia-based company formed in 1989 to promote the technology in the U.S.

ACC is produced by mixing a silica-rich material—fly ash or sand—with lime, portland cement, aluminum powder, and water. The aluminum powder reacts chemically to create millions of tiny hydrogen bubbles within the concrete, causing the material to expand to about twice its original volume. After the expansion is complete, the concrete is removed from the mold and cut into blocks, slabs, or other shapes. The pieces are moved into an autoclave—an airtight chamber that is filled with pressurized steam. The 10 to 12-hour autoclaving process causes a second chemical reaction that gives the highly porous material its strength, rigidity, and durability.

High insulation, low weight

WITH ITS HIGH AIR CONTENT, ACC CAN weigh two-thirds less than conventional concrete, with thermal insulation values of up to R-1.6 per inch, more than twice that of typical concrete. ACC can be created in different densities, depending on ingredients, and can be tailored to specific designs. Very low-density ACC, for example, has a low compressive strength but a high insulation value. A typical 8-by-8-by-16-inch block, with a density of about 30 pounds per cubic foot, offers a compressive strength of more than 500 pounds per square inch and an R-value of approximately 10.

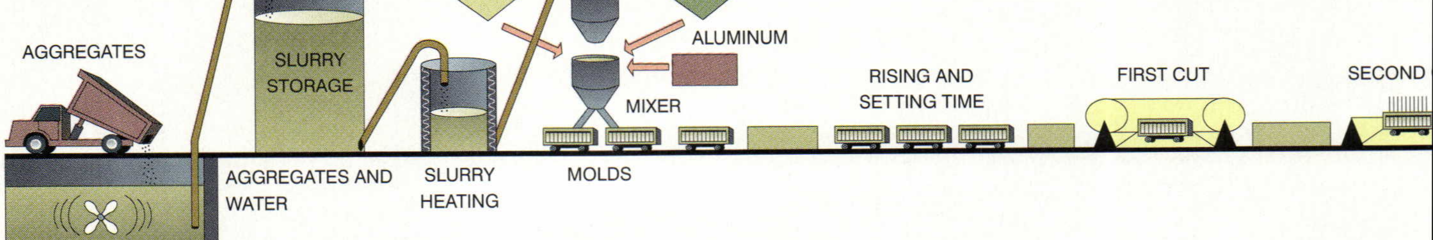
ACC's low weight and high insulation value, coupled with its relatively high strength, allows it to function as an all-in-one structural insulating system. Unlike conventional concrete, which typically requires additional insulation, or foamed concrete, which usually has a high insulation value but lacks structural strength, ACC can be used in moderate climates without insulation in low-rise commercial, industrial, and residential buildings. The precast material's lower weight also makes it easier to transport, lift, and assemble than typical precast concrete elements, and the material's fire resistance and high degree of sound absorption make it useful for interior partitions.

ACC is sometimes compared to wood because the two materials are lightweight, float on water, and are easily worked with conventional carpenters' tools. ACC can be shaped and cut to fit with a saw, permitting modifications on-site for the installation of plumbing and electrical elements. The material is also easily carved, either in the factory or on-site, to create special building forms or ornamental elements. In addition, ACC resists insects and rot, is totally inert and nontoxic, and does not burn or emit environmentally damaging gases.

American production possibilities

THE ACC PROCESS WAS DEVELOPED IN Sweden in the early 1920s, and factory production of the material spread throughout Europe, Japan, Russia, and many other countries in subsequent years. In Great Britain, ACC incorporates fly ash and is formed almost exclusively into blocks; in Germany and Japan, ACC is made from sand and is cut into a range of building components, including wall panels, floor slabs, roof slabs, and lintels. Why ACC has never caught on in the United States is a puzzle. Many in the construction industry cite an unwillingness by companies to risk the large amount of capital required, some $20 million, according to Edward C. Pytlik a professor of technology education at Wes Virginia University in Morgantown, to build a large ACC manufacturing plant without assurances of a strong market.

Virtually every major European ACC pro ducer has eyed the American market, and some 30 years ago, two manufacturers opened plants in the Midwest, but quickly closed them due to slow market acceptance Recently, two major ACC manufacturers, the Swedish Siporex and the German Ytong, obtained National Evaluation Reports (NER) on their ACC manufacturing methods from the Council of American Building Officials. Although local building officials have the discretion to approve the material even without an NER, the reports may help the companies gain approvals for producing ACC in the U.S. Other compani that have recently discussed building ACC



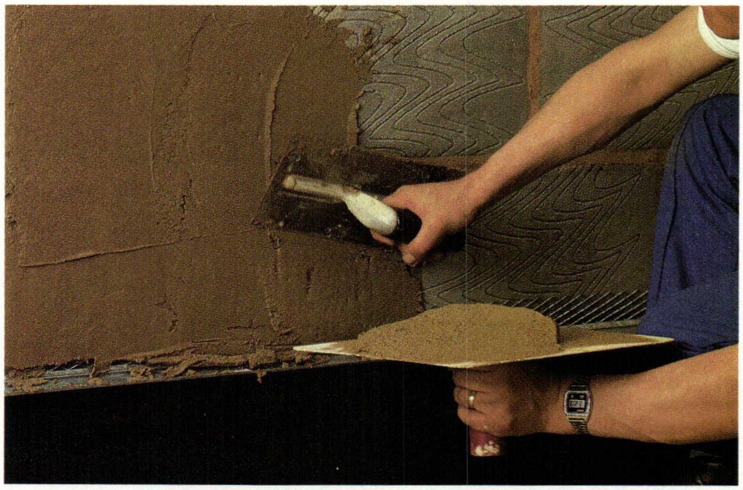
AUTOCLAVED CELLULAR CONCRETE MANUFACTURING PROCESS

plants in the U.S. include British ACC man-
ufacturer Thermalite, and Weyerhaeuser,
the Seattle-based wood products giant.

Of several dozen buildings constructed with ACC in the U.S., many were built with components manufactured by Domtar, a Canadian company that used Siporex technology. Architect Arthur P. Salk, a principal of Northbrook, Illinois-based Shayman and Salk Company, became interested in Domtar's material in the early 1970s and planned to build an ACC plant in Illinois. Domtar, however, terminated its ACC production following a labor dispute, and Salk, believing it would be too risky to build the plant unless he could begin by importing the material, abandoned his plan.

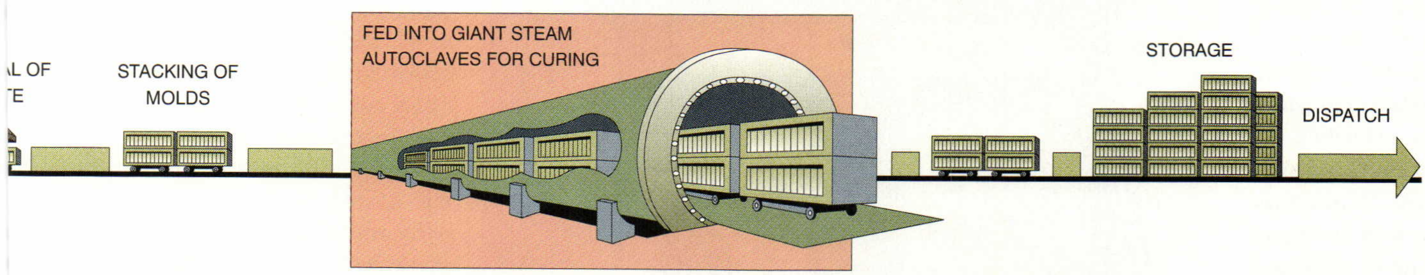
But before his supply ran out, Salk built a dozen warehouse and manufacturing buildings with ACC, including a 60,000-square-foot factory in Rosemont, Illinois, which was constructed of 20-foot-high, 6-inch-thick, reinforced ACC panels.

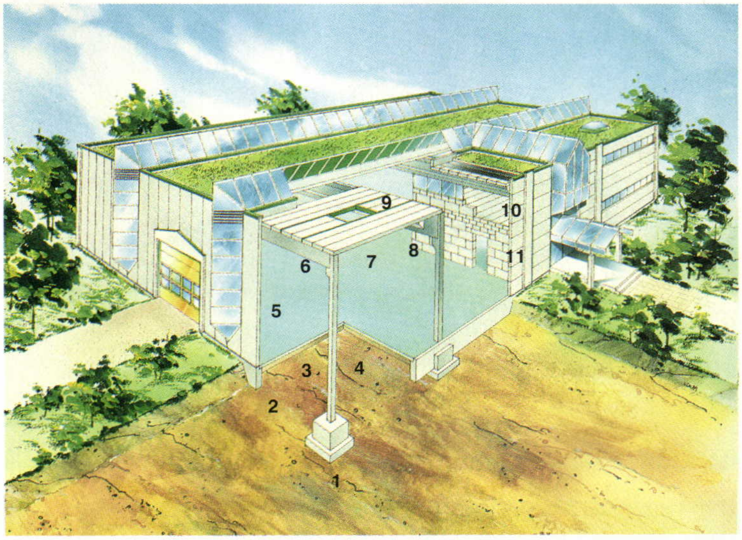
Virginia-based North American Cellular Concrete will seek to minimize the risks associated with entering the ACC market by keeping its initial plant investment relatively low and production capacity small, maintains company president Robert [illegible]auber. The initial plant, a scaled-down version of traditional European plants, will house just two autoclaves, rather than the dozen or more usually installed. Plans call for the plant to initially produce only two million blocks a year, using 5,000 to [illegible]0,000 tons of fly ash. NACC is considering locating the initial plant at an electric



PHOTOS COURTESY OF THERMALITE

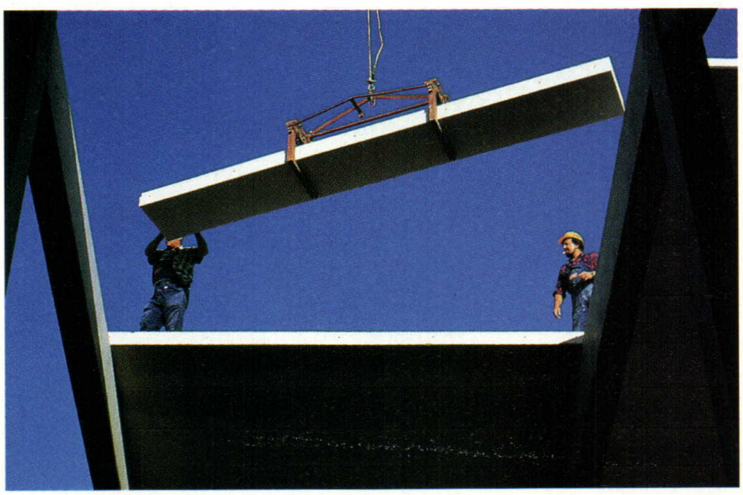
ACC can be cut on site with carpentry tools (top). The material is usually finished in stucco (above and left), or painted. During manufacture (bottom), ACC is subjected to heat and pressurized steam, creating lightweight highstrength concrete.

