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JULY 1995

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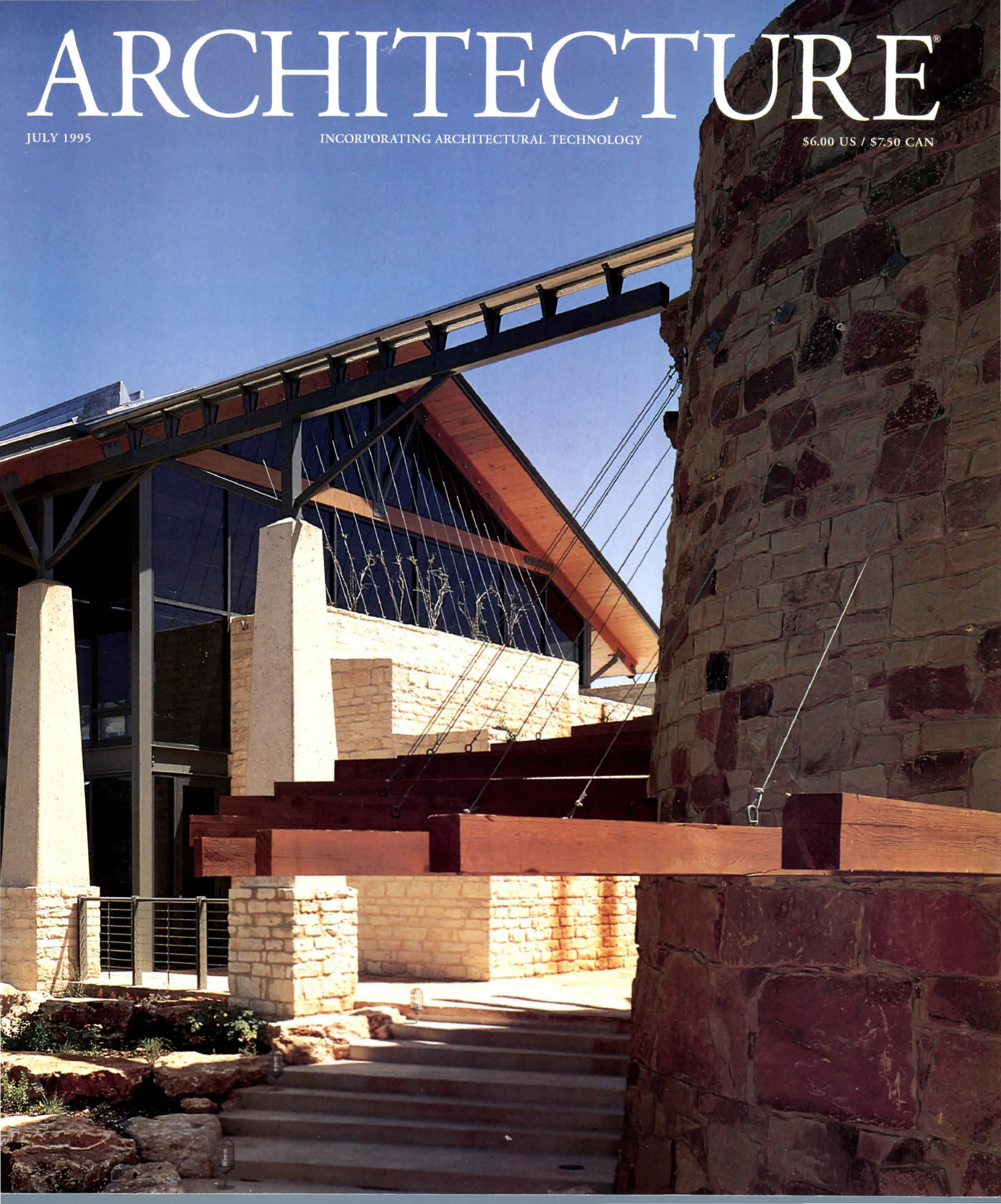

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Green Culture

Europe is ahead of the U.S. in offering incentives for environmentally sound design.

This issue marks our third survey of environmentally sensitive architecture. Since 1991, when we had a hard time trying to find a decent-looking green building, ecosensitive practices have slowly entered the mainstream of design, and their influence is growing. For example, architect William McDonough, whose green design of the Heinz Foundation is featured in this issue (pages 84-87), was recently appointed dean of the University of Virginia's architecture school and is now greening a younger generation. Even large, corporate firms, such as HOK and Gensler, are instituting their own environmentally correct guidelines (pages 121-127). And technologies such as photovoltaics (pages 109-117) are becoming easier to integrate with ordinary building elements such as curtain walls.

But for green buildings to flourish in this country, they require broader support from clients and architects, who, like most Americans, remain apathetic to environmental issues. During a recent international conference on global climate change held in Berlin, for example, Undersecretary of State Timothy Wirth confessed that the U.S. has "no constituency" for solving such ecological problems as global warming.

Driven by subsidies, stringent energy regulations, and mandatory worker protections, Europeans are well ahead in the race toward an environmentally sound future. Indeed, with Congress threatening to defund, deregulate, and decentralize our environmental laws, the U.S. may not even be a contender.

In this issue, we demonstrate how Europe's culture is far more attuned to sustainable practices than our own. The exuberant, Neo-Gothic engineering laboratory at De Montfort University in Leicester, England, designed by Short Ford (pages 88-97), is one of the largest naturally ventilated buildings in Europe. It was singled out by *The Independent*, a national newspaper in Britain, for its Green Building Award, over projects such as the Inland Revenue headquarters, a government building designed by Michael Hopkins (pages 76-83). Both buildings take advantage of incentives from the Building Research Establishment, a government agency that sets standards for sustainable design.

Similar environmental strategies applied in the U.S. rarely gain the attention of our major newspapers; American architects of Michael Hopkins' stature are almost never linked with green design or commissioned to design an energy-efficient complex for the government. Imagine *USA Today* giving an award to Frank Gehry for designing a green headquarters for the IRS.

Our greatest hope may lie in the progressive utility companies that have taken the lead in promoting energy awareness. The Bonneville Power Administration, one of five federally chartered hydroelectric companies, teamed up with Portland AIA for the third year in a row to sponsor a design competition based on energy conservation. In California, the Sacramento Municipal Utility District is promoting photovoltaic installations to help meet peak demand for power in the summer. And the Arizona Public Service Company recently commissioned an energy-efficient demonstration house (pages 139-141) to sell sustainability in the suburbs.

Such public-awareness efforts are a fine start, but the reason they exist at all is because they save the utilities money. For green buildings to flourish in this country, they require a broad-based constituency that realizes, like the Europeans do, that ecologically sound practice is more than a matter of energy awareness. It's a design concept that addresses the whole environmental picture, from site strategies to resource-conserving materials that reduce the costs—and extend the life—of a building over time. Only through such a comprehensive approach will sustainable design become part of our culture.

Deborah K. Dietsch

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Letters

Rare delight

The piece on Joseph Powell's Evanston Public Library (May 1995, pages 96-99) was a rare delight. I recall reading several years ago how the 28-year-old, recently laid-off Powell won a competition for the Evanston Public Library from a pool of 377 entries. Seeing the fulfillment of his entry design beautifully detailed and finished in a timely fashion proved an important point—Horatio Alger can triumph.

W. Richard Mahoney
Weiskopf & Pickworth
New York City

Insult to injury

As a native St. Louisan, I agree with the enlightened critique by Bradford McKee ("Protest," February 1995, page 47).

The design of the new Kiel Center is hostile to the prevailing architectural vocabulary of the extant Memorial Plaza, the ambitious civic center redevelopment project launched in 1923 by visionary civic leaders. Grafting the new building onto the truncated remains of the venerable Kiel Opera House adds insult to injury. As the historic fabric of downtown St. Louis continues to give way to ubiquitous developments, we run the risk of becoming a city without a past, an anonymous settlement. Sure, the new facility works well as a state-of-the-art sports arena. But the callousness of the design and the arrogance of civic leaders and architects who foisted it upon us are to be regretted.

Robert S. Barringer, AIA
Louis R. Saur & Associates
Clayton, Missouri

Academia on trial

Denise Scott Brown's article (March 1995, pages 43-47) reinforces the need for a strong liberal arts background preparatory to an advanced degree in architecture.

However, academia is also failing to emphasize the need for experience in the field. The student must become knowledgeable in new project development, business management, and market development. From the 1890s, those in the United States have recognized that a body of known information is best delivered under the isolating and insulating confines of an academic institution. But with architects financially hurting, the schools need a strong wake-up call. Denise Scott Brown has given a polite nudge.

Charles Machold Weymouth, AIA
Weymouth Architects
Wilmington, Delaware

Corrections

The following firms should have been credited in ARCHITECTURE's article on Phoenix (April 1995, pages 76-85): The Phoenix Museum of History (pages 78-79) is designed by Langdon Wilson with John Douglas. The Phoenix Central Library (pages 80-81) is designed by William Bruder and DWL Architects. Lescher & Mahoney/DLR Group is the executive architect of the Phoenix Art Museum (pages 82-83). Cornoyer-Hedrick is the associate architect of the Arizona Science Center (pages 84-85).

Events

Exhibitions

CHICAGO. "The Architecture of Bruce Goff, 1904-1982," through September 4 at the Art Institute of Chicago. Contact: (312) 443-3600.

MONTREAL. "European Architecture and the American Challenge, 1983-1960," through September 24 at the Canadian Center for Architecture. Contact: (514) 939-7020.

NEW YORK. "The U.N. in Perspective," through September 26 at MoMA. Contact: (212) 708-9400.

WASHINGTON, D.C. "Ticket to Paradise," through September 10 at the National Building Museum. Contact: (202) 272-2448.

Conferences

BROOKLYN. "History and Analysis of New York," July 10-August 11, at Pratt Institute. Contact: (718) 636-3453.

FREIBERG IM BREISGAU, GERMANY. "17th International Making Cities Livable Conference," September 5-9. Contact: (408) 626-9080.

LONDON. "100% Design," contemporary furniture, October 1-4. Contact: 011-44-181-849-6211.

MIAMI. "World Workplace '95," September 17-20. Contact: (713) 629-6753.

MILAN. "Eimu '95," international office furniture exposition, September 21-25. Contact: 011-39-2-485-921.

MINNEAPOLIS. National solar energy conference, July 15-20. Contact: (303) 443-3130.

PORTLAND. "Rail-Volution: Building Successful Communities With Rail," September 16-18. Contact: (800) 788-7077.

TORONTO. "International Lighting Exposition," September 27-29. Contact: (905) 890-1846.

Competitions

The Center for Health Design is sponsoring two design competitions in conjunction with the Eighth Symposium on Healthcare Design, to be held in November in San Diego: Health Environment Award, entry deadline **August 1**; and Healthcare Design, open to professionals and students, cosponsored by AIAS, entry deadline **October 2**. Contact: (510) 370-0345.

SURFACE, the new journal of the University of California, Los Angeles Department of Architecture and Urban Design, is sponsoring a public space ideas competition, to be published in the inaugural issue. Entry deadline: **August 1**. Contact: (310) 206-3495.

Boston Society of Architects is sponsoring Unbuilt Architecture Design Awards, a program open to professionals and students around the globe. Entry deadline: **September 26**. Contact: (617) 951-1433.

THEY DON'T MAKE THEATRES LIKE THIS ANYMORE. WHICH IS WHY THE

When it opened in 1921, the State Theatre in Minneapolis was hailed as the most luxurious showplace between New York and San Francisco. Sixty years later however, when planning began for a $130 million office/retail complex for the site, it appeared this grand old theatre would go the way of the silent films it once screened.

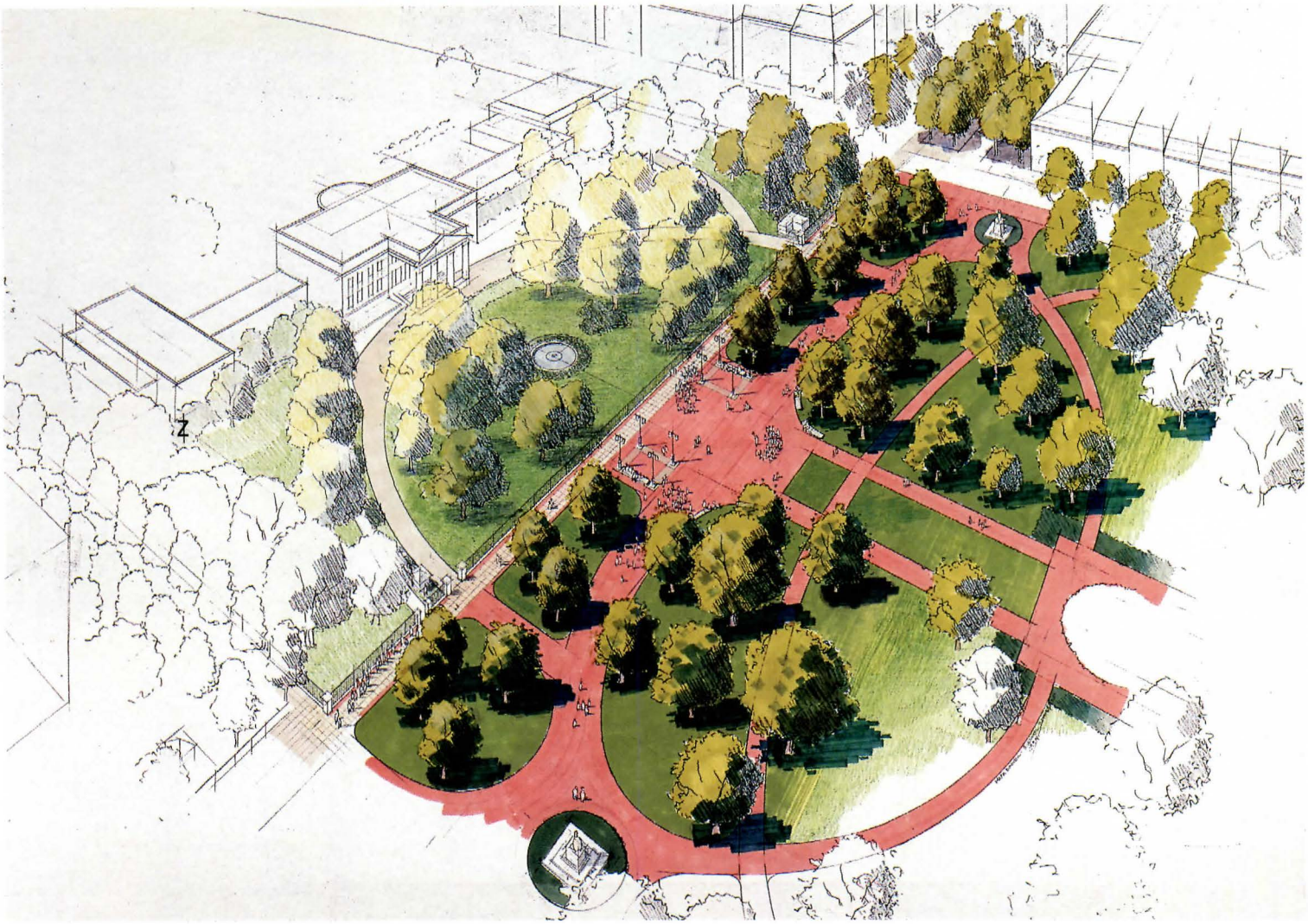
But in 1985, a determined group of preservationists succeeded in getting the State placed on the National Register of Historic Places. And one of the first companies to become involved in its restoration was Marvin Windows and Doors.

You see, the windows above the theatre's marquee posed a two-sided problem. Not only would they have to fit perfectly and look exactly like the originals, they'd also have to be durable and maintenance-free. And Marvin was the only manufacturer willing to make these unique windows and stand behind them.

And so, working from measurements of the existing openings, Marvin built the 3′ x 10′ windows and 6′ x 10′ double-width units with custom divided lites and the same gently rounded frames as the originals. In addition, each window received a commercial grade exterior finish in a color that matched the look and style of the building.

As a result, the State got windows that look like the originals but actually feature the newest ideas in design, craftsmanship and energy efficiency. And Marvin got the opportunity to prove once again that responsiveness

News



Architects Suggest Designs for Pennsylvania Avenue

On May 20, Pennsylvania Avenue was abruptly closed after security officials determined that the White House was vulnerable to terrorist attacks. Soon after the closing, the Clinton administration asked 11 architects and urban designers to suggest schemes for a pedestrian mall. "It is always upsetting to have to close a street," laments historian Vincent Scully, a member of the advisory team. "However, we must regard it as an opportunity to make a fine pedestrian square."

Architects suggested extending the lawns, gardens, and brick sidewalks of Lafayette Square up to the White House fence. Landscape architect Nicholas Quennell proposed planting trees informally about a new pedestrian plaza (above). Architect John Carl Warnecke presented a 1963 plan he had originally drawn up for President John F. Kennedy, which envisions more formal plantings across a granite plaza.

Renderings are strictly conceptual at this point; no funding is set. Architect J. Max Bond, who served on the advisory board, suggested staging a national design competition, in keeping with Pennsylvania Avenue's public spirit.—*B.A.M.*

Named for a French scientist who developed laminated glass, the Benedictus Awards honor projects that incorporate innovative applications of the material.

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Benedictus Winners Expand Laminated Glass Potential

The top winner of the 1995 Benedictus Awards is one of the largest self-supporting, all-glass buildings in the world. Submitted by the British architecture firm Design Antenna, the 36-foot-long, 18 1/2-foot-wide, and 11-foot-high entrance pavilion to the Broadfield House Glass Museum in Dudley, England, is constructed entirely of glass. Beams and columns fabricated from three sheets of plate glass support a roof of double-glazed panels, and glass mortise and tenon joints connect structural members. The only metal in the project is the steel bracket supporting the beams, fitted along the brick rear wall of the museum.

Structural and glazing engineers Dewhurst Macfarlane and Partners worked with Design Antenna to devise a means of combatting solar gain in the pavilion. A microscopic deposit of silver contained in the outer layer of glass filters the sun's rays without adding a visible tint. On the roof, the inner layer of glass is fritted to reflect sunlight.

"The simplicity of the concept, the clarity of thought, and the absolute perfection of its few details makes the pavilion a faultless performance," observed the jury, comprising architects Thomas Beeby of Hammond Beeby & Babka, Chicago, Dan Hanganu of Dan Hanganu and Associates, Montreal, and Fumihiko Maki of Maki and Associates, Tokyo.

The annual awards competition is sponsored by the American Institute of Architects, the Association of Collegiate Schools of Architecture, and Dupont, with the support of the Union of International Architects.

This year, the jurors selected six finalists in addition to the winner. One finalist, Kraaijvanger-Urbis Architects of Rotterdam, employs a strategy similar to Design Antenna's: Glass is the sole structural material employed in a bridge suspended between two office buildings. Since the structure is absolutely transparent, pedestrians on the bridge appear to float between the two buildings. Tetrapod castings support the corners of each panel, and are in turn supported by horizontal cables. Silicon butt joints replace mullions and form a waterproof skin.

Sharp, clean corners define the sculptural forms designed by finalists Eric Owen Moss Architects of Culver City, California, and Fujiki Takao Atelier of Tokyo. Laminated glass encloses voids in Moss's angular conference room, called The Box, mounted on top of a one-story

This year's seven award-winning projects, announced at the AIA convention in May, demonstrate new methods of controlling solar gain, thermal expansion, and condensation through diverse applications.

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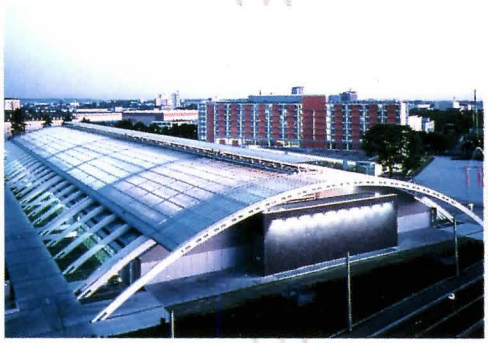
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office building in Culver City. Fujiki Takao Atelier evokes the image of a paper-covered lamp in the design of a police box for a new suburban development in Tokyo. The architect projected laminated glass screens out from the playful, porcelain-tiled base of the public safety facility, and lit the smokey panels from behind. Cast glass cubes cap the ends of the hardware and create a gridded pattern on the 6-meter square, semi-transparent facade.

An enormous glazed roof dominates Herzog + Partner's Design Center in Linz, Austria. Huge steel arches span distances twice the length of a football field, sealed by laminated glass. An innovative device inserted between double layers of glass enables natural light to penetrate the volume without overheating: Reflecting grids manufactured by Siemens of Germany regulate the amount of light that enters the space, reflecting direct sunlight while permitting diffused light to enter.

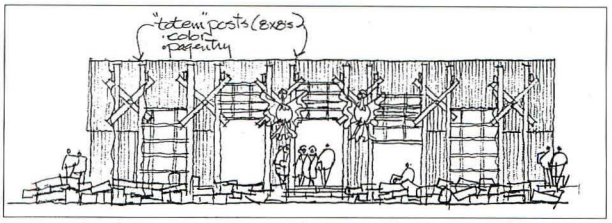
On a similar scale, Richard Brosi and Obrist & Partner's train station roof in Chur, Switzerland earned the Swiss architects finalist standing. The barrel-vaulted scheme relies on a principal compression member with intermediate radial ties to resist buckling. The glazing system is set above the plane of the skeleton to differentiate the two.

Pei Cobb Freed & Partners made this year's list with the firm's second pyramidal structure to be built at the Louvre. The inverted pyramid incorporates precision-cut and chamfered panes, connected by 15-inch stainless-steel sections drilled into the corners. To avoid condensation, warm air is filtered through the assembly via overhead fans.

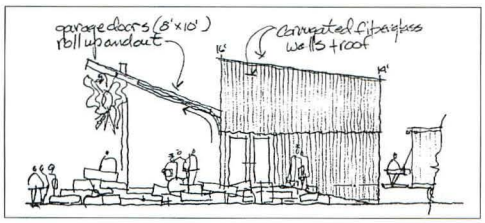
Students were also recognized for testing the boundaries of laminated glass. The design program specified a center for the study of world religions and cultures on Miyajima Island in the Inland Sea of Japan. Juha Mäki-Jyllilä of Tampere University of Technology in Finland won first place in the student division. Second place went to Kerstan Nabielek and Román San Emererio Pedraja of the University of Portsmouth in England. Carlos Puig, Xavier Vanceus, Rafel Moranta, and Jonathan Tugores of the Escola Technica Superior D'Arquitectura Del Vaués in Barcelona won third place.

Sponsors of the international design competition are gearing up for the next round of contenders. Entry forms for the 1996 Benedictus Awards are available now from the Association of Collegiate Schools of Architecture.—*Ann C. Sullivan*

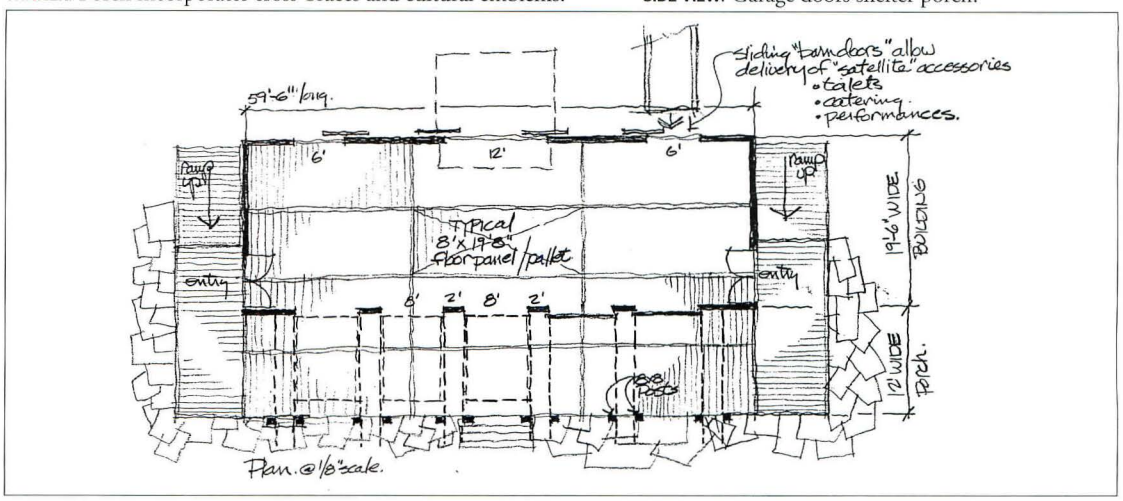
1 Design Antenna's self-supporting glass pavilion incorporates double-glazed roof and facades.
2 Museum pavilion's ceiling is fritted to inhibit solar gain.
3 Ceramic frit fused onto the pavilion's glass reflects sunlight.
4 Semi-transparent laminated glass clads Fujiki Takao's 6-meter square gridded police box.
5 Richard Brosi and Obrist & Partner's Swiss transportation center is covered by laminated glass vault.
6 Silicon butt joints eliminate mullions in triangular faces of Pei Cobb Freed's inverted pyramid. Spherical bearings center loads.
7 Laminated glass defines the corners of Eric Owen Moss's solid-volume conference room.
8 Roof of Herzog + Partner's Design Center in Linz captures daylight.
9 Kraaijvanger-Urbis Architects' transparent bridge links adjacent buildings.



WINNER: Porch incorporates cross-braces and cultural emblems.



SIDE VIEW: Garage doors shelter porch.



PLAN: Modular floor pallets rest on block foundation with rubble perimeter.

Seattle Holds Competition for Kobe Community Center

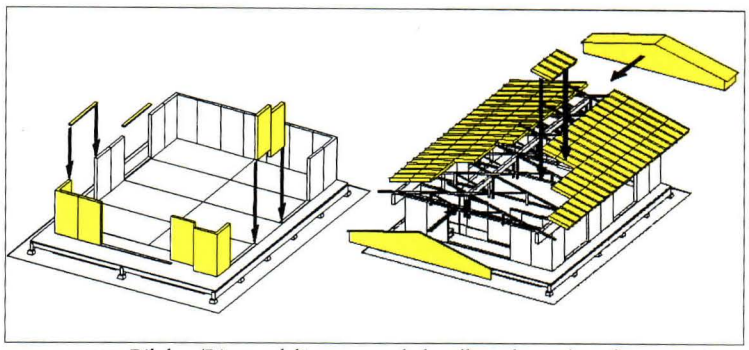
Kobe is the sister city of Seattle, where architects are helping the Japanese city recuperate from the January earthquake. In March, AIA Seattle sent a delegation to inspect damages and assist in recovery plans (ARCHITECTURE, May 1995, pages 30-33). The group included AIA President Chester A. Widom, Seattle architect Roger Williams, and seismic expert Christopher Arnold.

Now, the Seattle chapter has joined a consortium of public and private enterprises, led by the Washington State Housing Steering Committee, working to build a number of temporary community centers for residents displaced by the earthquake. The centers will provide a place to hold meetings, serve meals, and host cultural events during the construction of permanent facilities.

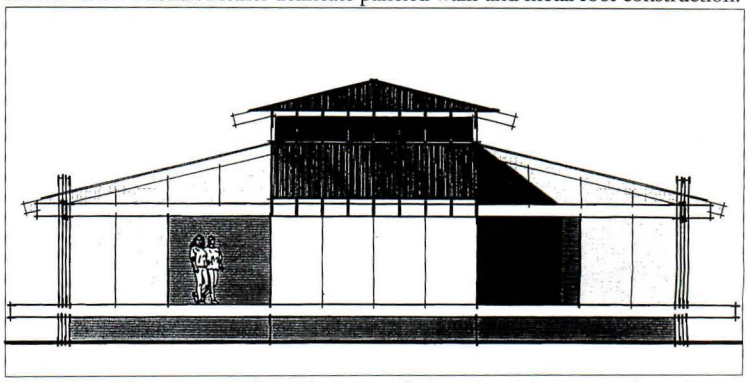
In May, AIA Seattle held a design competition to select an economical design, one that can be transported across the Pacific Ocean and assembled with little difficulty. The program specified an all-weather structure measuring 1,200 square feet with a raised floor. Freight restrictions limited dimensions to 8 feet wide by 8 feet high and 19 feet, 10 inches long. Architects were cautioned to anticipate limited availability of equipment, tools, and labor and encouraged to specify recyclable materials. The centers are expected to function for only three years.

Speed and ease of construction weighed heavily in the seven-member jury's decision. First place was awarded to Donald Carlson & Associates, whose fiberglass-paneled building incorporates color-coded wood members to facilitate assembly, prompting the jury to deem the winning submission "poetic, elemental, and economical."

Andre Bilokur of Callison Architecture and Patricia Bittner captured second place; and Stewart Chung of Mithun Partners received third place. Sponsors hope to raise $200,000 for the project and erect the winning design as soon as possible.—*A.C.S.*



SECOND PLACE: Bilokur/Bittner delineate paneled walls and metal roof construction.



THIRD PLACE: Chung's wood-framed pavilion features modular bays and windows.

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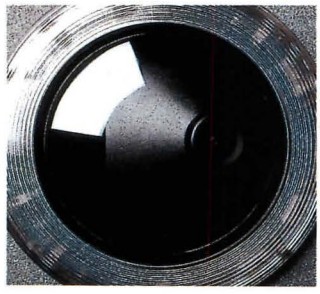

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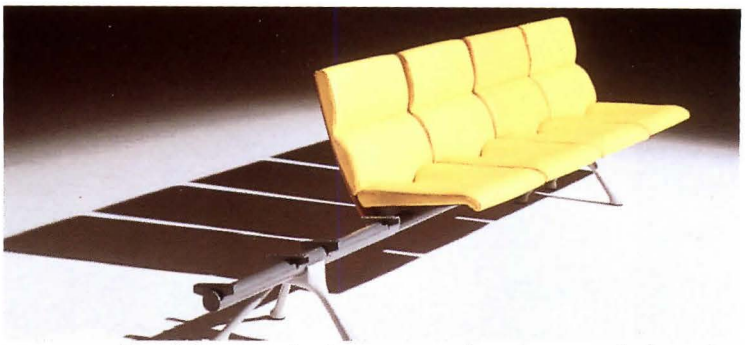
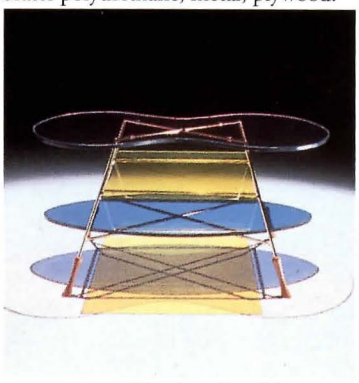


RENZO PIANO: Kansai Airport seating incorporates polyurethane, metal, plywood.

CHRIS CONNELL: CFC-free foam chairs.



KARIM RASHID: Glass/acrylic table.

MoMA's Brave New Material World

"Mutant Materials in Contemporary Design," on view at New York City's Museum of Modern Art through August 27, catches the material world by surprise: Approximately 150 international products and prototypes seem suspended in the existential act of changing from one state of being to another.

Organized by MoMA's new curator of design, Paola Antonelli, "Mutant Materials" is the right show for today, when genetic engineering promises revolutionary transformations of the body, images are digitized into endless permutations, and the 20th century morphs into the next. Unfortunately, the exhibit rarely clues visitors into the cultural contexts of its objects, relying on the rigor of Antonelli's keen eye for its interpretive clarity.

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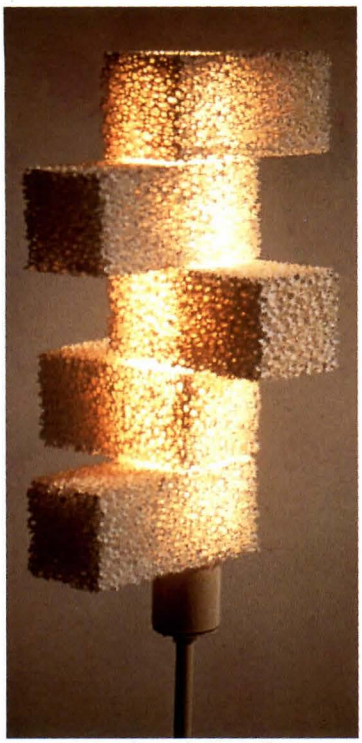
HISANORI MASUDA: Aluminum boxes.



HARRY ALLEN: Ceramic foam fixtures.

when used for turbine rotors and scissor blades, then foamed like sponge to make the translucent shade of Harry Allen's light fixture. Wooden chair seats can be as soft as leather. Visually, these new materials celebrate their mongrel nature; the mystery of what they're made of is part of their surreal beauty.

As the exhibition points out, truth to materials is no longer the holy grail that it was for Modern designers such as Charles and Ray Eames, although today's practitioners take for granted the Eameses' pursuit of industrial crossovers. Richard Sapper and Samuel Lucente's Leapfrog computer, which was inspired by material used for the Stealth fighter aircraft, mirrors the Eameses' success at translating World War II-era military designs into postwar chairs of molded plywood and fiberglass. Donald Chadwick and William Stumpf's insectlike Aeron chair brings the materials of the automotive industry to the office.

Much of the appeal of the objects displayed comes from their irreverent wit, evident in designs espousing concern for the environment. No serious Rachel Carsons here. Philippe Starck molds sawdust with Rococo élan for the cabinet of his Jim Nature television set, while Gaetano Pesce, the Michelangelo of the mutants, serves up a visually sumptuous armchair made of strips of waste fabrics bathed in resin. His stools moo like cows or ring like bells when you kick them.

The most encouraging aspect of MoMA's material world of technological wonders is how firmly centered it remains on the human body, which designers customize and extend. The Airflex baseball glove, for example, features air-inflated bladders that players manipulate to get the perfect fit. Vent Design's Animal wet suit affords its human wearer the underwater mobility of flipper, while Bob Evans's flexible polyurethane fins for the feet imitate the aerodynamics of fish. Forget your fears of the Creature from the Black Lagoon; rubber is us.—*Donald Albrecht*

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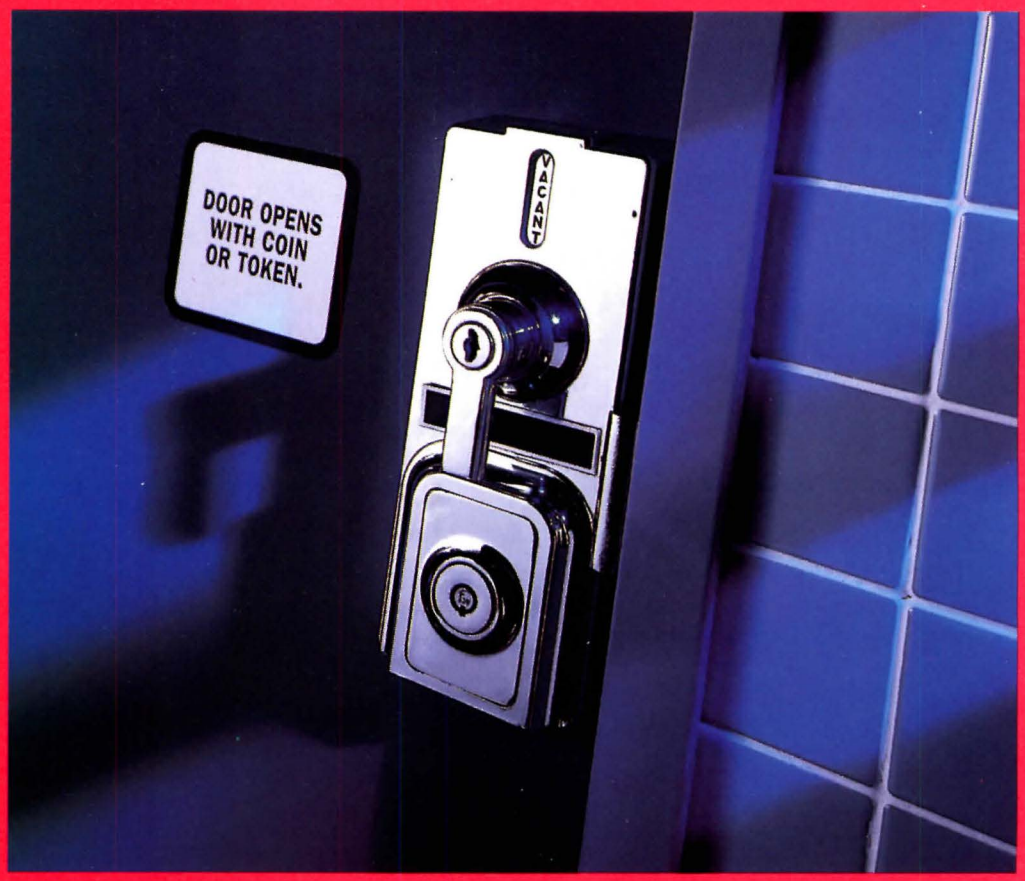

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A good deal more.

AIA in Barcelona

The latest meeting of the AIA Committee on Design clearly showed why every American architect—and politician—should definitely travel to Barcelona. The city wisely turned the 1992 Olympic Games into an opportunity for public improvements, constructing not only sports venues, but telecommunication towers, highways, an airport expansion, waterfront enhancements, and more than 100 public parks—all designed and built within five years.

These new structures and public spaces are remarkable for how they are seamlessly integrated into Barcelona's historic fabric. "The secret to our success is that the public sector controls our public space," explained David Mackay, whose firm Matorell, Bohigas, Mackay master-planned the Olympic Village. And it helps to have a "cultured politician," as Mackay described Mayor Pasqual Maragall, who masterminded Barcelona's urban reconstruction and who was reelected on May 28.

Many of the new buildings fostered by the 1992 Olympics were designed by Barcelona architects, offering conference participants a flavor of local talent. But foreigners stole the show: Richard Meier's Museum of Contemporary Art and Bruce Graham and Frank Gehry's hotel and retail complex are among the city's best new buildings; the Barcelona Pavilion by Mies van der Rohe, reconstructed in 1986, is an unsurpassed classic.

Chaired by Steve Goldberg, the well-organized program was popular, attended by 76 participants. It was led by Diane Gray of the Mies van der Rohe Foundation, who set a late Modernist agenda with tours of buildings by Josep Lluis Sert and José Antonio Coderch, a Barcelona architect active in the 1950s, rather than those of Antoni Gaudí.—*D.K.D.*

J.H. MORRIS

AMERICANS IN BARCELONA: Gehry's copper fish and Graham's hotel grace waterfront.

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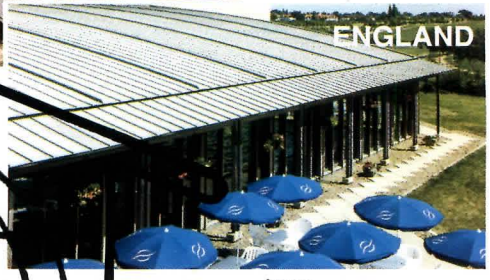

Arena
Stockley Park, Heathrow
Architects: Arup Associates

Dazaifu Treasures Museum
Tokyo, Japan
Architects: Satoh Total Planning and Architecture

JAPAN

Salegian Boys School Gymnasium
Tokyo, Japan
Architects: Sakakura Architects

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Danish prize

Finnish architect **Juha Leiviská** is the 1995 recipient of the Carlsberg Architectural Prize, a distinction that carries a purse of $250,000. The 59-year-old architect was selected from among 64 international candidates—including U.S. nominees Frank Gehry, Eric Owen Moss, Morphosis, I.M. Pei, Daniel Libeskind, Richard Meier, Ralph Johnson, and Antoine Predock.

Healthy commission

Stressing design excellence, the National Institutes of Health (NIH) is soliciting proposals for the $380 million NIH Clinical Center Complex in Bethesda, Maryland. Portfolio submissions are due August 14. Contact the U.S. General Services Administration, (202) 708-4900.

Media blitz

Architects are more aggressively promoting their skills through the media. AIA Miami is sponsoring "You and Your Architect," a cable TV series that airs in Dade County through the summer. In Chicago, AIA members orchestrated six two-hour seminars for the public this spring titled "Working With an Architect." On the national level, the AIA has joined private and public organizations to form the National Partners for Homeownership, launched after President Clinton announced plans to increase the level of homeownership to 8 million by the year 2001.

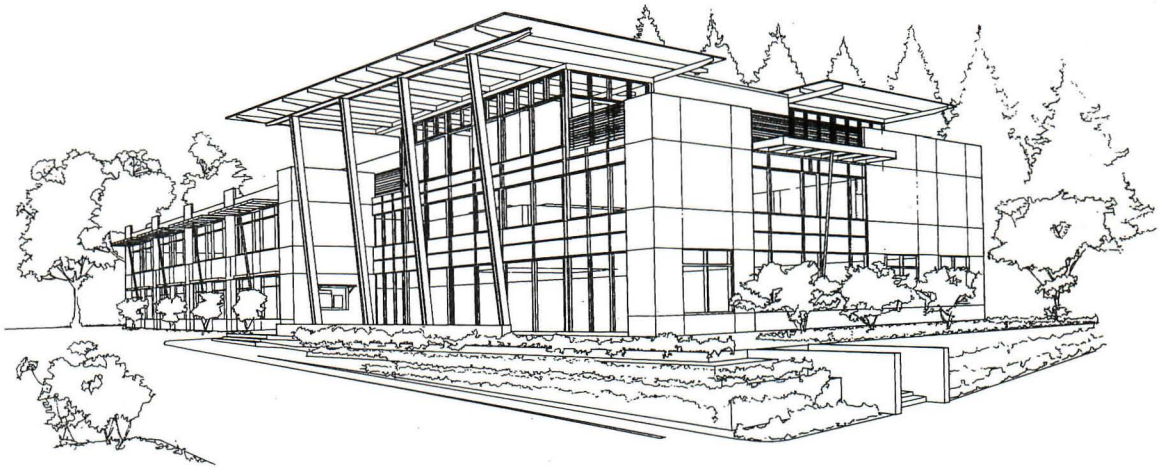
New appointments

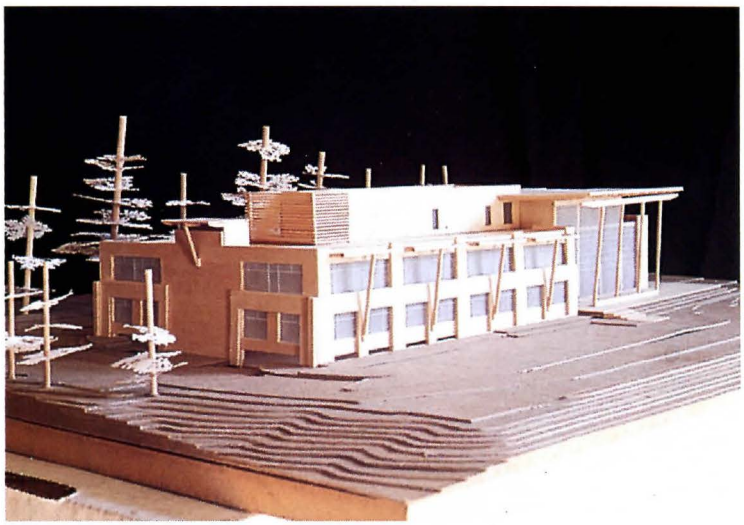
Prairie Architects' **Jonathan Lipman** is the new president of the Frank Lloyd Wright Building Conservancy. Architect **Patricia O'Leary** is the new dean of the College of Architecture and Planning at the University of Colorado at Denver. Planner **Eric Damian Kelly** has been named dean of Ball State University's College of Architecture and Planning.

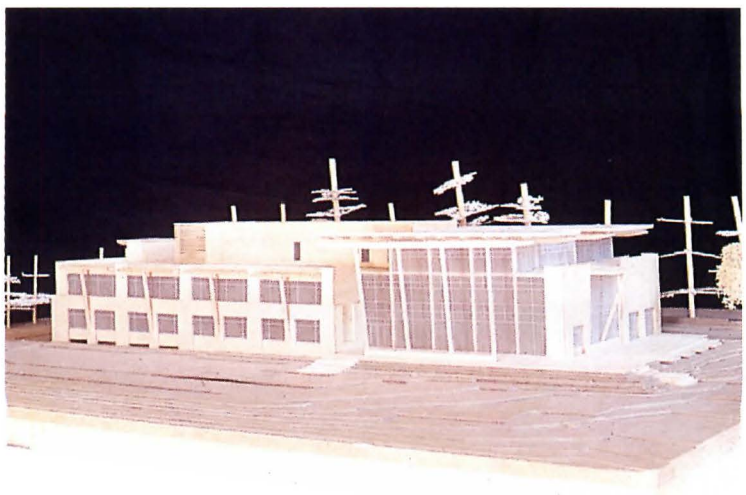
Carolyn Iu, AIA, & Neville Lewis, FIIDA, ASID, of Iu and Lewis Design LLC. *Innovators.* ***Interior Design*** *Magazine Hall of Fame members. And specifiers of DuPont Antron carpet fiber.*

On the Boards

Energy-efficient and daylighting strategies green a Seattle bank.







Northwest Federal Credit Union
Seattle, Washington
Miller/Hull Partnership

The $4.5 million Northwest Federal Credit Union, scheduled for completion next spring, exemplifies the draw of environmental design in market-driven commercial buildings. Miller/Hull combined site and daylighting strategies to reduce energy loads 30 percent below state code requirements, while maintaining moderate construction costs.

The east and west facades of the 40,000-square-foot building will incorporate large windows and steel sunscreens to maximize daylighting without extensive heat gain. The structure is shallow in the north-south direction to encourage natural ventilation where strict temperature control is unnecessary—approximately 15 percent of the floor area. In these sections, windows will supply adequate cross-ventilation. An energy-efficient mechanical system implements a "flush" cycle during the evening to cool the building and expel airborne contaminants.

The structural frame will be fabricated from 100 percent recycled steel and clad in cast-in-place concrete panels containing fly ash admixtures and high-performance, heat-mirrored glazing.

Interior finishes, including recycled-content gypsum board and ceiling tiles, are consistent with the firm's sustainable strategy.—*A.C.S.*

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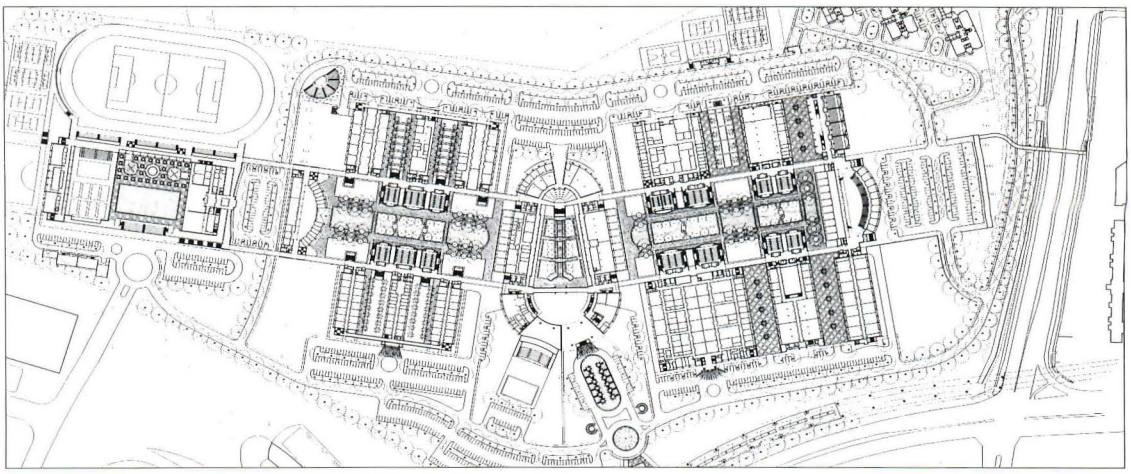
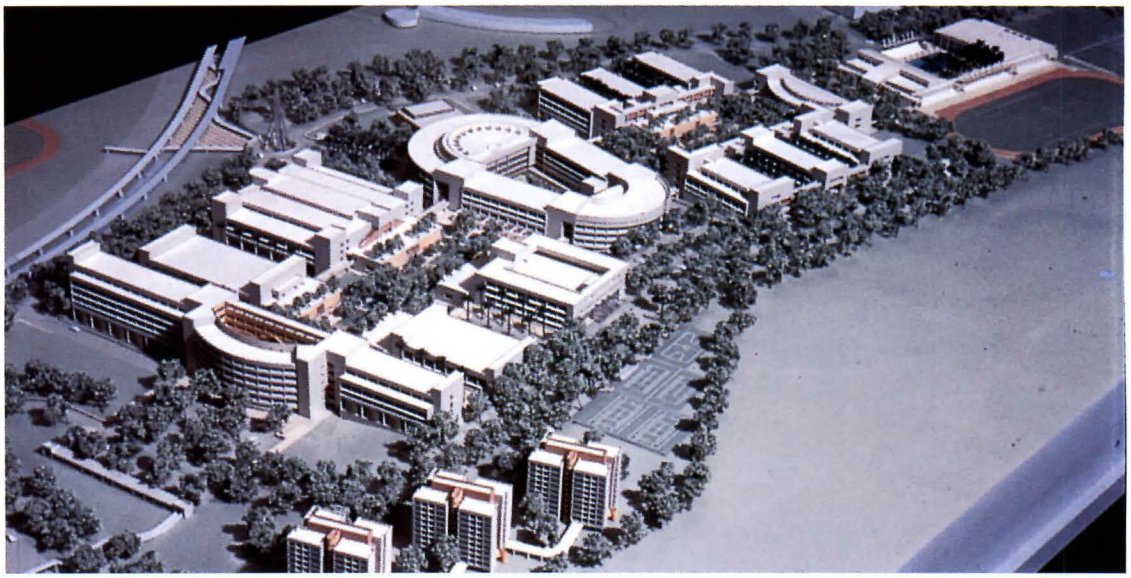


A new university campus is organized along a spine of courtyard gardens.



Nanyang Polytechnic
Singapore
Gwathmey Siegel & Associates, Architect

Over the past four years, Singapore's Ministry of Education has held design competitions to select architects for state-sponsored polytechnics. In 1991, the government selected London-based James Stirling Michael Wilford and Associates to design a campus plan for a new university, Tamasik Polytechnic; the project is currently under construction and is scheduled for completion next year.

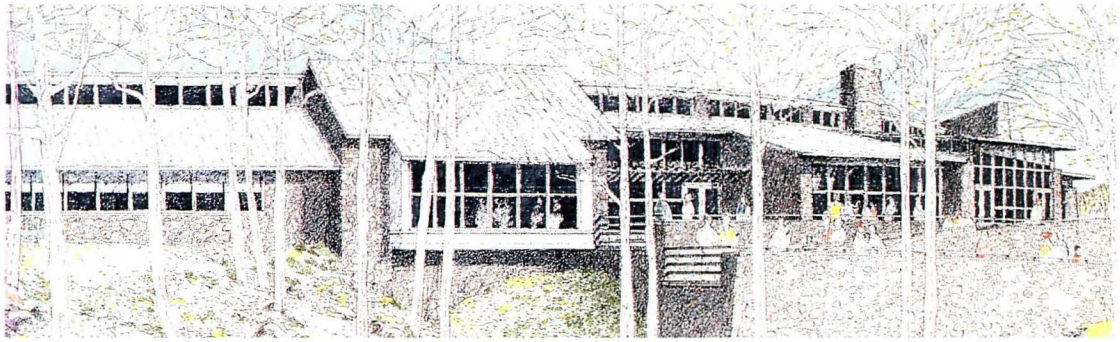
A second competition was held in 1993 to replace the existing facilities of Nanyang Polytechnic, which were scattered throughout Singapore, with a new 75-acre campus located in the central part of the island. New York City architect Gwathmey Siegel & Associates' entry was selected over eight other firms worldwide, including Cesar Pelli & Associates; Mitchell/Giurgola Architects; and Maki and Associates.

Gwathmey Siegel's campus plan comprises 2.3 million square feet of classroom, lab, and office space for Nanyang's four schools—engineering, business management, information technology, and health science—as well as administrative offices, a cultural center with an experimental theater, faculty housing, sports facilities, and a 1,200-seat auditorium.

The campus takes cues from Jefferson's plan for the University of Virginia in Charlottesville. It is arranged along a skewed north-south spine of open courtyard gardens, which will act as the primary circulation path for students. Like the Pantheon-inspired library of Jefferson's academical village, Nanyang's campus center—housing a library, cafeterias, administrative offices, and auditorium—forms the core of the campus. The four-story structure, covered by a 98-foot radial roof and organized around an open-air plaza, will connect the green pedestrian spine with the main automobile access beneath a port-cochere. Classroom blocks, ranging in height from three to seven stories, define the east and west edges of the spine. Colonnades opening onto the courtyards will extend along the campus buildings, to protect pedestrians from tropical rains. Double-height, tile-clad lecture halls extend from each classroom block into the courtyards.

The poured-in-place concrete classroom buildings will be finished in cement stucco, with ceramic tile applied to the curtain wall spandrel panels. On the north and south facades of the classroom buildings, precast concrete brise-soleils shade the interiors from the harsh equatorial sun directly overhead. The campus is slated to open for classes in September 1998.—*R.A.B.*

On the Boards



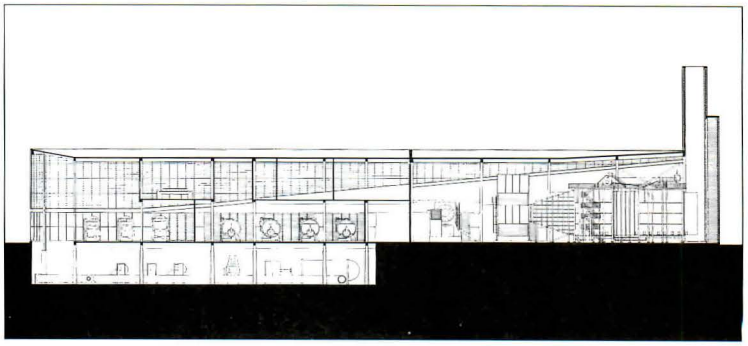
A new visitor's center saves a floodplain and uncovers an American Indian settlement.

Seneca Rocks Visitor's Center
Seneca Rocks, West Virginia
Susan Maxman & Associates

A visitor's center at Seneca Rocks, West Virginia, is the focal point of architect Susan Maxman's 45-acre master plan for a recreational area in the Monongahela National Forest. The new, energy-efficient building replaces a 1970s visitor's center recently destroyed by fire. Maxman's first step was to move the visitor's center away from its original site within a floodplain. When the new site was discovered to contain 7,000-year-old artifacts of an American Indian settlement, Maxman pushed her building to a northeast promontory of the plateau.

The 9,300-square-foot building, clad in local fieldstone and hardwood timber, curves along the plateau. Guided by the principle that visitors are more interested in nature than buildings, Maxman incorporated large, thermally glazed windows to address a spectacular view of rocky Roy Gap to the east. Reflective glass prevents solar gain on the west. Daylighting reduces the need for artificial lighting, and occupancy and daylighting sensors are in place throughout the facility. Insulated well beyond code requirements, the building also has operable windows. Because of the Stone Age artifacts exhibited, the center requires air-conditioning and is equipped with an energy-efficient HVAC system.

Maxman & Associates' master plan calls for restoration of the riparian corridor, moving parking lots out of the floodplain, and restoring native vegetation.—*H.L.*



Central Plant With Cogeneration
University of California
Davis Medical Center
Sacramento, California
Siegel Diamond Architects

A new central plant at the University of California's Davis Medical Center in Sacramento will meet all of the electrical demands of the campus. Designed by Los Angeles architect Siegel Diamond with Sacramento architect NCHD and Brown & Caldwell Engineers, the 58,000-square-foot power plant will occupy a prominent site on the southeast perimeter of the campus, flanked by the campus quad to the north, a federal office building to the south, and a public elementary school to the southwest.

The new plant will take advantage of cogeneration, the simultaneous generation of electricity and heat from the same fuel. By-products are captured and circulated to conserve energy and eliminate waste. At the UC Davis Medical Center, compressed natural gas fuels a generator that produces electricity. Incidental heat in the form of exhaust is contained and routed to a heat-recovery boiler, which releases high-pressure steam that is fed through turbine generators to produce additional electricity. This process also generates heat that is captured and converted to steam for campus heating.

The $6.7 million building will be constructed of concrete block, corrugated metal siding and roofing, and fiberglass panels to be compatible with its industrial function. A glazed lobby will incorporate structural steel bracing and a bent-plate metal stair. A hole in the concrete lobby floor will expose 3-foot-diameter pipes that transport hot and cold water to the campus, and a second-story mezzanine will overlook the massive mechanical equipment inside the wedge-shaped volume.

Outside, six metal-clad towers will supply water to cool mechanical equipment, as well as to power a fountain. The level of water circulating in the fountain will reflect the capacity at which the plant is operating. Construction is scheduled to begin in December.—*A.C.S.*

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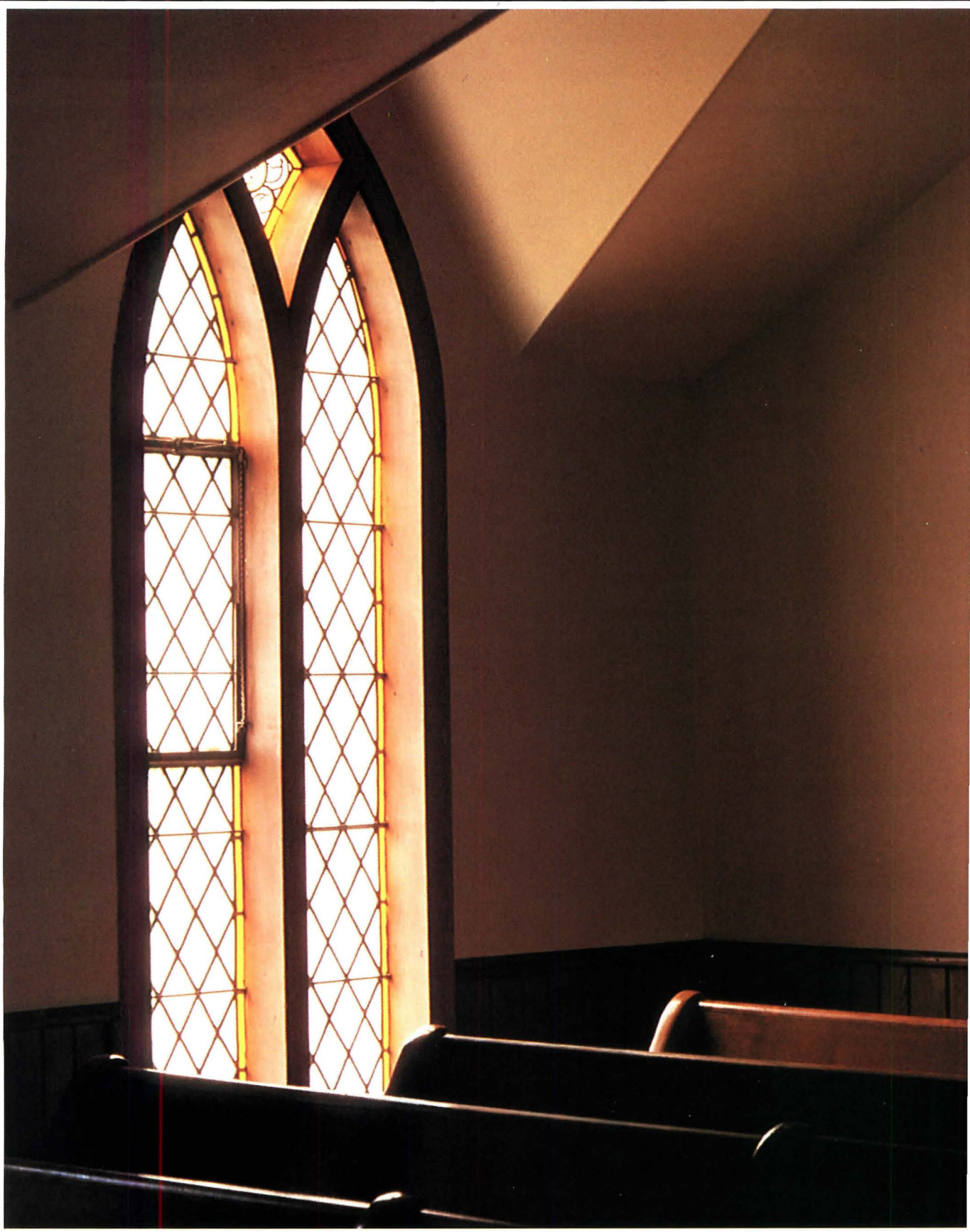

Protest

A downtown jail collides with the revitalization of a historic warehouse district.

H.L. STATA

JAIL II: Clad in precast concrete, Cleveland's new high-rise jail is an alien presence in the heart of downtown.

Fortresslike Jail Belies Cleveland's Comeback

Cleveland's robust revitalization includes the Rock 'n' Roll Hall of Fame and Museum, designed by I.M. Pei; Jacobs Field; and Gund Arena (ARCHITECTURE, April 1995, pages 58-69). But there is a flip side to this downtown development: The city-county Justice Center downtown has recently added a new jail that recalls Orwell's dystopian novel *1984*.

The fortresslike, 480-bed jail annex, called Jail II, is a meaner looking version of the original, 900-bed complex in the adjacent Justice Center, which also includes a 26-story courthouse and police headquarters. The 1976 Justice Center, by Richard L. Bowen Associates and Prindle, Patrick & Partners, with Pietro Belluschi, experienced massive overruns that influenced the look of Jail II profoundly. Architect Madison International and consultant Rosser International were strictly limited in Jail II's program and budget.

Jail II's designers tried to make their 12-story building harmonize with the Justice Center by matching its cornice height, echoing the band of windows on the fourth level, and revealing three-story columns on the building's base. But Jail II looks like a fatter, heavier version of the original building. It is sheathed in bright panels of precast concrete, rather than the ruddy-hued granite panels applied to the Justice Center.

The architects even had to fight for little things: setbacks for grass and trees along the sidewalks; corner notches in the lower stories to hide vents; and cell windows with bars concealed behind glass on the outside. One can celebrate these small victories while shuddering at the overall image.

More than anything, Jail II resembles a large-scale version of a minimalist sculpture, blown up to skyline scale. It is a bizarre, alien presence in the heart of downtown. It also clashes with the low-rise scale of the Victorian-era warehouse district next door, striving for rebirth as a residential neighborhood.

Despite its unsightliness, Jail II works well as a giant storage unit for inmates, who are now double-bunked in 72-square-foot cells designed for single occupancy. Tough-on-crime politicians take note: Versions of Jail II could be replicated elsewhere, affording other downtowns the semblance of an Orwellian nightmare come true.—*Steven Litt*

Steven Litt is the architecture critic of the Cleveland Plain Dealer.

Which building material would

Once upon a time there were three little pigs. (Great-grandchildren of th ones you used to know.) Each trotted off into the world to build his hom and fortune. The first two pigs thought only of themselves and little of our plane and chose to build with steel and concrete. They didn't care that it took nine time more energy to make a steel stud than a wood stud. Or that concrete productio leaves five times more solid waste than wood.

Meanwhile, the third and wisest pig chose to build with a renewabl building material—wood. Just knowing wood was replenished made him feel good

Protect Our Landscape

BRUCE BABBITT

Interior Secretary Bruce Babbitt urges architects to safeguard improved relations between buildings and nature.

For most of our history, we have taken the connection between landscape and architecture for granted. The contours of the land guided the patterns of settlement and design. Where there was a natural harbor, we built a wharf. Where there was a dense, virgin forest, we built log cabins. In the treeless desert, we built adobe houses close to the ground.

But with increased industrialization, we saw ourselves freed from the confines of place. The rise of a powerful, industrial, mobile economy brought us the flexibility to build where we wanted, with whatever materials we chose. For most of the 20th century, architecture focused on buildings rather than communities, and that contributed to the alienation that is all too prevalent in our society. We now have a sea of subdivisions, strip malls that run Main Street out of business, parking lots that lap at the walls of our schools and workplaces, and generic buildings that degrade our lives and our sense of place.

Recently, however, Americans have begun standing up for their heritage and for the identity that sets them apart from the rest of the world. In the past few decades, we have rediscovered the interdependence between architecture and the American landscape, the link that tells us not only where we are, but who we are. And we have begun to infuse that recognition into the design of new buildings and communities.

Where once we ran away from context, we now embrace it. Where once we would have taken a wrecking ball to an historic building, now we pause and ask: Can we restore it with new, stronger materials? Can we make it relevant, not as just a monument, but as a functioning part of the community?

I believe not only that we can, but that we must. For architects have rediscovered an important reality: The human spirit is greatly diminished when it is isolated from the sights and sounds of the natural world.

In his book *Biophilia*, Edward Wilson suggests that this affinity between people and natural landscapes is rooted in our evolutionary origins in the savannahs of Africa. Other writers like Ralph Waldo Emerson and Henry David Thoreau interpret nature as a reflection of the divine presence to which we aspire.

Whatever the ultimate source of our yearning toward nature, I share it and believe that when we alter our natural landscapes, we need not destroy them, but should try to integrate them with our designs. In fact, the fusion of the built environment and the natural landscape can enrich both the human spirit and the diversity of nature. We need only drive across the Golden Gate Bridge, step inside one of Frank Lloyd Wright's Prairie houses, or watch a hawk dive over New York's Central Park to understand this creative enhancement of the environment.

Today, with ever greater challenges of limited time, space, and budgets, we must find ways to work this concept into every building and community we design. We must create tools that encourage this connection. To that end, there are three specific areas in which my responsibilities as Secretary of the Interior and architects' responsibility toward community increasingly intersect.

The first is historic preservation, an extraordinary modern American innovation and success. The National Trust and the National Register of Historic Places represent an increasingly vital reflection of this new role of community. Historic preservation has moved from focusing on a single building to emphasizing a building's neighborhood and community to the integration of history, culture, and the natural environment.

From Charleston to San Francisco, New Orleans to Chicago, neighborhoods have devised laws to protect their local heritage. Philadelphia preserves its architectural mosaic that stretches from Independence Hall to the PSFS building. New Orleans' wrought iron balconies of the Vieux Carré still firmly anchor the city's character and identity.

Outside cities, the preservation movement is manifest on the cultural landscape.

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Opinion

Consider the Blackstone River Valley, a protected corridor where American craftsmen first built the machines that harnessed water to spin cotton at the beginning of the Industrial Revolution. Along the 50 miles that the Blackstone meanders through Massachusetts and Rhode Island, mill towns, canals, and the entire landscape testify to the radical changes in the way people lived and worked. People whose traditions helped to shape the landscape continue to leave their mark on it.

The second manifestation of an evolving sense of reconnection is the Clean Water Act, which has halted the dredging, filling, and destruction of our wetlands along sea coasts; in estuaries and marshes; and in lakes, streams, and adjacent watersheds, restoring fisheries from New York Harbor to the shores of the Pacific.

The Clean Water Act does not prevent development; to the contrary, it invites us to devise new ways to interconnect human habitats and the natural world. Last summer, I saw an impressive example of how natural wetlands can be integrated into development. The place is South Padre Island off the coast of Texas. On the mainland side of the bay you can see the effects of the old style of development, humanity at war with nature. Tidal wetlands are filled with rubble clear to the top of sea walls built in deep water. With the tidal flats destroyed, the flocks of terns, sandpipers, and willet disappeared. The white egrets and the blue herons that fish in the shallow tidal waters also moved out, leaving an impoverished place where concrete and seawater meet in silence.

By contrast, just across the bay, a visitor can see what architects and developers have created since the passage of wetlands laws. There are no sea walls. The waves still wash across tidal flats filled with shorebirds, egrets, and herons. And just beyond the tidal reaches there are houses, hotels, condominiums, restaurants, and a convention center, all carefully laid out to incorporate the tidal zones as part of the overall design.

Another important innovation that helps us to reconnect our built environment and the natural landscape is the Endangered Species Act. It has been the subject of much contention, but we are learning that this act is an opportunity, not an obstacle.

I think people and endangered species tend to congregate in the same places because those places are the most diverse, the most beautiful, the most productive environments, whether they are riparian corridors, wetlands,

SOUTH PADRE ISLAND: New buildings, such as convention center, incorporate tidal zone of Texas site.

ED LACASSE PHOTOS

CONVENTION CENTER: Design by Seattle architect Loschky Marquardt & Nesholm respects wetlands.

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the slopes of mountains, or tall-grass prairies. The Endangered Species Act, like the Clean Water Act, encourages flexibility for creative solutions to both habitat protection and development. The Habitat Plan encourages developers to resolve conflicts with endangered species by providing sufficient open space and natural lands to ensure biological vitality on the landscape.

Seen in this perspective, habitat conservation is just another form of open space planning, thoroughly in tune with the modern movement to put nature back into our neighborhoods and our daily lives. Habitat conservation plans are a way of selecting and blending the desirable and biologically important attributes of the landscape into the election and maintenance of open spaces.

In Texas, the Del Webb Corporation recently announced plans to build a retirement community in the oak-savannah hill country southwest of Austin. This region is also the home of two endangered beetles that live only in its subterranean limestone caves.

Not only did the architect protect the species, but also designed buildings around the habitat, even including a nature trail with more access to this special resource. Contrary to popular myth, developers assert that the presence of these species and their cave habitat actually increases the value of the property.

Even as these innovations are producing results, the laws are now being challenged. On May 16, the House approved sweeping changes to the Clean Water Act. And a bill now pending in the Senate can be summed up in seven words: The Endangered Species Act is hereby repealed. Proposed takings laws would weaken countless other laws that protect the American landscape and each American's unique sense of place.

That's why architecture is more than a technical job of providing consulting services to other people who can worry about the larger issues of community and the integration of history, culture, and landscape. Architects have been thrust into the leadership of their communities over this powerful movement to reconnect to our history, to our culture, to the landscape.

Architects can no longer think of their profession as being only about buildings or about a neighborhood. Because ultimately, architecture is about the way we live, the way we relate, and the way the built environment shapes human aspirations. Architects have the power to reconnect the American people with their landscape. That is no small challenge.—*Bruce Babbitt*

This article is adapted from a speech delivered by Secretary of the Interior Bruce Babbitt to the 1995 AIA convention in Atlanta.

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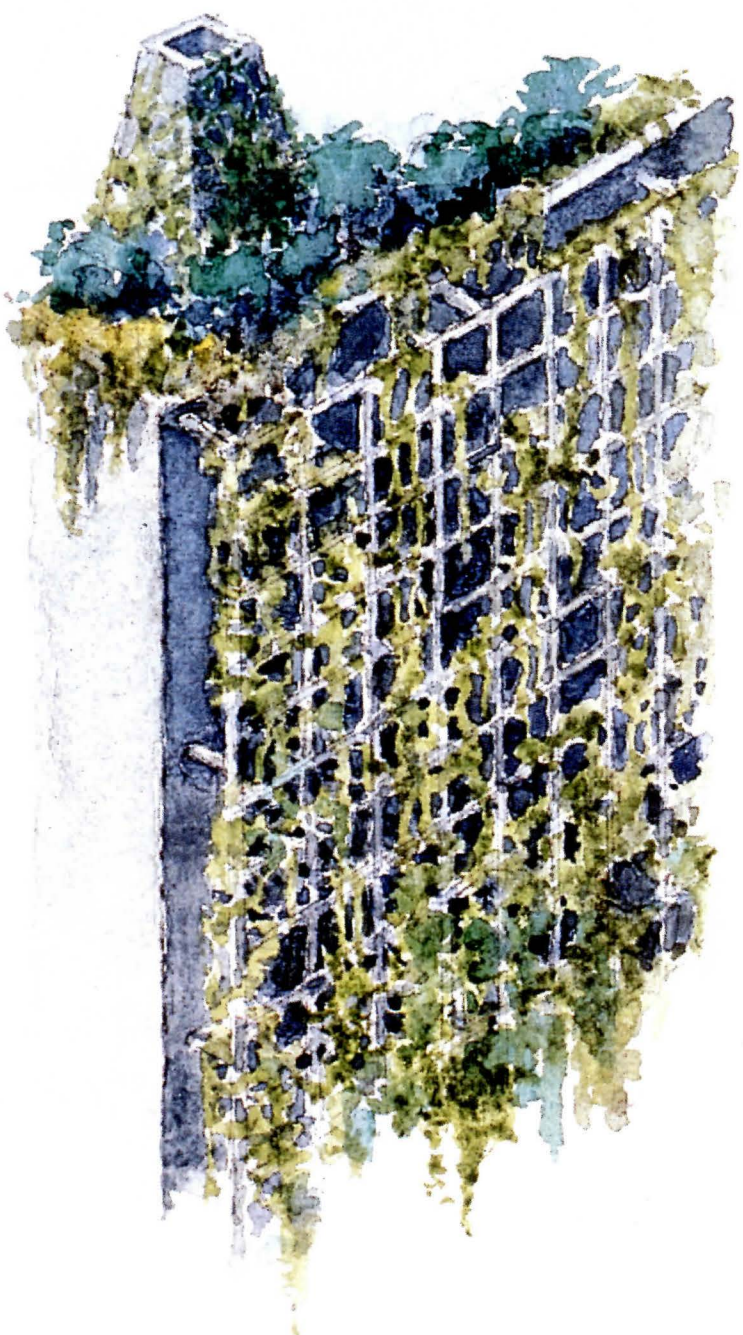
Sustainable Cities

Can architects extend ecological design beyond buildings to the urban scale?



Architects are blazing greener trails with ecological materials and more efficient systems for buildings such as those shown in this issue, yet natural ventilation, solar power, and rainwater harvesting are miniature gestures. Until sustainability becomes an integral part of urban and regional design, addressing such problems as transit, water quality, and more efficient infrastructure, these examples of eco-architecture will remain conscientious objectors in a determinedly wasteful world.

Sustainable development in the United States today is effectively blocked by the conflict between public and private interests. Controversy rages over the reach of such laws as the Clean Water Act, the Clean Air Act, the Endangered Species Act, rules governing solid and hazardous waste, and restrictions on grazing and logging rights. A conservative Congress is revising, and in some cases rescinding, statutes that were the seminal achievements of the environmental movement of the past 25 years. In May, for example, the House of Representatives voted to repeal the Clean Water Act's most stringent protections for the nation's waterways. The Senate has yet to act on the issue, but the House vote nonetheless reflects the electorate's mood.

Big, broad environmental laws are losing favor to the idea of localized controls, which, in some jurisdictions, translate into none at all. And in localities where regional leaders are taking sustainable design seriously, they are also learning they can take it only so far.

The City of Austin, Texas, for example, launched its Green Builder Program in 1990 to encourage sustainable design in newly built structures. Green Builder grew out of a successful energy-efficiency campaign the city started with local homebuilders in 1985. It has indeed made homebuilders and buyers more aware of sustainable design features in individual buildings. Yet in the larger picture, the city is still having trouble stopping urban encroachment on the fragile hill country to its west. To its credit, however, Austin has been more enterprising (*continued on page 65*)

Trawsfynydd Nuclear Electric Power Station
Trawsfynydd, Wales
SITE Environmental Design

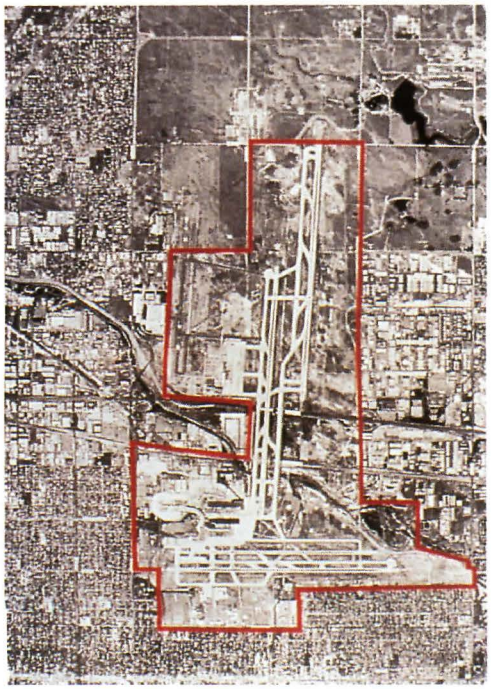
In October 1994, the British Broadcasting Corporation (BBC) invited the New York-based firm SITE to design a scheme for dismantling the Trawsfynydd (traws-VEN-ith) Nuclear Electric Power Station in Snowdonia, Wales. The effort was to be filmed for a documentary.

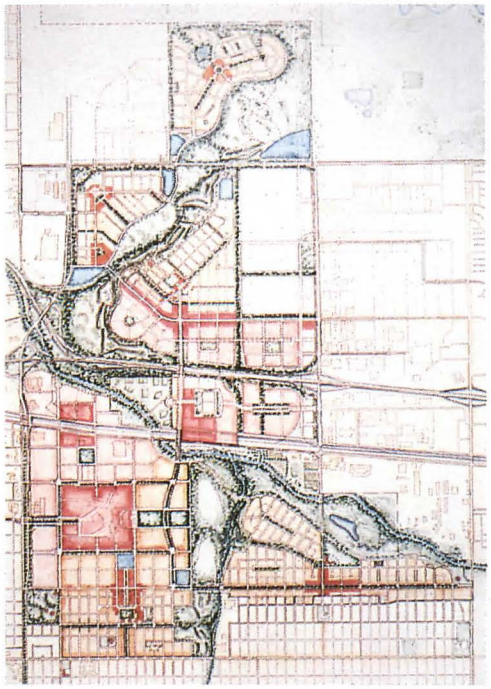
SITE's objective was to dismantle hazardous radioactive components quickly and put them into "green storage." The 39,000 plutonium reactor rods and other hazardous materials would be removed by remote-controlled robots. The existing 1959 reactor towers designed by architect Basil Spence would be draped in dense moss and ragweed (top left), allowing for "phyto-remediation"—the natural purging of toxins by plants.

SITE also called for building an international energy research and development center within an underground structure near the power plant. The terraced earth form of the research center (left) recalls the neolithic monuments and earthworks of Wales.

In researching the project, SITE called upon top nuclear physicists to suggest methods of nuclear waste disposal. "Welcome to the conundrum," said one. Since the world's first nuclear experiments were performed in the 1930s, SITE learned, even the world's nuclear experts have found no formula for disposing of the waste. Meanwhile, thanks to higher public awareness of nuclear danger, 450 nuclear power plants worldwide are expected to close over the next 30 years. These shutdowns will greatly increase the scope of an ecological problem that defies standard design solutions.

In most cities and towns, large-scale environmental retooling has been prompted by natural disasters or a major environmental crisis. . . . Embedded in our infrastructure lie grave environmental maladies.





Stapleton Redevelopment Plan
Denver, Colorado
Cooper, Robertson & Partners

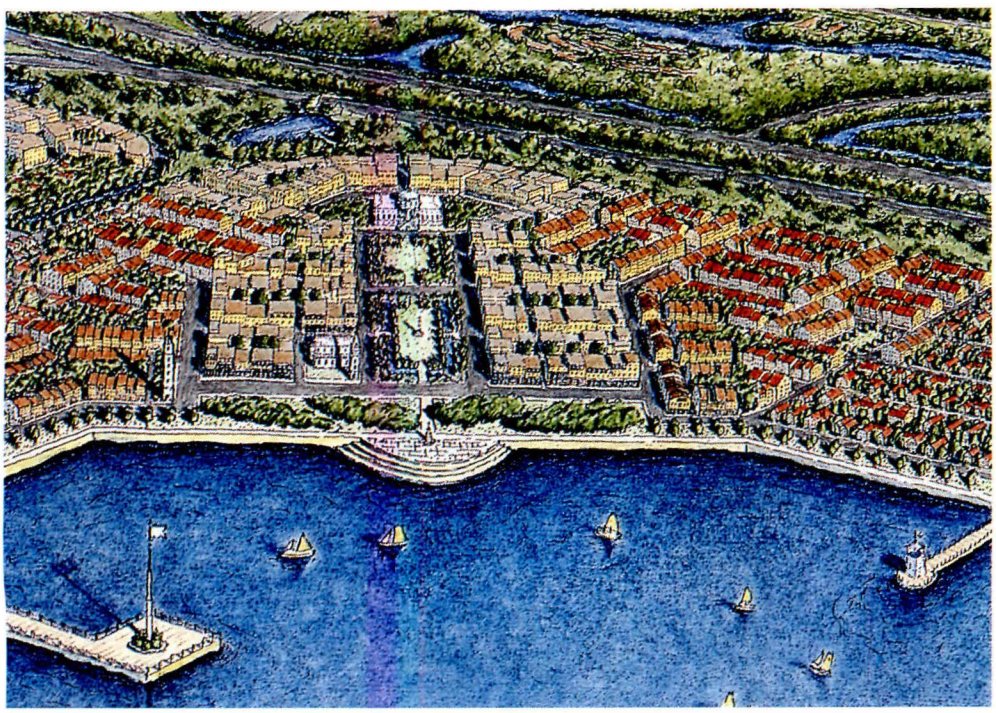
When the new Denver International Airport finally opened in March, Stapleton Airport closed, making it the country's largest abandoned civilian airport. The City of Denver annexed the 7.5-square-mile complex (top left) and hired Cooper, Robertson & Partners of New York to develop sustainable urban design guidelines for the site (bottom left), which encompasses 140 buildings and 3 million cubic feet of concrete.

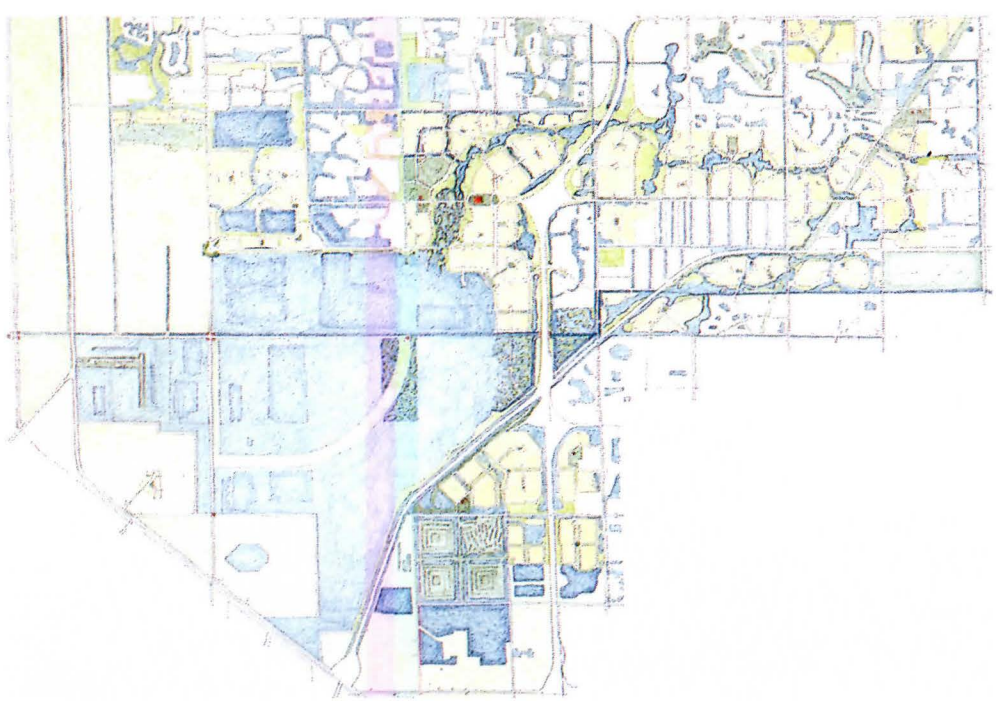
Cooper, Robertson's urban scheme (bottom right) calls for nearly 70 acres of medium- and high-density (15 units per acre), mixed-use development. Urban development will initially concentrate at the site's south end, continuing the grain of Denver's climate-responsive, north-south grid and linear parkways.

New neighborhoods will be built around drainage patterns reconstituted from the original condition of the site. The restored creek will double as storm drainage and an urban wildlife corridor.

The Stapleton plan, however, rests upon sustainability strategies that may prove imperfect, maintains Peter Katz, the San Francisco-based author of *The New Urbanism*, who was invited by city leaders to critique the Stapleton plan. Proposed walking distances from houses to stores or transit, notes Katz, are "worse than the suburban average."

Cooper, Robertson's team suggested crushing the airport's runways and recycling the concrete, but soon learned that such a strategy could wipe out the gravel industry in three states. The plan's environmental ambitions are unprecedented, but Stapleton may yet become a dueling ground of sustainability and market demands.