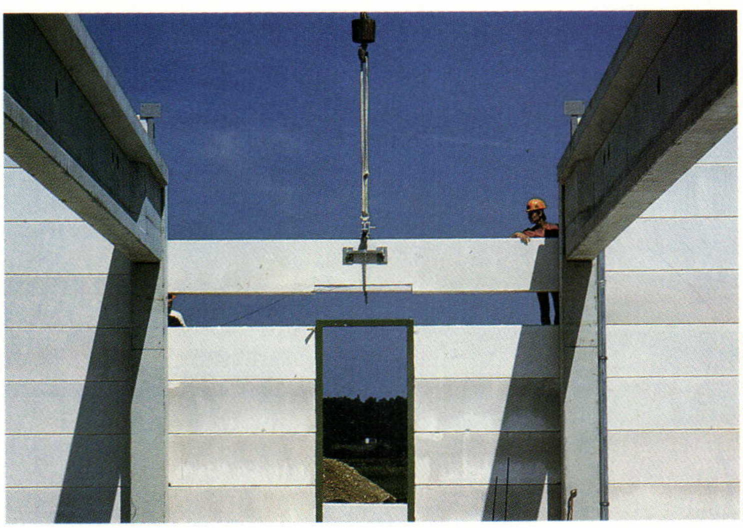




TYPICAL COMMERCIAL BUILDING APPLICATIONS

1 REINFORCED CONCRETE FOUNDATION
2 PRECAST FOOTINGS
3 REINFORCED CONCRETE SLAB ORIGINALS
4 REINFORCED PRECAST CONCRETE SUPPORTS
5 ACC WALL PANELS
6 REINFORCED CONCRETE BEAM
7 ACC ROOF PANELS
8 REINFORCED CONCRETE TRUSS
9 ACC FLOOR PANELS
10 ACC BLOCK UNITS
11 ACC LINTELS





PHOTOS COURTESY OF HEBEL

ACC is commonly used in low-rise commercial and industrial construction (top). In Germany and Japan, the material is usually formed into easily transported panels and lintels (center and bottom). British firms produce blocks in various sizes and densities.

power utility, close to a source of fly ash.

The company will launch its venture with a demonstration project in which it will set up a small, portable version of the autoclave plant at various electric utility sites for several months to produce sample blocks and showcase typical wall systems fo local architects, builders, and contractors.

Whether or not the time is right for the introduction of ACC manufacturing in the U.S.—especially given the current downturn in the construction industry—remains a subject of some debate. The material will compete for market share with a number of long-established, well-entrenched materials including traditional concrete masonry units, precast concrete, poured-in-place concrete, tilt-up concrete, and even wood.

Filling the timber gap

ACC'S AMERICAN INTRODUCTION COULD BE boosted by the current scare over the nation's wood supply. Within the past several years, the federal government has withdrawn public timberlands from harvesting, effectively cutting in half the supply of timber from public property. And during the last decade, the price of framing lumber has increased by 71 percent, according to figures collected by Burrle E. Elmore of Random Lengths, a Eugene, Oregon-based company that tracks the lumber market.

ACC may be one of many concrete products to fill the timber gap, especially in areas where masonry construction is already the norm for residential and commercial buildings. Such areas could include Southeastern states where humidity and insects make wood construction untenable. In fact developers are currently building homes in residential resort in the Florida panhandle with imported ACC building components manufactured by Hebel International, a major German ACC manufacturer. Hebel is also considering building a plant in the U.S and is examining possible sites.

The anticipated shortage of skilled labo in the construction industry may also bode well for ACC's acceptance. The prefabricated material's light weight makes it easy to lift, and its precise dimensions make it easier and faster to assemble than conventional concrete blocks, potentially reducin construction time.

And ACC offers other environmental be efits as well. Of the nearly 50 million tons of fly ash produced in the U.S. in 1990, ju 25 percent was reused; the rest was dump in landfills. About half of that recycled fly ash is already used in poured-in-place concrete as a substitute for cement, but far greater quantities of fly ash could be incorporated as ACC's major solid ingredient. Fly ash will constitute about 70 percent of the solid material in the ACC produced by NACC, and its use has generated $1 million in grants from the Electric Power Research Institute, a research arm of the electric utility industry anxious to recycle waste.

But ACC will undoubtedly have a difficult time carving out a place for itself in the slow-to-change U.S. construction industry, at least in part because it may not be an environmentally perfect material. During production, fly ash dust can be hazardous to workers' health, oil must be burned to run the autoclave that cures the material, and chlorofluorocarbons are released into the air during the manufacture of the aluminum powder used to aerate the mix. Research planned at the University of Pittsburgh to examine the blocks produced by NACC during its demonstration project may help remedy these environmental hazards.

Weighing the costs

AT THIS POINT, IT REMAINS UNCLEAR whether ACC will have the cost advantage that could speed its acceptance. NACC anticipates that its lightweight concrete blocks will sell for about the same price as ultra-lightweight blocks, which are made with expanded clay or pumice and are 10 to 15 percent higher-priced than typical concrete blocks. ACC proponents maintain that the price of the material must be considered in terms of a project's anticipated life-cycle costs, taking into account reduced insulation costs, heating and cooling needs, and construction efficiency. Viewed from a long-range perspective, they say, ACC will be as cost-effective as conventional building materials.

For architects searching for a versatile, environmentally friendly building material, ACC presents an appealing option. Paul Bierman-Lytle, president of the Masters Corporation, a New Canaan, Connecticut-based architecture and environmental construction firm, plans to build four houses with ACC by importing the material until it is produced domestically. "[ACC] has found value in a waste material in its production," says Bierman-Lytle. "It seems like an above-average building material from an environmental standpoint." In these ecominded times, praise like that could be enough to jump-start an industry. ■

—VIRGINIA KENT DORRIS

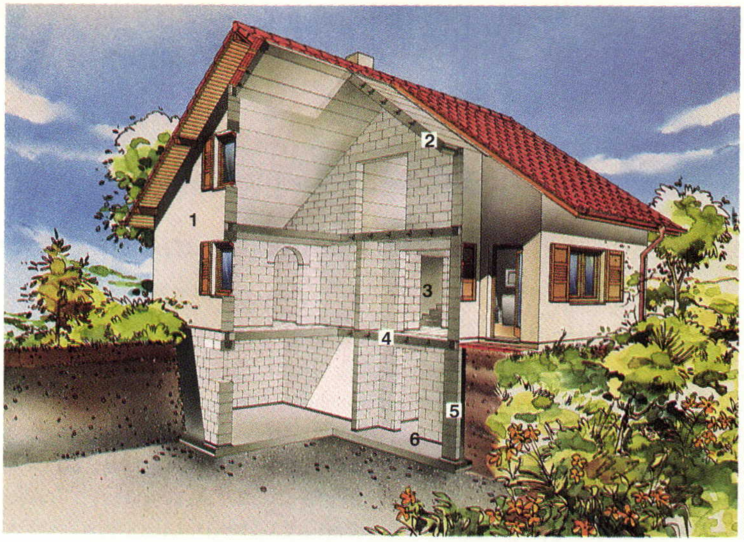
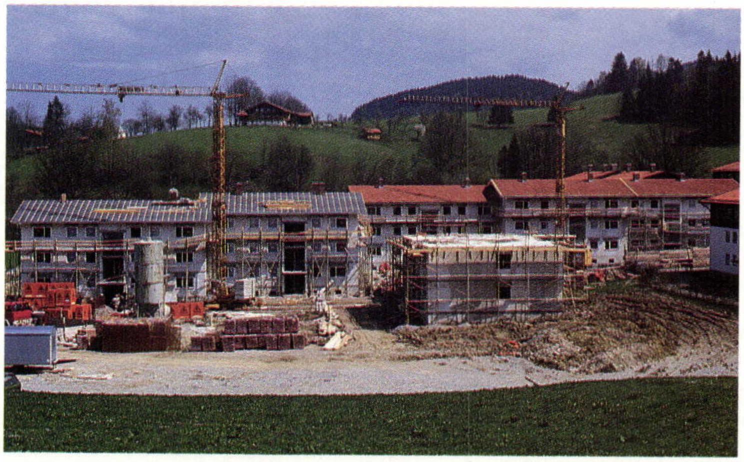


PHOTO COURTESY OF HEBEL

TYPICAL RESIDENTIAL CONSTRUCTION APPLICATIONS

1 PLASTER AND STUCCO FINISH
2 ACC ROOF PANEL
3 SOLID ACC STAIRWAY
4 ACC FLOOR PANEL
5 ACC LINTEL
6 ACC BLOCK UNITS



PHOTOS COURTESY OF THERMALITE

Thermally efficient ACC is well-suited to moderate climates, where the material requires no additional insulation (top and center). ACC blocks, typically laid together with a thin bed of mortar, are durable, lightweight, and available in a variety of sizes. Large blocks can be easily lifted by hand (left).

Concrete Improvements

Admixtures enhance concrete's performance and appearance.

"CONCRETE ON STEROIDS" IS AN APT DEscription of how admixtures affect concrete. They can greatly improve the material's strength, durability, and finishing, and allow concrete to be poured and set under less-than-ideal conditions. An admixture, according to the American Concrete Institute, is a material other than water, aggregates, and cement that is added immediately before or during the mixing of concrete. Color pigments, although added to concrete during the mixing stage, are not considered admixtures because they have little or no effect on the material's performance.

While it is possible to increase concrete's strength or consistency by adjusting the ratio of water to cement, admixtures often achieve the same results at a fraction of the cost, or enhance the material in other ways. A variety of commonly used admixtures permits a range of performance improvements.

Air-entraining agents

FIRST USED BY THE ROMANS, WHO INFUSED concrete with air by adding ox blood or urine to the mix, air-entraining agents are the most common and beneficial admixtures because they protect concrete from the ravages of freeze-thaw cycles. They improve the workability of concrete by enhancing the cohesiveness of its constituent parts, mitigating the separation of cement, sand, water, and aggregates. They also reduce "bleeding"—the tendency of water to float to the surface of concrete after it is poured.

Air-entraining agents create millions of microscopic bubbles distributed evenly throughout the concrete. When water infiltrates cured concrete and freezes, the voids left by the bubbles accommodate the expansion of ice crystals, preventing cracking and spalling. The bubbles also act as a "glue" or "lubricant" in wet concrete to keep the mix uniform, preventing separation of ingredients. Air-entraining admixtures should conform to the specifications outlined in the American Society for Testing and Materials (ASTM) standard C260. Because air-entrainers reduce concrete strength, ASTM recommends testing cured samples of the material.

Accelerators

IF THE CONCRETE MUST SET QUICKLY (IN fewer than 28 days) and develop strength early in the setting process, accelerating admixtures can be introduced to the mix. In buildings in which concrete is a major component, accelerators can cut construction time, permit the early removal of forms, allow finishing to commence sooner, and reduce the protection time necessary for concrete to cure in cold weather. However, these admixtures can cause shrinkage and discoloration as the concrete cures.

Calcium chloride is the primary ingredient of most accelerators. Because it can corrode imbedded metal, the chemical compound prohibits the use of accelerators in prestressed and reinforced concrete; calcium chloride accelerators are also not recommended for concrete containing metal conduit. These accelerators should meet ASTM C494 standards and tests for accelerating (Type C) admixtures, should not exceed 2 percent by weight of cement, and should be added in liquid form to ensure proper mixing.

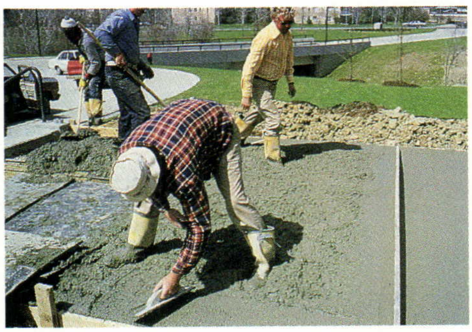
Nonchloride accelerators—substituting calcium nitrate, calcium formate, calcium nitrite, or sodium thiocyanate for calcium chloride—have not matched the performance of chloride-based accelerators. They are also approximately five times the cost of chloride-based admixtures and have been known to cause some metal corrosion. Architects should specify noncorrosive accelerators and request extended testing data from the manufacturer. Chloride levels in mixing water and sand should also be monitored.