Western C-9 Basin Plan
Dade and Broward Counties, Florida
Duany Plater-Zyberk
Dover, Kohl & Partners

An impending regional water crisis in South Florida prompted a governor's commission, citizen environmental groups, and the regional water authority to stage a charette last February for a stretch of suburban frontier along the Everglades known as the C-9 Basin. Suburban and agricultural expansion is causing the Everglades to lose water and, as a result, plant and animal species.

The C-9 Basin plan emphasizes water conservation and public space in the new suburbs between Dade and Broward counties. Channels dredged for drainage would create a complex of public recreational waterways (top left) rather than utilitarian canals; vegetation in these waters would cleanse and restore oxygen to polluted urban storm water before it reaches the aquifer and the ocean. Leakage from the Everglades would be slowed by a system of terraces stepping eastward (site plan, left), replacing an ineffective system of levees. A new hydrodynamic system for the entire region would collect rainwater during wet seasons and allow it to be released to wells and fields during droughts.

In addition, the architects have proposed consolidating development rights in certain areas to condense future suburban growth. Infrastructure would be optimized by zoning workplaces into neighborhoods, which would also ease gridlock for commuters.

The basin plan for this South Florida suburb is but a concept at this point, however it shows how environmental emergencies can push government and whole communities into thinking about sustainable development.

Water forces a rethinking of suburban development in places where its absence or abundance has become a problem. A charette in South Florida produced a plan that allows waterways to shape settlement patterns.

than most municipalities in the move toward sustainable design. In most cities and towns, large-scale environmental retooling has been prompted by natural disasters or major environmental crises. Since the Mississippi and Missouri river floods of 1993, for example, residents of Valmeyer, Illinois, and Pattonsburg, Missouri, have decided to rebuild away from the floodplains on higher ground and to develop sustainable land use plans.

Environmental imperatives of both plans were complicated by tension between public and private goals. In Valmeyer, residents had purchased property before new town designs were begun, which made ecological master-planning more difficult, contends Kansas City architect Robert Berkebile, who led an intensive public design process in both towns. The design-assistance team "got to Valmeyer too late with too little," Berkebile maintains.

In Pattonsburg, by contrast, environmental and urban design experts were able to make their pitch before residents staked their claims. As a result, the town's design preserves local streams and ponds; orients blocks toward winter sunlight; and creates walkable, mixed-use neighborhoods. Before the floods, "we hadn't looked at sustainable planning issues in an integrated way for community-scale projects," Berkebile admits. "But we're beginning to do that and to see positive results." Still, in other river towns such as Grafton, Illinois, and Portage des Sioux, Missouri, people have vainly rebuilt houses along the banks, defying the rivers' power.

Farther west, landowners become far prickler when talk turns to condensing residential development or defining its urban quality. In Denver, for example, where the city's gigantic new airport opened in March, municipal leaders are planning the reuse of Stapleton Airport as a mix of residential and commercial development. The Stapleton project is expected to become a model of sustainable design (page 63), maintains Brian Shea, principal of Cooper, Robertson & Partners, which leads the master-planning team, and so "the strategies for implementing the plan must be all new." However, Shea adds, "it gets complicated when you're in a part of the country where regulation is not well accepted."

Among the most ambitious parts of the Stapleton scheme, which Denver's city council approved in March, is a strategy to bring back the delicate prairie destroyed when the airport was built in the 1930s. The ghost of the site's original topography provides the first clues for restoring former drainage patterns, according to Shea. "The secret to organizing the site," he explains, "is to know where the water's going—and where it went."

Increasingly, water forces a rethinking of suburban development in places where its absence or abundance has become a problem. One recent example is a three-day charette, held in February, to plan a new suburban community between Miami/Fort Lauderdale and the Everglades. The workshop, steered by planners from the South Florida Water Management District, with architects Duany Plater-Zyberk and Dover, Kohl & Partners of Miami, produced a conceptual plan (facing page) that condenses suburban sprawl and allows waterways to shape settlement patterns—rather than the other way around.

No developer has actually put money down on the plan, but local landowners came away from the charette with a new appreciation of how construction affects the ecosystem. "We tried to show [landowners] in the region what's good about compact development," remarks Daniel M. Cary, director of planning for the South Florida Water Management District.

Yet, embedded in our industrial infrastructure lie grave environmental maladies for which prescriptions seem politically inconvenient or practically impossible. Nuclear power, for example, presents intractable waste problems. Nuclear physicists themselves don't know what to do with plutonium leftovers, which have a radioactive half-life of at least 2,000 years.

The practical problems of curing our nuclear ills became apparent recently during production of a documentary by the British Broadcasting Corporation (BBC). For the documentary, the BBC asked several architects, among them the New York firm SITE, to design ways to dismantle the nuclear power plant in Trawsfynydd, Wales. The product of the BBC's program turned out to be window dressing rather than waste disposal (page 62). Yet SITE took the opportunity to pose pertinent new questions, even if they arrived at no real answers to the nuclear quandary.

Such exercises may seem futile in the face of overwhelming ecological odds, but even atop toxic infrastructure, sustainably designed buildings "serve as pedagogy," asserts Berkebile. Sustainable infrastructure and planning are far from standard practice, but they are slowly entering the mainstream, owing much to the advocacy of architects.

For example, following the "greening" of both the White House and Pentagon over the past two years, the AIA's Committee on The Environment is sponsoring 19 environmental design charettes to be held simultaneously this fall. The workshops will take on such urban design and infrastructure-related problems as reusing an abandoned power plant in Connecticut and conserving a major aquifer in Texas. Architects will join experts at each site to propose solutions that embrace economic opportunity, social equity, and environmental responsibility. This design charette approach was piloted at the AIA's "Sustainable Grand Canyon Workshop," which sought ways to ease the pressure of tourism on the national park.

Educating communities to the long-term benefits of sustainable planning could help save entire towns, just as historic preservation has accomplished over the past 30 years. Now that Americans are turned off by environmental regulation, architects must play an increasingly important role in preserving our land and water, before future emergencies require more drastic action.—*Bradford McKee*

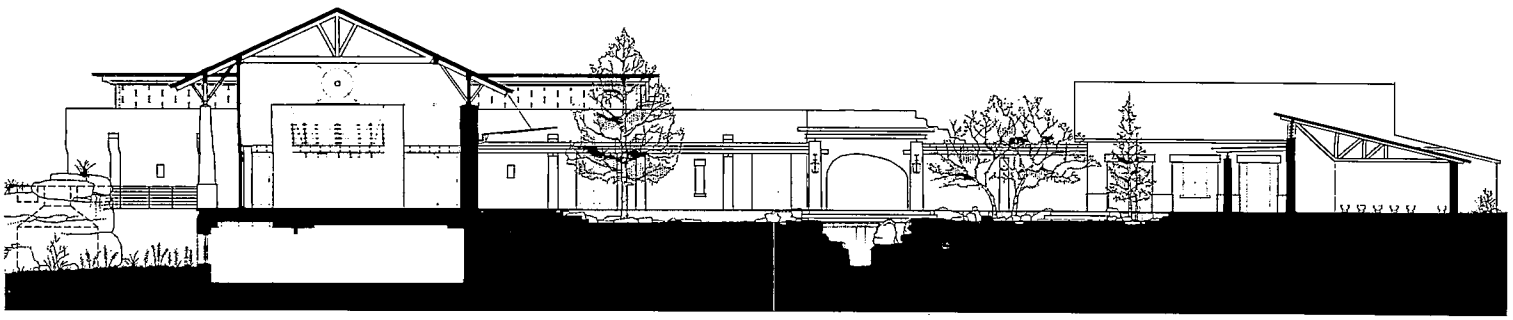
National Wildflower Research Center
Austin, Texas
Overland Partners, Architect

Lady Bird's Legacy

The new National Wildflower Research Center caps a 13-year crusade by Lady Bird Johnson on behalf of native plants. In addition, the project marks the emergence of a talented young architecture firm, Overland Partners of San Antonio. In giving form to the former First Lady's dream, the architects reinvigorated many tired Texas vernacular conventions.

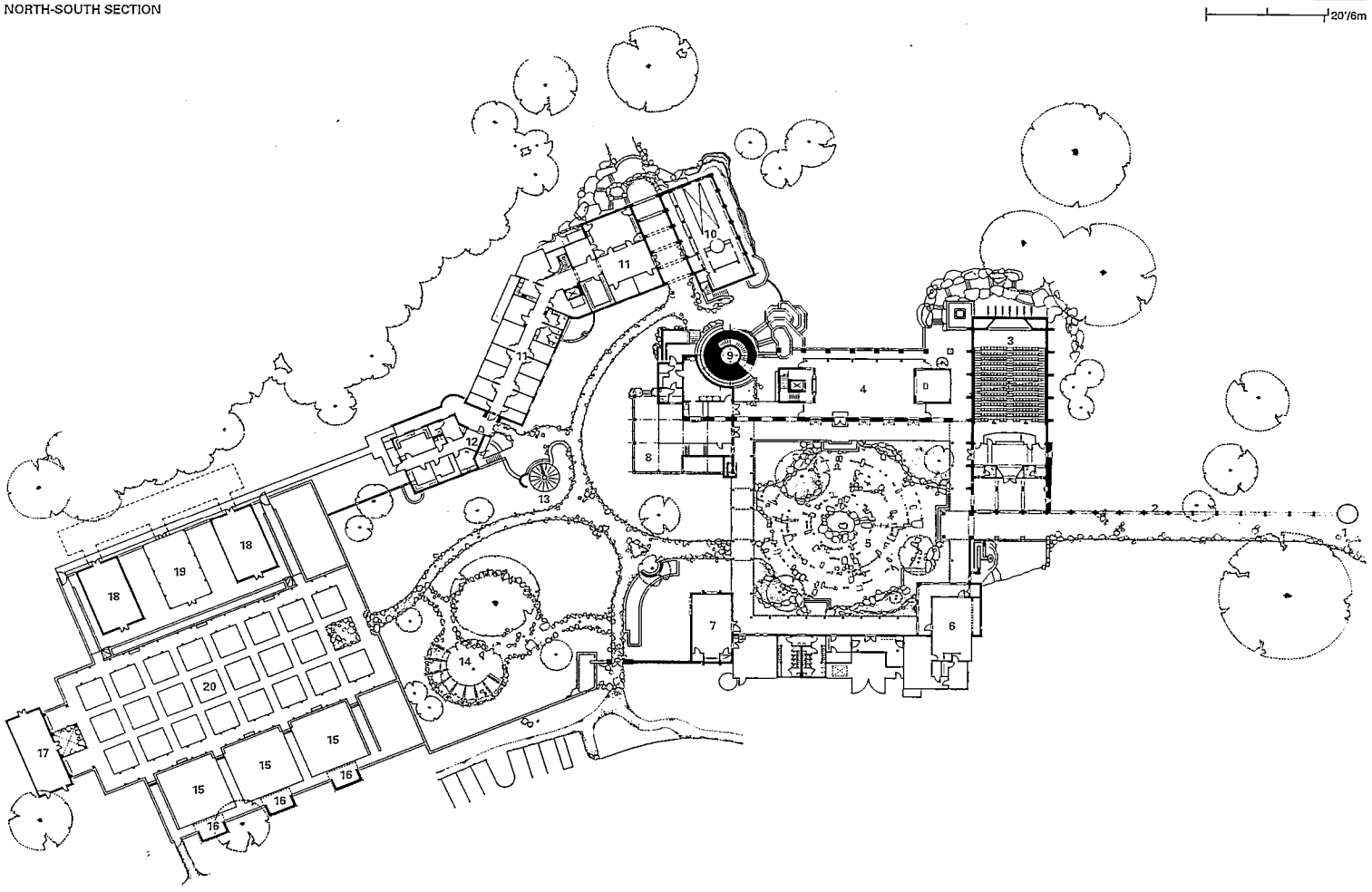
Located southwest of Austin on 42 acres of reclaimed ranch land, the $9 million center is dedicated, in the words of its mission statement, to "total resource conservation" and "the primacy of native landscape and its intrinsic beauty." The National Wildflower Research Center teaches by example rather than precept, showing visitors that the solutions to many of today's seemingly complex environmental problems lie literally in their backyards.

THESE PAGES: Auditorium, gallery, library, and office wing (left to right) of the $9 million National Wildflower Research Center appear to grow out of reclaimed ranch land on 42-acre parcel southwest of Austin.



NORTH-SOUTH SECTION

20'/6m



FIRST FLOOR PLAN

40'/12m

1 CISTERN
2 AQUEDUCT
3 AUDITORIUM
4 GALLERY
5 MAIN PLAZA
6 GIFT SHOP
7 CHILDREN'S DISCOVERY ROOM
8 KITCHEN
9 OBSERVATION TOWER
10 LIBRARY/BOARDROOM
11 ADMINISTRATION
12 RESEARCH LABORATORIES
13 SEED SILO
14 PERGOLA
15 COMPARATIVE GARDEN
16 PAVILION
17 DISPLAY GREENHOUSE
18 RESEARCH GREENHOUSE
19 SHADE HOUSE
20 DEMONSTRATION GARDEN

FACING PAGE, TOP: Galvanized-metal overhangs slope back to catch rainwater from roof.
FACING PAGE, BOTTOM: Main courtyard integrates shade, water, and native Texas trees and plants.
SECTION: Courtyard view of Wildflower Center shows gallery with a multipurpose room below, entry arch, and garden shelter (left to right).
PLAN: Auditorium, gallery, café, children's room, and gift shop are arranged around courtyard; angular volume to north contains staff offices. Demonstration gardens (left) form gridded counterpoint to informal landscape of native wildflowers and trees (center).

Mrs. Johnson originally conceived the center as a single large building surrounded by gardens and meadows; an object on, rather than in, the landscape. But Overland Partners persuaded her to consider a village of smaller structures that would be kinder to the land and provide greater flexibility for exhibits and educational programs. "We wanted the center to be more about plants than buildings," explains Partner Richard Archer. The trustees went along, sacrificing a certain amount of efficiency and convenience (no staff parking at the front door, for example) for subtlety and self-effacement.

From the parking lot, visitors see only a veil of trees and a stone path that winds past an arched wall reminiscent of the ruined cloister at Mission San Jose in San Antonio. Along the top of the wall runs a narrow aqueduct that drains water from nearby roofs. Because the Wildflower Center sits atop the endangered Edwards Aquifer, water conservation is critical. Through ingenious water-harvesting devices, each designed by the architect, the center will collect enough rainwater (up to 450,000 gallons annually) to make pumping the aquifer unnecessary. Its cisterns, aqueducts, and canals tie the buildings back to the land as well as to one another.

The entry path skirts a small aquatic garden filled with water lilies, oats, and other native plants and stops in a formal courtyard containing a fountain and several large oak trees. This combination of plaza, water, and shade is quintessentially South Texan. Yet the buildings that frame the central space—gallery, auditorium, children's discovery room, and observation tower—transcend regional clichés. Familiar limestone walls, metal roofs, and deep overhangs have been combined freshly and provocatively.

The gallery on the north side of the courtyard has the spare, airy quality of an old pole barn. Wood trusses and large north windows make it feel spacious and transparent. Every joint and peg and support is revealed to highlight the builder's art. Yet there are enough crisp, contemporary details—exposed air ducts set vertically, galvanized siding on the elevator shaft—to offset any suggestion of mindless rural nostalgia.

TOP LEFT: Shelters facing gardens provide shade.
LEFT: Sandstone arches along entrance path recall cloister of local mission.
FACING PAGE, TOP: Comparison gardens allow visitors to evaluate the merits of native and greenhouse plants. Trellis will be planted with native vines.
FACING PAGE, BOTTOM: The 23 demonstration gardens are used for display and for research on native plants.

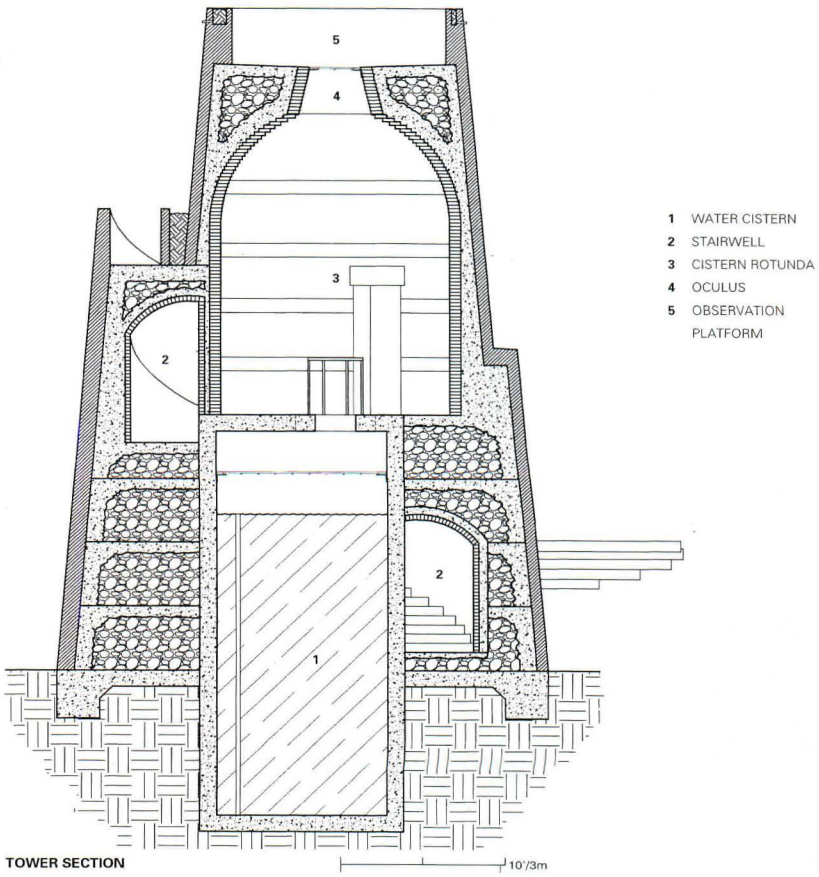
The lecture hall to the east, on the other hand, is dense and compressed—the Kimbell Art Museum's auditorium reconceived with sandstone buttresses and massive fir beams in the ceiling. It is as focused and introspective as the gallery is bright and expansive. And it is this continuous interplay between mass and lightness that gives the center its energy. Overland has not served up Southwestern scenography. Buildings are broken into parts —roof, floor, and walls—and examined critically for new insights into regional design.

The library and staff offices are canted 30 degrees to the central courtyard and display the rambling, run-on character of a small farm. The library is solidly Romanesque in front, glassy and open in back where it looks out on a restored wildflower meadow. The dogleg office wing is covered in corrugated metal, with a small seed silo in front as the icon of everything the Wildflower Center is about. The nearby stone observation tower, which holds 15,000 gallons of water, provides a vertical counterpoint in a horizontal composition as well as a dramatic demonstration of the mason's art.

"We wanted to see the buildings crafted, not just constructed," explains Archer. The Wildflower Center could serve as an exhibit of Texas crafts, especially the fluid and almost seamless stonework that was once commonplace in South Texas. Walls, arches, and buttresses exude depth and textural richness, the opposite of what Texas architect O'Neil Ford used to call "peanut-brittle rock work."

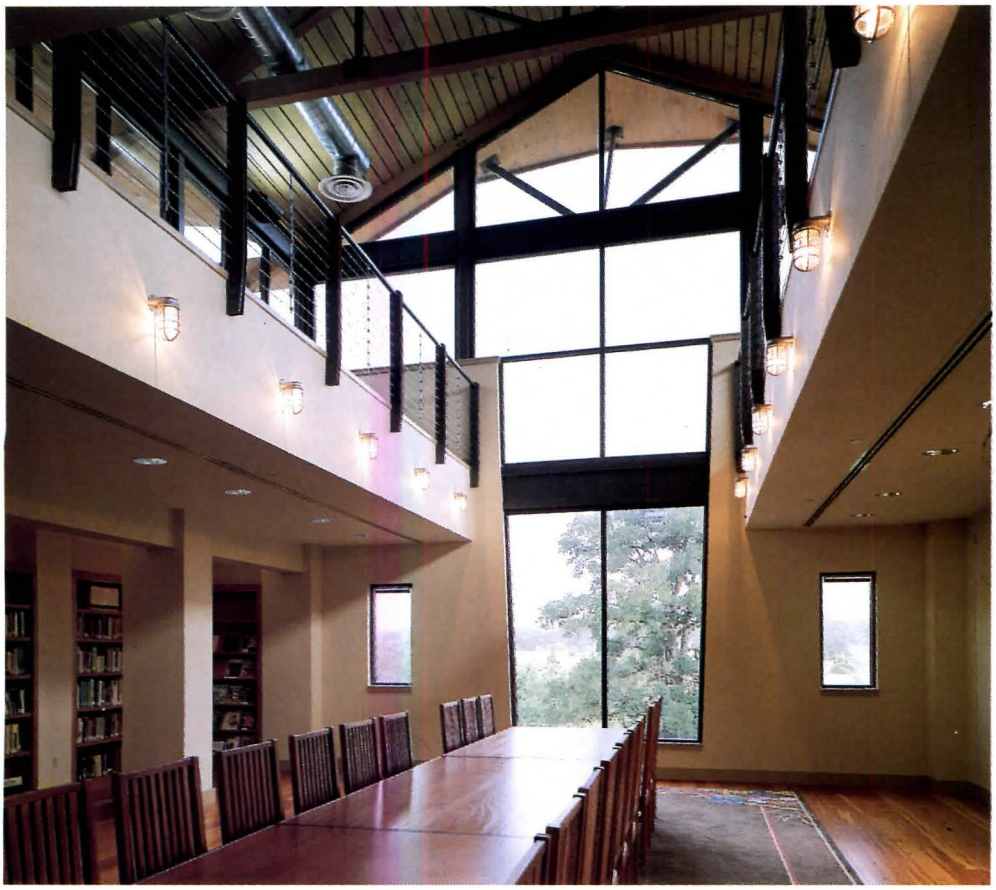
The Wildflower Center celebrates the ecological, economic, and esthetic value of native plants. "Its strength is not that it's pretty," maintains Partner Bob Shemwell, "but that it has powerful ideas behind it."

With strong guidance from landscape architects J. Robert Anderson, Eleanor McKinney, and Darrel Morrison, the center is laid out as a sequence of pedagogical spaces, starting with the formal courtyard containing a fountain and native trees, followed by a more picturesque garden of native trees and shrubs mixed with swaths of buffalo and Johnson grass. Beyond lie 23 demonstration plots—butterfly, hummingbird, Native American, and children's gardens—as well as three



TOWER SECTION

FACING PAGE, TOP: Stone cistern doubles as an observation tower offering dramatic views of the site.
FACING PAGE, BOTTOM: Elevated aqueduct connects cistern (left) to gallery (right).
TOP RIGHT: Oculus allows views into well. Bricks are corbeled inward to support load of tower.
SECTION: Cistern consists of concrete tank with brick cap and facing of local sandstone.



comparison gardens showing the difference between those planted with hothouse exotics and those filled with native species.

At the Wildflower Center, the process of building was as important as design. To protect the site during construction, all vegetation was tagged and priced. A mature live oak tree cost $25,000. A cedar elm went for $10,000. Turf grass brought $30-$40 a yard. Any contractor who got careless with a backhoe had to pay up. Not a single specimen was damaged, underscoring the spirit of stewardship that informs the entire project.

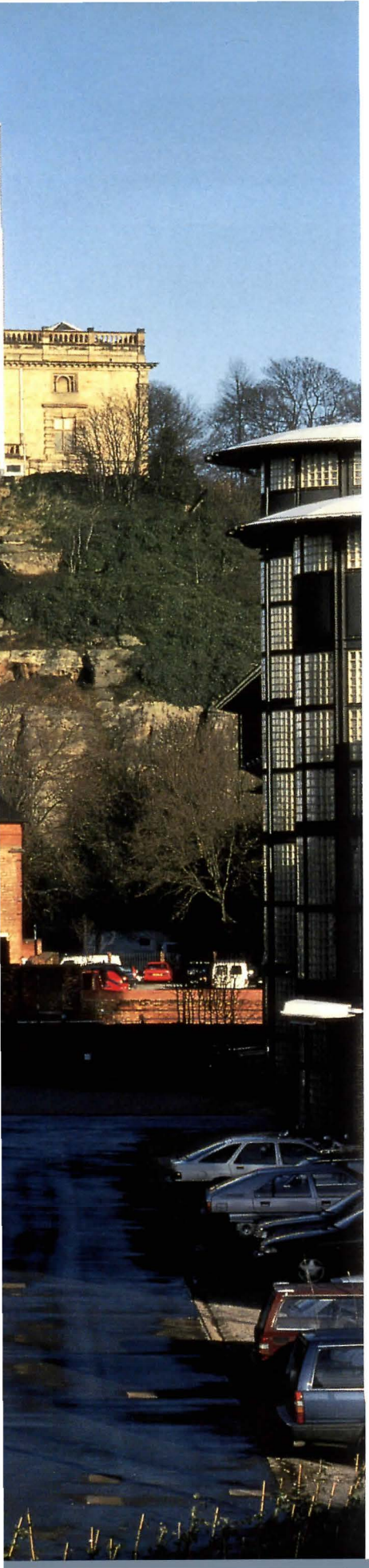
Occasionally, Overland tried too hard: too many forms in the courtyard, overworked details in the auditorium. This is a familiar problem for young architects, who, fearing that they might never get another big commission, decide to shoot the moon.

In every critical area, however, the National Wildflower Research Center shows exemplary sensitivity to what exists as well as to what could be. It celebrates the land and the value of rootedness; and it shows others how to build well and imaginatively on a fragile landscape. Even though the center may still be "more about plants than buildings," it is as compelling for architects as for botanists and horitculturists.—*David Dillon*

TOP LEFT: Research library is purposely on axis with native cedar elm; window mimics branching of tree.
LEFT: Arched windows in basement gallery offer eye-level views of landscape.
FACING PAGE, TOP: Airy gallery hosts traveling exhibits and small ecological demonstrations.
FACING PAGE, BOTTOM: Sandstone buttresses and laminated-fir beams define 232-seat auditorium.

NATIONAL WILDFLOWER RESEARCH CENTER
AUSTIN, TEXAS

ARCHITECT: Overland Partners, San Antonio—Richard Archer (principal-in-charge); Robert Shemwell, Timothy Blonkvist, Hobson Crow (design principals); Daniel Ochoa III (project manager); Yew Kee Cheong, Ory Eshel, Steve Fong, Stan George, Xavier Gonzalez, Robert Hanley, Andrew Matjasko, Jeff Russell, Sheila Sandin, Shawn Sasse, Robert Schmidt, Madison Smith, Bob Wise (project team); Patsy Steves, Stephanie Murray, Kay Glass (interiors)
LANDSCAPE ARCHITECTS: J. Robert Anderson, Eleanor McKinney
ENGINEERS: Danysh Lundy & Associates (structural); Barron Engineering Inc. (mechanical/electrical); Bury & Pittman (civil)
CONSULTANTS: Darrel Morrison (environmental); Archillume Lighting Design (lighting)
GENERAL CONTRACTOR: Bartlett Cocke/Austin Commercial
COST: $9 million
PHOTOGRAPHER: Timothy Hursley



Inland Revenue Center
Nottingham, England
Michael Hopkins & Partners, Architect

High Dividends

For two decades, British architects and engineers have been exploring energy-efficient offices. Seminal prototypes were designed, although never built, by the Property Services Association, a former government department, now privatized, which was responsible for constructing and maintaining government buildings. They consisted of low-rise blocks of naturally lit and ventilated offices arranged around courtyards; excess heat was absorbed by a heavy concrete structure. Michael Hopkins' Nottingham Inland Revenue headquarters pushes this approach to new levels of efficiency. It is the first scheme awarded maximum possible points by the Building Research Establishment's Environmental Assessment Method (BREEAM), which encourages energy-efficient, nonpolluting buildings (ARCHITECTURE, August 1990, page 17).

But the offices for the Inland Revenue Center, the British equivalent of our Internal Revenue Service, are significant for other reasons. Traditional low-maintenance materials that improve with weathering, such as brick and lead, were factory-prefabricated into larger units for rapid assembly on site. And in extending the old city center, the new building promotes a site-sensitive urbanity that is uncharacteristic of most office complexes.

Overlooked by Nottingham Castle, the site is sandwiched between a canal and railway. Construction was under way on an earlier design/build scheme before public outcry halted it as unworthy of its historically sensitive location. An invited competition was staged, stressing views of the castle, "green" solutions, and quick construction to honor previous commitments in relocating staff.

Only Hopkins' entry divided the 400,000 square feet of offices into smaller blocks, separated by roads lined with trees and parking. The radially aligned streets offer views of the castle. Three-story blocks along the railway lines and four-story canalside blocks retain distant views of the castle.

Office blocks are quadrangular and L-shaped, each folded out of a section that, except for differing in height, is otherwise constant. Rounded ends allow the L-shaped blocks to comfortably confront the angles of the boundary, and cylindrical towers punctuate street corners to resolve the nonorthogonal geometry.

FACING PAGE: Quadrangular office block is naturally ventilated through glass block-enclosed corner stair towers. Masts and struts of pavilion's tent roof are visible behind east facade. Nottingham Castle overlooks site.

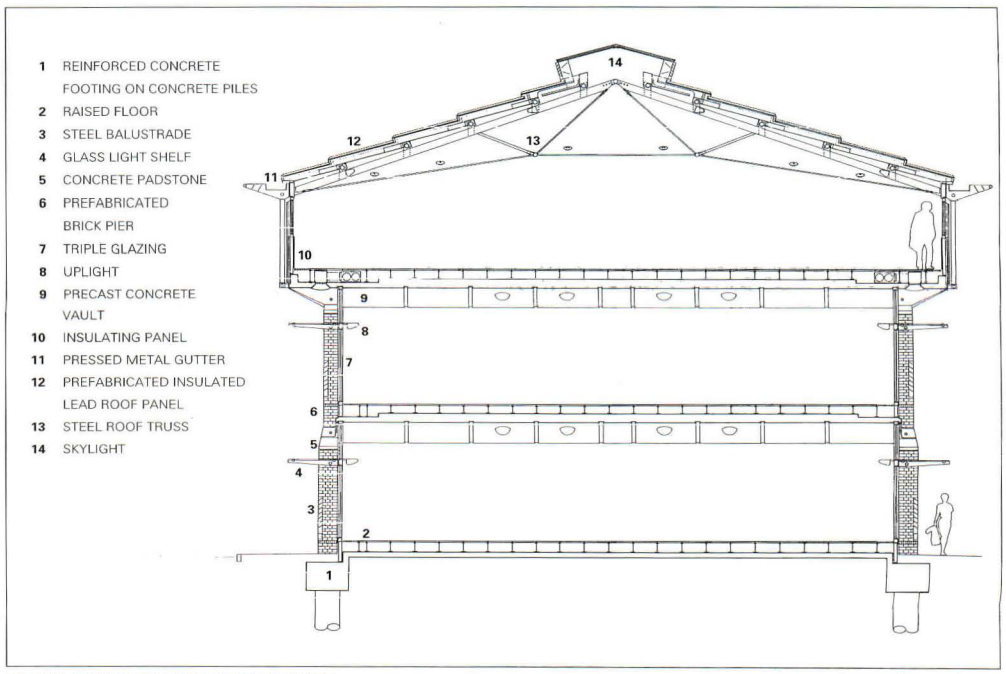
Alongside the canal, a pavilion containing a multipurpose sports hall, cafeteria, and child-care center is covered with a tensile fabric roof. Since the pavilion is used primarily at lunchtime and in the evening, it is not designed to be as energy efficient as the rest of the complex, yet operable windows permit natural ventilation.

Except for the cast-in-place concrete service cores, the structure of the offices was assembled from large factory-made units. One-story-high brick piers, which diminish in dimension with decreasing load, are topped by concrete capitals with precast concrete vaults that span as folded plates across a column-free interior. The overhanging top floor and roof are supported by a steel structure, and both are clad in lead-finished panels. All these precisely made components are left exposed with minimal on-site finishing.

The exposed brick and concrete components absorb excess heat, allowing natural ventilation without other forms of cooling. Though windows can be opened, ventilation is assisted by under-floor fans drawing outside air via slots below the windows. In winter, fan coil units heated by hot water from a refuse-burning dedicated heating system warm air coming into the building. In summer, the building's energy management system switches on all fans so that cool night air purges heat from the structure.

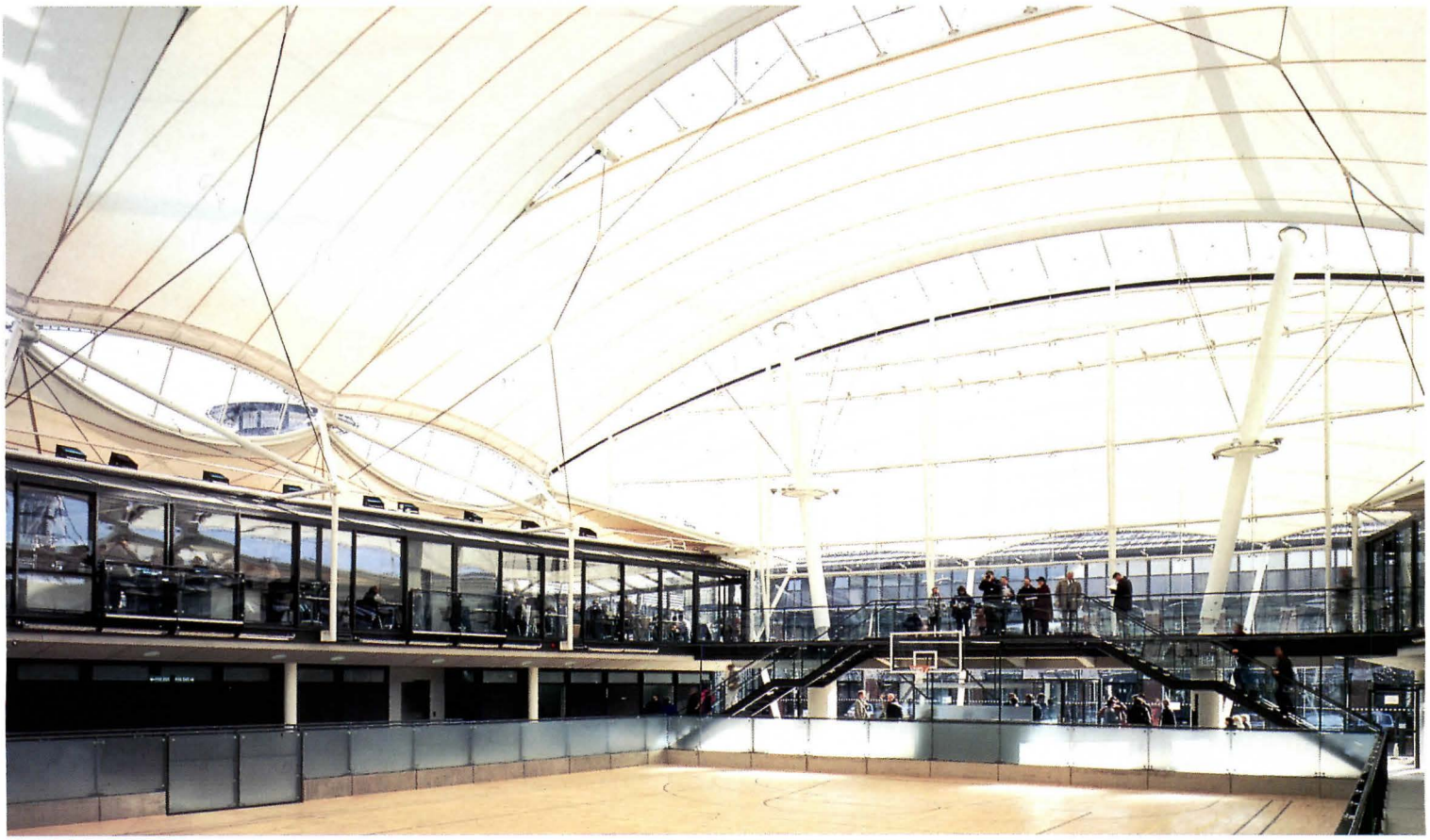
Although the air underneath the ceiling might be warmer, the perceived temperature for occupants has been calculated to not exceed 27 degrees centigrade, or 80.6 degrees Fahrenheit, for more than 22 hours a year. This is the new standard for buildings in Britain, as long as there are breezes from open windows. It is higher than the 21 degrees centigrade set for air-conditioned buildings and is based on new studies showing that people who have access to breezes and can control their own conditions readily accept temperatures heretofore unthinkable.

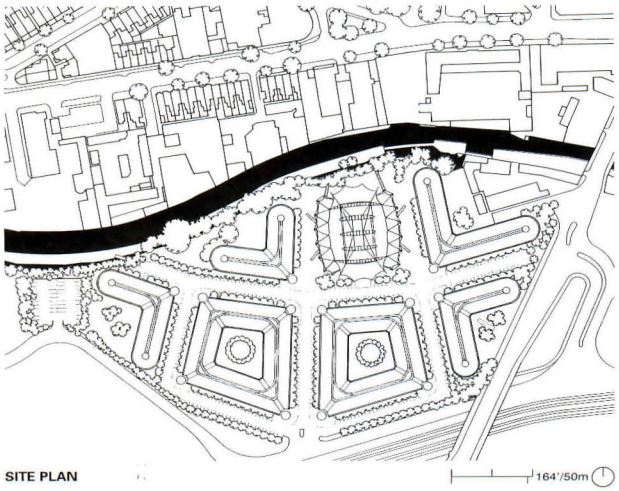
The warm air is drawn along the ceiling and down corridors and is extracted by chimney effect in the stair towers, whose glass block walls are warmed by the sun. The energy management system controls the rate of this flow by raising and lowering the caplike



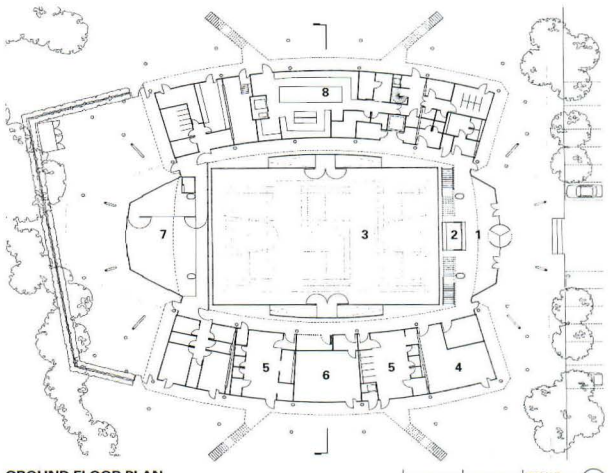
TYPICAL SECTION THROUGH OFFICE BUILDING

FACING PAGE, TOP: Vehicular access to the site is from the south through a road aligned with the castle.
FACING PAGE, BOTTOM: Southern elevation shows corner stair towers, brick piers, and concrete vaults. Lanternlike exhaust stacks cap helical stairs.
TOP RIGHT: Brick piers narrow with diminishing load.
SECTION: Offices are identical in section. Top story is illuminated by a central skylight.



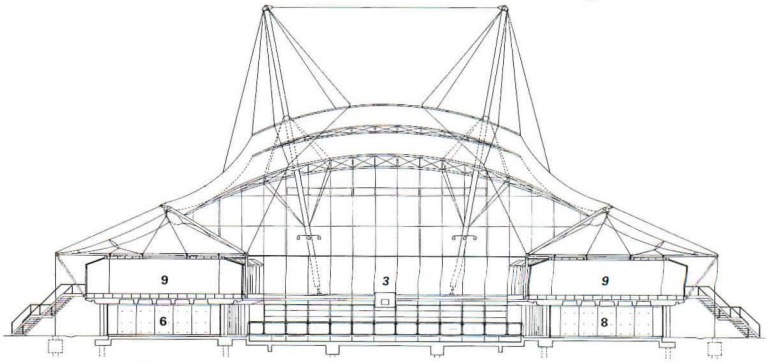


SITE PLAN



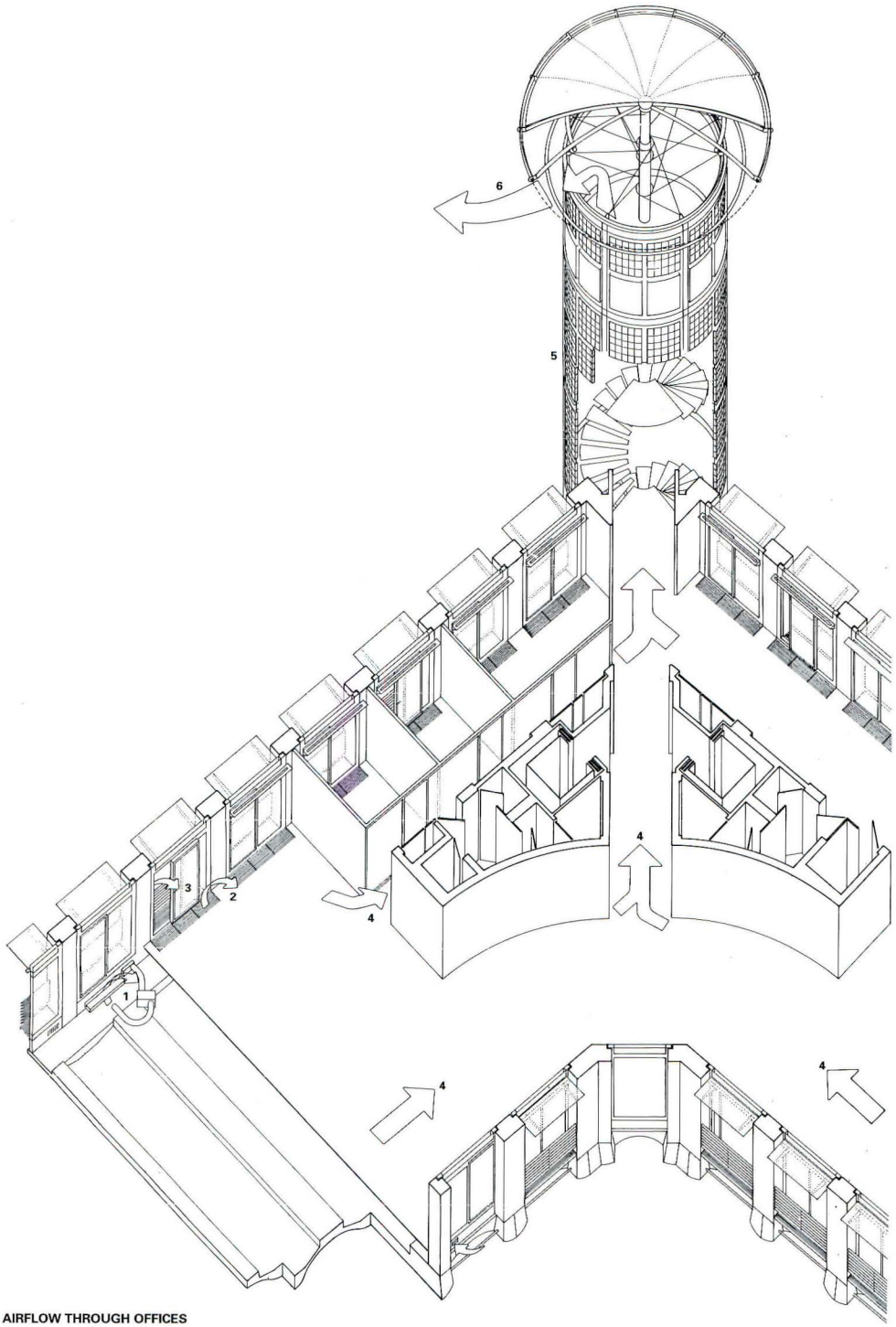
GROUND FLOOR PLAN

1 ENTRANCE
2 SECURITY/ RECEPTION
3 MULTIPURPOSE SPORTS HALL
4 MULTIGYM
5 LOCKER ROOM
6 MECHANICAL
7 CHILD-CARE CENTER
8 KITCHEN
9 CAFETERIA



EAST-WEST SECTION

FACING PAGE, TOP: Canalside tensile-roofed building contains gym, child-care center, and cafeteria.
FACING PAGE, BOTTOM: Overhanging roof and glass front welcome visitors into commons building.
ABOVE: Gymnasium is shaded by Teflon-coated fabric roof. Operable windows at north and south ends of building allow natural ventilation.
SITE PLAN: Quadrangular and L-shaped buildings surround courtyards to facilitate natural ventilation.
SECTION: Tensile-roofed gymnasium has skylights set into the roof for added daylight.
PLAN: Commons building comprises food facilities and lockers wrapped around multipurpose gym.



AIRFLOW THROUGH OFFICES

1 INDIVIDUAL FAN-ASSISTED AIR INTAKE UNDER FLOOR
2 AIR INTAKE THROUGH FLOOR GRILLES
3 AIR INTAKE THROUGH WINDOWS
4 EXHAUST AIR DRAWN TOWARD STAIR TOWER
5 STAIR TOWER ACTS AS SOLAR CHIMNEY
6 TOWER ROOF RISES TO ALLOW AIR EXHAUST

roofs of the towers by up to 3 feet, 6 inches.

For the best natural light, the office blocks measure only 45 feet, 4 inches wide. However, the top floor overhangs on both sides by 4 feet and is fully glazed between piers, floor, and vaulted ceiling. From the top of each pier, shelves of partially reflective glass project to reflect light onto the ceiling and deep into offices and to shade the glass below. Further shading is provided by the projecting piers and steel louvers that serve as balustrades when the big sliding windows open. Low sun and glare is screened by individually adjustable venetian blinds in the outer cavity of the triple glazing.

Because the window head is rounded, the venetian blinds above the light shelf are fixed at 45 degrees to the plane of the glass. This angle, the dark gray blinds and window frames, and the decision not to use white concrete for the vaults make the offices appear gloomy despite excellent light conditions.

On the outside, the lowered blinds impart an unfriendly demeanor augmented by the heavy-handed rhythm of the brick piers. Here, too, white concrete would have brightened the facades. Against them, the tented exuberance of the pavilion is welcome.

Nevertheless, any quibbles about Hopkins' design should not obscure its achievement: Ove Arup & Partners calculates that the energy consumption for lighting and heating is a third of what would be normal for a complex of this size.—*Peter Buchanan*

AXONOMETRIC: Air flows from windows and underfloor fans and is exhausted through stair towers.
FACING PAGE, TOP LEFT: Top floor air exhaust follows central skylight, ventilating through roof ridge.
FACING PAGE, TOP RIGHT: Downlights are recessed within curved concrete ceiling.
FACING PAGE, BOTTOM LEFT: Air from cellular offices escapes through doors to pass along undulated ceiling.
FACING PAGE, BOTTOM RIGHT: Glass block stair tower serves as solar chimney, exhausting air.

INLAND REVENUE CENTER
NOTTINGHAM, ENGLAND

ARCHITECT: Michael Hopkins & Partners, London—Michael Hopkins, Ian Sharratt, William Taylor, Peter Romaniuk, Pamela Bate, Peter Cartwright, Brendan Phelan, Stephen Macbean, Ernest Sim Fasanya, Jonathan Knight, Lydia Haack, Alan Jones (design team)
CLIENT REPRESENTATIVE: Turner & Townsend
ENGINEER: Ove Arup & Partners
CONSULTANTS: Arup Acoustics (acoustics); Turner & Townsend (cost estimator)
MANAGEMENT CONTRACTOR: Laing Management
COST: Withheld at owner's request
PHOTOGRAPHER: Martine Hamilton Knight/Arcaid

Heinz Family Office and Foundation
Pittsburgh, Pennsylvania
William McDonough + Partners, Architect

Office Ecology

As a philanthropic organization that places environmental stewardship high on its priority list, the Heinz Family Foundation was a perfect patron for architect William McDonough+Partners, one of this country's highest profile proponents of green architecture. The foundation is led by Teresa Heinz—who has guided many of the Heinz family's philanthropic ventures since the 1991 death of her husband, U.S. Senator John Heinz, in a helicopter crash. In January, Teresa Heinz announced the first winners of the annual Heinz Awards, $250,000 cash awards to five individuals who have made significant contributions in areas that include public policy, the environment, and the arts. The environmental winners were Paul and Anne Ehrlich, biologists at Stanford who have offered solutions to population growth and resource protection.

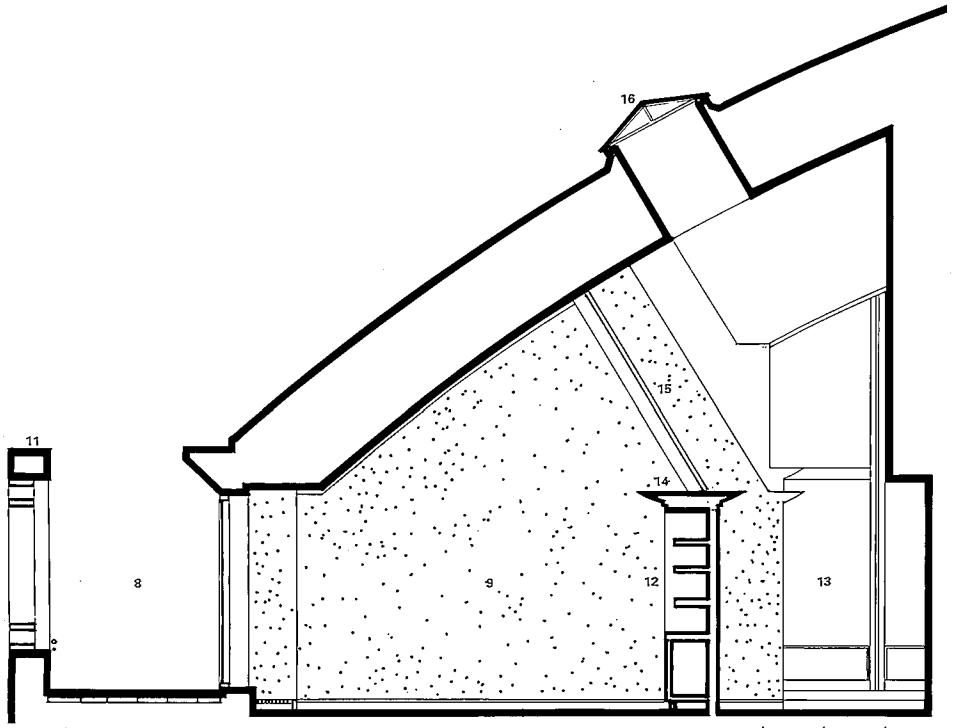
McDonough—who moved his practice from New York to Charlottesville, Virginia, after being appointed dean of the University of Virginia School of Architecture—transformed the bare penthouse in Pittsburgh's 32-story CNG Tower into an elegant loft filled with daylight and outside air. "People would rather work outside than inside," he points out, "and the psychology here is of being outside." The architect developed a scheme that treated the space as "a landscape, rather than an enclosure," including elements such as a plant-filled solarium and private offices with offset walls and large clerestories.

Following client Heinz's charge "to make a place where people can work and be healthy," each perimeter office has at least one outside window; the few core offices have eye-level windows that align with outside views. Eight large rooftop skylights pour in more light. To further conserve energy, low-voltage motion detectors turn off the lights in unoccupied offices.

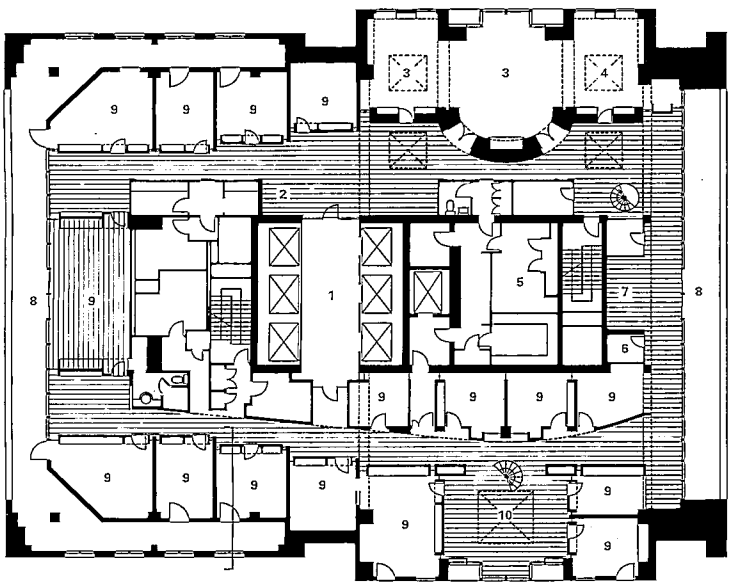
Each office has an individual thermostat, and a dedicated system delivers tempered outside air to each office through wall-mounted registers. Isolated from the HVAC equipment, this system feeds outside air at a rate of 30 cubic feet per minute (cfm) per person, exceeding the 15-to-20-cfm per person ASHRAE standard. Additionally, each office has an operable window, and many have operable hinged glass doors leading to terraces. Esthetically, however, the

THESE PAGES: View from reception area of Heinz Family Office and Foundation offers glimpses into boardroom, distinguished by limestone-clad rectangular volume and glass-topped, curved wall finished in frescoed plaster.


57



SECTION THROUGH OFFICE



FLOOR PLAN

1 LOBBY
2 RECEPTION
3 CONFERENCE ROOM
4 LIBRARY
5 MAIL ROOM
6 KITCHEN
7 STAFF LOUNGE
8 ROOF TERRACE
9 OFFICE
10 SOLARIUM
11 EXISTING PARAPET WALL
12 BOOKSHELF
13 WINDOW WALL
14 UPLIGHT
15 GLAZING W/ GLASS FIN
16 SKYLIGHT

HEINZ FAMILY OFFICE AND FOUNDATION
PITTSBURGH, PENNSYLVANIA

ARCHITECT: William McDonough + Partners, Charlottesville, Virginia—William A. McDonough (principal-in-charge); Carl Finer (project architect); Sang Lee, Andrew Kamins, John Amatruda, Gene Sparling, Karen Howard, Susan Stern, Herve Hamon (design team)
ENGINEERS: Brace Engineering (structural); Burt Hill Kosar Rittelmann Associates (mechanical/electrical)
CONSULTANTS: Hal Levin & Associates (air quality); Jerry Kugler Associates (lighting); Shen, Milsom, & Wilke (acoustics)
FURNITURE/MILLWORK: James Wood Works; Griffin Interiors; Wyatt Incorporated; Daniel Bothe Woodworkers
GENERAL CONTRACTOR: Mascaro Incorporated
COST: Withheld at owner's request
PHOTOGRAPHER: Durston Saylor

SECTION: Skylit perimeter office incorporates cove lighting on bookcase wall and access to terrace.
PLAN: McDonough offset walls of perimeter offices to break monotony of rigid corridors. East and west facades open to daylight and terrace.
FACING PAGE, TOP: Layout is likened to a village of small houses, with glazed reveals between each office. Clerestories admit light from overhead skylights; cove lights supplement natural illumination.
FACING PAGE, BOTTOM: Cabinetry and casework in offices are built of sustainably harvested hardwoods.

round registers and rectangular control panels of the supplemental air system are crude and intrusive, given McDonough's refined detailing and well-crafted furniture.

The material palette was set by nontoxic materials and sustainably harvested woods without limiting the high-end feel. Heavily trafficked floors are finished in vitex, a dense tropical hardwood. Furniture, casework, and doors are fabricated from narra (a New Guinea rosewood), kwila (a golden-brown wood from Southeast Asia), mersawa (a cream-colored New Guinea wood), and chontaquiro (a salmon-colored wood with a coarse grain).

McDonough selected local furnituremakers who are members of the Woodworkers Alliance for Rainforest Protection, a Burlington, Vermont-based nonprofit coalition of North American artisans and environmentalists that helps clients obtain sustainably harvested woods. This approach was no more costly than purchasing high-quality catalog furniture, McDonough maintains.

Carpets were researched for low emissivity and tacked down or laid with water-based adhesives. Paints were custom-mixed to eliminate fungicides and biocides (preservatives needed when paints are stored, not freshly applied). All-natural plasters with integral colors were applied to boardroom and executive office walls, then hand-polished with trowels to produce a leatherlike finish.

A tightly ordered arrangement of rooms gives an illusion of spaciousness. Visitors enter from the elevator lobby to a low-ceilinged reception area that opens to a massive curved wall—the central volume of the boardroom. The plaster wall stops just short of the ceiling, topped by a band of glass. McDonough+Partners repeated this visual device—making walls read as objects rather than planes—in each of the private offices.

While principles of sustainability were closely followed in the Heinz offices, McDonough admits that this is the deluxe environmental version. "Still, the issues addressed in the Heinz offices could be addressed at every budget," maintains the architect. Strategies such as making indoors resemble outdoors, connecting everyone to daylight, and delivering ample outside air to each employee are feasible within conventional budgets, he adds, if planned from the start. "The cost per person is roughly $1,000 to deliver fresh air at workers' breathing zone. When you look at the amortization over time—say 10 years—then that will cost you $100 per year. That is a very effective argument with corporate CEOs."—*Vernon Mays*

The Queen's Building
School of Engineering and Manufacture, De Montfort University
Leicester, England
Short Ford and Associates, Architect

Green Gothic

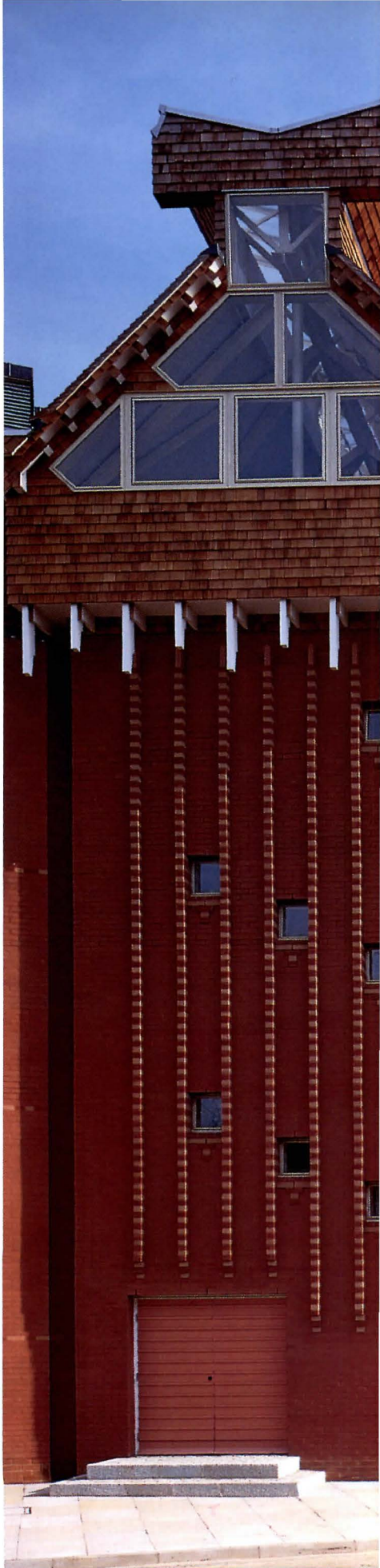
Because of their famously temperate climate, the British have been reluctant to invest in expensive mechanical systems to cool their buildings. Only 20 years ago, developers were still building office towers in which the only way to keep cool during the few really hot days of summer was to open the windows.

Now, just as the British are getting used to American-style, deep-planned, air-conditioned buildings with sealed external envelopes, the world pollution crisis has forced them to think again about the benefits of natural light and ventilation. But these days, even ordinary office buildings are full of heat-producing electronic equipment, so simply opening the windows is not enough. As a result, the science of passive environmental controls is now being studied enthusiastically by British architects, excited by its potential to generate new forms.

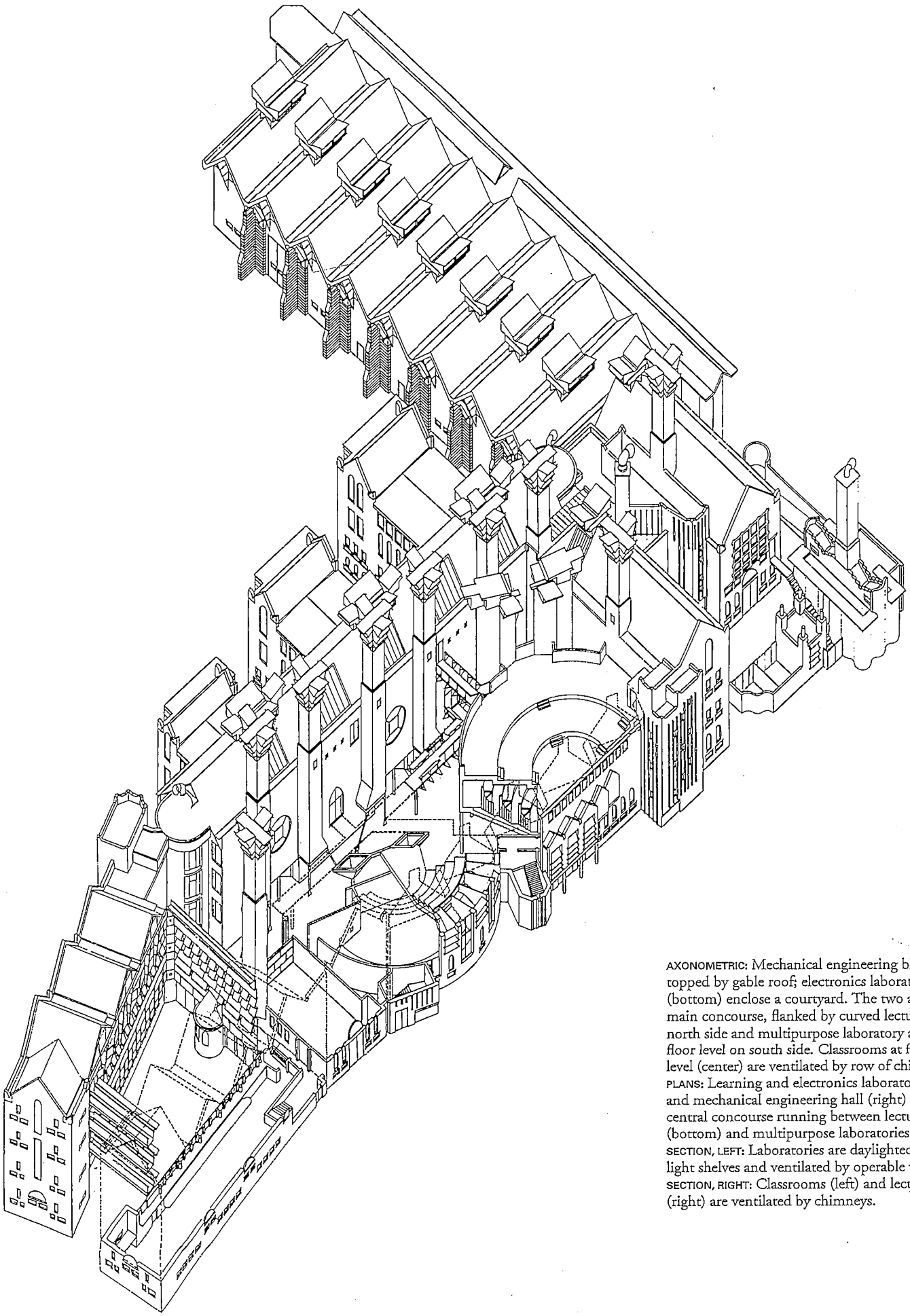
The new engineering laboratory for De Montfort University in Leicester, designed by London-based Short Ford and Associates, is a startling demonstration of the possibilities of the new "green" architecture. The Queen's Building is crammed full of heat-producing machinery, and yet it is almost completely naturally ventilated and cooled. It achieves this remarkable feat by reviving that most traditional of environmental control devices, the chimney.

Not since the Elizabethan country house has the chimney been allowed such architectural prominence. Except for a few specialized "clean" rooms, all of the building's laboratories, classrooms, and lecture halls are ventilated by a combination of openings in the external wall and either roof vents or chimneys.

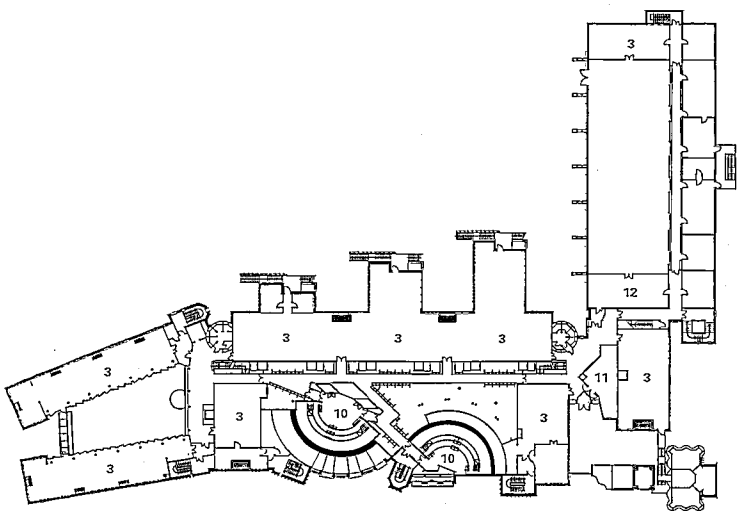
Comfort in buildings is as much a psychological as a physical experience; merely the act of opening a window can make one feel cooler. Classrooms and laboratories are therefore provided with operable windows so that the occupants are in control and, just as important, feel that they are in control. Behind the scenes, however, a computerized building management system monitors the temperature, controls the heating system, and adjusts the mechanical dampers in the chimneys and roof vents to ensure that the optimum balance is maintained and that energy is not wasted. The ventilation itself may be passive and natural, but mechanisms that control it are active and automated.



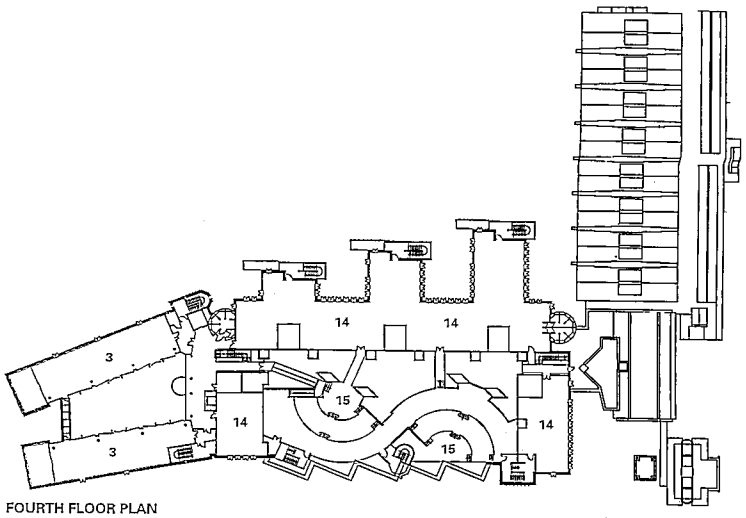
THESE PAGES: Polychromatic brickwork, gable roofs, and lancet windows of engineering labs recall Gothic Revival. The building's style, however, is less important than its ground-breaking passive environmental strategy.



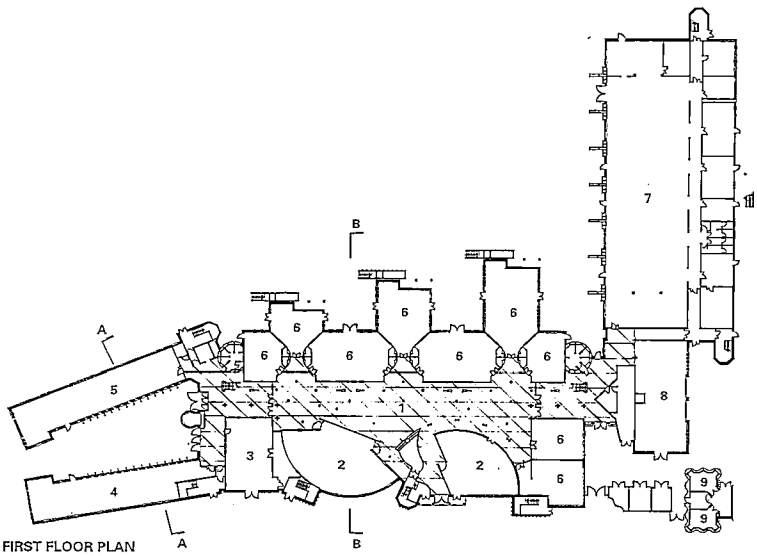
AXONOMETRIC: Mechanical engineering block (top) is topped by gable roof; electronics laboratory blocks (bottom) enclose a courtyard. The two are linked by main concourse, flanked by curved lecture halls on north side and multipurpose laboratory at second floor level on south side. Classrooms at first floor level (center) are ventilated by row of chimneys. PLANS: Learning and electronics laboratories (left) and mechanical engineering hall (right) are joined by central concourse running between lecture halls (bottom) and multipurpose laboratories (top). SECTION, LEFT: Laboratories are daylighted through light shelves and ventilated by operable windows. SECTION, RIGHT: Classrooms (left) and lecture halls (right) are ventilated by chimneys.



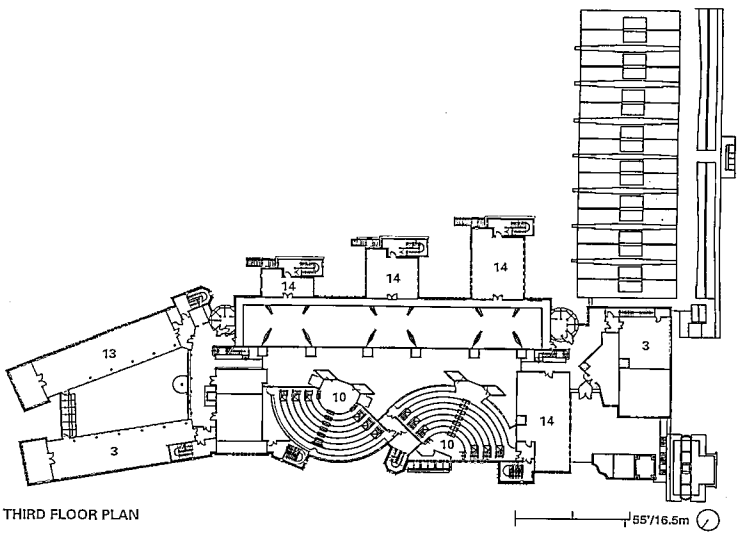
SECOND FLOOR PLAN



FOURTH FLOOR PLAN



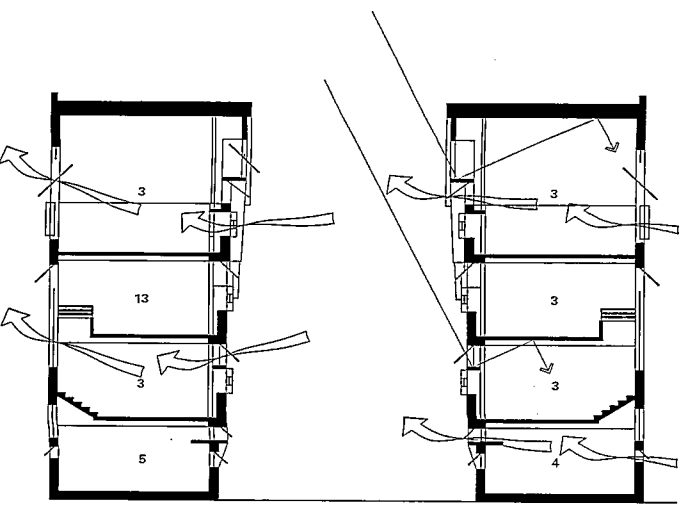
FIRST FLOOR PLAN



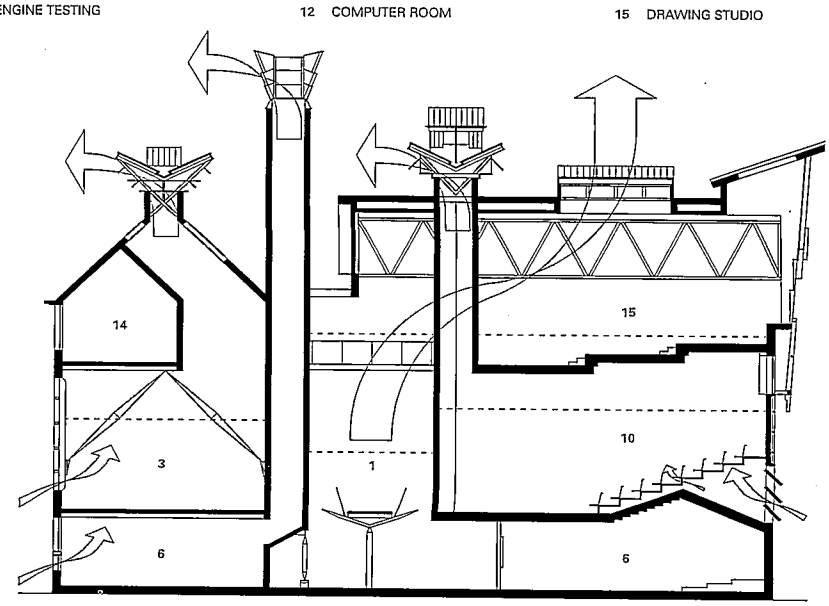
THIRD FLOOR PLAN

55'/16.5m

1 CONCOURSE
2 LECTURE THEATER
3 MULTIPURPOSE LAB
4 LEARNING LAB
5 ELECTRONICS LAB
6 CLASSROOM
7 MECHANICAL LAB
8 CAFETERIA
9 ENGINE TESTING
10 AUDITORIUM
11 MECHANICAL
12 COMPUTER ROOM
13 COMPUTER-AIDED DESIGN
14 STAFF/FACULTY OFFICE
15 DRAWING STUDIO



SECTION A-A



SECTION B-B

13.75'/4.2m

This is a heavy building of loadbearing brick walls and concrete floors, and the heaviness is also part of the environmental strategy. A heavy structure takes time to heat up and cool down, so it serves as an environmental buffer that moderates the internal temperature. In winter, the heat produced by computers and machinery is augmented by ordinary water-filled radiators served by an efficiently combined heat and power plant.

Short Ford's energy-saving strategy also applies to lighting as much as to heating, cooling, and ventilation. Most of the activities that take place in this building require high levels of lighting—up to 75 foot-candles in the mechanical laboratories. In a conventional building, this would mean lots of artificial lighting producing lots of heat, and the necessary compensatory cooling would have a high energy cost. Though this is a building of large internal spaces, its L-shaped plan is relatively shallow so as to take full advantage of natural daylight.

Windows are designed differently according to their orientation and the function of the rooms that they light. High windows in south-facing laboratories, for example, have deep mullions and transoms to soften the light and reduce the glare. In electronics laboratories, where scientists work seated at benches in front of computer and oscilloscope screens, the windows are provided with internal light shelves that cut out the direct view of the sky and reflect the daylight back into the middle of the room.

Windows are shaded to reduce unwanted solar heat gain. When the sun is not shining, the heat loss through large windows and roof lights is a positive benefit, helping to get rid of the unwanted heat produced by machinery, computers, and people.

The plan can be analyzed into three parts, corresponding to three types of engineering laboratories. At the west end of the complex is the hall-like mechanical engineering laboratory, full of heavy machinery, with two floors of offices and smaller labs along one side. At the east end, two, four-story projecting wings, partly enclosing an open courtyard, house the electronics laboratories. In the main central block, teaching spaces and labs are arranged on either side of a full-height atrium, which also borrows daylight

FACING PAGE: Triple gabled porch announces main entrance between two lecture theaters.
TOP RIGHT: Series of chimneys ventilate south-facing classrooms in main block.
RIGHT: Electronics laboratory blocks are connected by bridges across narrow courtyard.

from the large, open-plan multipurpose laboratory at second floor level on the south side. On the north side are two lecture halls with raked floors. On top of these, open to the concourse, are drawing studios with curious S-shaped plans and stepped floors.

The Queen's Building has been open now for two years, and the initial reports of an extensive monitoring operation indicate that it is comfortable to use and very cheap to run. Its complex, articulated form and high-quality materials may look expensive, but in fact, because of the savings on air-conditioning, the structure cost no more to build than a conventional building of the same type. It is a ground-breaking demonstration of the benefits of passive environmental control.

What is even more remarkable, however, is that the Queen's Building is also a powerfully expressive piece of architecture. The influence of various 19th-century architects is evident in its Gothic Revival form. Polychromatic brickwork recalls the churches and colleges of William Butterfield, circular towers and turrets might have been designed by Norman Shaw, and the dramatic combination of brickwork and exposed steel in the interior is obviously influenced by the visionary schemes of the great French theorist Viollet le Duc. In addition, there is even an American influence in the extensive application of Richardsonian cedar shingles to clad the upper floors.

The heart of the building is the concourse, a quasi-external space, like a high, narrow street, threaded through by a steel-framed walkway at second floor level. The volumes on either side of the concourse are clad in brick, carefully detailed and decorated with colored string courses. Here and there, they are punctuated by windows of various shapes—circular, rectangular, and arched—for borrowed light.

In true Gothic tradition, the form of these buildings arises from their functions to fit into a regular structural grid. Each space is designed from the inside out, and the resulting forms are then combined into a montage-like composition. The effect is most dramatic in the case of the two lecture theaters. Facing opposite ways and set at an angle to the prevailing grid, their curved back walls bulge out into the concourse on one side and the

TOP LEFT: Mechanical engineering block (left) features stepped brick buttresses.
LEFT: Shingled bay's top floor contains faculty offices.
FACING PAGE: Steel louvers at top of chimney are visible behind roof monitor; operable windows ventilate classrooms. Stepped brick walls conceal staircases.

street on the other. These massive brick and concrete forms do not rest on the ground, however, but are hoisted upon slender steel columns with treelike branching struts.

Even when the plan is relatively simple and straightforward, like that of a single-story mechanical engineering block, the structure is elaborate and expressive of its function. On the east side of the block, for example, the repetitive gable roof rests on a loadbearing brick wall that is stiffened by very medieval-looking stepped buttresses. These buttresses have an environmental as well as a structural function, incorporating ducts for natural ventilation. At the other end of the building, the little courtyard between the narrow peninsula blocks of the electronics laboratories is clad not in the usual polychromatic brickwork but in smooth white mineral fiber panels. Once again the reason is environmental—to reflect more daylight into the laboratories.

Britain's weather may be temperate, but its critical climate is rather severe, and Short Ford's explicit historic architectural references tend to be frowned upon. Lancet windows, ecclesiastical external buttresses, and gabled roofs are not to everyone's taste, and the proliferation of such features tends to obscure the environmental message of the building. What is important about the Queen's Building is that its architect has won back territory from the mechanical engineer and once again assumed full responsibility for the internal environment. The chimneys and elaborate sculptural roof vents that dominate Short Ford's composition may look picturesque, but they also have a real job to do, and they do it well.—*Colin Davies*

TOP LEFT: North-facing glazing in top floor faculty offices maximizes daylight and cools building.
LEFT: Raked steel structure in multipurpose laboratory supports faculty office level above.
RIGHT: Concourse is criss-crossed by steel bridges with floors incorporating glass block.

SCHOOL OF ENGINEERING AND MANUFACTURE
DE MONTFORT UNIVERSITY
LEICESTER, ENGLAND

ARCHITECT: Short Ford and Associates, London—C. Alan Short, Brian Ford, Anne Goldrick, Peter Sharratt (design team)
LANDSCAPE ARCHITECT: Livingston Eyre Associates
ENGINEERS: YRM Anthony Hunt Associates (structural); Max Fordham Associates (mechanical/electrical)
GENERAL CONTRACTOR: Laing Midland
COST: $124 per square foot
PHOTOGRAPHER: Peter Cook

Center for Energy and Environmental Education
University of Northern Iowa
Cedar Falls, Iowa
Architects Wells Woodburn O'Neil

Campus Energy

Until recently, the most remarkable building on the University of Northern Iowa's small, undistinguished campus in Cedar Falls was a football stadium crowned by an oversized inflatable fabric dome. This state-supported university of nearly 13,000 students, however, is known more for its expanding environmental curriculum than for football. Over the past few years, the university has launched new environmental programs within its undergraduate science majors and established a master's degree in environmental science and technology; students and faculty develop environmentally oriented curricula for the state's public schools.

Now, the Center for Energy and Environmental Education is drawing attention from scientists at NASA and the National Science Foundation, who praise

THESE PAGES: University of Northern Iowa's new Center for Energy and Environmental Education exposes elongated south-facing facades to the sun, virtually eliminating the need for artificial lighting on bright days.

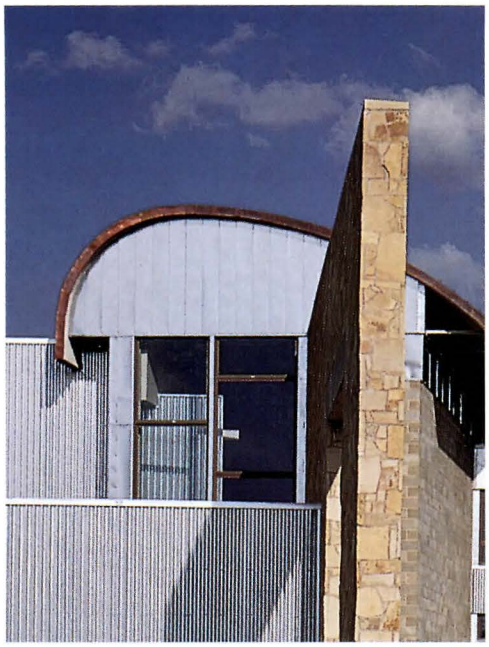
the ecomindedness of the new campus building, designed by the Des Moines firm Wells Woodburn O'Neil. The architect crafted the subtly "green" structure from practical, environmentally friendly materials, with a commonsense approach to daylighting and passive solar techniques.

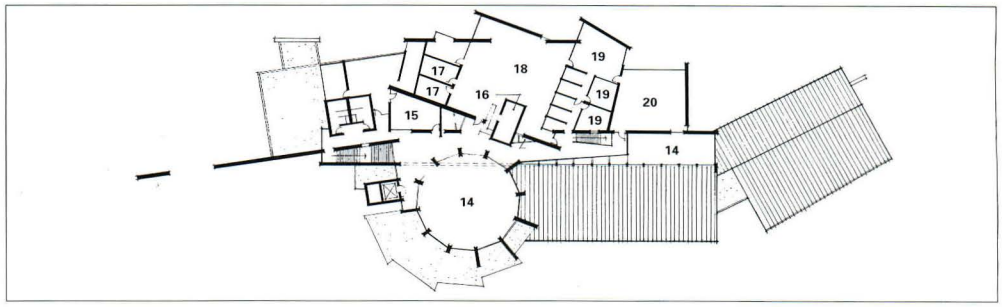
The new center, funded entirely by a $4 million grant from the U.S. Department of Energy, consolidates the university's environmental laboratories, classrooms, and library and creates a training facility for professionals and educators alike. "The building is a symbol on the campus that testifies to the university's direction and its environmental emphasis," explains Rick Stinchfield, executive assistant to the university president. As such, the center is a didactic tool, wherein theories of environmental efficiency are tested and exhibited in a tangible way.

From the earliest stages of design, Wells Woodburn O'Neil worked with The Weidt Group, a Minnetonka, Minnesota-based energy consultant, to devise strategies for maximizing the building's efficiency. As a result of this close collaboration, the building incorporates such energy-minded features as natural ventilation; sensors that turn lights on and off, depending on the amount of daylight; and efficient mechanical systems. These green maneuvers reduce the building's energy consumption to one-third that of the typical campus building.