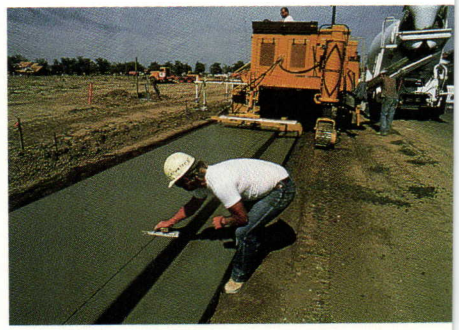
Retarders

AT THE OPPOSITE END OF THE ADMIXTUR spectrum, retarders slow hydration o concrete, thus extending its setting time Retarders aid in pumping concrete ove long distances—such as across a buildin site or up multiple stories in high-ris buildings—by allowing more time i which to place the material. Such admixtures permit finishing to start later o proceed more slowly; they also enable th surface of the concrete to be flushed wit water to expose the aggregate.

Retarders, which should conform t standards and tests specified in ASTM C49 for retarding (Type B) admixtures, mitigat the effects of hot weather, which naturall shortens concrete setting time and ma cause cracking. In large building elemen

PHOTOS COURTESY OF MASTER BUILDERS





uch as massive pylons, retarders allow suc-
essive layers of concrete to bond and pre-
ent "cold joints," which form when wet
oncrete is poured atop hardened concrete,
weakening bonding between the two pours
nd inviting failure.

Vater reducers

MPROVING CONCRETE'S CONSISTENCY, CO-
esiveness, and what the construction trade
alls "flowability" (the ability of concrete to
low evenly, without lumps) can be
chieved with a water-reducing admixture,
which lubricates the particles in the mix.
uch an agent affords concrete better con-
istency when it is pumped; enhances rein-
orced concrete by providing better cover-
ge of steel as concrete flows around it; and
hortens vibration time, an advantage when
ours are made in tight, inaccessible spaces.

Water reducers also allow the specified
oncrete slump to be maintained while low-
ring the water-to-cement ratio by as much
s 10 percent. This practice yields greater
oncrete strength and hardness, effectively
llowing less cement to be used without
acrificing performance—which can save
noney. However, water reducers may cause
hrinkage and reduce the concrete's initial
trength. Because water reducers tend to
low concrete hydration, an accelerator may
e added. There are also water reducers that
urposely retard or accelerate setting time.

High-range water reducers, known as
superplasticizers," decrease the required
mount of water by at least 12 percent and
s much as 30 percent. When added to con-
rete with a normal water-to-cement ratio,
uperplasticizers increase the slump and flow
f the mixture without sacrificing its
trength. Superplasticized concrete must be
oured within 30 to 60 minutes after the su-
erplasticizers are added, which may limit its
se in logistically complex work. All water
educers must meet ASTM standard C494; su-
erplasticizers must meet standard C1017.

A number of less common admixtures are suitable for special concrete conditions. Pumping aids increase the viscosity of concrete to counteract the pressure of the pump, which tends to remove some of the material's water. Fungicidal and germicidal admixtures will temporarily inhibit the growth of bacteria and fungi within the material and on its surface. Volcanic ash, fly ash from burnt coal, clays, and slags can also be added to concrete to improve its workability, add strength, and increase resistance to damaging sulfates.

Consider the season and climate in which the concrete will be poured and whether the finished product will need to resist freeze-thaw cycles. Will the pour be continuous, does the concrete need to be placed quickly, and will it be pumped long distances?

Selection criteria

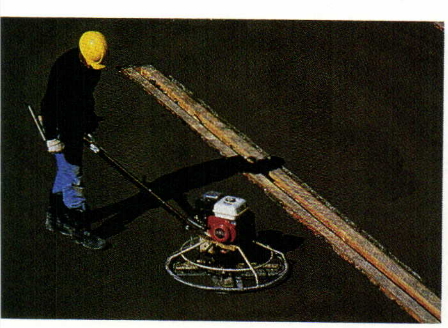
THE CHOICE OF AN ADMIXTURE HINGES ON A number of factors, including concrete's desired performance, location, and placement conditions. "If two admixtures can deliver the same strength requirements as water reducers but one provides better flowability or retardation, those secondary qualities will be the deciding factors," explains Noel P. Mailvaganam, an internationally recognized authority on admixtures at the Institute for Research in Construction at Canada's National Research Council in Ottawa.

When choosing admixtures, Mailvaganam recommends considering the season and climate in which the concrete will be poured, and whether the finished product will need to resist freeze-thaw cycles. Will the pour be continuous, does the concrete need to be placed quickly, and will it be pumped long distances? Answers to these questions will narrow the choices among admixtures and suggest the right combination. Requirements for high or low slump, early or late strength, color pigments, or reinforcing metal also influence admixture selection, as do degree of finish and ultimate concrete profile. For example, high-strength concrete that needs a quality finish, good flow, and will be poured in hot weather suggests a water-reducing admixture in combination with a retarder and superplasticizer.

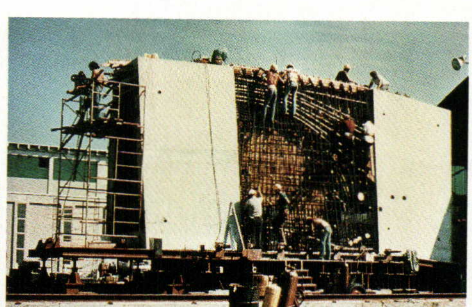
After an admixture is selected, trial pours, as outlined in the ASTM standards, should be made. Because the same admixture will perform differently depending on types of cement, sand, aggregate, and water, it is imperative that every ingredient and its precise quantity in the test mixture be reproduced during construction. Test materials should be native to the location of the building, as a single brand of cement may vary depending on where it is manufactured. Such variables can be compensated for by "overdesigning" the mix with a factor of safety between 2.5 and 3 times the strength needed.

Mailvaganam suggests that architects obtain an admixture sample's infrared analysis from its manufacturer. During construction, the admixture should be compared through solids content and specific gravity analysis to the sample. If variations in the mix are found, an infrared analysis will confirm them. Mailvaganam suggests that admixtures with variations of more than 5 percent should be rejected. ■

—MICHAEL J. CROSBIE



NOEL P. MAILVAGANAM



Admixtures improve performance under various conditions. Pumping aids improve viscosity in multistory construction (facing page, left); air entrainers help pavement resist freeze-thaw cycles (facing page, center); accelerators allow finishing to commence sooner (facing page, right) and reduce curing time (far left). Pours with intricate reinforcing can benefit from water reducers (left) to improve rebar coverage.

A Guide to Concrete Admixtures

TYPE OF ADMIXTURE	EFFECT ON CONCRETE	INGREDIENTS GENERALLY USED	METHOD OF ADDING	ADVANTAGES	DISADVANTAGES	MAJOR USE IN CONCRETE
Accelerators	Speeds hydration of cement	Calcium chloride	Maximum 2 lb./ 94-lb. bag of cement	Speeds setting time; develops strength earlier; lowers freezing point of water by 3°F; increases heat due to hydration	Increases expansion and contraction; reduces resistance to sulfates; increases efflores-cence and the corrosion of high-tension steels	In cold weather, speeds setting time and strength and shortens protection time
Air-entraining agents	Introduces minute air bubbles throughout concrete	Rosin, beef tallow, stearates, vinsol resin, lauryl sodium sulfate, foaming agents	Usually 1/4 to 1 1/2 oz./100 lb. cement	Increases plasticity and cohesiveness; reduces bleeding; greatly increases resistance to freezing and thawing	Requires careful control; may require more frequent slump tests; causes some loss of strength	For all concrete exposed to freezing, thawing, and salt application
Latex (non-reemulsifiable bonding type)	Improves adhesion and increases both tensile and flexural strength	Organic polymer-type latex and air-detraining agents (do not use air-entraining cements)	Generally 4 gal./ 94-lb. bag of cement	Increases water retention, adhesion to substrates, tensile strength, and resistance to freez-ing and thawing	More difficult to finish; a steel-troweled finish should be avoided	Flash coats, toppings, course leveling, and patching
Inert, finely divided powders	Corrects gradation of aggregates deficient in fines	Powdered glass, sand (silica), slate flour, stone dust, lime	As per manufacturer's directions	Corrects deficiency in fines for coarse aggregates; improves workablity	Increases water requirements and drying shrinkage; decreases strength in rich mixes	Improves workability
Water reducing or plasticizing agents	Lowers water-cement ratio; lubricates solid particles in mix (aggregates)	Polyhydroxylated polymers, lignosulfonates, or hydroxylated car-boxylic acids with calcium chloride or another accelerator in another formulation	As per manufacturer's directions	Reduces water content; increases workability and plasticity	Decreases early strength; may slow hydration	Improves workability and plasticity
Pozzolanic, finely divided powder	Reacts with free lime during hydration of cement to form cementitious materials	Volcanic ash, fly ash (residue from burning coal), calcined shale and clay, siliceous materials, natural cements, some slags	As per manufacturer's directions	Controls alkali-aggregates reac-tion; improves workability; reduces heat generation, expansion, and contraction; increases strength after 28 days; increases resistance to sulfate attack; may increase permeability	May cause excessive drying shrinkage; reduces durability; reduces early strength	Controls alkali-aggregate reaction; increases resistance to sulfate attack
Retarders	Slows hydration of cement	Zinc oxide, calcium lignosulfonate, derivatives of adipic acid	As per manufacturer's directions	Slows setting; reduces heat due to hydration; reduces expansion and contraction	Some loss of early strength; requires careful control; may require more frequent slump tests	For very hot weather and massive concrete

SOURCE: *Construction Materials, Second Edition*
by Caleb Hornbostel, John Wiley & Sons, New York, 1991, reprinted with permission

Computer-Assisted Model-Building

Architects are exploring new ways to craft traditional representations.

ALTHOUGH RECENT ADVANCES IN RENDERing and animation software have greatly improved the realism of computer images, architects still rely on the power of traditional models to communicate the spatial and textural qualities of buildings. But wood, plastic, and matte board are being assembled through new computer-aided techniques. The simplest involves gluing paper CADD drawings onto cardboard, which is then cut and assembled the old-fashioned way. This low-cost procedure doesn't require any special equipment beyond an ordinary computer and laser printer.

At the other end of the spectrum, special machines mill polyurethane foam or mold plastic, guided by data from CADD drawings. These machines are still very expensive and are generally only purchased by service bureaus that perform production work for architectural firms. Nevertheless, the time and labor saved can make their application highly competitive, and the quality of the resulting models can be dazzling.

Model-cutting devices include the CAMM-3 modeling machine from Roland Digital (below), and the milling machine that carved a topographic model (bottom) of the city of Brea, California, in polyurethane foam.

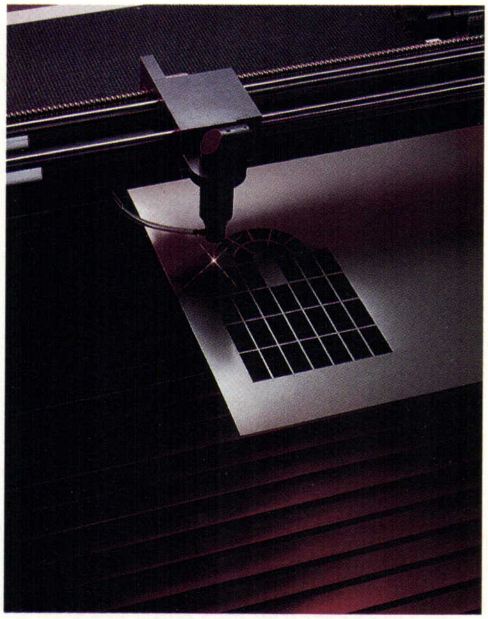
Low-tech approaches

EVEN WITHOUT ELABORATE EQUIPMENT, architects can take advantage of many simple but effective ways to apply the computer to model-building. Tom Ponte, a Denville, New Jersey-based model-maker, still uses traditional materials and techniques. But before starting a project, Ponte creates a 3D computer model that allows him to plot dimensionally precise plans and elevations on paper, from which he can take measurements. Rotating the model onscreen as he works helps Ponte understand a building's form from multiple perspectives.