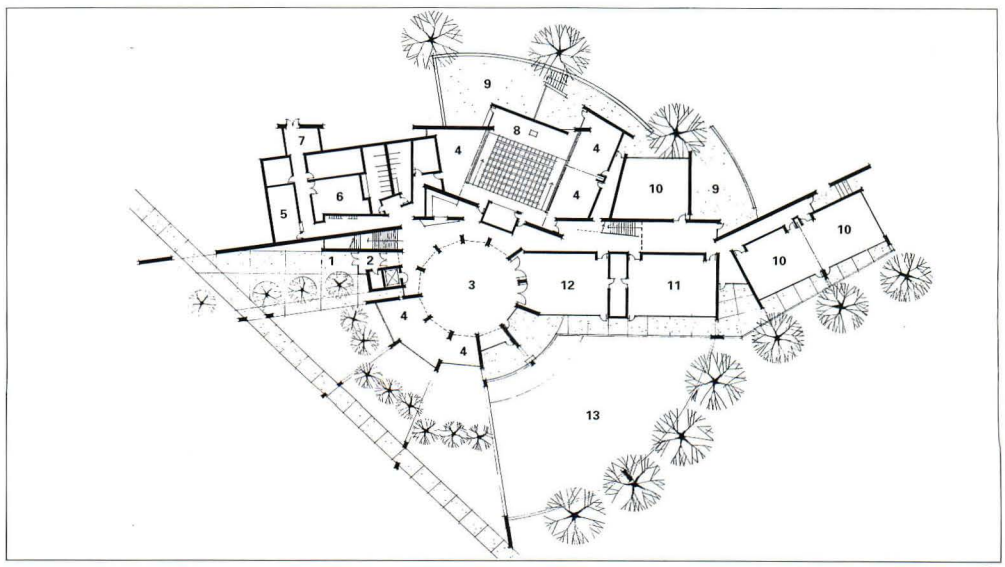
Wells Woodburn O'Neil sited the building to capture as much beneficial solar radiation as possible. The 28,000-square-foot structure is located to the southeast of the main campus, adjoining the university's existing technology center and a tall-grass prairie and forest preserve. Bridging a pedestrian walkway, a limestone wall quarried from native rock emerges from the west face of the building to create a portal between student housing and classroom buildings and to mark the formal entrance to the center.

To the north of a brick and glass lobby, the two-story limestone wall slices through the building to define a primary circulation path and distinguish south-facing spaces open to daylight from closed spaces to the north. The wall also doubles as a "thermal





SECOND FLOOR PLAN

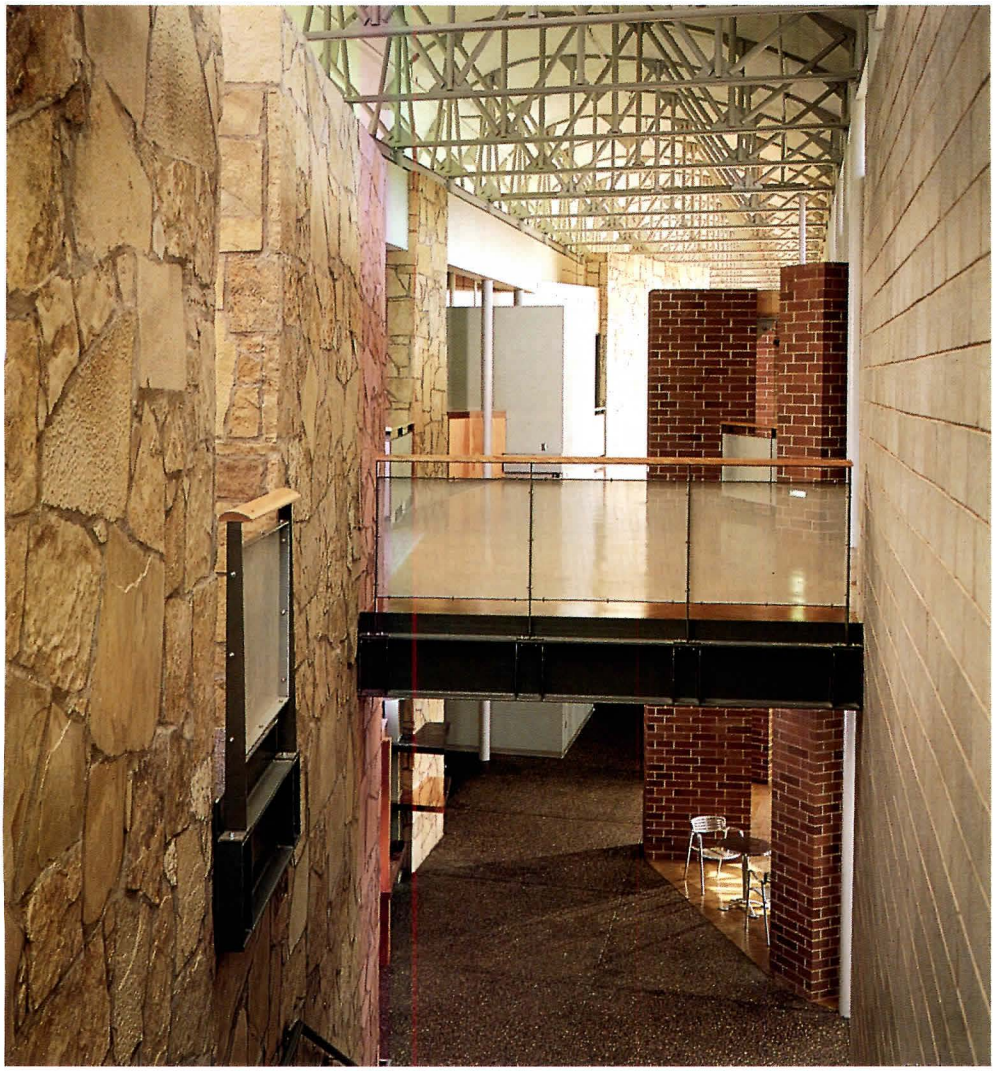


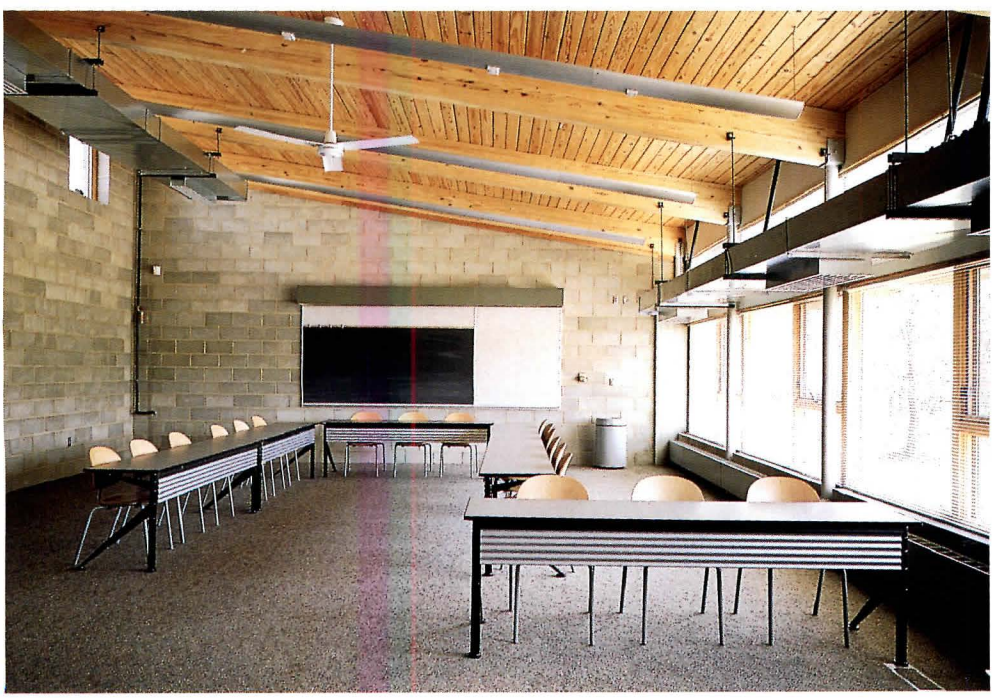
FIRST FLOOR PLAN

40'/12m

1 MAIN ENTRANCE
2 VESTIBULE
3 RECEPTION/EXHIBIT AREA
4 SEMINAR ROOM
5 RECYCLING ROOM
6 MECHANICAL
7 RECEIVING
8 AUDITORIUM
9 OUTDOOR CLASSROOM
10 CLASSROOM
11 ENERGY STUDIO
12 ENVIRONMENTAL STUDIO
13 OUTDOOR LECTURE
14 OPEN TO BELOW
15 CONFERENCE ROOM
16 MATERIAL PROCESSING
17 VIDEO ROOM
18 RESOURCE ROOM
19 FACULTY OFFICE
20 CURRICULUM DEVELOPMENT CENTER

FACING PAGE, TOP: Native Iowa limestone wall extends west from building to create pedestrian portal.
FACING PAGE, BOTTOM: Fractured north elevation is clad in brick, concrete block, and galvanized steel.
TOP LEFT: Corrugated steel clads west facade.
TOP RIGHT: Zinc-coated steel cables act as downspouts.
PLANS: Linear spine separates common areas to north from studios and classrooms to south.





sink" that stores solar heat during the day and then releases the stored heat after dark.

Energy and environmental studios, seminar rooms, and classrooms are arranged on one level and oriented toward the south to open onto informal outdoor classrooms. The elongated, glazed sheds of the building's south facade give way on the north to a fractured assembly of planar volumes enclosing two levels of faculty and student offices, a library and auditorium, and support spaces.

Both inside and out, the architect's choice of materials responds to environmental concerns, not to a Midwest vernacular or contextual precedent. Sometimes overstated, the palette of unfinished limestone, brick, concrete block, copper, and wood was selected because of the low amounts of energy required to manufacture these materials.

Sustainable materials are also employed throughout the interior: Insulation and drywall panels are composed of recycled material. When possible, concrete floors were left exposed to allow the slabs to store solar heat and also improve indoor air quality by eliminating the volatile organic compounds emitted by carpet glues and resins.

Clearly, sustainable architecture exists in many shades of green. With its rough-hewn materials and straightforward environmental sensibilities, the center proves that energy-efficient designs can be constructed without high-tech, machined components. Achieving substantial environmental benefits with minimal means, the center is a model of homespun sustainability that's entirely appropriate to the American prairie.—*Raul A. Barreneche*

TOP LEFT: Limestone wall defining main circulation spine stores solar heat during the day.
LEFT: Classrooms of the center feature south-facing glazing to maximize daylight.
FACING PAGE: Oculus atop cable-stayed pine roof of brick and glass lobby admits daylight.

CENTER FOR ENERGY AND ENVIRONMENTAL EDUCATION
UNIVERSITY OF NORTHERN IOWA
CEDAR FALLS, IOWA

ARCHITECT: Wells Woodburn O'Neil, Des Moines—Douglas A. Wells (principal-in-charge); Kevin R. Nordmeyer (project architect/designer); Douglas Buffington, Rob Whitehead (design team)
ENGINEERS: James Wilson (structural); Alvine and Associates (mechanical/electrical)
CONSULTANTS: The Weidt Group (energy/environmental design); Stecker/Harmsen (cost); Robbie Lord (collaborating artist)
GENERAL CONTRACTOR: Larson Construction Company
COST: $3.3 million ($127 per square foot)
PHOTOGRAPHER: King Au

WITH VULCRAFT ON DECK, THIS

The Ballpark at Arlington, home of the Texas Rangers, built with Vulcraft composite deck.

Technology & Practice

Green materials and methods are growing up. A new generation of ecology-conscious tools allows architects to meet the growing demand for sustainable design more easily. For instance, photovoltaic systems (above) have shifted away from experimental, stand-alone units to building-integrated panels that clad and electrify a facility, as our technology feature reveals.

Likewise, sustainable design practice is losing its cult status and merging with the mainstream. Our practice feature details how large firms such as Hellmuth, Obata & Kassabaum and Gensler and Associates are developing environmental expertise to create healthier places to work for government agencies and corporate clients.

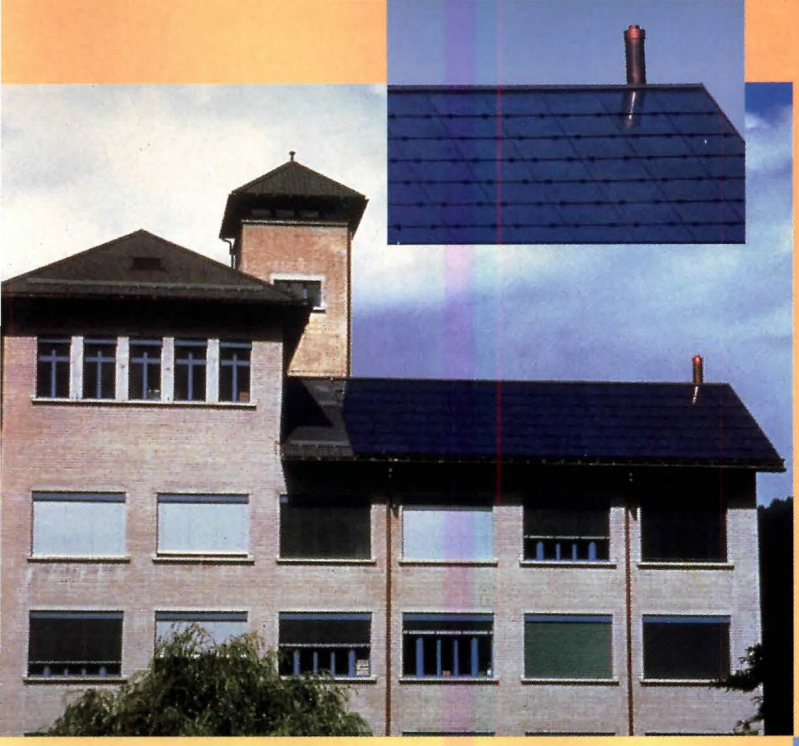
Energy efficiency has gained broader appeal in the residential market, as illustrated by a house designed by Phoenix-based Jones Studio, whose cardinal program element was energy conservation. Commissioned by a local utility, the Arizona Public Service Company, the demonstration house aims to educate the suburban home-buying public about the benefits of building sustainably.

The evolution of sustainable design ultimately hinges on accessibility to ecologically sound specifications. This month's computer feature covers a range of databases that give green-thinking architects shortcuts to surveying and selecting more environmentally sensitive materials.

Sustainable Design.

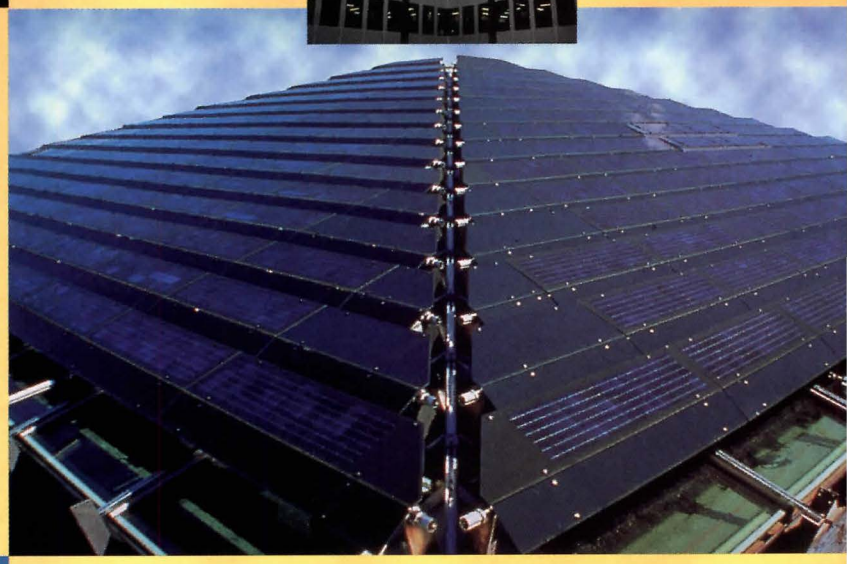
Building integrated solar electricity.

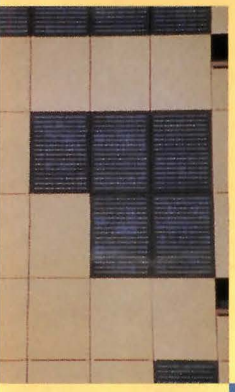
Multifunctional Photovoltaic Modules – PV building components – developed by Atlantis Energy can now be formed into any size or shape. Atlantis Energy's architectural innovations combine structural function with solar electric generation. Thru system design, additional solar heat is supplied.



Renovated Office Building:
Hybrid photovoltaic shingles

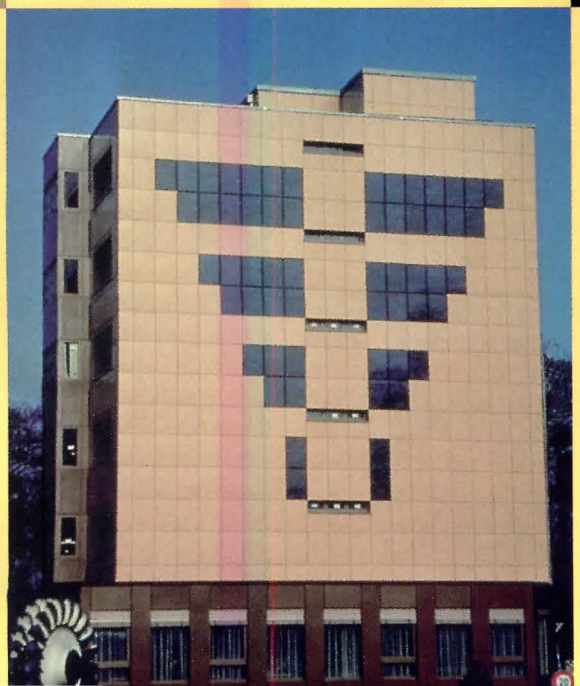
Digital Equipment Corp
Photovoltaic atrium louvers





Atlantis Photovoltaic Modules as manufactured by SOLAR BUILDING SYSTEMS, are of the highest structural quality and incorporate solar cells like those from SHARP Electronics, the most efficient commercially available.

Utility Company Headquarters:
Photovoltaic façade



Typical Integrated Applications

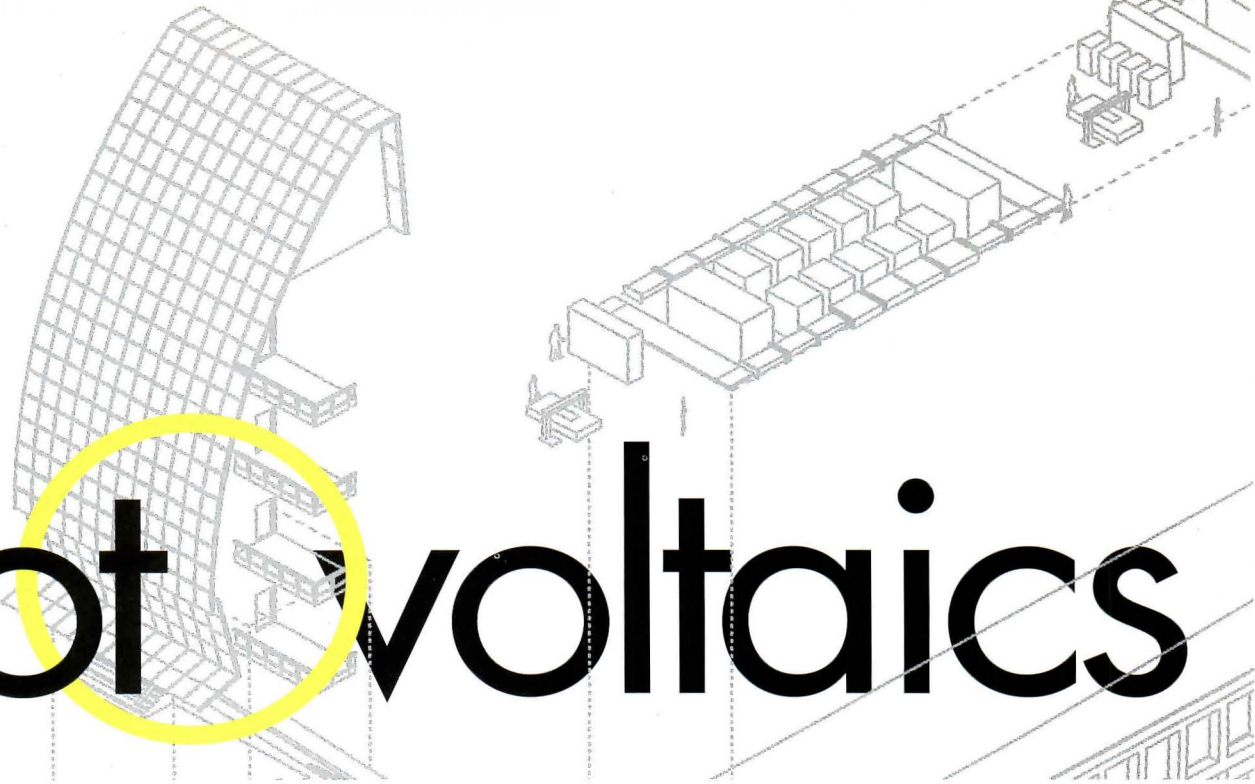
- Facades
- Curtain walls
- Shear panels
- Roof Shingles
- Skylights
- Glazing
- Awnings

ATLANTIS ENERGY, INC.
Design and Supply of Turn-Key PV Power Systems

SOLAR BUILDING SYSTEMS, INC.
Custom Manufacturing Plant

West: 916.274.2743 • East: 302.479.0807

Circle 208 on information card



Photovoltaics

The most promising alternative to nuclear and fossil fuel power generation is silent, requiring no moving parts. No pollution is emitted, no fuel is consumed, and no natural resources are depleted. Photovoltaics, the technology that harnesses the energy of the sun to directly produce electricity, is yielding increasingly more efficient and less expensive power since it was developed 40 years ago and utilized to power satellites in space and augment remote utility grids.

Now, photovoltaic devices are infiltrating the built environment. Isolated stand-alone and roof-mounted units are being joined by a new generation of solar panels that are integrated into the skin of a building to both clad and power the structure. The implications of such building-integrated photovoltaic units are revolutionary: Mass-produced materials with integral photovoltaic arrays will transform rooftops, facades, playgrounds, and sidewalks into energy producers.

Photovoltaic cells are semiconductor devices that depend on light to generate power. A semiconductor is an element that is neither a conductor nor an insulator, but lies in between the two and depends on an outside stimulus to produce electrical current. The emergence of silicon-based semiconductors in the 1950s enabled researchers at Bell Laboratories to develop the first effective photovoltaic cells, the culmination of more than a century of experimentation.

A photovoltaic module consists of silicon solar cells laminated onto a sheet of glass or a structural backing, usually metal or plastic. Sunlight strikes the silicon cells and stimulates a flow of electrons, producing an electrical charge that is collected by metal conducting strips laid over the cells. Panels of photovoltaic cells are wired in series and linked to an inverter, an electronic device that converts solar-generated electricity from direct current to alternating current.

Early photovoltaics converted only 1 or 2 percent of available energy. In the past five years, panels with conversion efficiencies measuring 14 percent have reached the market; and systems now in development have achieved levels as high as 23 percent. It is the cost of photovoltaics that remains the greatest obstacle to

widespread application. Today, the cost of electricity generated by photovoltaic panels is two to four times greater than that of utility-generated power. However, costs are dropping rapidly. Over the past 20 years, prices have fallen from $500 per peak watt to less than $5 per peak watt today.

Building-integrated photovoltaics represents one of the most promising, cost-effective applications of the technology. Employed as roofing panels, skylights, curtain wall cladding, canopies, or rainscreens, such systems generate electricity at the point of use, as opposed to centralized power plants, whose distribution networks lose as much as 25 percent of energy during transmission. Building-integrated systems eliminate the expense of the separate infrastructure required of stand-alone panels and the conventional building materials they displace.

Progressive-minded utilities have played a significant role in the drive to integrate photovoltaics in building design. In California, the Sacramento Municipal Utility District has mounted an aggressive campaign to promote photovoltaic installations on residential and commercial buildings, sharing the cost of systems. The utility benefits as does the consumer: In summer, when the electrical network is most taxed and photovoltaic arrays are most productive, photovoltaics can help an overburdened utility grid meet its peak demand. In return, the grid powers the building during off-peak hours.

Owners of custom houses were the first clients to support experimental, building-integrated systems, and clients involved in energy research were the first commercial backers. In this country, high-profile commercial commissions featuring custom-designed, photovoltaic systems include Kiss Cathcart Anders' manufacturing facility for Advanced Photovoltaic Systems (ARCHITECTURE, June 1993, pages 74-79). Anderson DeBartolo Pan's Solar Energy Research Facility for the National Renewable Energy Lab (NREL; ARCHITECTURE, March 1994, pages 121-125) incorporates roof-mounted photovoltaics and photovoltaic-activated shades.

Despite the fact that the technology has been proven to be effective, reliable, and durable, the absence of standardized systems on the market deters most architects. But new design standards are being developed by consortiums of architects, cladding companies, and solar panel manufacturers, funded by the NREL and the Department of Energy's PV: BONUS program. One design team, consisting of Solar Design Associates, Kawneer, and Solarex Corporation, for example, expects to have a commercial photovoltaic curtain wall system available next year.

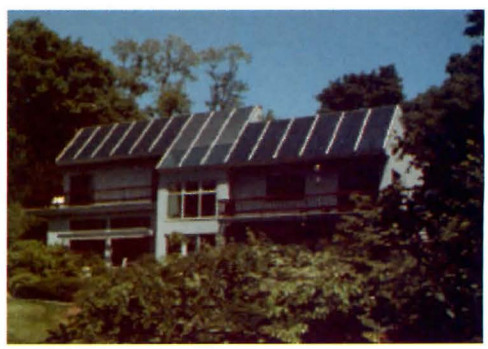
The successful development of building-integrated photovoltaic design is rooted in reconciling the energy technology with standard construction methods. Panels' weight, strength, and size must be addressed; and site variables such as cloudiness, precipitation, and seismic conditions must be factored into the design. Building codes that address photovoltaic specifications must be instituted; and uniform utility standards and metering rate structures must be developed.

Design considerations are not as formidable a deterrent as a lack of motivation. In the United States, the electric grid is so efficient and relatively inexpensive that there is little incentive to search for alternative sources of energy. In Europe and Japan, higher energy costs and heightened environmental awareness make photovoltaics more attractive.

The AIA's American Institute for Architectural Research (AIA Research) is conducting a series of workshops to introduce architects to building-integrated photovoltaics. The first session was held in Sacramento in April, and workshops followed in May at the AIA convention in Atlanta; last month in Stamford, Connecticut; and this month in Minneapolis. Additional workshops are scheduled this fall in Phoenix and Los Angeles.

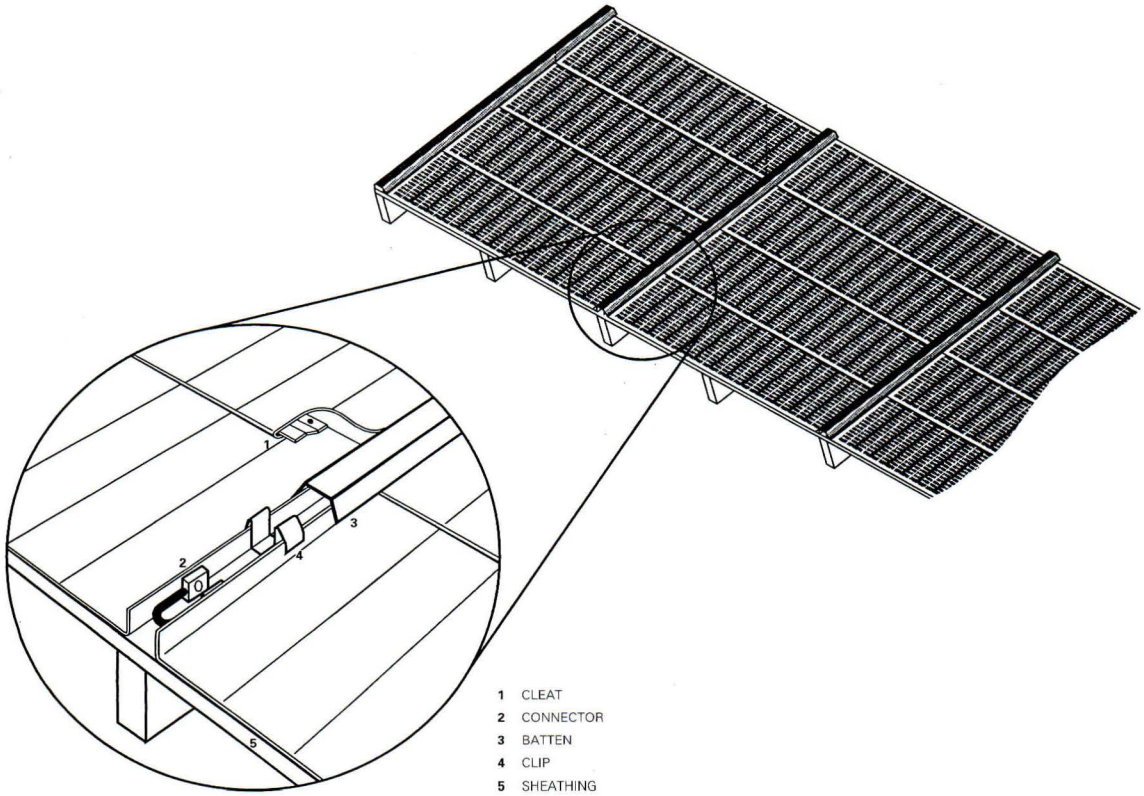
AIA Research also offers a curriculum to teach architecture students about photovoltaic applications. Currently, more than 50 schools are working with the AIA to teach photovoltaic design in studio and lecture courses. The AIA is also helping to coordinate an ideas competition, sponsored by the Department of Energy and NREL, that will be announced this fall and will award designs that incorporate existing photovoltaic technologies and available products.

The market for photovoltaics is expanding, as more architects embrace environmental design strategies and clients are sold on a green corporate image. Current research and development will continue to yield higher efficiencies and, in turn, lower costs; but the only way photovoltaics will truly reach its potential is when the technology is combined with other sustainable design elements, such as energy-efficient mechanical systems and lighting: Less electrical demand equals fewer panels and lower costs. Predicts Solar Design Associates President Steven Strong, "Photovoltaics will become so well-integrated into the fabric of the built environment that it will become ubiquitous."—*Ann C. Sullivan*

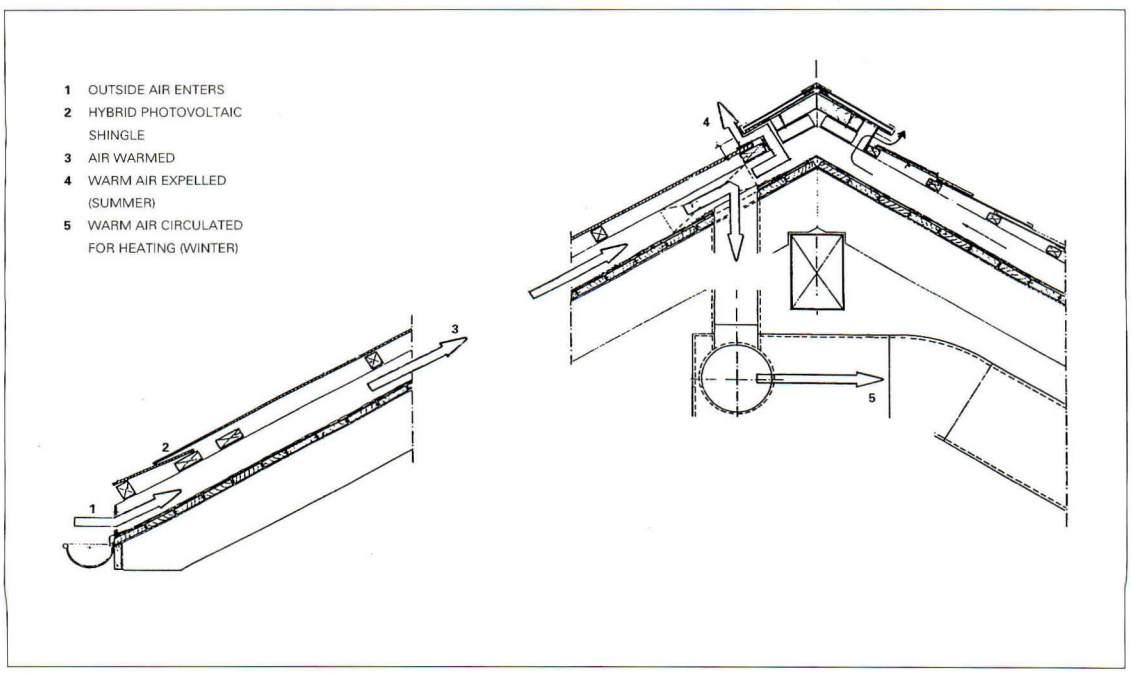


Residential applications

Solar Design Associates



1 CLEAT
2 CONNECTOR
3 BATTEN
4 CLIP
5 SHEATHING



SECTION OF HYBRID PHOTOVOLTAIC-SHINGLED ROOF

8"/20cm

Houses are being constructed across the country with building-integrated photovoltaics to dispel the myth that solar-electric power is limited by geography. For 15 years, Solar Design Associates has designed building-integrated residential systems that double as a finished weathering skin and roof structure, from California to Maine.

The Harvard, Massachusetts-based firm typically attaches photovoltaic modules directly over rafters spaced 24 inches on center, as in a house in Kennebunkport, Maine (facing page, top photo). No supplemental waterproofing is required. For a house in Brookline, Massachusetts (facing page, center photos), for example, Solar Design Associates specified a south-facing array capable of producing 4.5 kilowatts of power under full sun.

Manufacturers are competing to develop standardized building-integrated photovoltaic systems. Photovoltaic panels compatible with batten-seam metal roofing components are currently available from United Solar Systems Corporation (USSC). Electrical wiring is protected by the batten (top drawing). A prototype of this system was constructed in Lausanne, Switzerland, in January (facing page, bottom).

San Diego-based USSC in conjunction with Energy Conversion Devices is developing a photovoltaic unit that resembles an asphalt shingle in form and construction. Mounted on a flexible stainless steel substrate, the modules are nailed in place over standard roof sheathings.

Atlantis Energy, a Swiss company with an office in Grass Valley, California, offers a hybrid photovoltaic shingle designed to generate electrical and thermal energy. Outside air flows under the eaves to cool photovoltaic cells, increasing their electrical output. The air is warmed as it reaches the ridge and collected and distributed during winter months to heat the structure (left).

Curtain wall systems

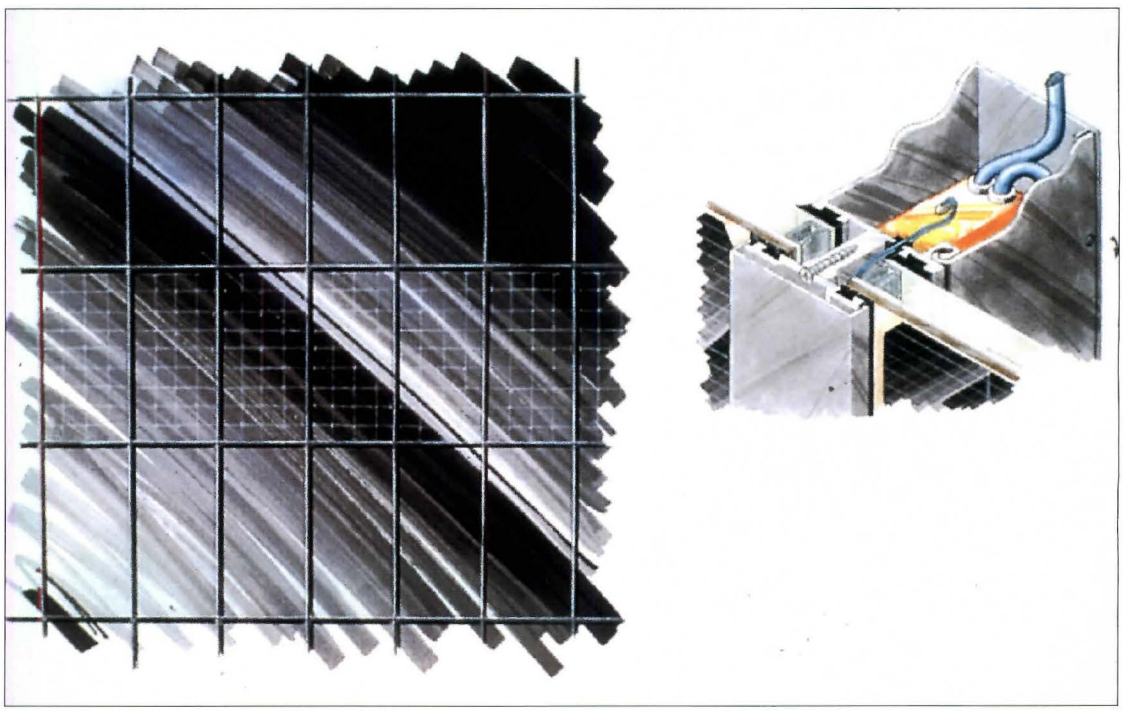
Ove Arup & Partners

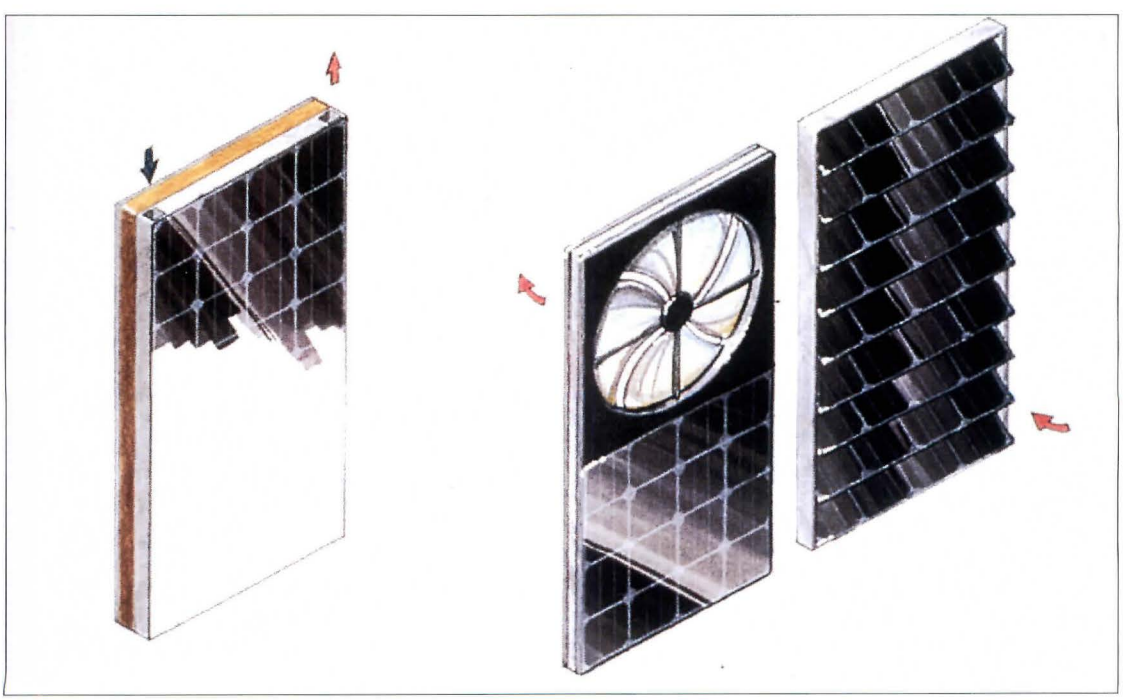
A facade renovation completed last December by Ove Arup & Partners at the University of Northumbria in Newcastle-upon-Tyne transforms an aging concrete structure into one of England's most technologically advanced buildings. At a cost of $800,000, its cladding incorporates photovoltaic panels affixed to the south facade of the 1960s classroom building. The new facade is capable of producing enough electricity to supply one-third of the building's annual consumption.

Ove Arup & Partners has been active in research and development of building-integrated photovoltaic systems for five years. The Northumbria project follows a three-year study of the potential of photovoltaic applications, commissioned by the British government. In conjunction with BP Solar, a division of British Petroleum, Arup's Facade Engineering Group has developed photovoltaic systems for rainscreen cladding, shading panels, roof panels, and curtain walls.

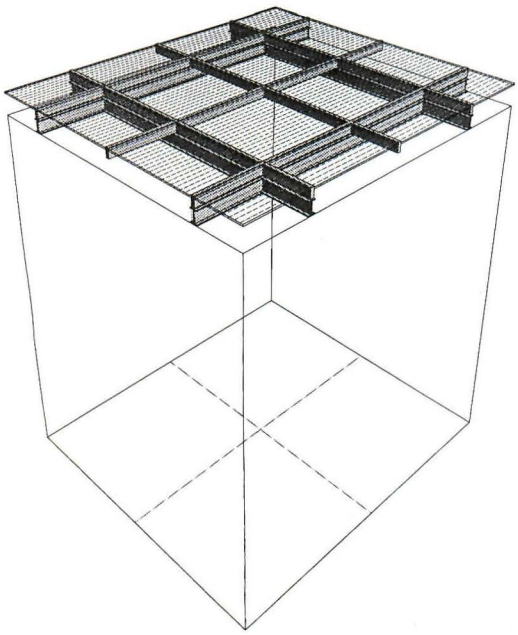
The Northumbria system is a rainscreen application. The photovoltaic panels function as a weather barrier, back-ventilated and drained. Arup has also designed photovoltaic curtain wall systems that consist of factory-assembled, double-glazed units, each with an outer laminated panel, a sealed air gap, and an inner pane. The outer laminate sandwiches solar cells, encapsulated in a resin, between two glass panes. The system incorporates typical curtain wall details. Vertical mullions house photovoltaic junction boxes and accommodate cabling, accessed by a hinged opening (top right).

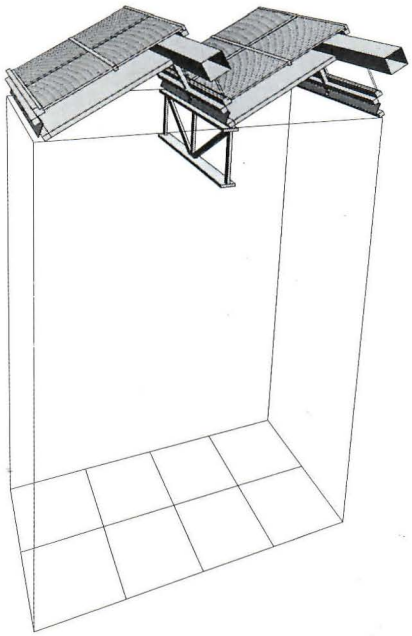
Arup's designs for future units include panels with built-in fans, and air vents with photovoltaic cells mounted on louvers (right). The firm's objective is to demonstrate that photovoltaics is not prohibitively complex and offers an economical solution to power generation.