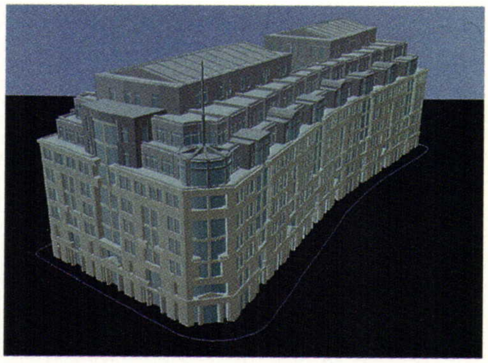
Another low-tech, computer-assisted model-making option is to plot plans or elevations on paper, glue them to cardboard or foam-core board, and cut them out as is traditionally done with blueprints. According to architect Frank Mascia of the Tucson, Arizona-based Collaborative Design Group, this method is effective for building simple study models. "Just because you have a computer," Mascia insists, "doesn't mean you should expect to push a button and have something created automatically. You can still mix media as you always have."

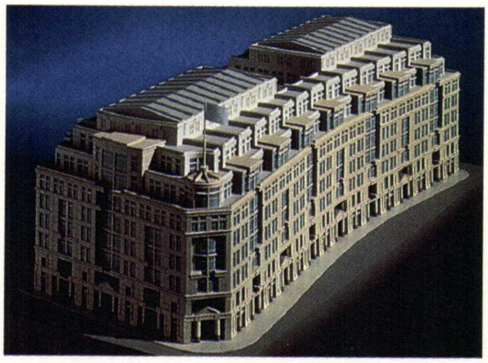
The main drawback to this technique, Mascia has found, is that its simplicity makes it most appropriate for study models, and often, by the time a building is in the computer, the design process has passed that stage. But for architects who undertake preliminary design on computers, the method can be fast and effective.

The Zimmer Gunsul Frasca Partnership (ZGF) often uses CADD drawings to produce models. Bertha Martinez, an associate and CADD manager of ZGF's Seattle office, found that when plotted from a CADD file and glued onto layers of cardboard, contours of a hilly site and building footprints are much more precise and ensure that site and building



The LaserCAMM (above) cuts and scores matte board, plexiglass, and other materials. Swanke Hayden Connell Architects created both rendering (below) and physical model (bottom) from the same CADD files.





models will fit together more accurately. "We also do facade studies to develop stone or brick coursing elevations and corner details," Martinez explains. "We plot the elevations, then glue them onto a volume. That's very effective for quick internal studies."

The advantage of building models from CADD drawings, she asserts, is that the drawings do not have to be specially prepared. "If we're working on design development and suddenly decide we'd like to build a model, it's a free by-product of our electronic data."

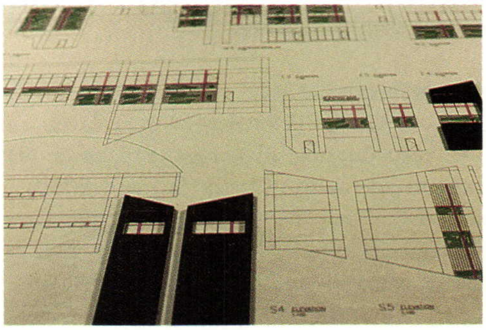
Laser techniques

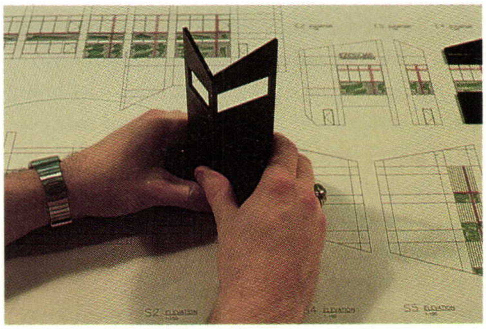
AS FAST AS IT MAY BE TO PRODUCE MODEL templates by plotting drawings, that technique requires the time and patience of a skilled human knife-wielder. In recent years, however, laser cutting has become increasingly popular. The LaserCAMM is a machine that reads standard DXF files, which are familiar to most CADD-conversant architects, and cuts and scores matte board, plexiglass, or a variety of other materials with a laser beam. About the size of an office photocopier, this machine is much faster and more accurate than cutting by hand. The model pieces are then glued together in layers by traditional processes.

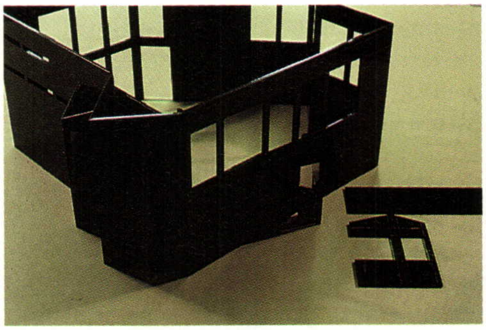
Scale Models Unlimited (SMU) of Menlo Park, California, developed the LaserCAMM and provides laser-cutting services to architectural firms worldwide. They can receive CADD files from architects via disc or electronic mail and then edit the files, removing dimensions, text, and other elements not pertinent to the cutting. They must ensure that the lines and arcs in the drawing are mathematically precise and do not overlap. SMU may redraw the files from scratch, except when working with an architect who is familiar with their requirements.

The Denver-based architectural firm Ohlson Lavoie enjoys a fast turnaround from SMU because the architects send their CADD files in a form that requires little or no further processing. Daniel Heier, the model director at Ohlson Lavoie, creates separate files for each layer of material. On a recent project, he specified the main wall structure to be cut from 1/8-inch plastic, scored to simulate tile, the window panes from 1/16-inch clear plexiglass, and the window frames and mullions from a thin layer of brass.

"When the layers are glued together," Heier explains, "we get a recessed, three-dimensional effect." Heier and his assistant spent one working day creating the CADD files from the architects' sketches. That night, they sent the files to SMU by electronic mail. Next morning, the pieces were cut and shipped overnight back to the architects. On day three, Heier completely assembled the model. He estimates that the labor savings for this project were about 80 percent of the cost of hand-cutting. But even with unlimited time, a human model-builder can't cut arched windows in plexiglass as precisely as a LaserCAMM. Ohlson Lavoie specializes in designing health clubs, and the detailed models the architects produce are used primarily to persuade potential members to join the club. These physical models, Heier claims, are essential for giving customers a sense of realism.







Architects at Ohlson Lavoie in Denver see their designs come to life in no time thanks to laser-cutting technology. The plexiglass pieces are cut and etched on the LaserCAMM, which is "guided" by CADD data. Wall pieces cut from exterior elevations (top) are then mitered and assembled by hand (center and above). A three-dimensional effect is created by layering several kinds of material. The estimated savings in labor with this method is about 80 percent of the cost of cutting the pieces by hand.

Swanke Hayden Connell Architects (SHCA) of New York also applies laser-cutting techniques to its presentation models. The firm is now designing a London office building that will restore the historic character to a neighborhood damaged by insensitive post-World War II development. SHCA system engineer and designer Michael Rosenberg believes their detailed physical model was the best medium for showing the community how the proposed building would fit and reshape the site. "With the laser technology," Rosenberg asserts, "the scores and cuts were much straighter and more consistent than any by hand. This created the beautiful model we needed to help sell the building."

Although SHCA's 3D computer models are effective for in-house communications and are more responsive to daily design changes, Rosenberg feels that such on-screen models are less suitable for presentations to nonprofessionals. Architects can produce highly detailed static renderings or low-detail animations, but the technology is not yet available to enable a viewer to move through a highly detailed computer model in real time. Rosenberg explains, "With a physical model, a lay-person can look around at will and see any portion of the building, not just the key areas the animator has chosen to show off."

Computer-controlled milling

AS POPULAR AS LASER-CUTTING HAS BECOME, it remains a two-dimensional medium until human labor assembles the cut pieces. However, new technologies that can create three-dimensional models are emerging. Glenn Johnson, an Orange, California, model-builder, has developed a computer-controlled machine that mills large regional models from polyurethane foam, using topographic data from the United States Geological Survey. In addition to moving in two dimensions as a flatbed plotter pen does, the router also moves up and down in response to elevation data, cutting hills and valleys into the foam. Later, the model is further developed with trees, roads, and buildings added by traditional methods.

Architect J. Todd Stoutenborough of Irvine, California, was a senior principal of LPA in Irvine when he worked with such a model with community members and planners of the City of Brea. The model, nearly

4 feet by 8 feet in size, was used in conjunction with photographs of the area. Community members could visualize the hilly site from ground level, as well as get a bird's-eye view. "They wanted to expand the city's population," Stoutenborough explains, "but preserve the hills in this 7.4-square-mile study area. When planning is done from maps, people take a two-dimensional approach and cut into the hills with no regard to their natural beauty." By showing how housing developments could be clustered halfway up the hills, the architects and planners could preserve canyons and ridges. "This is the way people used to plan their towns hundreds of years ago," Stoutenborough claims, "before they had topographic maps."

Brea city planner Jay Trevino is enthusiastic about this model as a way to market development ideas to the community. "Topographic maps are an anathema in a community workshop setting," he argues. "They're even difficult for civil engineers to read. By contrast, people find this model approachable. They understand it, recognize it, and see relationships they might not see otherwise." In the past, Trevino explains, such detailed models would have been prohibitively expensive, but with Johnson's milling machine, they are becoming more affordable. From now on, all major developers in the area will be required to submit their own models for use in public hearings, and Trevino is particularly impressed with the level of accuracy the computer is able to provide. "Traditional model builders may have fudged to make things fit," he observes, "but the technology gives us a great deal of confidence in these models."

Rapid prototyping

THE NEWEST TREND IN MODEL-BUILDING technology, called rapid prototyping, is primarily the domain of mechanical and industrial designers in their development of product mock-ups. One player in this field is the CAMM-3 from Roland Digital of Irvine, California. This desktop milling machine works with DXF files and can cut small parts, up to about 6 inches in each dimension, from wax, plastic, or wood. Although they are used mostly for consumer product prototypes, these machines are also well suited to carving building massings for urban-scale models. The relatively low-cost equipment enables designers to produce models in-house, bypassing reliance on expensive model-building service bureaus.

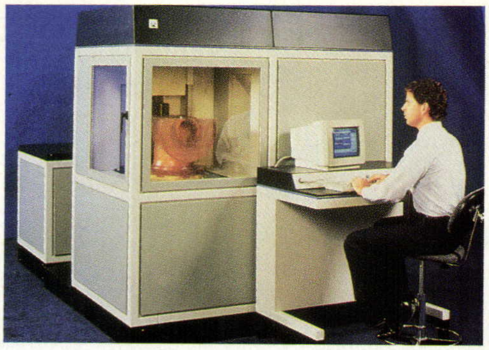
Another rapid prototyper is the Stereo Lithography Apparatus (SLA) from 3D Systems in Valencia, California, which uses geometric data from a solid or surface modeling CADD program and redefines an object in terms of thousands of thin horizontal slices. The SLA's optical scanning system guides an ultraviolet laser beam, which "draws" each slice on the surface of a vat of liquid resin. Where the beam strikes, the liquid solidifies into plastic. new slice is drawn.

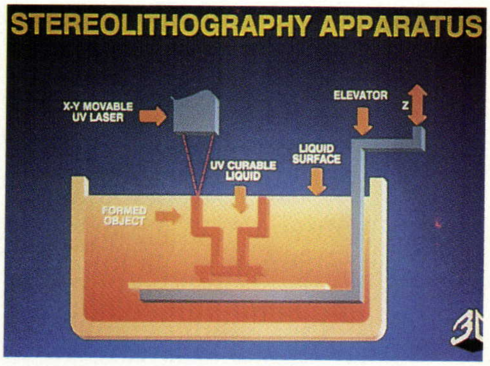
Because each layer is .005 inches thick, this process can take up to 24 hours, but the resulting pieces are extremely precise and can be highly detailed. Stefan Berger of Laser-Tech Engineering in Irvine, California, reports, for example, that the grooves in the miniature trash cans were discernible in a model of a service station he recently completed. SLAs produce complex models that would be impossible to create with mechanical milling machines and can even handle detailed interiors. The largest SLA has a vat size of 20 by 20 by 24 inches. As with many areas of current technology, the cost of these systems is decreasing as their speed, efficiency, and popularity grows. Although few architects have begun to use the technology, it will be increasingly common to see stereo-lithography offered by service bureaus that build architectural models.

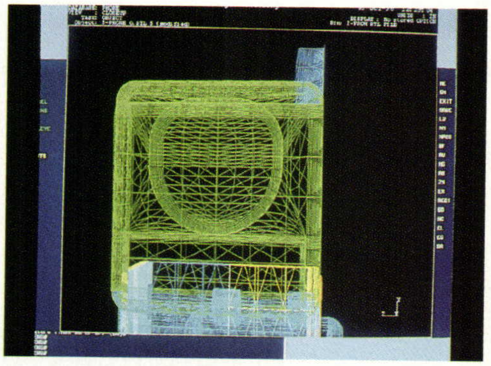
Future modeling

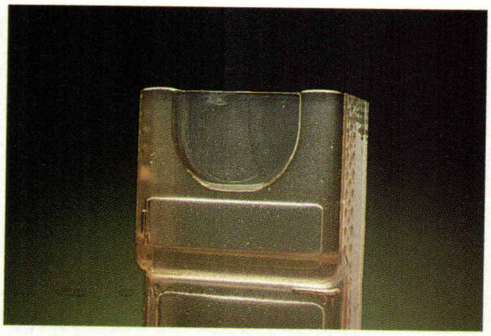
IT MAY SEEM IRONIC THAT THE TECHNOLOGY for building models is developing in step with the imaging technology that may eventually render them less necessary. But many architects remain skeptical about whether old-fashioned models will ever be completely supplanted. ZGF's Martinez insists that the look and feel of a physical model are still important to clients. "But you can't walk around in a model the way you can in a computerized animation," she maintains. "I think there is room for both media; one can't replace the other."

—B.J. NOVITSKI







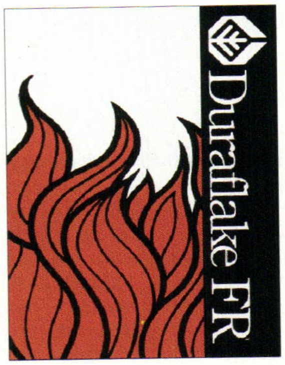


3D Systems, a Valencia, California-based company, pioneered the technology of stereolithography. A CADD-driven laser beam (top) strikes the surface of a vat of resin (second from top), solidifying the liquid into a model, one thin layer at a time, and gradually shaping the model as it is lowered. A stereolithographic model is first developed using three-dimensional CADD software (third from top), then "grown" from the resin vat (second from bottom), and finally hand-finished (bottom).

ARCHITECTURE'S LITERATURE PORTFOLIO

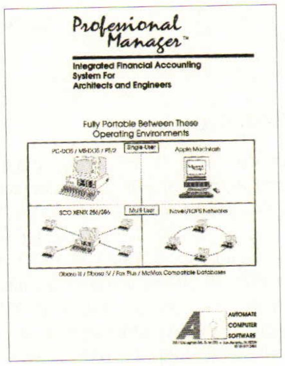
The Literature offered on these pages (with rare exception) are free for the asking. Simply fill out one of the postage paid reader service cards located elsewhere in this issue, circle the appropriate numbers and drop it in the mail.

Duraflake FR Fire-Rated Particleboard



DURAFLAKE FR is smooth, grain-free, class 1 fire-rated particleboard designed to meet fire code regulations. It is an excellent substrate for fine wood veneers, high and low pressure laminates and vinyls in all wall systems, furniture and fixture applications where fire codes, public safety, or reduced insurance rates are a factor. Call (503) 928-3341.
Circle 5.

Automate Computer Software

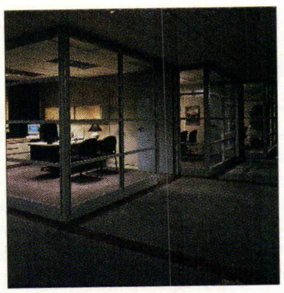


IBM PC/APPLE MACINTOSH SOFTWARE. INTEGRATED BILLING AND FINANCIAL ACCOUNTING SOFTWARE FOR ARCHITECTS AND ENGINEERS. Consists of Billing, Job Costing, Project Cost Management, Payroll, Accounts Receivable, Accounts Payable and General Ledger. MS-DOS or Apple Macintosh versions. Free literature - Automate Computer Software, 7551 Callaghan Road, Ste 270, San Antonio, TX 78229 - Call (512) 377-0461.
Circle 7.

LinEl Inc.

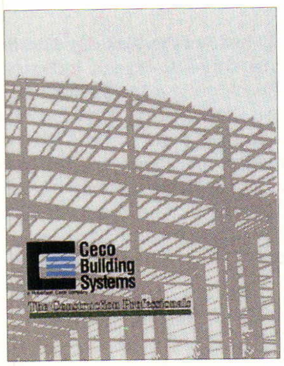
LinEl Inc - skylights/panels. In the battle against the elements, you win with style and comfort. From design to fabrication, to installation LinEl offers one source service world wide. The fastest growing company of its kind, LinEl has the resources and know-how to be competitive on any size commercial project. For lower maintenance the LinEl system has proven to be superior. For more information call Doug Poe at 1-317-831-5314.
Circle 9.

Transwall Corporation



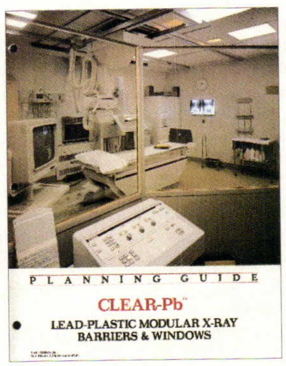
TRANSWALL'S PRIVATE & OPEN PLAN PARTITIONS ENHANCE OFFICE SPACE. Transwall offers a full line of private and open plan office partitions. All systems include a wide choice of fabrics, baked enamel finishes and trim. Work surfaces. storage units and accessories readily interchange between lo and hi-wall. Freestanding computer support furniture blends with panel-mounted work surfaces. Electrical and electronic support is system integrated. For more information call 1-800-HI-1-WALL.
Circle 11.

Ceco Building Systems



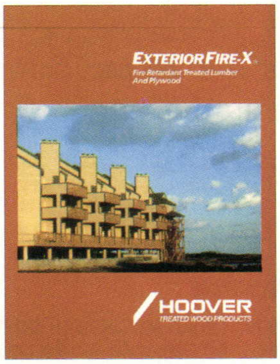
The Construction Professionals. This new 16-page brochure is an overview of the capabilities of Ceco Building Systems in pre-engineered metal building construction. The Construction Professionals includes dramatic photography of completed projects, plus technical data including Frame Systems. Tilt-Wall Construction, MultiStory Construction, Covering Systems, Roofs, Architectural Treatments, Retrofit, Accessories and Mini-Warehouses.
Circle 13.

Nuclear Associates



FREE X-RAY ROOM PLANNING GUIDE. Made of lead-impregnated, transparent plastic, CLEAR-Pb® X-Ray Room Shielding from Nuclear Associates provides complete radiation protection with panoramic viewing in hospital x-ray, CT and special procedures rooms. Features include prefabrication for quick on-site assembly, shatter-resistance, 200 stock sizes, choice of lead equivalencies. Free CLEAR-Pb Planning Guide available.
Circle 15.

Hoover Treated Wood Products



EXTERIOR FIRE RETARDANT WOOD. Exterior fire retardant treated lumber, siding and plywood meets code requirements for exterior decks, stairways, siding and many other applications. Available in cedar, pine, douglas fir, redwood and other softwood species. UL listed. Treatment has little effect on wood color and it can be stained or painted.
Circle 17.

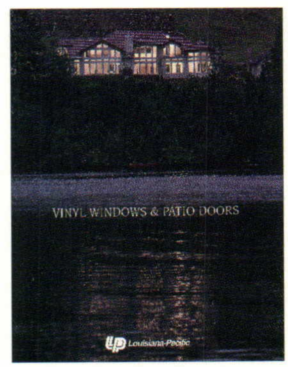
Wayne-Dalton Corp.

WayneTec™ , a computer-intelligent details and specifications package, eliminates the tedious process of specifying commercial and industrial upward-acting doors. Media contact: Julie Arosteguy, Keller-Crescent Co., 1100 E. Louisiana St., Evansville, IN 47711, (812) 426-7720.
Circle 19.

Adams Rite Manufacturing Co.

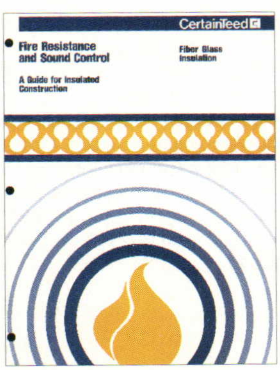
Exit devices — 32-page catalog shows Adams Rite Mfg. Co. touchbar exit devices Series 8000 (listed for life safety) and Series 3000 (listed for fire doors rated up to 3 hours). Ten finishes of aluminum, brass, bronze and stainless materials are shown along with various matching entry trim, electric operation, monitoring and other options. Contact: Adams Rite Mfg. Co., 4040 S. Capitol Ave., P.O. Box 1301, Industry, CA 91749; 213-699-0511, Fax 213-699-5094.
Circle 21.

Louisiana-Pacific



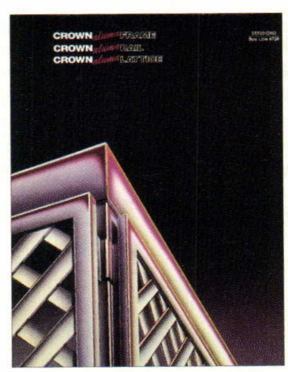
Louisiana-Pacific's vinyl windows and patio doors meet the most demanding new energy codes and are a perfect fit for new construction as well as replacement. Made with a new generation of stronger, modified uPVC, they won't rust, rot, scratch or dent. And they're available in a wide range of sizes and styles, including a large variety of custom shapes.
Circle 23.

CertainTeed Corporation



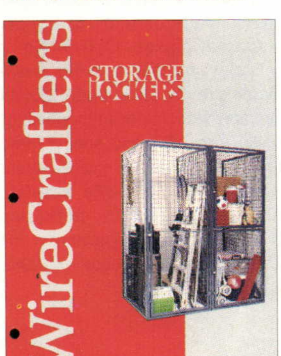
Sound Control and Fire Resistance Brochure. New 12-page brochure offers architects data on the sound control and fire resistance properties of fiber glass insulation. Explains terminology, details existing codes and states standard measurement procedures. Also contains detailed drawings of more common wall assemblies for buildings.
Circle 25.