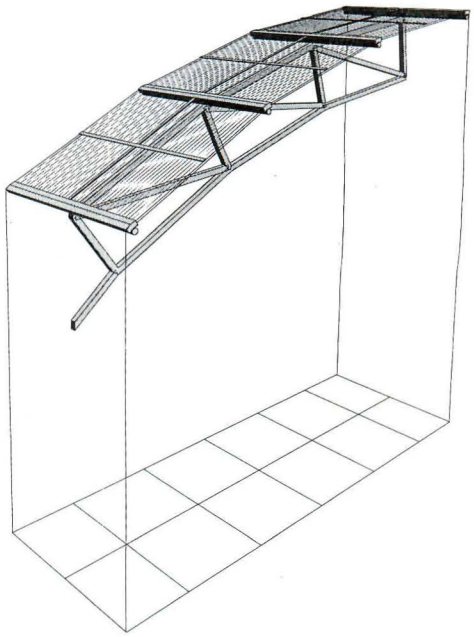


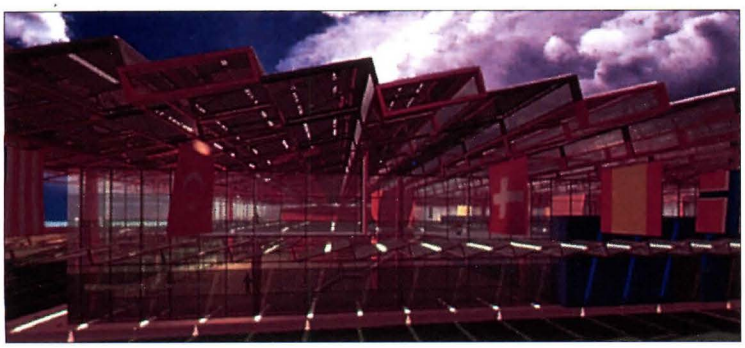


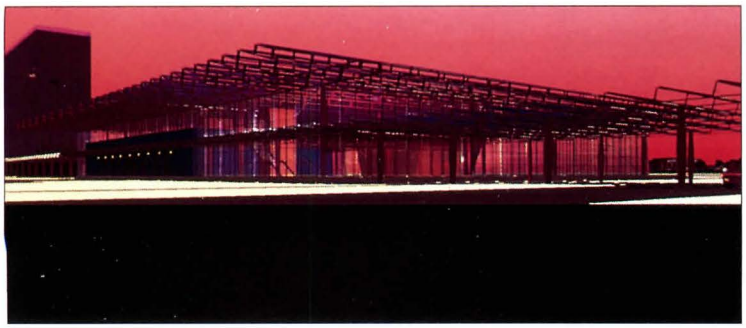
Kiss & Company











Cost-effective building-integrated photovoltaic applications exist today, concludes a case study funded by the National Renewable Energy Laboratory and published in February. New York architects Gregory Kiss and Jennifer Kinkead of Kiss & Company, formerly Kiss Cathcart Anders Architects, conducted the research with Mahadev Raman of Ove Arup & Partners, New York. The team proposed a conference center with photovoltaics integrated into the roof (left and bottom). Energy performance, construction cost, and payback were calculated for five different configurations in each of six locations: New York City, Miami, Phoenix, Chicago, Cincinnati, and Oakland, California.

The examined designs include single-glazed and double-glazed roofs with insulating glass-substrate photovoltaics; a light monitor sawtooth roof with indirect north daylighting; and a sawtooth roof with north light and active heat recovery (above center). Flat roof (above left) and sloped (above right) constructions were also tested.

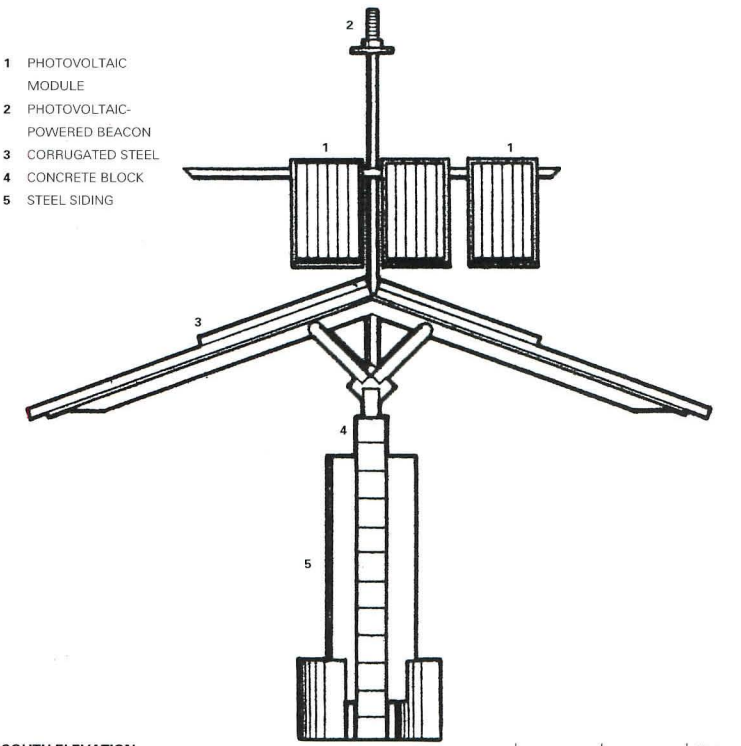
Three types of photovoltaic technologies were evaluated: crystalline silicon, characterized by a high cost and high efficiency level; amorphous silicon, with a lower efficiency and lower cost; and advanced thin-films, still in development and expected to yield high efficiencies while maintaining low costs.

Data were calculated as compared with a standard, flat, opaque, insulating roof. Payback periods were determined to be greater than 14.5 years. This figure does not allow for tax benefits, which the team believes would reduce payback to within a 10-year range. Of the six locations, Oakland came out on top, with good solar performance, a mild climate, and high energy costs. No one photovoltaic technology proved to be most cost-effective in all cases.

Nature Center

Jones Studio

SCOTT ZIMMERMAN PHOTOS



SOUTH ELEVATION

Located beyond the expansive reach of the utility grid, a sheepherding route between Phoenix and Prescott, Arizona, preserves 19th-century America. There's no electricity, automobiles, or fast food joints.

On this site, designated a National Historic Trail, Phoenix-based Jones Studio designed rest rooms, an information kiosk, and two picnic shelters for tourists embarking on the Black Canyon Hiking and Equestrian Trail. The site re-creates the layout of a frontier outpost; and the buildings recall the vernacular of aged wood structures that remain standing along the 60-mile trail. They are constructed of concrete block, weathered steel siding, and galvanized corrugated roofing panels (left). These simple forms and rustic materials belie the project's underlying technical sophistication.

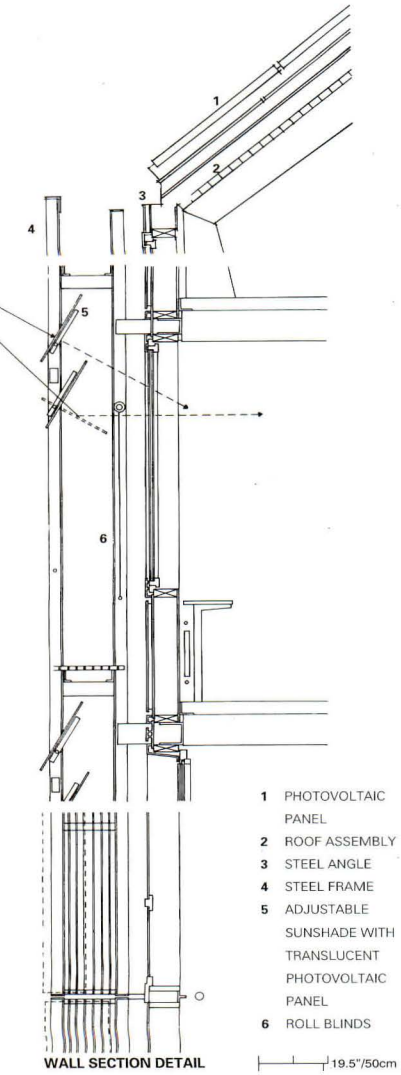
Three photovoltaic modules mounted on the roof of the kiosk and oriented south (above) power three compact fluorescent lights in the rest rooms; a beacon on the roof of the kiosk to orient returning travelers; and exhaust fans for waterless composting toilets. The system is completely autonomous. There is no backup utility source.

The photovoltaic modules, manufactured by Solarex Corporation, are angled at 45 degrees for optimum year-round performance. Measuring 20 inches by 43 inches, each panel is capable of generating 64 watts per hour in peak sun. The combined energy output of the three lightbulbs, two fans, and beacon is approximately 80 watts per hour.

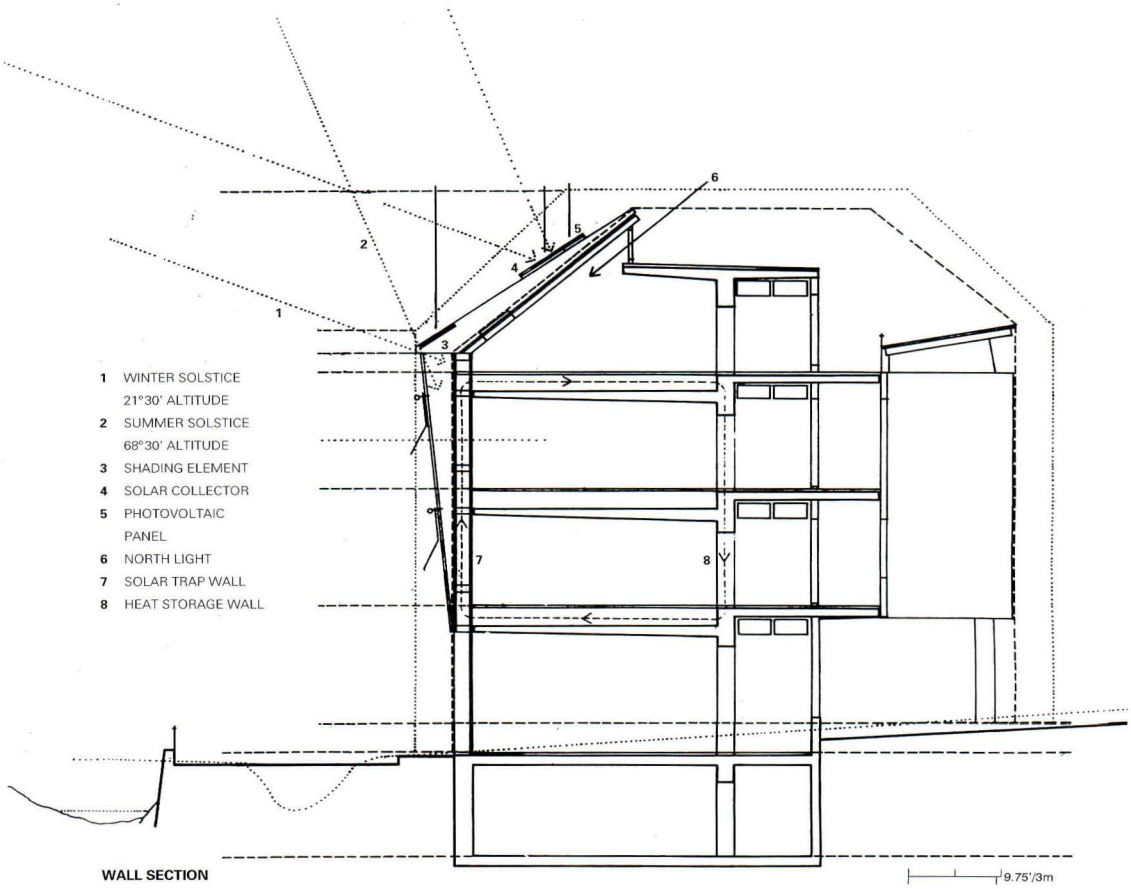
A single conductor runs beneath the earth and connects the array to the rest room structure, where four deep-discharged, lead acid batteries store surplus energy generated during the day and distribute power at night. The batteries are capable of storing enough energy to power the fixtures for four days.

Office Building

Angélil/Graham Architecture



WALL SECTION DETAIL

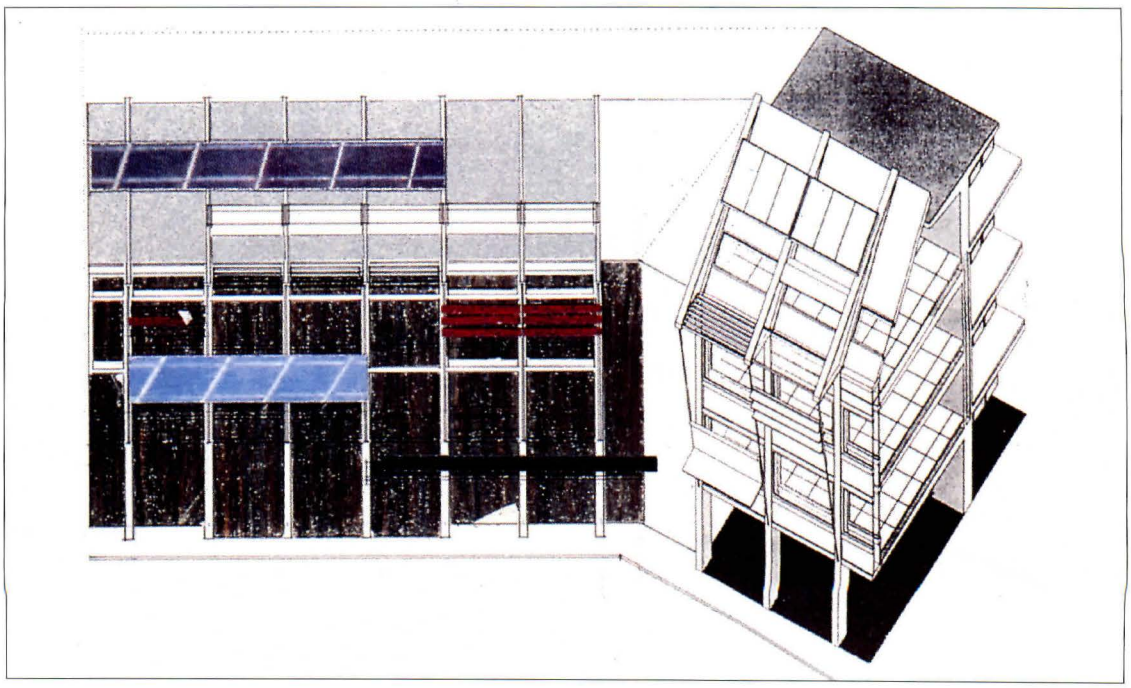


WALL SECTION

In 1990, Los Angeles architect Angélil/Graham won a competition to design Esslingen Town Center, located outside of Zurich, Switzerland. Photovoltaic panels contribute to the firm's overall sustainable strategy for the town, which also employs passive solar collector walls, solar thermal panels, and recyclable materials.

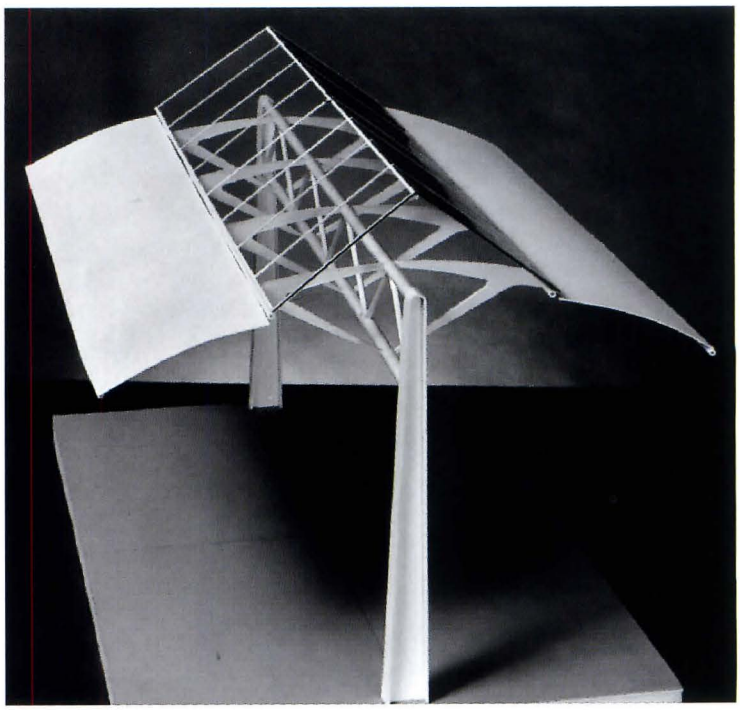
Esslingen's public structures include a post office and train station, plus five office buildings. Photovoltaic panels will be integrated on the sloped roofs of the office buildings (above). Additional modules will double as sunshades on the south facade (right), incorporating translucent, thin-film photovoltaics, to admit some daylight.

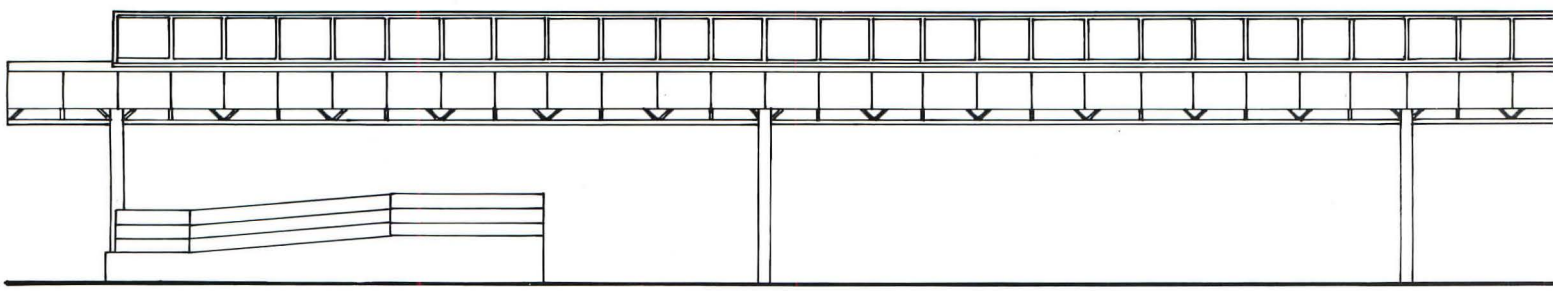
Because direct-current fixtures are compatible with solar-generated power, Angélil/Graham is specifying as many such fixtures as possible in the office buildings, to supply electricity directly at the point of use.



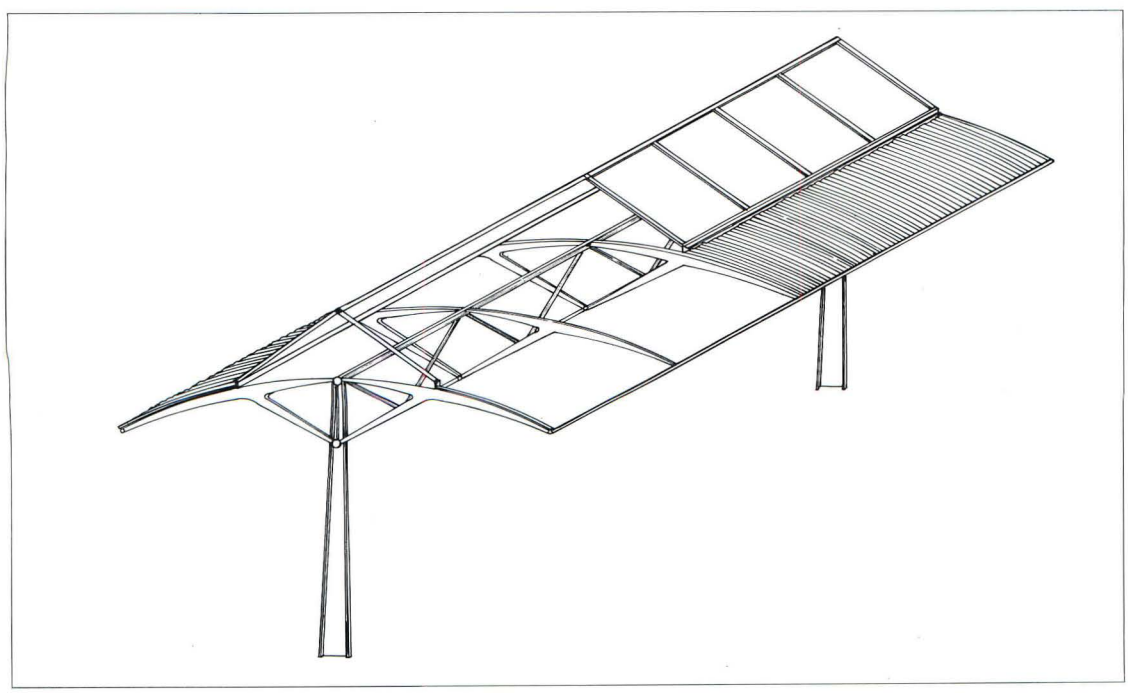
Airport canopy

William Nicholas Bodouva + Associates and STV Group



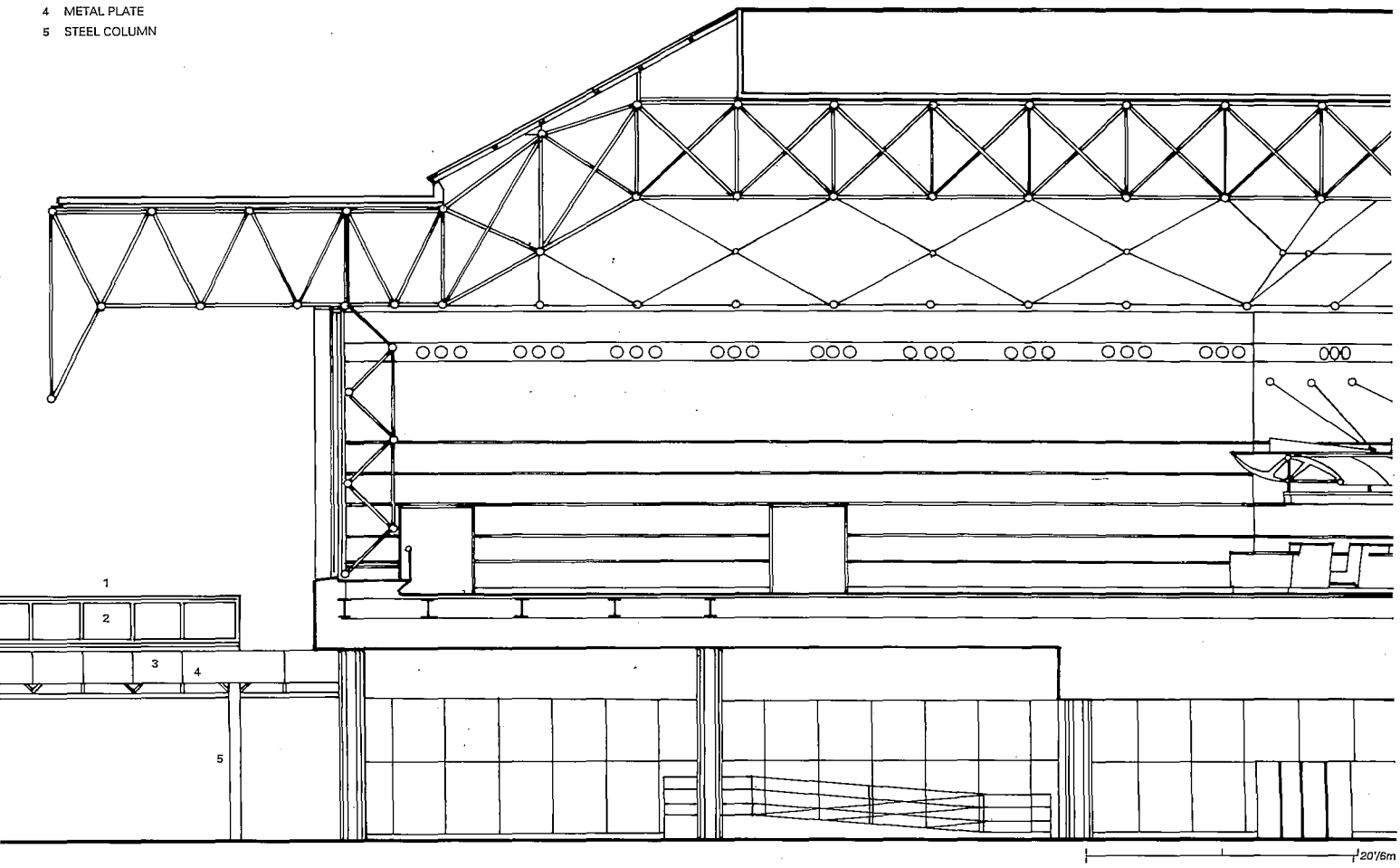


WEST ELEVATION



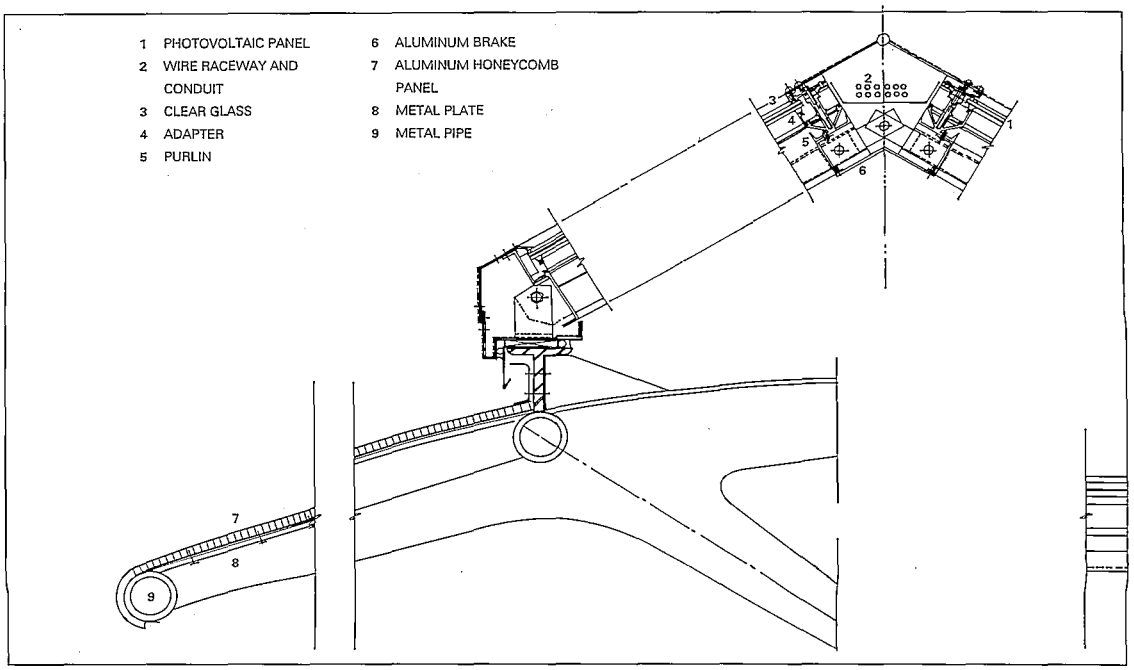
When the $39 million expansion of Baltimore/Washington International (BWI) Airport opens in 1997, it will double passenger capacity, expand parking, improve access roads, and incorporate a new light-rail station. Designed by New York-based William Nicholas Bodouva + Associates and Baltimore-based STV Group, the expansion will also boast one of the most visible examples of building-integrated photovoltaics in the country.

The light-rail station, adjacent to the two-story terminal, will be topped by a 325-foot-long canopy that features a 2,000-square-foot photovoltaic array (above). Steel columns support aluminum panels and a central skylight that runs the length of the structure (left). Photovoltaic cells will be laminated onto glass panels on the southwest face of the triangular skylight. Conventional glass panels on the northeast face of the skylight allow daylight to



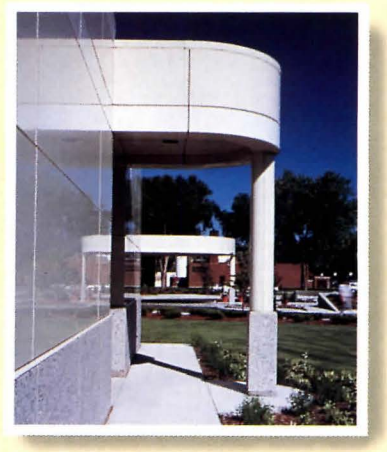
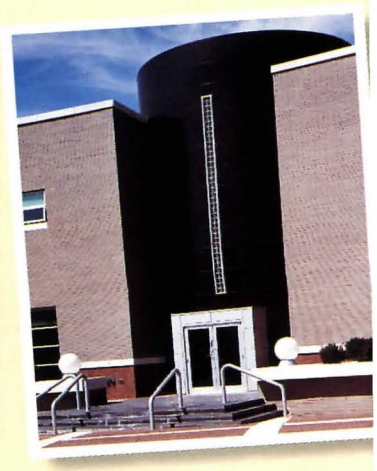
penetrate the shelter (facing page, top). Electrical lines inside the aluminum ridge of the skylight feed into the building's power supply (right).

Architect Solar Design Associates is consulting on the canopy's solar-electric design, which represents the first application of a new modular power inverter. A small device mounted on the back of each photovoltaic panel, this inverter directly converts solar-generated power from direct current (DC) to alternating current (AC). The individual inverters replace the large, cumbersome, centralized inverter incorporated into most solar-electric-powered buildings. They save space and eliminate the need to run DC wiring from panels to the remote inverter. Instead, AC wiring, which is less expensive and much more familiar to architects and electrical contractors, feeds power directly from the panels into the building's electrical network.



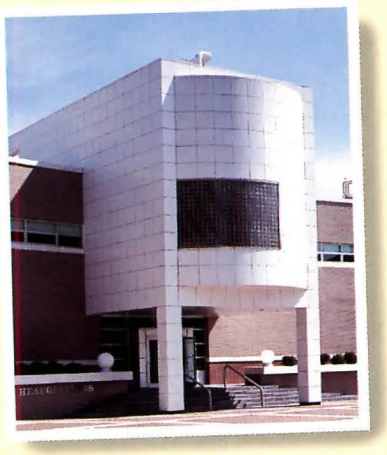
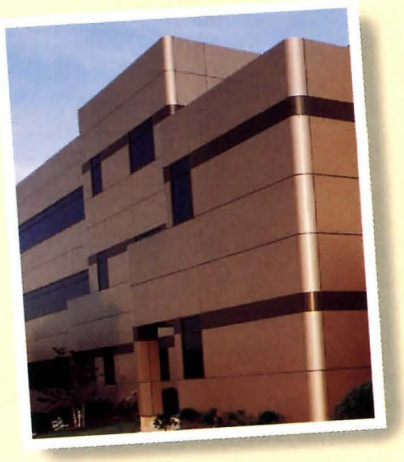
CANOPY DETAIL



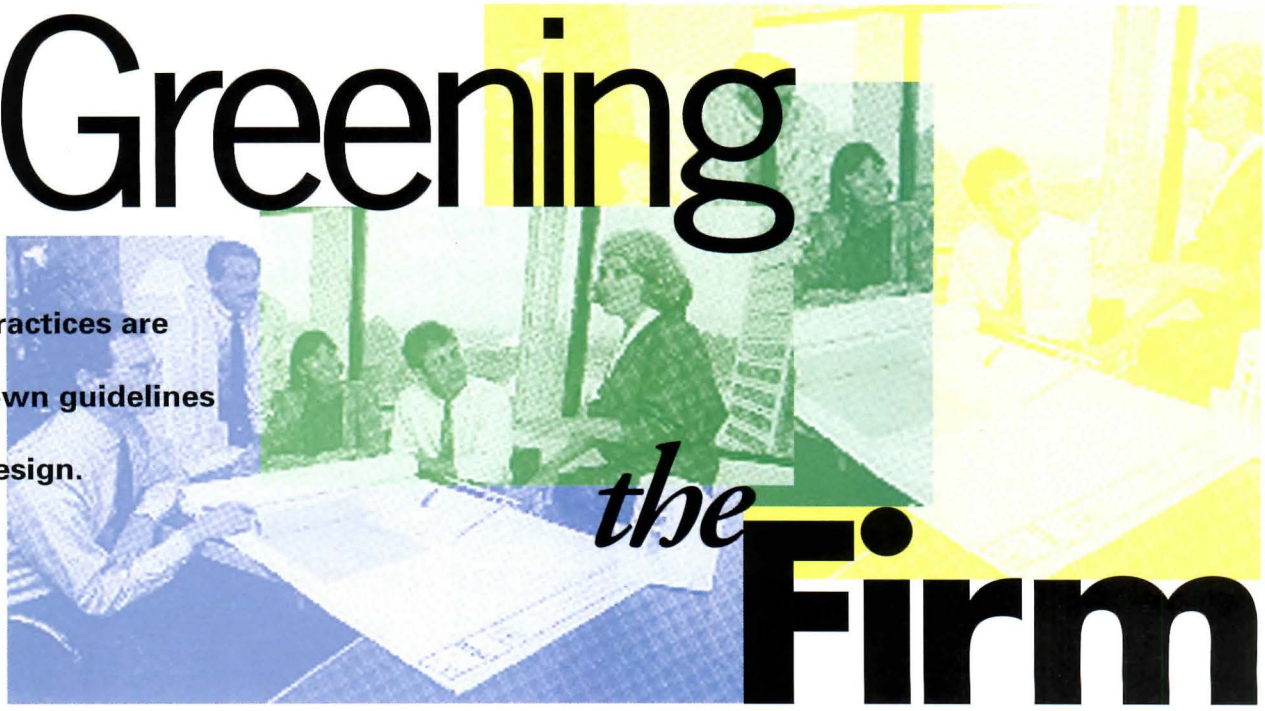
CREDIT UNION






Greening the Firm



Large corporate practices are developing their own guidelines for ecosensitive design.

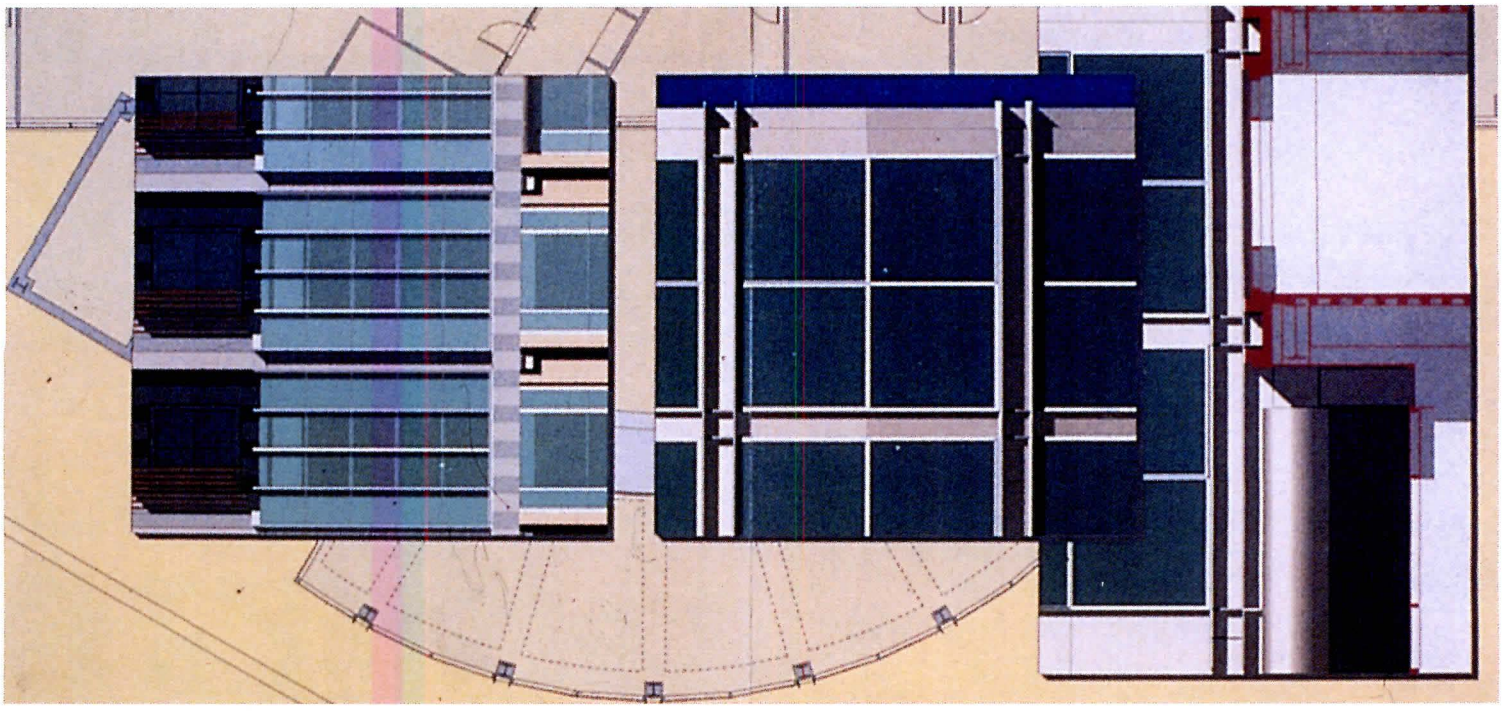
Sustainable architecture is no longer the purview of a handful of boutique architecture firms. Large, corporate practices have begun to incorporate sustainable ideas and building products into their practices.

Some of these mainstream firms are developing environmental expertise in response to the demands of specific projects. For example, RTKL Associates is striving to develop its environmental acumen as a result of being chosen to renovate three historic buildings in Washington, D.C.'s Federal Triangle as a new headquarters for the Environmental Protection Agency. Polshek and Partners recently persuaded a client to specify sustainable materials and systems for a $14 million high-rise renovation in New York City.

Green expertise is certainly an effective marketing tool. Veazey, Parrott & Shoulders, a midsized, Evansville, Indiana-based architecture and engineering firm, will move into offices this fall that it renovated in the spirit of the Croxton Collaborative's National Audubon Society headquarters (ARCHITECTURE, June 1993, pages 62-69) to demonstrate sustainable architecture firsthand to clients.

Government agencies and corporate clients are asking architects to design healthy working environments for their employees. They must be willing to pay a small premium for sustainable architecture since the higher price of some "green" products, such as certified sustainable wood, can drive up project costs. But most of these clients insist that the project be both sustainable and economical. Architects, in turn, report that as the market for green materials expands, they are better able to bring in projects within budget.

Architects are also discovering that sustainable design does not always require a lot of sophisticated technology. The most environmentally sensitive solution may reuse an existing structure, for example. And while some firms are developing green materials databases, these resources are not critical for ecosensitive practice. Contact the AIA's Committee on The Environment at (202) 626-7482 for information on seminars, meetings, and other resources.—*Virginia Kent Dorris*



Hellmuth, Obata & Kassabaum

Two years ago, Hellmuth, Obata & Kassabaum Chairman Gyo Obata decided to position HOK as a leader in sustainable design, calling for an environmental strategy to "become part of the consciousness of the firm."

Since then, HOK has developed an electronic materials database available on-line in each of the firm's 14 offices. This year, the firm is distributing an in-house *Sustainable Design Guide* to architects on staff. The guide contains a checklist of environmental design goals, as well as specific actions to help accomplish these objectives.

For example, one aim is to exceed by 30 percent the energy consumption model developed by ASHRAE for specific building types. To achieve this goal, HOK's guide presents daylighting strategies and ways to maximize passive solar energy benefits.

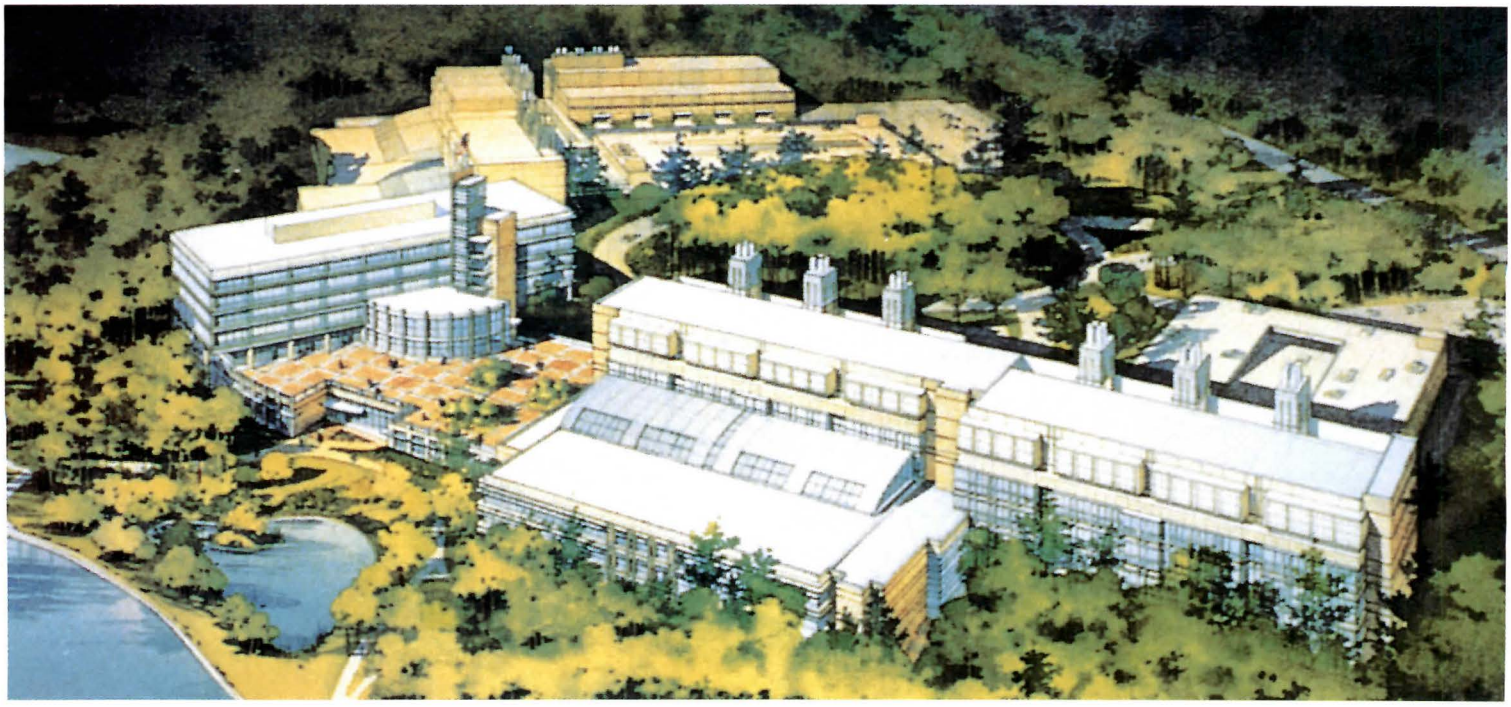
The database and guide were compiled internally by specialists in planning, energy, materials, indoor air quality, water conservation, and waste management. These specialists work with "green advocates" from each HOK office, employees selected by management for their interests and knowledge. The advocates meet twice a year in person and each month via conference calls.