CROWNalumaCORP



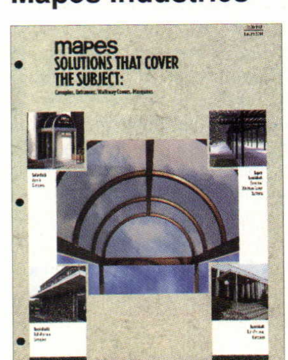
Maintenance-Free Lattice System. Aluminum frames/rails designed for use with CROSS VINYLattice provide a complete, easily installed, durable lattice system. Ideal for balcony and utility enclosures, building facades, fences and trellises. Entire installations can be shipped in pre-assembled sections thus reducing labor costs and waste. CROWNalumaCORP will custom fabricate to meet special design or code requirements. For quotation send drawings to 3174 Marjan Dr., Atlanta, GA 30340. Phone: 800-521-9878, Fax: 404-457-5125.
Circle 27.

Wire Crafters Inc.



Four page brochure describes this line of all steel woven wire lockers for multi-family building storage areas. Choose from single or double tier units. A variety of in stock or custom sizes available. Easy to install. Many advantages over solid wall lockers. Send for free brochure or call 1-800-626-1816. Wire Crafters Inc., 6208 Strawberry Lane, Louisville, KY 40214-2900.
Circle 29.

Mapes Industries

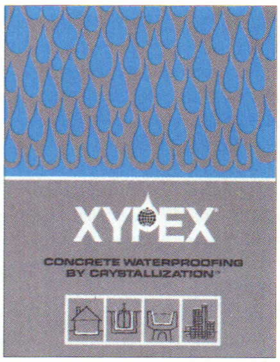


Aluminum/Acrylic Walkway and Entrance Covers. Mapes Industries manufactures a complete line of roll formed, extruded and acrylic walkway covers. Ideally suited for A.D.A. requirements for entrances. The walkways can be designed for any budget and are available in an unlimited range of styles and profiles.
Circle 31.

Envirospec, Inc.

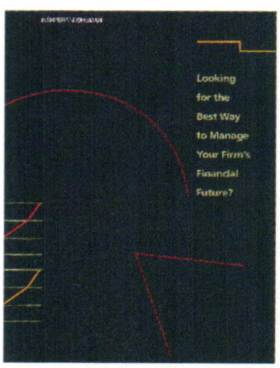
A PRACTICAL SOLUTION TO ROOF PAVER STONE APPLICATIONS. New bulletin shows a better way to transform a roof into a patio, terrace, balcony, walk-way, plaza podium, promenade, or just plain roof deck, using the Pave-El Pedestal System. Designed to elevate, level, and space paver stones for drainage in any weather, Pave-El reliably protects roof, paver stone, membrane and insulation. Envirospec, Inc., Ellicott Station Box 119, Buffalo, NY 14205 (716) 689-8548
Circle 33.

Xypex Chemical Corporation



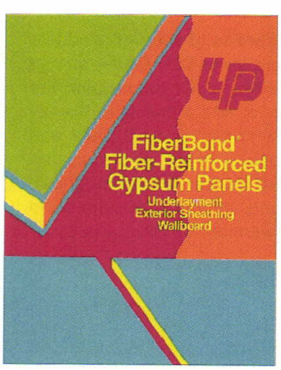
Concrete waterproofing by crystallization. Although applied as a slurry coating, Xypex is a chemical treatment which waterproofs by penetrating the concrete with a crystalline formation which 'plugs' the pores of the structure preventing water seepage. Xypex is ideal for use on the 'inside' of wet underground structures. Xypex Chemical Corp. 604-273-5265.
Circle 37.

Harper and Shuman, Inc.



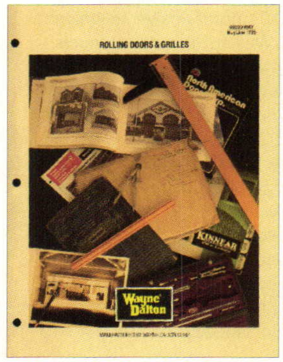
Financial Management Systems. The only systems sponsored by the AIA. Harper and Shuman develops, sells and supports financial management software specifically for architectural and engineering firms. CFMS (Computer-based Financial Management System) runs on the DEC VAX and MICRO/CFMS runs on PCs and networks. A modular approach lets you buy only what you need. **Call today 1-800-872-4050. Harper and Shuman, Inc.**
Circle 41.

Louisiana-Pacific



FiberBond is a fiber gypsum panel reinforced with recycled newspaper. Wallboard for interior walls and ceilings, new exterior sheathing designed for use on the outside of sidewall framing and new underlayment for flooring. Provides a solid, impact-resistant surface; excellent sound control; thermal insulation; and moisture resistance.
Circle 45.

Wayne-Dalton Corp.



A new catalog from Wayne-Dalton features its Kinnear and North American line of rolling doors and grilles for industrial and commercial applications. Media contact: Julie Arosteguy, Keller-Crescent Co., 1100 E. Louisiana St., Evansville, IN 47711, (812) 426-7720.
Circle 35.

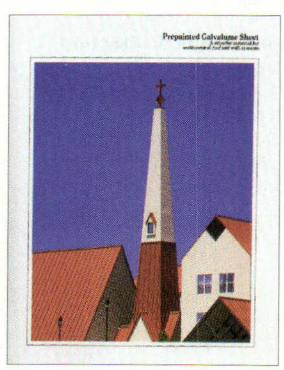
Kaylien Inc.

HARD TO PLEASE CLIENTS? Design a door just for them. Then let us manufacture your creation in Lustr-Metl® Bronze, Pewter, Copper or Aged Brass. Sculptures, LOGO's, Scenic reliefs or Symbolic motifs. Make your own unique door or adapt one of ours. Brochures from Kaylien Inc. Call 800-748-5627.
Circle 39.

Fantech

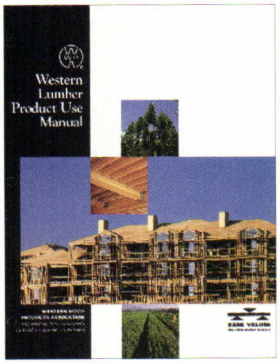
ADVANCED BATH FANS PROVIDE QUIET, POWERFUL VENTILATION. The Fantech ultimate bathroom exhaust systems are state of the art in restroom ventilation. Unique remote mount fan motors provide whisper quiet operation, and high efficiency inline design provides industrial strength power. Ultimate systems come with easily installed round plastic grills that won't fade or rust. Combine two grills with one fan to vent multiple areas. Perfect for high humidity areas such as showers and whirlpools. Call 813-351-2947.
Circle 43.

Bethlehem Steel Corp.



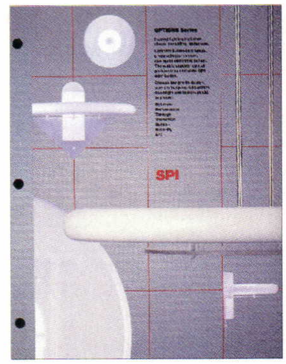
Bethlehem Prepainted Galvalume Sheet is ideal for a wide range of painted applications. It is particularly well suited when superior atmospheric corrosion resistance is required for pre-engineered buildings, architectural panels, siding, roofing (both conventional and standing seam), and other building components. Product characteristics, corrosion-resistance properties, typical applications, and approved paint systems are discussed in this 12-page booklet.
Circle 47.

Western Wood Products



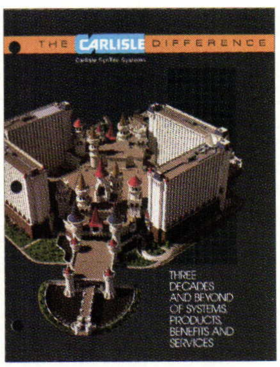
WESTERN LUMBER PRODUCT USE MANUAL. Comprehensive technical manual on Western Lumber products. Includes information on basic categories of lumber, grades, sizes and species groups, new Base Values and Adjustment Factors for dimension lumber, along with design values for structural decking, MSR lumber, structural glued products, posts & timbers, also end-use recommendations and specification guidelines, section properties, relative mechanical properties, appearance lumber grades and sizes, and industrial products.
Circle 49.

SPI Lighting



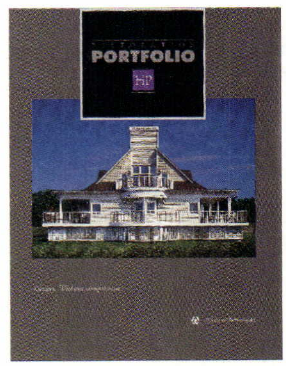
New Options Series Ideal For Low-Ceiling Applications. The contemporary, low-profile fixture series provides exceptionally wide, balanced indirect light distribution. In addition to pendant units, the Options series also includes wall and ceiling-mount fixtures as well as wall sconce and pier mount versions. Down-lighting and an acrylic bottom shield in a variety of shapes and colors are offered as accessories.
Circle 51.

Carlisle SynTec Systems



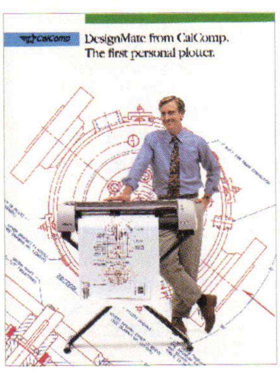
Carlisle SynTec Systems "Capabilities" Booklet. Carlisle remains the industry Leader of innovative EPDM Roofing Systems, Products, Customer Services and Benefits. Experience "The Carlisle Difference" in this 12 page booklet which features Sure-Seal® and Brite-Ply™ Mechanically-Fastened and Fully-Adhered Roofing Systems. Also included is Hypalon-based HyChoice™ and the most recent introduction, the unique Metal Retrofit Roofing System.
Circle 53.

Wolverine Technologies



Restoration Portfolio HP™ is the luxury High-Performance vinyl siding for architects committed to total quality and customer satisfaction. Its strength, bold shadowlines, rich colors, satin-like finish and complementary accessories provide a lifetime of outstanding beauty for homeowners who demand the ultimate in beauty, durability and convenience. Luxury without compromise. Contact Wolverine Technologies at 1-800-521-9020.
Circle 55.

CalComp

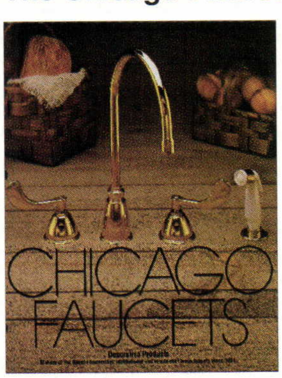


LARGE FORMAT 8-COLOR PLOTTER FOR PRICE OF MONOCHROME OR SMALL-FORMAT PLOTTER. Eight-page brochure describes CalComp's new low-priced DesignMate pen plotter. The brochure details the plotter's versatility (it plots on ANSI 1- through 4-size media, on desktop or optional stand); ease of use; unmatched reliability; and unsurpassed plot quality. Illustrating the brochure are full-color reproductions of actual plots produced on a DesignMate, including architectural drawings and renderings. FREE COPY.
Circle 57.

Haws Drinking Faucet Company

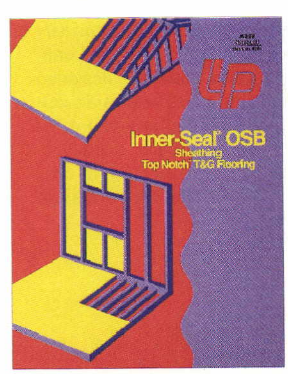
HAWS RELEASES NEW FULL COLOR DRINKING FOUNTAIN/WATER COOLER CATALOG. The new Haws catalog features a complete line of indoor and outdoor drinking fountains and water coolers available in a wide variety of colors and finishes. Featured are the innovative "Hands off" sensor operated water coolers, as well as the exclusive Fashion Plates™ designer collection. For your free copy, Phone (510) 525-5801.
Circle 59.

The Chicago Faucet Company



The Renaissance Collection®. Twenty pages of full-color photos of Chicago Faucet's beautiful Renaissance Collection of kitchen, bath and bar faucets. This information brochure also includes detailed ordering information and roughing-in demensions.
Circle 61.

Louisiana-Pacific



A complete line of exterior products made from Inner-Seal OSB—lap and panel sidings, soffit panel, trim and fascia board, with a protective overlay that's pre-primed to hold paint and stain longer. Uniformly strong and consistent composition throughout. Exceptional moisture resistance to prevent warping, splitting and buckling.
Circle 63.

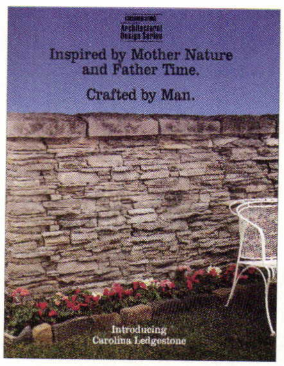
Intergraph Corporation

MicroStation, Version 4. The CAD Standard of Excellence. From conceptual design to production drawings to facilities management, MicroStation is the architect's CAD software of choice. With more than 500 commands and features, including a graphical user interface, built-in rendering, and multi-line element, MicroStation automates the workflow for efficient, easy production.
Circle 65.

Louisiana-Pacific

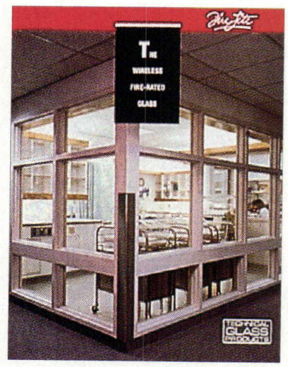
Made from 100% recycled newspaper, Nature Guard insulation costs less than fiberglass and has a 3.8 R-value—the highest available. Its fluffy, natural fibers completely seal the wall cavity, resulting in lower air infiltration and greater sound absorption. And it helps keep our environment cleaner.
Circle 67.

Stone Products Corporation



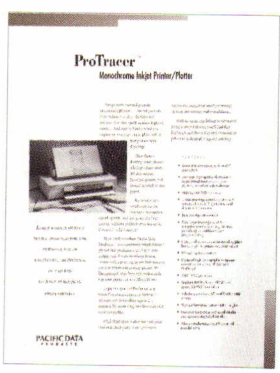
Stone Products Corporation introduces the Cultured Stone® Architectural Design Series. The first in their premium quality product line is Carolina Ledgestone. Achieve the look of weathered drystacked ledgestone with this modular system that fits together more easily, quickly and beautifully than ever before. Whether you're designing a distinctive interior facing or a dramatic home exterior, Carolina Ledgestone offers you nature's own design. . .and a cost-saving array of man-made improvements.
Circle 69.

Technical Glass Products



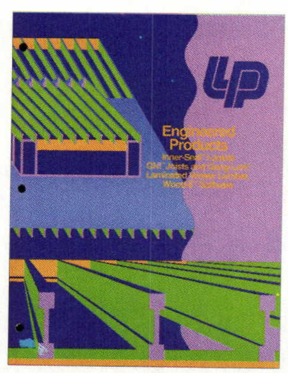
FireLite—The Clear Choice in Fire-Rated Glass. Technical Glass Products introduces you to **FireLite**—the wireless, fire-rated glass ceramic. FireLite looks like ordinary window glass, yet it is listed with both U.L. and Warnock Hersey for use in fire-rated locations. The literature provides product usage, specifications, comparative technical data and design applications for this revolutionary product.
Circle 71.

Pacific Data Products



Meet ProTracer—a large format printer/plotter designed for the personal use of PC CAD and desktop publishing professionals. ProTracer combines the desktop convenience and low price of a laser printer with the ability to produce 360 dpi, A- to C-size (17 x 22") output. Using the latest in inkjet technology, ProTracer provides Epson and IBM emulations, an ADI/PADI plotter driver, and optional accessories including HP-GL and PostScript emulation, memory boards and sheet feeders.
Circle 73.

Louisiana-Pacific



Engineered wood products are designed to eliminate the common problems of solid sawn lumber. Gang-Lam LVL, Inner-Seal I-Joists and GNI Joists are stronger, more stable and easier to handle than solid sawn lumber. Catalog includes span and uniform load charts, and information on Wood-E® engineering software also available.
Circle 75.

For further information on Architecture's Literature Portfolio:

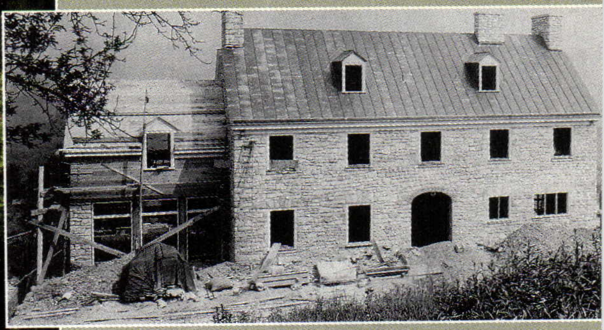
Jan Johnson
Johnson & Associates
1625 Oak Hill Road
Chester Springs, PA 19425
Phone: 1-800-642-4866
Fax: 1-215-983-0655

FOLLANSBEE Roofing Metals enviable records of longevity and beauty.

Today, re-roofing costs are a major consideration in the design of all types of structures. TERNE, the old "tin" roof, and TCS® terne-coated stainless steel, are establishing enviable records of longevity...adding a gracious beauty to outstanding function, at a cost competitive in value with other roofing materials.

62 years in place... the charm and durability of a TERNE roof!

This house, near Pittsburgh, PA was originally roofed with TERNE in 1929. Painted several times since, the roof remains as testimony to the durability o TERNE and a perfect complement to the charm and beauty of the residence.



A standing seam roof of Follansbee Terne with over 62 years of service... still performing its designed function.

TCS and a roofing lesson... weathering to beauty and generations of service

Hinsdale High School, Hinsdale, Illinois, was built in 1977 and roofed with TCS. Requiring no painting, it has weathered to a soft gray and will stay that way through generations of service. TCS, introduced by Follansbee in the 1960's, gains its finest testimonials from a distinguished roster of architects who continue to specify it for major projects.

Now weathered to an attractive, warm gray, the standing seam roof on Hinsdale High School will remain beautiful without paintin

See our catalog in Sweets and Sweets Canada

TERNE...the beauty of color
TCS...beauty by mother nature

FOLLANSBEE

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Call us toll-free 800-624-6906
Circle 149 on information card

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in the UK and in Europe through FOLLANSBEE UK, Ltd. 44-81-367-6463 and BRODERICK STRUCTURES 44-483-750-207

in the Pacific R through SUMITOMO CORP. (03) 3237-413

Locking Up

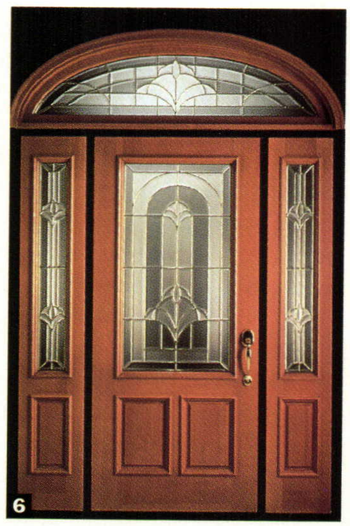
New door hardware heightens security and accessibility.

1

2

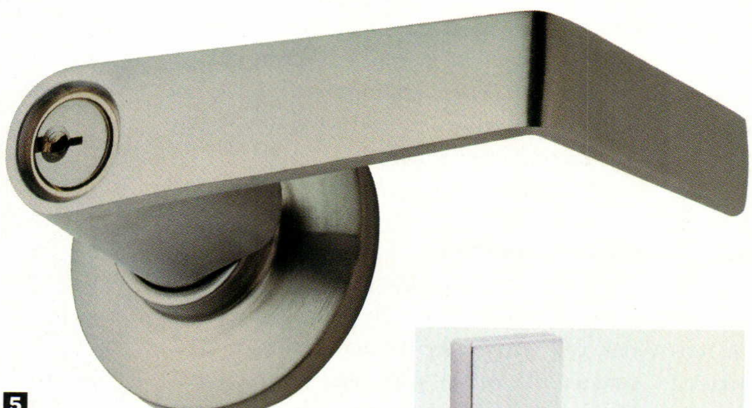
3

4



6

1. The Phoenix knob by Weiser Lock is available in a variety of finishes, including brass with enamel. Circle 401 on information card.
2. Kwikset's Titan line of door hardware includes solid forged-brass handle-sets, solid brass levers, deadbolts with 1-inch latches, and pry-resistant knobs. Circle 402 on information card.
3. LaVona's Unique Hardware manufactures ceramic drawer pulls, knobs, switchplates, hooks, and towel holders in a wide range of colors. Circle 403 on information card.
4. The Florentine line by Nicolai Doors features a floral patterned oval insert with matching sidelights and transom. The triple-

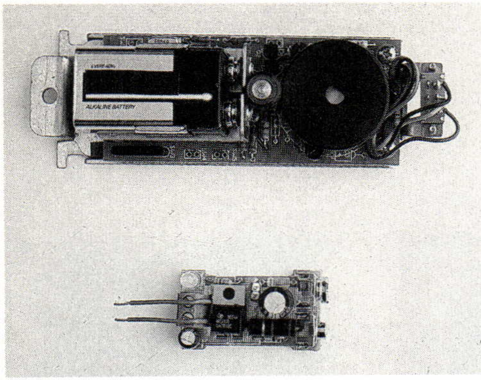


5

insulated glass is hand-cut and highlighted by brass caming. Circle 404 on information card.
5. Schlage Lock Company introduces the ADA-compliant S-Series keyed levers. They are constructed of zinc and finished in a variety of materials, including brass, bronze, and chromium. Circle 405 on information card.
6. A fleur-de-lis created with smoked and clear beveled glass

7

highlights the Simpson Door Company's Arlington Court wood door series. The Douglas fir or western hemlock doors measure 1 3/4-inches thick and 3 feet wide, and are available in two heights: 6 feet, 8 inches or 7 feet. Circle 406 on information card.
7. Best Lock offers a patented system for key production. Compatible with all of its hardware, the system allows keys to be replicated by only one user, or limits key cutting to factory-authorized representatives. Circle 407 on information card.



Door Hardware

NT MONARCH HARDWARE, A NEWMAN Tonks company, has added a battery-powered alarm system (above) to its pushbar exit devices. When the pushbar is depressed, a light flashes and an alarm sounds continuously for 10 minutes. Falcon Lock, also a Newman Tonks subsidiary, offers the ADA-compliant Avalon and Quantum lever trims with spring systems designed to prevent the handles from drooping. Newman Tonks offers a selection of solid brass and tubular handles manufactured by NT Quality Hardware that are intended for glass doors. Available in 3/4-inch- and 1-inch-diameter solid brass or 1 1/4-inch-diameter tubing, the hardware is suitable for a variety of commercial and institutional settings.

Circle 408 on information card.