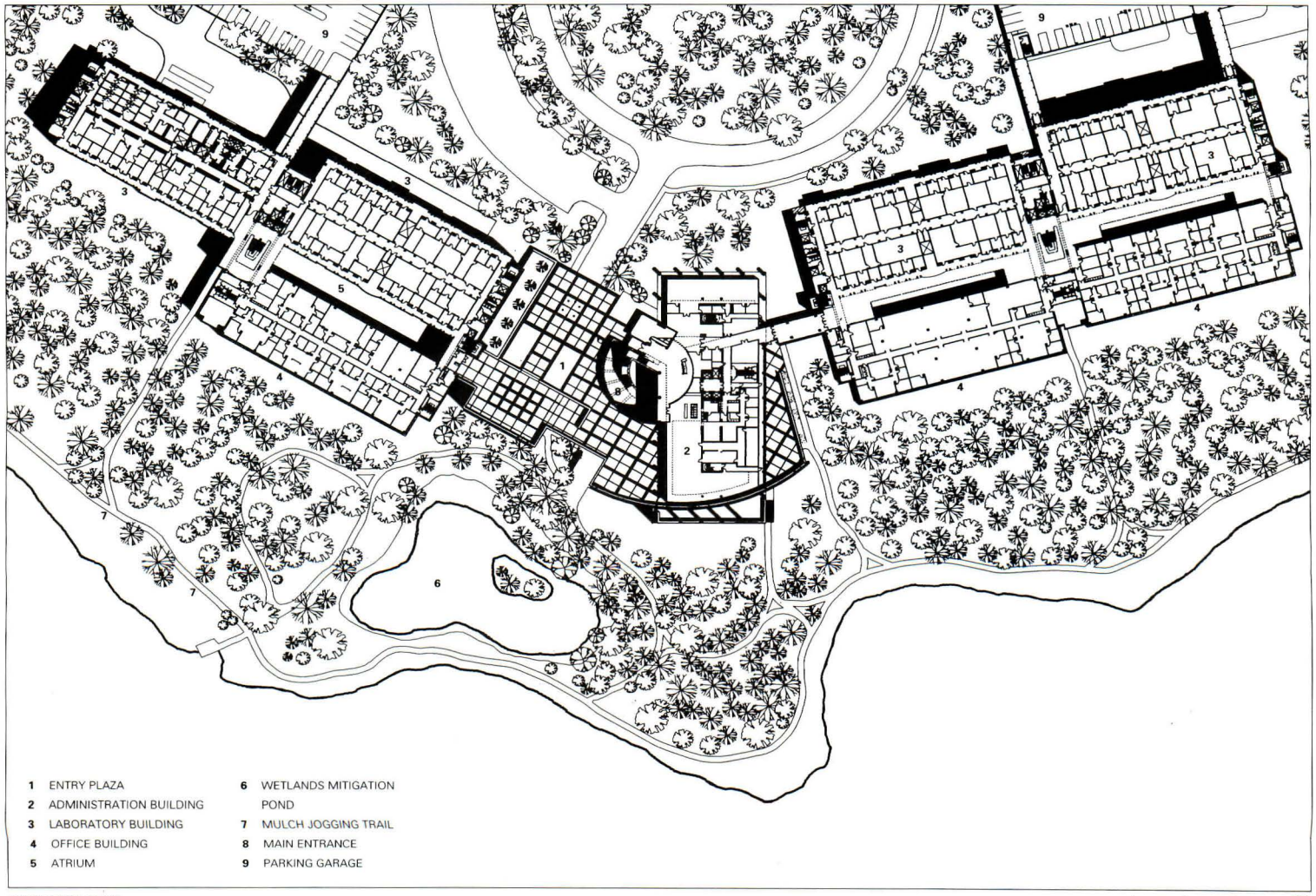
Each office supports its own "green team," which develops and implements environmental strategies. Members of these teams have compiled data by querying product manufacturers; participating in conferences; consulting with colleagues outside HOK; and studying books, journals, and research. "Our goal isn't to pick projects that we can 'green up.' It is to push every single project in that direction," explains William Odell, senior vice president.

A U.S. courthouse in Tampa, Florida, is one such project. HOK won approval from the General Services Administration to develop the 17-story urban building under sustainable practices. The architects not only addressed energy efficiency, but also drew upon the firm's new data on building materials and construction waste recycling.

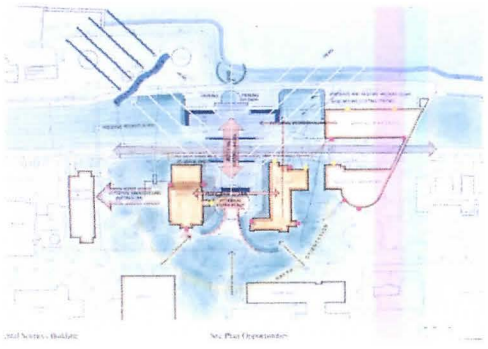
HOK's environmental initiatives are currently focusing on the design of a research and office complex for the Environmental Protection Agency in Research Triangle Park, North Carolina. According to Sandra Mendler, project designer in the firm's Washington, D.C., office, HOK hopes to create a comprehensive, cost-effective sustainable design, minimizing the building's impact on its 126-acre, undeveloped site.

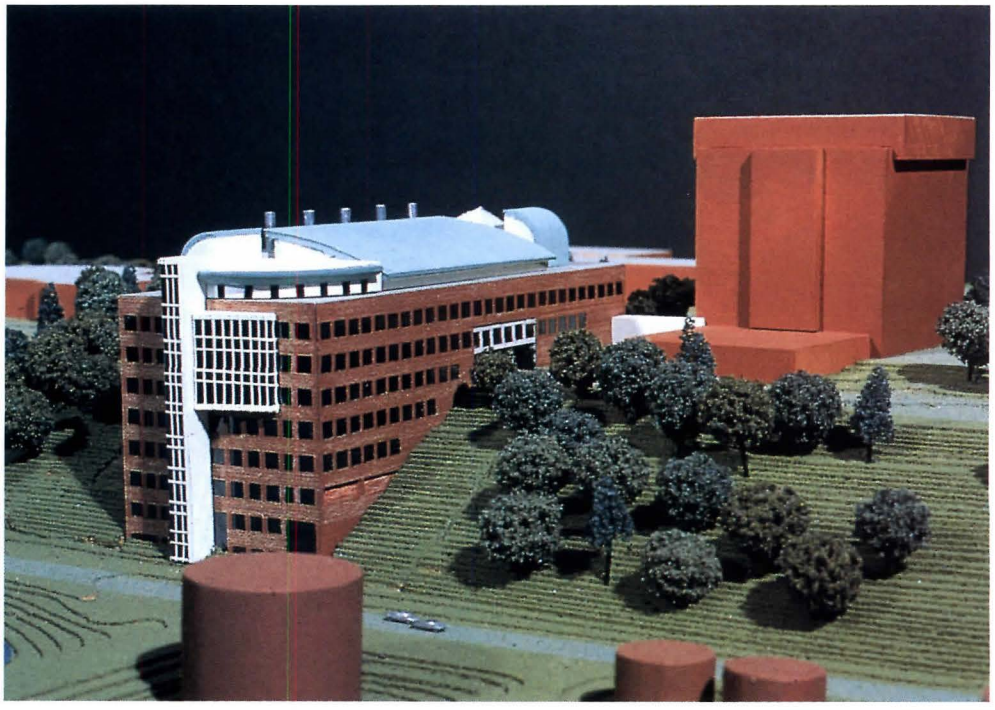
ABOVE: Spectrally selective low-emissivity tinted glass limits heat gain on the north elevation of Environmental Protection Agency's new research center in Research Triangle Park, North Carolina.
FACING PAGE, TOP: Complex includes a central administration building, positioned on a north-south axis to take full advantage of solar energy. Laboratory and office blocks are oriented east-west to prevent reintrainment of air from laboratory exhaust stacks.
PLAN: Structured parking for 900 cars will minimize the impact of cars on the site. HOK specified pervious mulch footpaths to diminish runoff.





MAIN LEVEL PLAN





Smith Hinchman & Grylls Associates

Environmental priorities have added a new dimension to the design process at Smith Hinchman & Grylls (SH&G). The Detroit-based, 390-member firm has adopted an environmental model, or sustainable design checklist, to help determine the long-term global impact of architectural decisions.

Smith Hinchman & Grylls developed this environmental model four years ago during the design of a research and office building in Saginaw, Michigan, for the Consortium for International East Science Information Network (CIESIN), developed with environmental consultant Robert Berkebile of Berkebile Nelson Immenschuh McDowell Architects. The checklist is now guiding the design of a $60 million Environmental Sciences and Engineering project at Michigan Technological University in Houghton. The university, which last year launched an interdisciplinary "initiative for the environment" to focus attention on sustainability, hopes the new laboratory and teaching building will serve as a brick-and-mortar example of creative solutions to environmental challenges.

The firm also expects to broaden the application of its environmental model to more traditional building designs. SH&G applied energy-saving devices in designing the Chrysler headquarters in Auburn Hills, Michigan, and expects to employ its environmental ideas more fully while renovating housing in Detroit for the nonprofit Focus Hope. "There are clients who do not even want to know about this dimension, but we do it on our own," explains Carl Roehling, SH&G senior vice president and director of corporate and education architecture.

SH&G's environmental model sets performance goals in seven areas: land, water, plants and animals, air, energy, solid waste, and materials. Objectives for land might include minimizing site disturbance and positioning the building to best preserve the natural terrain. Goals concerning plants and animals could include stockpiling and reusing removed vegetation and specifying only organic pest-control methods. Solid-waste goals might include designing to minimize waste during construction and striving to eliminate the concept of waste altogether.

Roehling advocates a "no-tech" design approach to sustainability. Careful orientation of a building with respect to sun, wind, and land, for example, can positively influence the performance of the entire building envelope. And sensitive operation of lighting and ventilation systems can mitigate the production of waste and pollution. "We are a mainstream firm, and most of our clients are not interested in demonstration technology that may be passé in a couple of years," he explains.

Environmental information is disseminated within SH&G by an ad hoc committee of six to 20 architects that meets during lunch about once a month to discuss experiences. The group invites the rest of the firm

Environmental Design Dynamics

STEP 1

Assessing successful examples of sustainable design.

- Program: Building type, significant features, purpose.
- Systems: HVAC, lighting, etc.
- Environmental features: Light-sensitive controls, regionally produced materials, solar orientation, etc.

STEP 2

Environmental modeling.

- Land: Examine site features; minimize tree removal and maximize tree replacement.
- Water: Consider rooftop collection systems for greenhouse irrigation.
- Plants and animals: Minimize disturbance to vegetation.
- Air: Protect indoor air quality with non-VOC-emitting materials.
- Energy: Manipulate building's thermal mass to minimize temperature swings.
- Solid waste: Install recycling based on life-cycle analysis.
- Materials: Specify products based on life-cycle analysis.

STEP 3

Partnering—securing cooperation of suppliers, contractors, and owners to create sustainable buildings.

- Design: Identify and encourage suppliers that provide green products.
- Construction: Encourage contractor to recycle construction waste, minimize site disturbance.
- Occupancy: Encourage owner/manager to purchase sustainable products after completion and maintain building systems and materials in an environmentally friendly manner.

to quarterly seminars on environmental modeling and related issues. Session topics have included mechanical and electrical systems; a recent update on the firm's sustainable initiatives drew 35 people. "Designers are taking this information to heart," claims Jeffrey Hausman, project manager for corporate and education architecture. "Even people who are not familiar with it pick it up and embrace it right away."

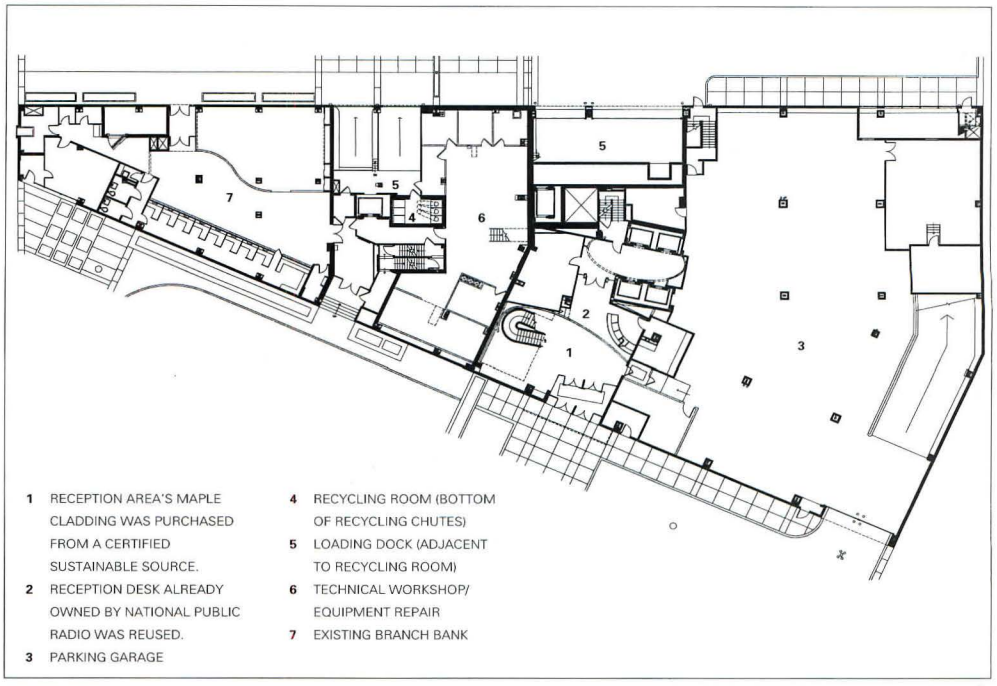
During the past four years, SH&G has compiled environmental information in a materials database of more than 400 items by querying manufacturers about a product's toxicity, life expectancy, production process, impact on indoor air quality, and other environmental attributes. Creating the database, however, has required more effort and money than is practical, Hausman maintains. Accurately assessing building products is especially difficult because of the regional nature of the information: A product that is manufactured nearby may be appropriate for a local project, but perhaps not for an out-of-state building. As a result, the architecture firm will probably rely largely on commercially available green databases in the future.

SH&G stresses the value of applying its environmental model early: To provide maximum impact, sustainability must be considered from the outset of design, along with a project's cost, program, and quality level. An important aspect of the SH&G strategy includes environmental benchmarking, or assessing and comparing a proposed design against successful sustainable design examples. Benchmark buildings scrutinized by SH&G include NMB bank in Amsterdam, National Audubon Society headquarters in New York City, West Bend headquarters in Wisconsin, and the Rocky Mountain Institute in Colorado. A typical benchmark comparison examines how site runoff was handled, the type of glazing specified, energy-conservation measures, and the type of mechanical system installed.

For example, SH&G specified a terrazzo floor in the south lobby of the new Michigan Technological University to absorb and reradiate solar energy, much like the thermal-storage system installed at the benchmark Rocky Mountain Institute. Site rainwater will be collected to irrigate low-maintenance plants that will cover the new laboratory building's roof; a site rainwater collection system was similarly specified at the benchmark NMB bank building.

FACING PAGE, TOP LEFT: Wooded site of Michigan Technological University's new Environmental Sciences and Engineering Building in Houghton slopes toward Portage Lake, a branch of Lake Superior.
FACING PAGE, DRAWING: Early in design, SH&G analyzed site's environmental characteristics, including prevailing winds, solar orientation, topography, and plant cover. Courtyard was inserted later.
FACING PAGE, TOP RIGHT: Stair and lounge protrude beyond brick-faced north side. Curved air intake structure on roof takes advantage of prevailing winds.
ABOVE: SH&G applies its environmental model at the inception of design, along with cost, quality, and program models, to develop an ecosensitive solution.

MAXWELL MACKENZIE PHOTOS



FIRST FLOOR PLAN

Burt Hill Kosar Rittelmann Associates

Creating healthy buildings has been a priority at Burt Hill Kosar Rittelmann Associates for 20 years. The firm's focus now includes indoor air and lighting quality, thermal and acoustic comfort, and environmentally responsible materials. "The emphasis has shifted from energy efficiency to create a better balance," explains Principal Harry Gordon, current chairman of the AIA's Professional Interest Area on the Environment.

In the late 1980s, Burt Hill developed a strategic plan to broaden its ecosensitive knowledge and resources and began developing a library and database of environmentally advantageous building materials.

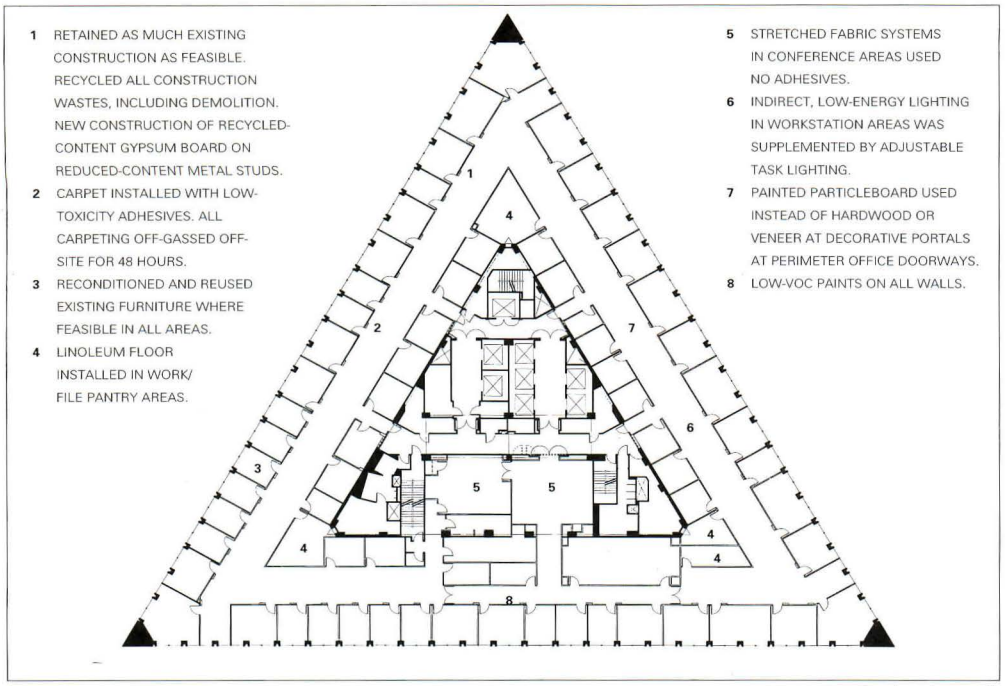
Almost all of Burt Hill's projects now contain a sizable environmental component, although few clients arrive with an environmental agenda in hand. The architect addresses sustainability issues at the outset of each project, in programming, conceptual design, and design development to increase sustainability without increasing cost.

While energy efficiency was the priority during design of a new headquarters for the International Institute of Energy Conservation in Washington, D.C., Burt Hill specified materials with high recycled content and improved indoor air quality by selecting finishes that did not emit volatile organic compounds (VOCs). "If we design a better building within budget, and the people who work there are more comfortable and more productive, it's hard for clients not to respond well," explains Gordon.

Another project that naturally lent itself to a sustainable solution was the renovation of a former bank building in Washington, D.C., as a new headquarters for National Public Radio (NPR). The client wanted both state-of-the-art recording studios and high-quality general office spaces on a shoestring budget. "We wanted to create a superior facility with an emphasis on environmental issues," explains Gordon.

To save energy and improve lighting quality, the architect replaced existing illumination with fluorescent fixtures wired so that occupants can adjust lighting levels as needed. Daylighting was increased in the interior by opening offices along the building perimeter. Burt Hill specified low-VOC-emitting paint, carpet, and adhesives to preserve optimal indoor air quality and staged the installation of finishes and furniture to permit off-gassing and adequate ventilation.

TOP LEFT: Maple millwork at doorway and behind company logo in reception area of National Public Radio headquarters in Washington, D.C., was purchased from a certified sustainable source. **ABOVE LEFT:** In a studio, maple strip flooring was specified in a grade that creates less waste. Energy-efficient halogen track lighting saves electricity. **PLAN:** Existing elevator shafts were transformed into recycling chutes for aluminum, glass, and paper. These chutes, located adjacent to the copy room and employee kitchen, empty into a recycling room at ground level with direct access to a loading dock.



42ND FLOOR PLAN

ROLAND BISHOP PHOTOS

Gensler and Associates

Just a few years ago, clients measured the value they received from Gensler and Associates in terms of the cost and durability of their designs. But the focus has shifted, says John Carter, an associate and chairman of Gensler's Design Ecology Committee, established in 1991 to study and promote sustainable architecture. While still demanding functional, high-quality buildings, many owners want projects to serve their own needs and those of the environment, taking care not to squander natural resources.

One such client is Home Box Office (HBO), the cable television giant, which hired Gensler to redesign and expand its offices on two floors atop an existing Los Angeles high-rise. Carter says the project seemed an ideal opportunity to apply environmental principles, since Gensler's internal environmental committee had already begun collecting data on sustainable materials and was sponsoring conference calls among some of the firm's 17 offices every six weeks to share information. "HBO was very receptive and had its own specific ideas about creating a healthy environment," recalls Carter.

For HBO, Gensler drew up a plan for the expanded office space that minimized waste by reusing 25 percent of existing walls. All construction waste was recycled: Steel, wood, copper wire, and gypsum board were sorted and collected in containers on the site. In keeping with usual practice, Gensler also called for about 10 percent of the existing furniture to be reupholstered and reused.

Gensler has created and distributed an *Ecology and Design Sourcebook* to its architects and interior designers that includes checklists, questions for clients, and case histories and has incorporated green product information into its master specifications. Most of Gensler's current designs have an environmental aspect, but President Arthur Gensler is adamant in his refusal to be labeled as an environmental zealot. "Common sense is the rule I go by: commonsense use of site, materials, and energy," Gensler explains. "My clients recognize that we all live on one planet and that we have to keep moving forward."

Other environmentally conscious clients include Sony Pictures Entertainment, which hired Gensler four years ago to renovate several buildings at its L.A. headquarters and studio lot. The architect responded by incorporating nontoxic interior finishes, motion-sensitive lighting controls, and operable windows. The Gap is another repeat client that is interested in sustainable design. Working with William McDonough Architects, Gensler and Associates is now completing the design of an office building with a sod roof for the retailer in San Bruno, California.

TOP RIGHT: Main reception area was repainted with low-VOC-emitting paints. Desk and furniture are original; chairs were recycled and recovered.
ABOVE RIGHT: Typical open office area contains fabric and particleboard workstations. Light fixtures atop file cabinets point at ceiling to create indirect light.

Databases of sustainable materials help architects specify building products that respect the environment.

You've worried about global warming, read about the owl versus tree debate in the Northwest, sympathized with a colleague's headaches after she selected a new carpet for an airtight office building and is now receiving complaints from tenants. You want to do the right thing—client be willing—but have little time or money to research hundreds of potentially ecofriendly building products.

Specifying "green" materials is a complex task that can challenge even the most ardent environmentalists among architects. In fact, there is no official word on what is or is not green, as international scientists have yet to reach a consensus on the technique for determining greenness. The scope and weighing of data collected through life-cycle assessment—the review of a product from resource extraction to disposal—is still being hotly debated among manufacturers, environmentalists, and others worldwide. Once the details of the procedure are agreed upon, a significant amount of research will be required to amass and analyze the environmental ramifications of building products.

It is this breadth and depth of knowledge of building materials that AIA's Committee on The Environment (COTE) sought when it first published

the AIA *Environmental Resource Guide* (see ARCHITECTURE, January 1992, pages 99-101) in 1992.

Impatient with the snail's pace of this enormous and ultimately necessary undertaking, many architects have looked for other means of assessing the greenness of products. Increasingly, they have turned to a number of well-respected guides emerging in different regions over the past few years, including the *Guide to Resource-Efficient Building Elements* from the Center for Resourceful Building Technology in Missoula, Montana; *Environmental by Design* by Kim Leclaire and David Rousseau in Vancouver; and *The Sourcebook for Sustainable Design* by Architects for Social Responsibility, a committee of the Boston Society of Architects.

More recently, several computerized databases have emerged to assist the well-intended practitioner in quickly scoping out the range of green possibilities. While none professes to be the definitive source, each can help make an architect's next project a little more ecofriendly than the last.

All-purpose resources

A few databases, such as the Sustainable Design and Construction Database from the National Park Service (NPS), try to tackle the whole gamut of environmental issues, rating products over their entire life cycle and across a range of environmental criteria. First released on disk in 1994, the NPS database profiles about 800 products.

Architects can search this software by CSI division, by the state in which manufacturing plants are located, or by a combination of the two. An individual entry contains the CSI section; product type, brand name, and description; basic manufacturer information (name, address, and phone numbers), plus plant location and technical contact if applicable; date information was last verified; and 14 boxes representing the environmental criteria by which NPS rates a material. The criteria range from whether the material is sustainably obtained to its toxicity during installation, use, and maintenance. Graphic icons are placed in their respective boxes if the product in question scores favorably according to that criterion.

The first version is available for Windows only on floppy disk for $7. A second version, scheduled for release in October, will have more extensive searching capabilities; contain more products but take up significantly less hard drive space; establish more quantifiable icon definitions; and include sustainable standards and ratings that the product has met. The NPS hopes to have the new release available on the Internet as well. For more information, fax NPS' Denver Service Center at (303) 969-2930.

The Resources for Environmental Design Index (REDI Guide) from Iris Communications is another all-purpose electronic guide, released in February. It is simple to use, with on-screen buttons that help to navigate logically through the listings. Specifiers can search through more than 1,000 building products by CSI division, manufacturer name, product name, keywords, geographical region of distribution, and four environmental categories (natural, low-toxicity, recycled content, sustainably harvested woods). The next screen lists all records that meet the search criteria.

Clicking an entry on this list shows a detailed description of the product, including its applications and contents; manufacturer information; area of distribution, and, in some cases, price; codes and certifications met by the product; and the environmental categories in which it performs well.

The database is available on floppy disk for both Macintosh and Windows for $49. It is updated at least once a year. For more information, contact Eugene, Oregon-based Iris Communications at (503) 484-9353.

Material alternatives

Since last fall, Seattle architects have been dropping by the new Sustainable Building Resource Center to access the Sustainable Building Specifier database, developed by Environmental Works Community Design Center and funded in large part by Washington state's Department of Ecology. The database, run on Windows, allows an architect to specify a product type by entering a CSI number or by clicking onto the appropriate component of a rendered house.

The computer responds with a listing of material alternatives that will satisfy the application in question and rates these generic products according to nine criteria, including embodied energy, recycled content, environmental impact, and indoor air quality. The designer indicates two or three generic materials to investigate further, and at a click of a screen button, the selected materials are evaluated in more detail.

Only after the designer selects a family of materials that satisfies the project's environmental goals is the practitioner directed to proprietary information on particular products in that family. This product entry includes the product name, description, basic manufacturer information, date of last update, and environmental criteria rating. A final report, printed out at the end of a session, includes all the products of interest for a particular project.

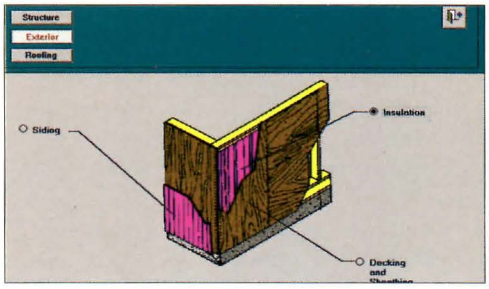
Environmental Works is still developing its system and making plans for wider distribution. For more information, contact Environmental Works at (206) 329-8300.

Single-topic databases

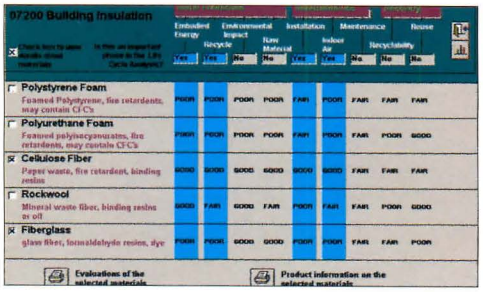
Architects can now choose from several databases focusing on a narrower range of environmental issues. The Harris Directory, for example, lists only products with recycled content. The first version was released in August 1994, with updates every six months. It currently contains about 700 companies and more than 1,800 products. A product entry includes a description; amount and type of recycled content; any other incidental environmental benefit the product may offer; and standards organizations whose tests it has met.

Sustainable Building Specifier

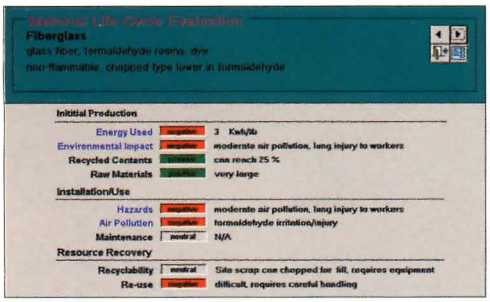
SEARCH MENU: Information retrieved by assembly.



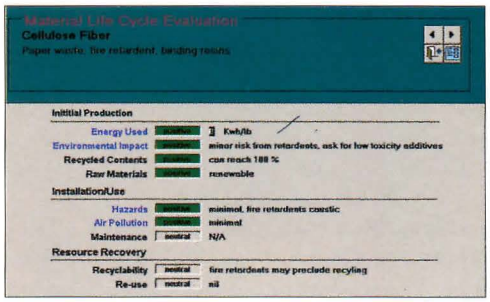
ASSEMBLY: Architect chooses building component.



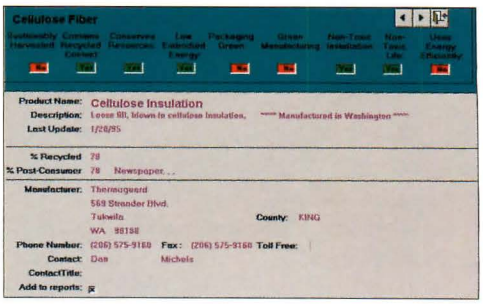
ALTERNATIVES: Blue bands highlight primary criteria.



FIBERGLASS: Rating includes sustainable characteristics.

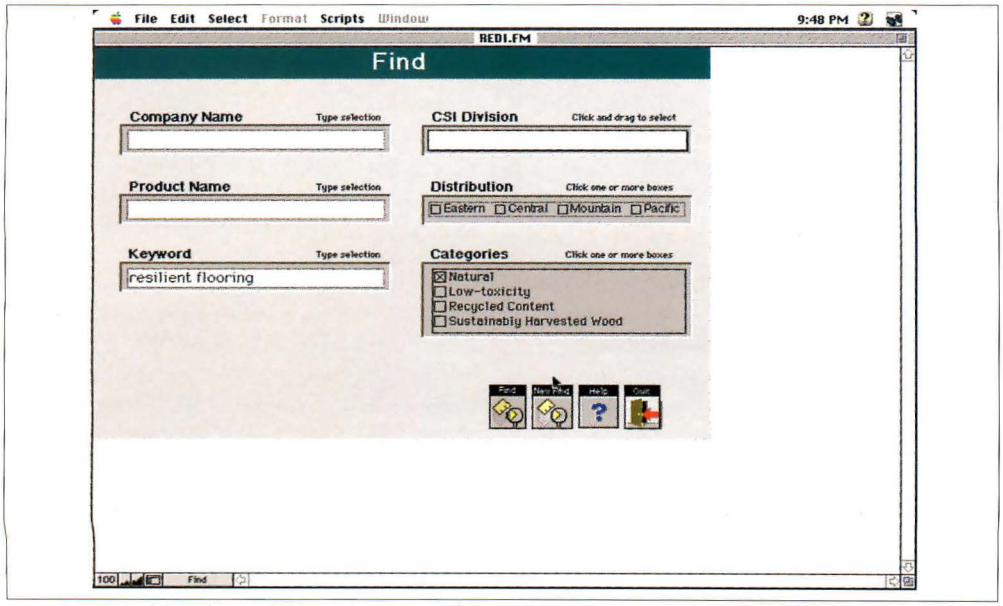


CELLULOSE: Green indicates environmental strengths.

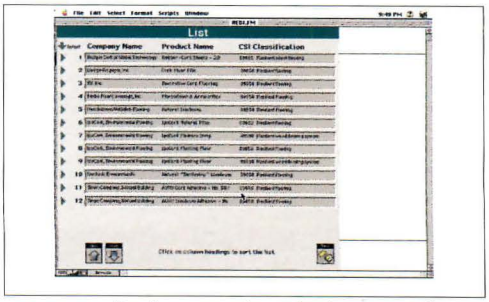


PROPRIETARY ENTRY: Product-specific rating is at top.

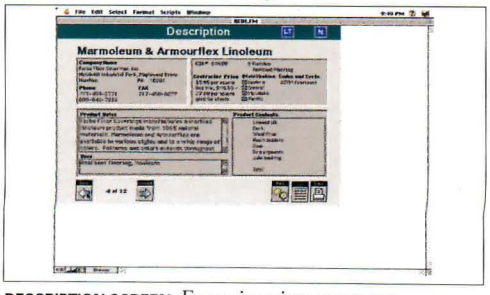
Resources for Environmental Design Index (REDI Guide)



FIND SCREEN: Architect begins by inserting criteria for search.



LIST SCREEN: Products meeting criteria are noted.



DESCRIPTION SCREEN: Entry itemizes contents.

This database runs on both Macintosh and Windows in several different formats, with varying degrees of flexibility. For example, architects with their own copy of FileMaker Pro for Macintosh can get a version of The Harris Directory that functions as a fully working database. Practitioners can search according to various categories; update phone numbers and insert additional notes on an existing record; add new products to the database; reformat the entries; and print product information for a particular project.

The Harris Directory: Recycled Content Building Materials is available on floppy disk from Stafford•Harris at (206) 682-4042. The annual fee of $69 includes a six-month update. It can also be accessed on-line through Energy Design Update (EDU). For more information, including rates, about the on-line service, call EDU at (212) 662-7428.

Building health

The Indoor Air Quality Product Directory from E-House, an environmental building consulting firm located in Cheltenham, Pennsylvania, concentrates on materials and systems that affect the health of building occupants. Released in May, the directory features thousands of brand-name products, ranging from paints and flooring to air filters, from more than 450 companies.

An architect can search by product type; CSI division or number; brand name; keyword; state location of company headquarters; or notes, such as project name, previously entered by an architect. A search yields a listing of companies, CSI numbers, and product types that fit the initial criteria. From this list, a click on an entry takes the user to a specific record that includes a detailed description of the product in question, a simple rating of the product for other environmental considerations (RR if the manufacturer's literature claims any recycled content and EE if the product has an energy-efficiency component); other products by the same company; and basic manufacturer information. The individual record can be printed or marked for later review.

E-House offers a reader service card option in which the architect can print out a page with his or her name, address, and codes for as many as 25 marked records per year. Once this is mailed to E-House, the company will forward the appropriate information to the respective manufacturers so that additional product information will be sent to the practitioner.

Floppy disks are available for either Macintosh or Windows for $50. E-House will also sell a paper version. Yearly updates are planned, with previously registered subscribers receiving a discount. E-House also intends to provide limited access to the guide as well as information on energy-efficient and resource-responsible building products on Internet's World Wide Web by August 1. For more information, contact E-House at (215) 663-1611.

Sustainable forestry

Tree Talk is a Vermont-based nonprofit company that focuses on sustainable forestry. Its Woods of the World database was first released in June 1994. An improved version, Woods of the World Pro 2.0, is scheduled to come out this summer along with a smaller and much less expensive edition known as WoodMatch 2.0. The full version, which will contain information on about 950 species and wood-based composite products, is geared to forest product companies and researchers; the scaled-down model, which will contain about 350 species and composites, is directed to architecture firms, small- to medium-size woodworkers, and students.

With beautiful graphics, including video and color images of various wood grains, the Woods of the World database provides an exhaustive amount of information on lumber. The software helps architects determine whether a wood is endangered, and if so, what species of similar characteristics may be available as an alternative.

According to Richard Miller, president of Tree Talk, the new versions will include an improved, window-based interface that will help practitioners navigate through its extensive database. They will be available on CD-ROM and, without video, on floppy disk for both Windows and Macintosh. Depending on format, the Pro edition will sell for as little as $249; WoodMatch will sell for $39. An updated version is released every six months. For more information, call Tree Talk in Burlington, Vermont: (802) 863-6789.

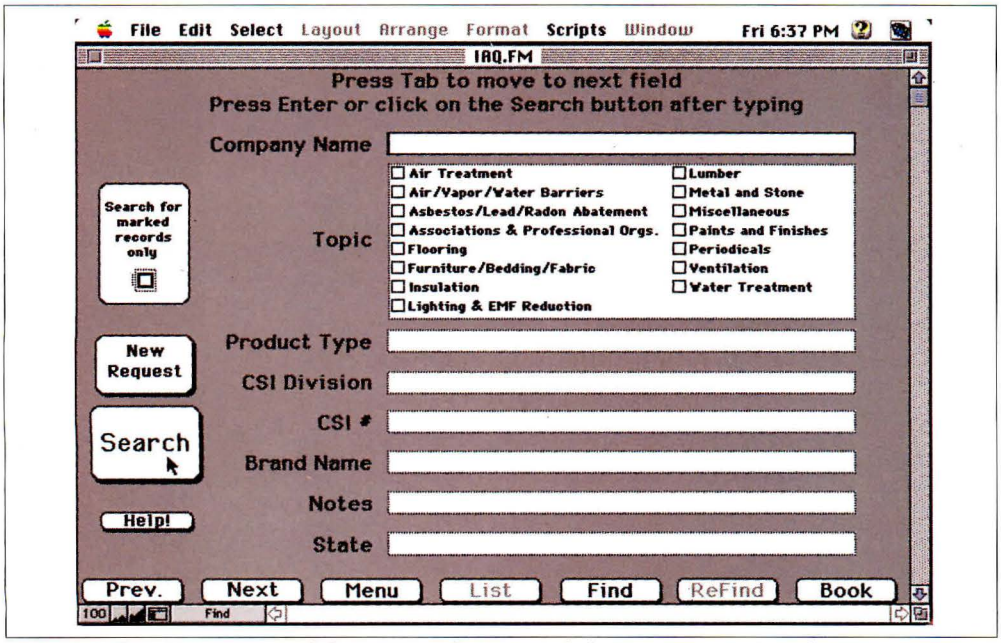
Manufacturer bias

These electronic catalogs offer guidance to concerned architects, once overwhelmed by a miasma of environmental criteria and products of unknown environmental effects. But practitioners—relieved at the relative ease in applying these tools—should not lose sight of their limitations.

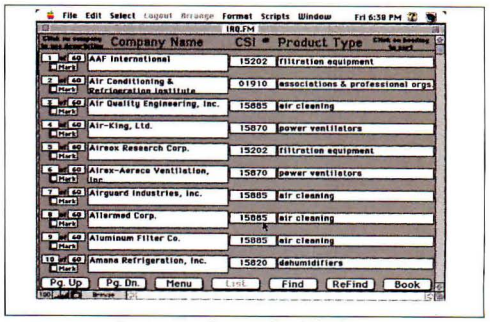
With few exceptions, for example, data come from manufacturers' literature rather than being screened and evaluated by an objective panel of material experts. In addition, to make an informed decision, an architect must be aware of how each database accounts for environmental ambiguities and conflicts inherent in streamlining this complex body of information. And in a market that changes very quickly and exhibits regional differences, national databases that cannot be updated and expanded by architects can feel restrictive and sometimes undermine environmental goals. A few firms, such as Hellmuth, Obata & Kassabaum, have responded to this dilemma by developing their own in-house systems.

"Databases are great and will evolve," maintains Bruce Millard of Architects Studio in Sandpoint, Idaho. "But they should work together. How can I take my personal research and put it into their universal database?" Answering that question—and developing a comprehensive, interactive database—remains the next frontier for green software.—*Nancy B. Solomon*

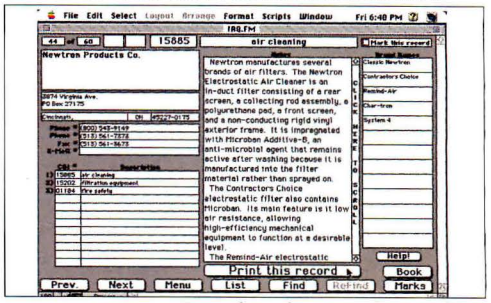
Indoor Air Quality Product Directory



FIND SCREEN: Practitioner can search by a variety of criteria, including company, topic, and user notes.