Ceramic Tiles

AMERICAN MARAZZI MANUFACTURES GLAZED ceramic tile for exterior and interior applications. The single-fired, frost-resistant Florentine line is available in 12-inch-square units. The Mission series features a rugged finish and a selection of four earth colors. Intended to emulate natural stone, the Empire series is produced in four colors and three patterns. Ceramicraft tiles, which are suitable for residential applications only, are manufactured in two sizes and six colors.

Circle 409 on information card.

Wood Doors

WEYERHAEUSER MANUFACTURES THE STILE & Rail wood door series for commercial office settings in 18 standard configurations or custom models. Veneers are produced in a range of domestic and exotic woods. The company also offers the Marshfield Series of architectural doors with lumber, particleboard, acoustical, or hollow cores.

Circle 410 on information card.

Product Resource

THIS NOVEMBER THE NATIONAL INSTITUTE of Building Sciences (NIBS) will begin to include proprietary product information in its Construction Criteria Base compact disc system, published quarterly for architects and engineers involved in federal construction. The discs also include technical information such as construction specifications, standards, codes, regulations, and manuals.

Circle 411 on information card.

Drinking Fountain

THE MODEL 3202 VANDAL-RESISTANT DRINKing fountain, manufactured by Haws, is suitable for parks, rest stops, schools, and other public facilities. The handicapped-accessible unit is constructed of 1/8-inch-thick sheet steel and features a chrome-plated, solid brass bubbler. *Circle 412 on information card.*

Wire Panels

WIRECRAFTERS OFFERS A RAIL AND WIRE panel system for mezzanines, aisles, and loading docks. Constructed of 10-gauge steel woven into 1-by-2-inch mesh, the panel material is welded to a steel frame.

Circle 413 on information card.

Folding Window Wall

THE FOLDING WINDOW WALL IS MANUFACtured by Architectural Openings with laminated mahogany, hemlock, cherry, oak, or other wood species, and insulated glass. The window wall allows unobstructed room openings up to 24 feet wide.

Circle 414 on information card.

Prefabricated Walls

EASTERN EXTERIOR WALL SYSTEMS DESIGNS, manufactures, and installs prefabricated exterior wall systems for the application of stone, ceramic tile, metal, glass, and other surfaces. The company also produces Cast-lite, a precast synthetic material in full panels or trim pieces. *Circle 415 on information card.*

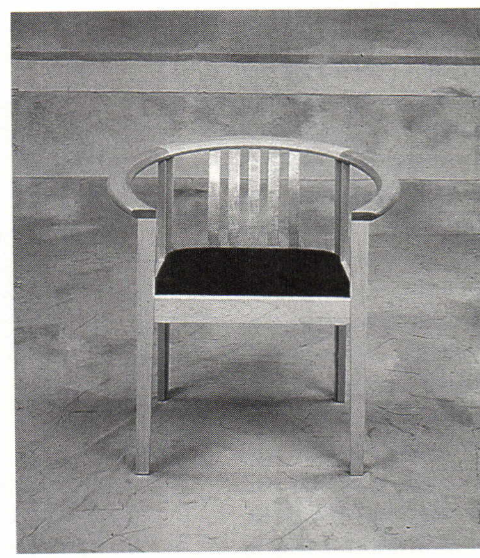
Door Assembly

THE ACOUSTICAL/EMI/RFI STEEL DOOR AND frame assembly is manufactured by Krieger Steel Products to prevent electromagnetic and radio frequency interference in office interiors, laboratories, computer and communications centers, and healthcare facilities. The lightweight system operates with radial bearing cam lift hinges. *Circle 416 on information card.*

Grating Guidelines

IKG INDUSTRIES HAS PUBLISHED A NEW catalog on its Deck Span safety grating, which comprises metal planks with serrated, diamond-shaped openings designed to reduce slippage. The catalog includes complete load tables and design and installation guidelines for a range of applications.

Circle 417 on information card.



Office Seating

GEIGER INTERNATIONAL INTRODUCES THE Jewel chair (above), designed for office settings. The chair offers a curved backrest and is constructed of maple, mahogany, or cherry wood. The seat, backrest, and side panels can be upholstered.

Circle 418 on information card.

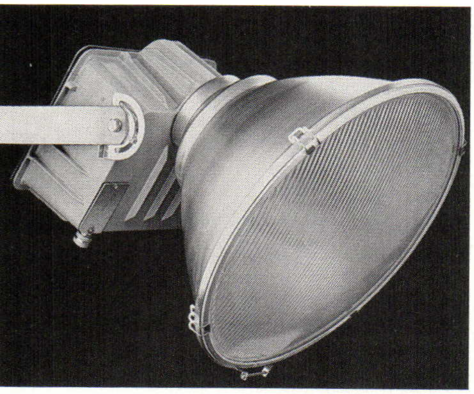
Tile Membrane

COMPOTITE CORPORATION PRODUCES A four-page brochure on Composeal Gold, a 4-ply waterproof membrane for thin-set tile installations. The membrane, which is heat-sealed to exterior and interior surfaces, is designed to protect tile floors, walls, and decks against cracks caused by shrinkage. The brochure provides installation details, antifracture and waterproofing test results, and additional information.

Circle 419 on information card.

Traction Elevator

SCHINDLER ELEVATOR CORPORATION MANUfactures the Miconic traction elevator for mid-rise building applications. The Miconic relies on microprocessors for each car to manage the elevator's operating controls. The system offers a variety of control features and can be installed in buildings with banks of up to eight cars. *Circle 420 on information card.*



Durable Floodlight

PRISMBEAM II FLOODLIGHTS, AVAILABLE from the Holophane Company, include a die-cast aluminum casing and a borosilicate prismatic glass lens (above) that is thermal-shock-and impact-resistant. The lens is latched with hinges to allow for tool-free lamp replacement. *Circle 422 on information card.*

Slip-resistant Surfaces

SAFETY GROOVING IS A PROCESS DEVELOPED by Diamond Safety Concepts that transforms tile, brick, stone, and concrete floors into slip-resistant surfaces by scoring patterns into the finish material. The width and depth of the grooves is designed to approximate that of adjacent grout joints. The procedure is appropriate for commercial kitchens, entrances, walkways, access ramps, and pool decks.

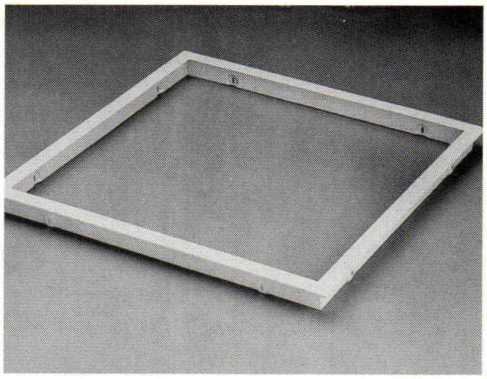
Circle 422 on information card.

Ventilation Frames

TITUS OFFERS THE TITUS RAPID MOUNT PLASter frame (right), designed to reduce installation time of the company's grills, registers, and diffusers in plaster and sheetrock ceilings. *Circle 423 on information card.*

Automated Opener

PRODUCED BY LCN, THE AUTO-EQUALIZER IS a pneumatic door operator that opens doors slowly to provide easy access for the physically impaired. *Circle 424 on information card.*



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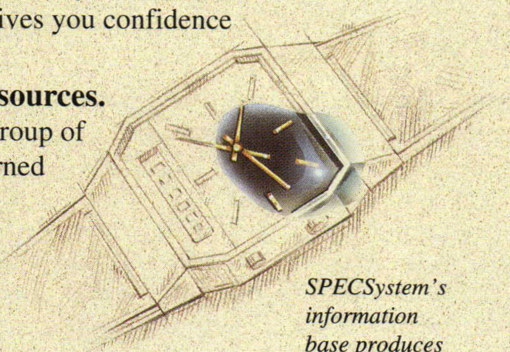

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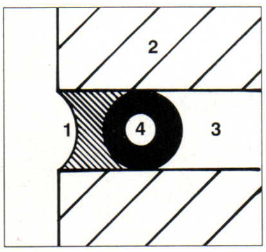
Concrete *CSI Division 03000*

Window Detailing



JOINT SECTION

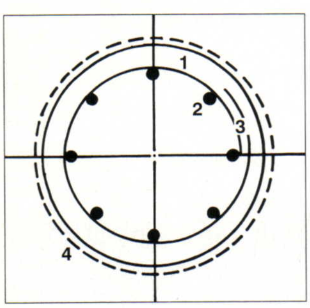
1 SEALANT BEAD
2 SUBSTRATE
3 JOINT
4 BACKER ROD

A simple detail that can be added in the forming of concrete panels for windows can help deter water infiltration. Half-round or V-shaped grooves at the window heads create drip edges that work to keep water from flowing back toward the window frame (detail, left). The grooves also add a shadow line that gives the openings a cleaner, crisper appearance.

Harrison McCampbell, AIA
McCampbell & Associates
Knoxville, Tennessee

Stress Cracking

Minimum concrete depth over steel reinforcing in columns, as stipulated by structural engineers and the American Concrete Institute, may be sufficient for structural integrity but insufficient to prevent stress cracks, particularly in finely textured concrete. Stress cracks do not affect the structural stability of the column, but ruin its appearance. Such cracks tend to develop near rebar ties that bind the reinforcing rods together (detail, left). Determining how much to increase concrete depth to mitigate stress cracking will depend on the concrete mix and the size of reinforcing, but a factor of 25 percent is a good rule of thumb. Construction tolerances and forming methods may affect actual thickness of concrete coverage. The increased depth and reinforcing size should be studied with a structural engineer.



COLUMN PLAN

1 MINIMUM COVERAGE
2 REBAR
3 LAPPED COLUMN REBAR TIES
4 COVERAGE TO MINIMIZE STRESS CRACKING

Vernon M. Seieroe, AIA
J. Erik Hartronft, AIA
Midyette/Seieroe/Hartronft
Boulder, Colorado

Sealants *CSI Division 07900*

Performance Criteria

When specifying sealants that will be long-lasting and weather resistant, architects should narrow their selection by asking questions that address sealant performance. For example, what is the joint pattern, how closely spaced are the joints, how deep are they, and should the joints be expressed or hidden? What is the joint substrate material, and will the sealant adhere to it? Can the sealant accommodate movement in the substrate due to structural deflection, dissimilar materials, temperature changes, or concrete creep? How long does the sealant need to last? Is the sealant compatible with adjacent materials such as flashing or roofing? Will adjacent materials, such as porous stone, be discolored due to oil migration from the sealant, and does the sealant attract or retain dust and dirt? What colors are available? Will installation occur in warm or cold climates? Sealants graded on these performance criteria will provide the best barrier for a particular joint and will improve the quality of the building project.

Peter Graffunder, AIA
Hammel Green and Abrahamson
Minneapolis, Minnesota

Color Selection

When matching sealant pigments to adjacent materials, color fastness should be given the same attention as the shade itself. Colors should be selected from the manufacturer's standards, which guarantee various performance characteristics including color fastness. When an identical match is unavailable, the sealant's appearance is generally more pleasing if the pigment is slightly darker than the adjacent materials. If it is necessary to specify a custom tone, be aware that the likelihood of fading or discoloration is great, since pigments are mixed in untested combinations. Generally, darker sealants fade more than lighter ones. Precautions to help prevent discoloration should be taken during and after installation. Wet-tooling the sealant with a detergent solution will often cause discoloration, as will chemical or acid washing of walls after sealant application.

Rai Muhlbauer, AIA
Herbert S. Newman and Partners
New Haven, Connecticut

Architects are encouraged to contribute their Neat ideas, including drawings, sketches, and photographs, for publication. Send the submissions to: NEAT *File, Michael J. Crosbie, 47 Grandview Terrace, Essex, Connecticut 06426, or by fax (202)828-0825.*