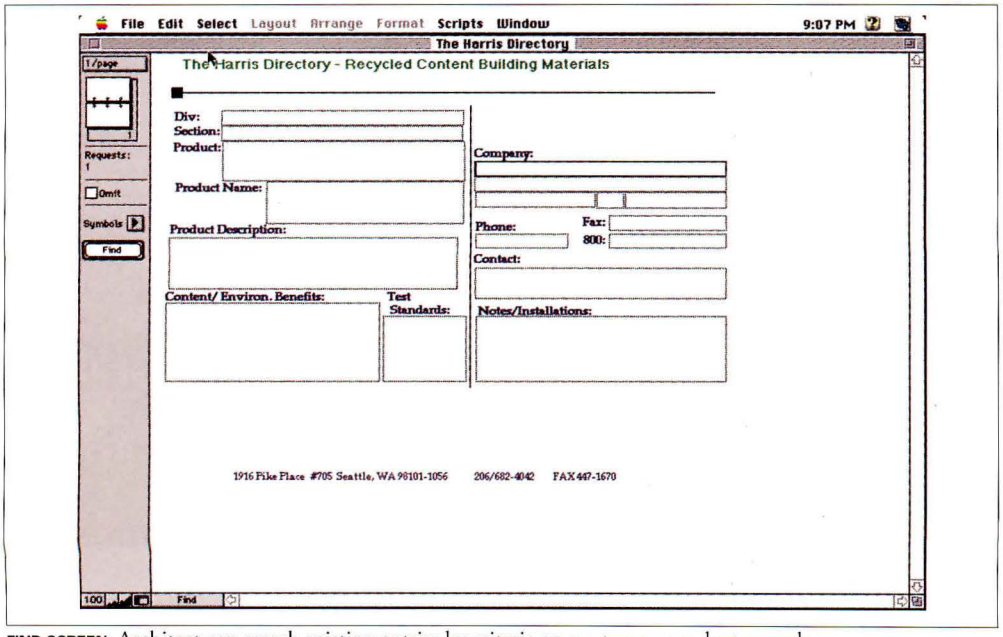


LIST SCREEN: Items can be marked for later review.

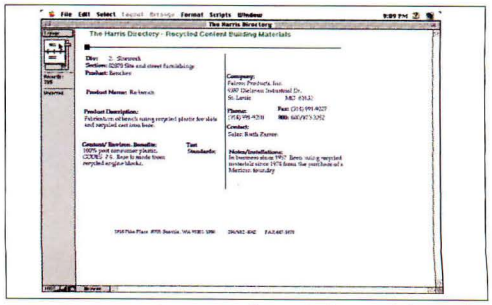


DESCRIPTION SCREEN: Several products are discussed.

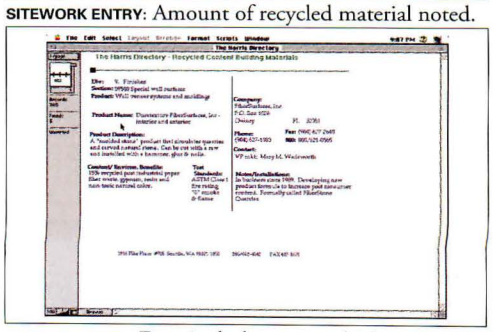
The Harris Directory: Recycled Content Building Materials



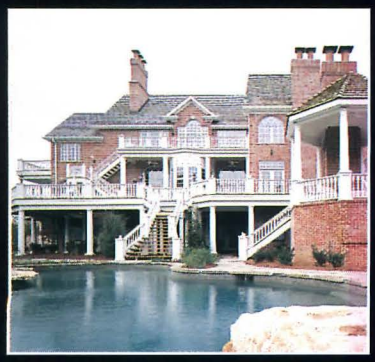
FIND SCREEN: Architect can search existing entries by criteria or create new product records.

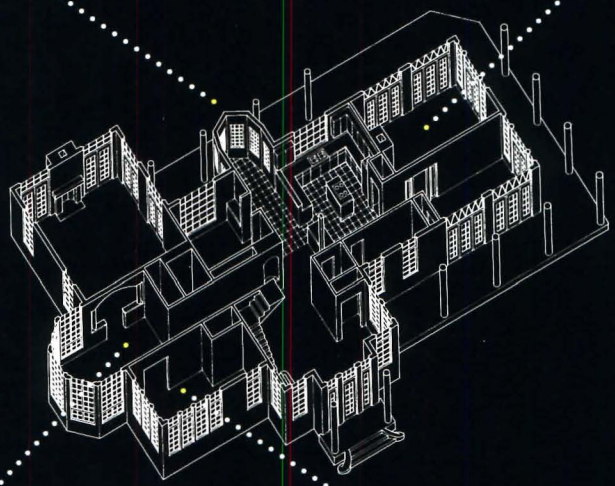


SITEWORK ENTRY: Amount of recycled material noted.



FINISHES ENTRY: Data include test standards met.





Desert Conservation

Energy-efficient strategies are showcased in a Phoenix house.

More than any other American city, Phoenix owes its development to a single technological innovation: air-conditioning. Without the ability to mitigate summer heat, 110 degrees and beyond, it is unlikely that even the most savvy developer could have sold this desert to the 2 million people who have moved here since 1945.

Now, one of the utility companies that enabled the man-made microclimates to march across the "Valley of the Sun" has built a 2,640-square-foot exhibition house that, although air-conditioned, is intended to encourage energy efficiency. The Environmental Showcase Home is the brainchild of Arizona Public Service Company (APS) President Mark DeMichele. Built in a residential subdivision in a growing part of Phoenix, the house is a demonstration project aimed at both the public and developers.

Phoenix-based Jones Studio won a two-stage competition to design the house with a solution that married a conventional plan with a dramatic butterfly-wing roof and sunken pool and garden. APS wanted the building to appeal to a broad audience, however, and rejected Jones' initial proposal as too radical. Jones' final scheme maintains the one-story ranch-style floor plan of the original design, but substitutes a more conservative roof profile and landscape design.

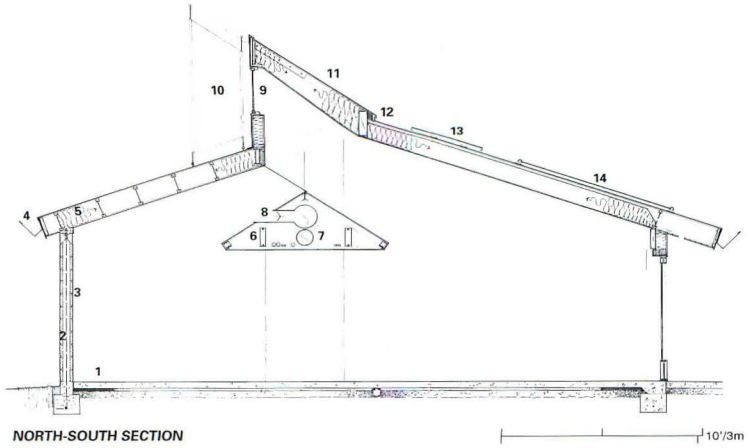
Design Principal Edward Jones is one of the Southwest region's more innovative and thoughtful architects, drawing particular inspiration from both the organic sensibilities of Frank Lloyd Wright and the Modernist heritage of the Case Study houses. His firm's showcase house embraces mass-production materials, exposed construction and mechanical systems, and easy integration of interior and exterior spaces.

Energy management technology anchors the design. For example, fabric panels march in 8-foot intervals along the clerestory windows on the north facade, absorbing and transmitting sunlight, but reflecting heat. Rainwater is harvested from the rooftops and reused. Site design strategies maintain indigenous plant materials. Both passive and active energy strategies are smoothly integrated into the character of the project. APS and Jones Studio (with project architect Tom Hahn and an extensive list of technical advisors) designed the house as a "green" building, with materials selected for their long-term energy-use implications, as well as their short-term efficiencies.

Despite its pedagogical responsibilities, the comfortable house eschews didactic excursions into technological arcana. Photovoltaic power cells and recycled newspaper insulation are tempered by exhibits of readily available, efficient kitchen appliances and natural fiber furnishings. The technology in the house is accessible, though not necessarily financially viable: Due in part to esoteric equipment and the display of some energy and mechanical systems for demonstration purposes, construction costs were three times the local average.—*Reed Kroloff*

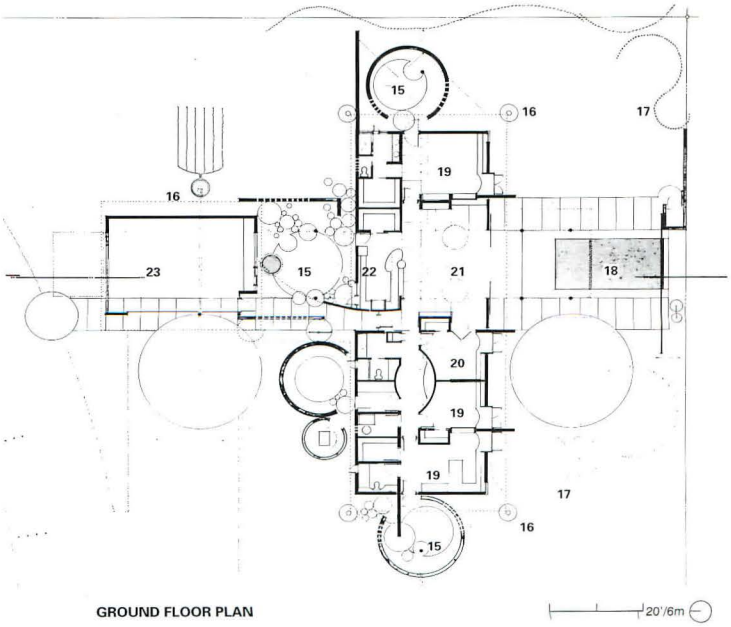
BELOW RIGHT: West end of demonstration house by Jones Studio terminates in a garden enclosed by curved block.

1 POLISHED CONCRETE FLOOR W/ RECYCLED FLY ASH
2 NON-CFC-BLOWN POLYURETHANE INSULATION
3 SANDBLASTED, INSULATED CMU WALL W/ FLY ASH
4 RECYCLED OVERSIZED GUTTERS W/ CISTERNS
5 RECYCLED PAPER INSULATION
6 RECYCLED METAL FRAMING
7 RECYCLED METAL SUPPLY DUCTS W/ TAPED JOINTS
8 SUPPLY AIR DIFFUSER/ BUTTERFLY DAMPER
9 HIGHLY INSULATED CLERESTORY WINDOW
10 FABRIC SHADE/DAYLIGHT REFLECTOR
11 RECYCLED METAL ROOFING
12 VENT FOR ROOF
13 PHOTOVOLTAIC PANEL
14 HEATING COLLECTOR ARRAY
15 PATIO
16 RAINWATER CISTERN
17 RECYCLED METAL FENCE
18 POOL
19 BEDROOM
20 STUDY
21 LIVING/DINING ROOM
22 KITCHEN
23 GARAGE



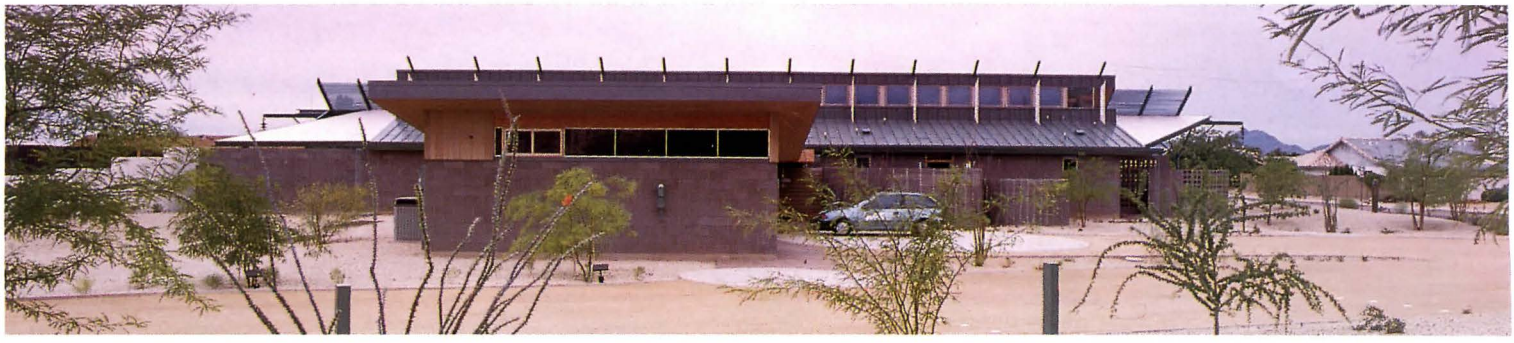
NORTH-SOUTH SECTION

10'/3m



GROUND FLOOR PLAN

20'/6m



TOP: North elevation shows clerestory windows, solar baffles, and patio shade screens.
ABOVE: Garage and entry court project from north.
SECTION: Insulation dams and ventilators convect heat out of the R-38 insulated roof before it reaches recycled cellulose ceiling insulation. North-facing clerestory windows and innovative reflectors direct daylight into main living spaces.
PLAN: Long east-west axis minimizes thermal gain by orienting glazing to north and south exposures.

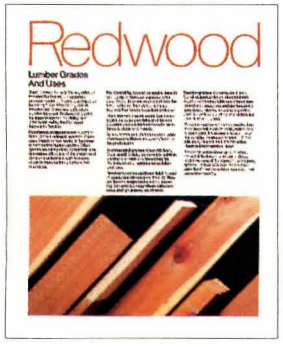
ENVIRONMENTAL SHOWCASE HOME
PHOENIX, ARIZONA

ARCHITECT: Jones Studio, Phoenix—Edward M. Jones (design principal); Neal E. Jones (project principal); Tom J. Hahn, Jr. (project architect)
LANDSCAPE ARCHITECT: e group
ENGINEERS: Slaysman Engineering (structural); McNulty & Associates (mechanical); Grommes-Meade Engineering (electrical); D.N.A. Engineering (civil)
CONSULTANTS: Lighting Dynamics (lighting); Xeris Group (irrigation); Littler Associates (specifications)
GENERAL CONTRACTOR: Homes and Son Contractors
COST: $1.2 million (including research development costs)
PHOTOGRAPHER: Scott Zimmerman

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.

California Redwood Association

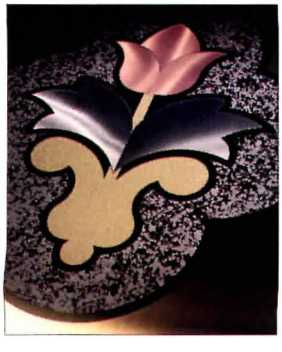


REDWOOD LUMBER GRADES AND USES—NEWLY REVISED GUIDE TO SPECIFYING REDWOOD. Free four-page color booklet is a visual exploration of the range of grades, grains, and textures available to those specifying redwood. Photographs of each grade make it easy for specifiers and consumers to visualize finished appearance. The booklet also offers a useful guide to specialized grades and redwood grademarks. CALIFORNIA REDWOOD ASSOCIATION, 405 Enfrente Drive, Novato, CA 94949, 415-382-0662.
Circle 22.

Xypex Chemical Corporation

Concrete waterproofing by crystalization. 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 Corporation, 604-273-5265.
Circle 26.

Surface Design + Technology



CUSTOM METAL GRAPHICS—Surface Design + Technology produces exquisitely decorated architectural sheet metal, incorporating such innovative finishes as multi-directional, radial and non-directional satin finishes, with copper, nickel and gold electroplating. **Specify your own design,** logo, pattern or texture from our 24 Standard ALPHA COLLECTION Designs. Call (800) 537-1127, Fax: (305) 696-4064. Servicing specifiers worldwide.
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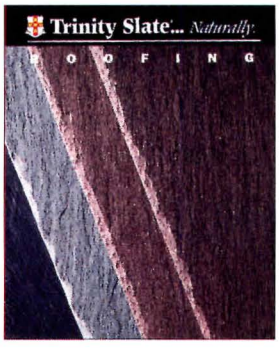
Ar*kid*tecture Funscapes is the newest addition to **Interiors Systems' Signature Series.** The Ar*kid*tecture collection uses a unique computerized cutting system to produce standard and custom acoustical ceiling tile designs for schools, children's clinics, hospitals, daycare centers, retail stores. Use single or multiple panels with any design, logo, or color. Call 1-800-782-0070.
Circle 24.

Newfoundland Slate Inc.



Trinity Slate . . . *Naturally.* Newfoundland Slate Inc., North America's largest slate producer provides the most durable natural roofing material. **Trinity Slate**® is available in 6 unique unfading colors and delivers a service life in excess of 100 years. For a complete brochure, installation guidelines, samples and inquiries regarding roof design and slate specification call **TOLL FREE 1-800-975-2835.** Thank you. Sweets GBR - 04475/ NEW Buyline 7685.
Circle 28.

Transwall Corporation

Reasons Stacking System For Improved *Office Spaces*—REASONS by Transwall, is a new stacking system designed to provide improved office space facilities with maximum flexibility and a minimum of parts inventory. It offers quick off-module changes for work surfaces and overhead storage, which can easily be rearranged on horizontal rails without structural panel changes. Total wire management is provided in the 4" thick panels, as well as an unlimited choice of aesthetic color selections.
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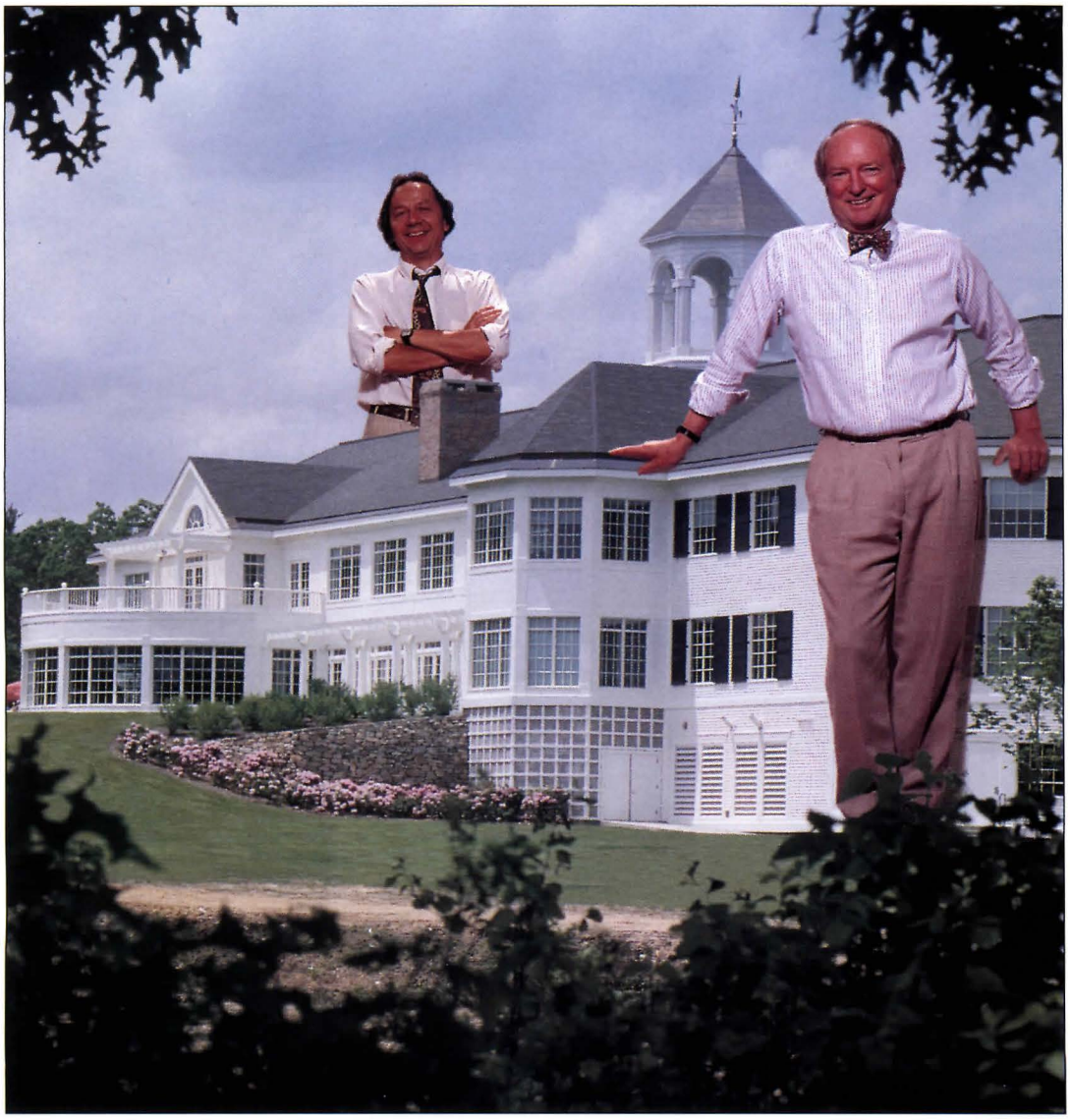

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Circle 222 on information card

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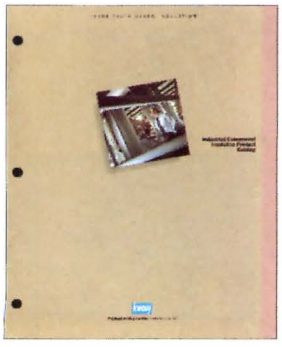
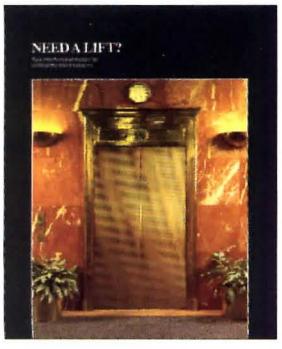


Free catalog of industrial and commercial insulation. Premium quality Knauf industrial and commercial insulation products offer excellent performance and handling. Knauf Elevated Temperature products offer performance at operating temperatures of up to 1000° F in a variety of forms. Our full-color catalog is a handy reference tool with descriptions, applications, features, benefits, technical data and specifications compliance. Products to depend on. People to count on. Knauf Fiber Glass.
Circle 34.

Rigidized® Metals Corp.



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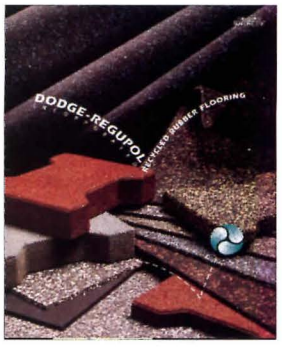
Circle 38.

Dodge Regupol



Dodge Regupol's new 8 page brochure describes and illustrates in detail the attributes of its innovative recycled rubber flooring products. Made from 100% premium quality recycled rubber, Everlast Tile™, Ever-Roll™, and Regupol™ Pavers & Tiles are suited for an infinite variety of commercial, industrial and sports applications and offer natural resiliency, unmatched durability and environmental acceptability.
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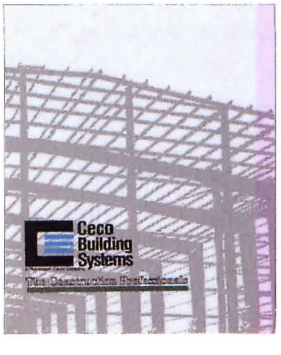
Ceco Building Systems



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.
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Knauf high density fiber glass batt insulation for sidewall, floor, ceiling and cathedral applications provides greater R-value per inch than standard batt insulation. It helps builders meet or exceed local and Model Energy Codes without altering traditional framing requirements.
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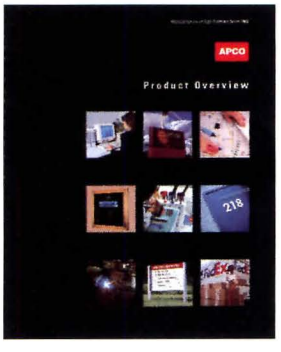
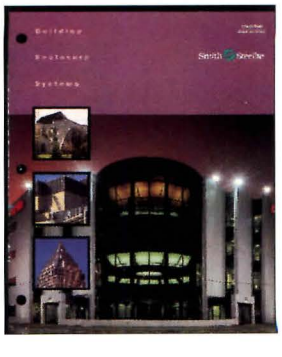
APCO Graphics, Inc.



As a leader in the sign industry for over 28 years, APCO offers the expertise required to meet a broad range of wayfinding and identification needs. The award-winning product line features interior and exterior sign systems, signmaking software, displays, directories, and ADA compliant signs. Today, as always, APCO delivers the quality sign products and exceptional service that have become its trademarks throughout the years. APCO, 388 Grant St. SE, Atlanta, GA 30312; (404) 688-9000.
Circle 44.

Smith Steelite



36-page catalog describes Smith Steelite's metal enclosure systems for non-residential insulated and non-insulated walls, roofs, composite walls, profiled panels, curved panels, structural standing seam roof, windows, vents and louvers. Also systems for explosion release, sound absorption, firewalls, asbestos panel replacement. Includes product features, applications photos, specifications, color selector guide, protective coatings specifications. Call 1-800-759-7474.
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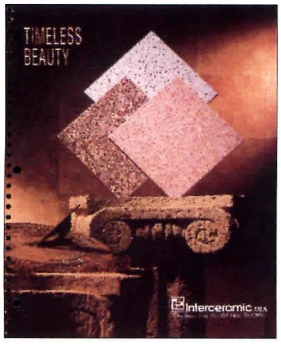
Interceramic, USA



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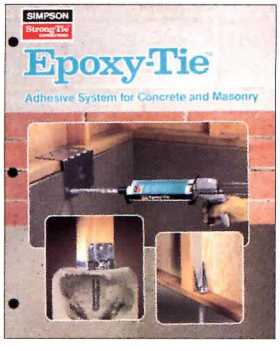
Circle 54.

Simpson Strong-Tie® Company, Inc.



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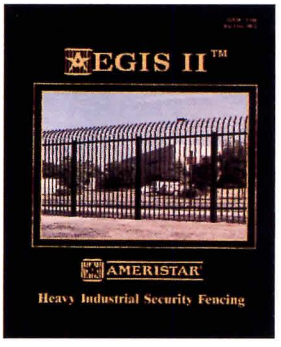
A/D Fire Protection Systems Inc.

A/D Firefilm® Decorative, Thin-Film Intumescent Fireproofing. A/D Firefilm® permits the designer to use the appearance of exposed steel with the steel fully protected from fire. Rated up to 2 hours for beams and columns. It is applied as a thin-film coating 0.016 to 0.120 in. thick. During a fire, A/D Firefilm® expands to form a meringue-like layer up to 4 in. thick which insulates the steel from fire. The topcoat is available in most colors in gloss and semi-gloss finishes. A/D Fire Protection Systems, Inc, (800) 263-4087 or (416) 292-2361.
Circle 62.

Openings

TOTAL DOOR®: The OPENINGS® Solution—TOTAL DOOR® is a fire rated door assembly that includes all hardware. Pairs do not require coordinators, vertical rods, astragals, flush bolts or floor strikes. Will retrofit to any frame. Meets all codes and ADA. Wood and metal faces available to 3 hours. Lifetime limited warranty on locks and panics.
Circle 52.

EGIS™

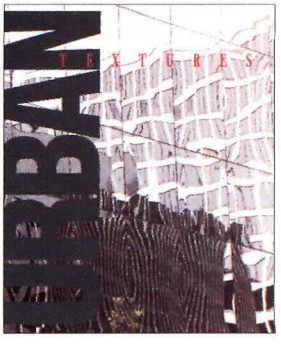


Aegis ornamental fence systems feature strong Forerunner™ rails, internal retaining rods, & specially designed panel brackets. Aegis II industrial ornamental fence offers the strongest security ornamental fence available in today's market. Aegis holds the distinction of having its fence systems specified by more architects & builders than any other in the market. Panel design is a component system for easy shipping. Call (800) 321-8724. P.O. Box 581000, Tulsa, OK 74158-1000. Fax# (918) 835-0899.
Circle 56.

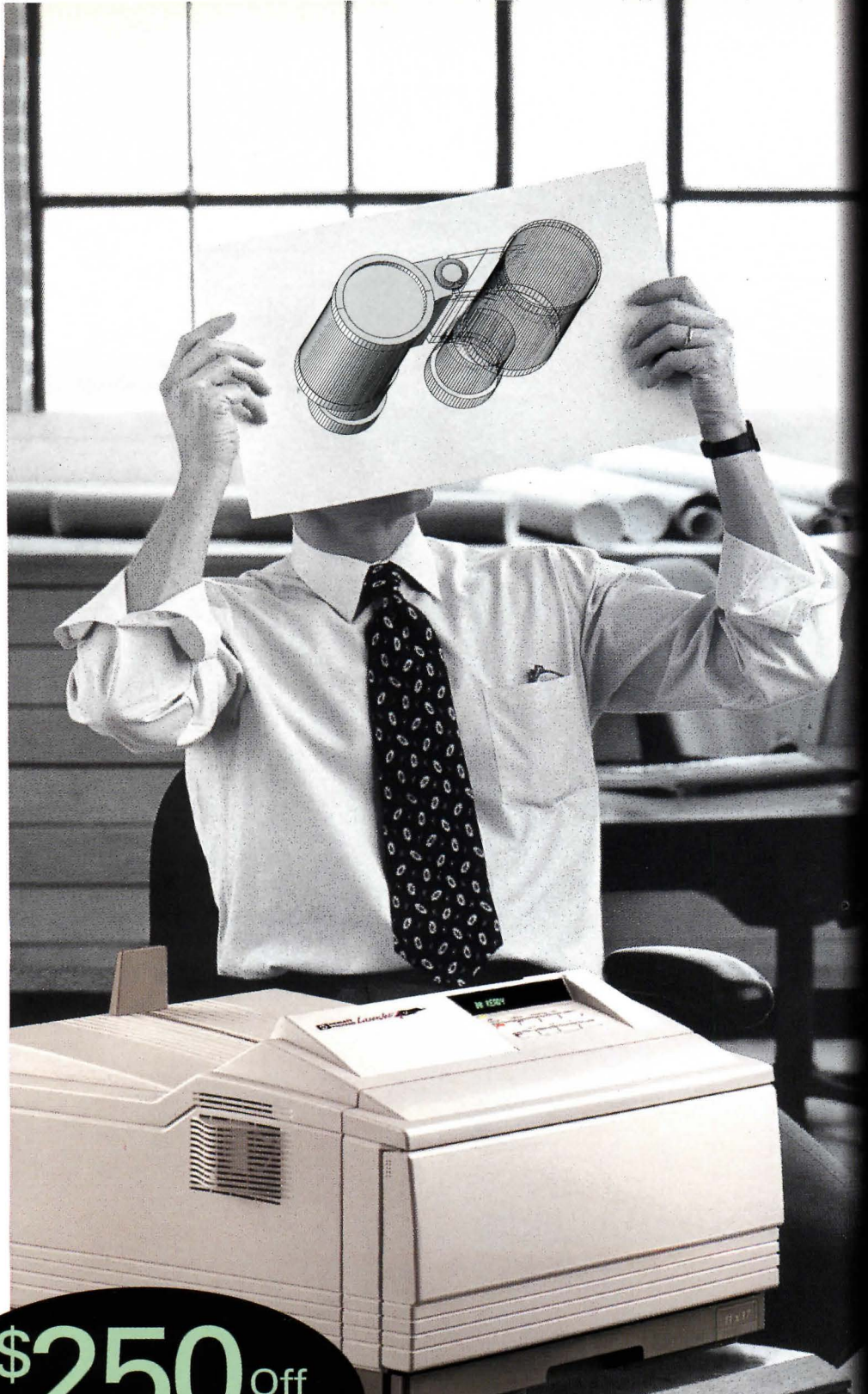
Virtus Corporation

Finally, A Powerful, Easy 3-D World Builder. Create and roam through your own virtual worlds with Virtus WalkThrough Pro 3-D modeling and design software. Build homes, offices, theatre sets, and trade show booths and apply perspective correct texture maps. With Virtus WalkThrough Pro you will build, decorate and walk through three dimensional virtual models in minutes. Virtus Corporation, 1-800-847-8871, Fax 919-460-4530.
Circle 60.

Mohawk Commercial Carpet



Urban Textures Brochure—A collection of coordinating patterns and solids from Mohawk Commercial Carpet and AlliedSignal Fibers. A wide variety of commercial carpets—from solid color cut piles to graphics and wovens. The brochure features photographs of the carpets paired with the Urban Textures which inspired them. MOHAWK COMMERCIAL CARPET, 800-618-1234.
Circle 64.



Size it up.

B-size output for under $2,000* with the HP LaserJet 4V.

Whether you're doing a check proof or final output, you need a fast, accurate way to do B-size printing. The LaserJet 4V not only delivers work at 11˝ x 17˝, but gives designers the high degree of accuracy they need. In addition to 600 x 600-dpi print quality, HP ups the accuracy with Resolution Enhancement technology, microfine toner and 120 levels of gray. And because deadlines are meant to be met, the LaserJet 4V handles a variety of paper sizes with a 33-MHz RISC-based processor and a 16-ppm engine. B-size prints at 9 ppm. Of course the printer is totally compatible with all leading CAD software, including AutoCAD™. Adobe™ PostScript™ software is optional. Get the accurate B-size output you need for less than $2,000. Call for more information and print samples.† And get the big picture.

HP LaserJet Printers

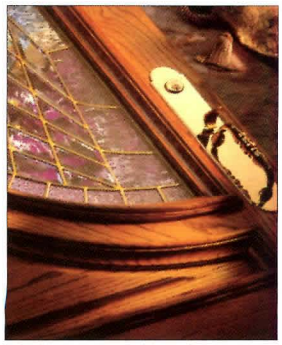
HEWLETT® PACKARD

$250 Off
HP LaserJet 4V with HP JetDirect card
Offer good thru 7/31/95

*Average U.S. retail price. Actual price may vary. AutoCAD is a U.S. trademark of Autodesk, Inc. Adobe and PostScript are trademarks of Adobe Systems Incorporated which may be registered in certain jurisdictions. ©1995 Hewlett-Packard Company. PE12539

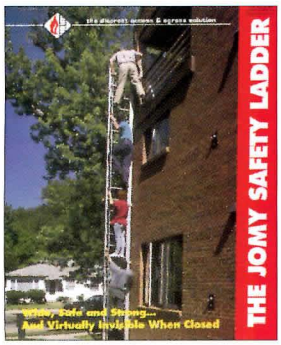
†**Call 1-800-LASERJET, Ext. 9173.** In Canada, call 1-800-387-3867, Dept. 9173.

International Wood Products



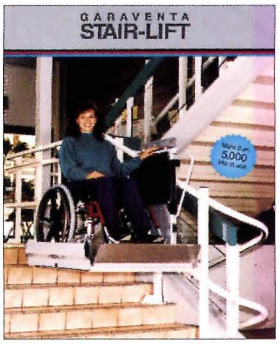
ENTRY DOORS AND DOOR SYSTEMS—International Wood Products has earned a solid reputation among homeowners, architects and builders for creating the world's finest doors. Hand crafted from solid hardwood and built with an unmatched attention to quality and detail, IWP doors come with an outstanding 5 year warranty. Call for free brochure. 1-800-877-9482.
Circle 66.

Jomy Safety Ladder



The Discreet Access & Egress Solution—Security requirements, space constraints, and aesthetic considerations are a few of the problem-solving applications for the JOMY Safety Ladder. The ladder's discrete appearance makes it an ideal solution for access and egress requirements. The JOMY Safety Ladder looks like a drainpipe when closed, but opens to a heavy-duty ladder with slip-resistant rungs and a **safety rail.** JOMY Safety Ladder Co., 1728 16th St., Ste 201, Boulder, CO 80302, 800-255-2591.
Circle 70.

Garaventa (Canada) Ltd.

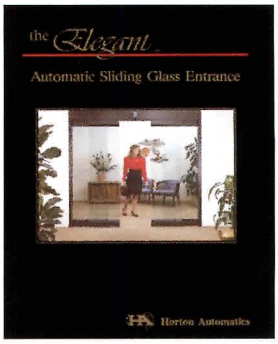


New Stair-Lift Brochure—If you've been wondering why the Garaventa Stair-Lift is the first choice of building owners around the world, get a copy of our new brochure. It'll spell out the reasons why Garaventa is the world's most popular stairway access solution. It's more attractive, durable and reliable, and safer and easier to use than any other platform lift. Quite frankly, Garaventa is the best value. Call today: 800-663-6556 or 604-594-0422.
Circle 74.

Monarch Studios, Inc./Michael F. Pilla

Architectonic Art Glass designed and executed under complete supervision of principal artist, Michael F. Pilla, of Monarch Studios, Inc. This art glass is typically constructed with copper cames, complimented by a unique fabrication system, and a wide variety of glass as desired. Monarch Studios is an art glass studio that has been working with design professionals creating original work since 1976. **(612) 644-7927.**
Circle 78.

Horton Automatics

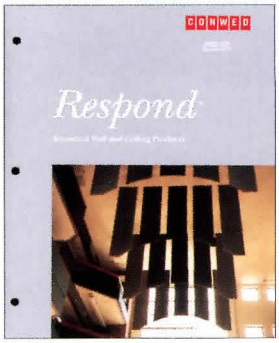


Horton Automatics Elegant™ automatic sliding glass entrance system meets the demands of modern architecture yet conforms to building codes and energy conservation requirements. Automated by the state-of-the-art, micro processor driven, Series 2001 operator. Glass panels slide quietly on a concealed track. For emergency egress, a breakout feature that allows panels to swing out is also available. Call 1-800-531-3111.
Circle 68.

Invisible Structures, Inc.

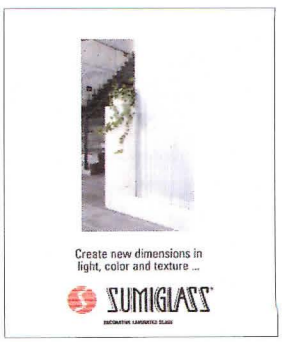
Pave With Grasspave^2. Grasspave^2 invisible porous pavers are made entirely from recycled plastics, saving truckload volumes of plastic articles from landfills, and creating sparkling green and real grass-covered spaces where asphalt once reigned—in firelanes, overflow and event parking lots, and residential drives and parking.
Circle 72.

Conwed



CONWED RESPOND ULTIMATE I PANEL—Conwed Respond Ultimate I is an acoustical wall and ceiling panel designed for use in areas requiring abuse resistance and excellent acoustical absorption. It utilizes a glass fiber core faced with an acoustically transparent open perforated rigid vinyl sheet and wrapped with fabric or vinyl. Ideal for use in: gymnasiums, theaters, and multi-purpose rooms. Conwed, 1205 Worden Ave. E., Ladysmith, WI 54848, 800-932-2383, Fax: 800-833-4798.
Circle 76.

Sumiglass by North American Glass



Sumiglass by North American Glass is a designer series of laminated safety glass. Printed films, decorative papers and even some fabrics can be laminated between glass to create a stunning light control and privacy product. Choose from a variety of stock patterns or allow us to create a custom pattern for you.
Circle 80.

Each of Our Bricks Has a Pedigree. No Wonder So Many of Our Customers' Buildings Win "Best of Show"!

Careful breeding sets the stage for triple crown horses and prize winning show dogs.

We see parallels in brick making. For example, the first requirement for brick performance is raw material quality, followed by detailed knowledge of processing, mixing, shaping, drying and firing the raw materials to produce individual brick.

Ultimately, architects and builders marshall the brick into structures that shield, service and enhance our world.

For 110 years, Belden Brick has made product quality its primary objective. So it's not surprising that we were first in our industry to be certified by the International Standards Organization for our quality management system.

That's why – more than ever – quality continues to be the first thing we make sure of, and the last thing we take for granted.

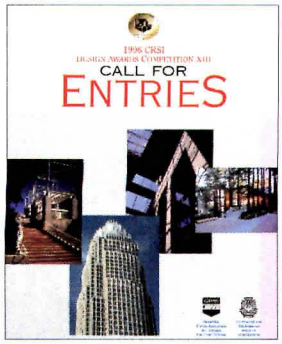
Circle 224 on information card

THE Belden Brick COMPANY
CANTON, OHIO 44701
216-456-0031

An ISO 9002 Registered Company

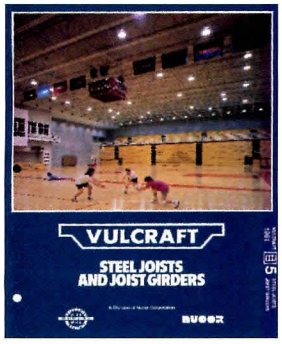
(216) 456-0031

CRSI



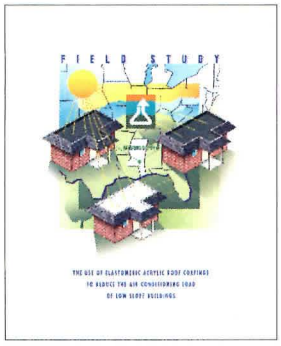
CRSI Design Awards Competition— Entries for CRSI's thirteenth biennial competition for concrete structures, predominately site-cast and conventionally reinforced now being accepted. Open to Registered Architects, Engineers, General Contractors, Owners or Developers. For structures completed in U.S. between 1/1/93-10/27/95. Ask for Call for Entries brochure that includes general information and rules. Call 1-708-517-1200.
Circle 82.

Vulcraft



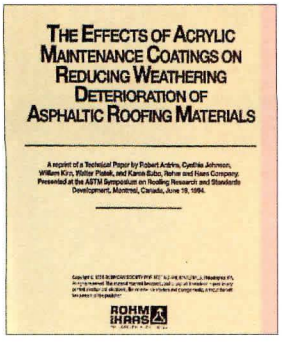
STEEL JOISTS AND JOIST GIRDERS. This 94-page design manual provides indepth information for the optimum use of steel joists and joist girders. As the largest producer in the United States, Vulcraft has the most experience and expertise in the application, design and manufacture of these products. The economies of steel joists and joist girders contribute to their increasing utilization.
Circle 86.

Rohm and Haas Company



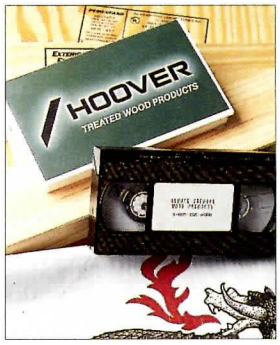
ACRYLIC ROOF COATINGS SAVE ENERGY AND EXTEND THE LIFE OF A ROOF! This attractively illustrated brochure shows how elastomeric acrylic roof coatings can substantially reduce air conditioning energy demand, while prolonging the life of a roof by protecting it from degradation by heat, sunlight, water and thermal shock.
Circle 90.

Rohm and Haas Company



ACRYLIC COATINGS PROTECT ASPHALT ROOFS—This new, comprehensively illustrated brochure shows how elastomeric acrylic maintenance coatings reduce weathering deterioration on asphalt-based roofing materials. This publication is a compilation of a presentation that was made at the recent ASTM Symposium On Roofing Research And Standards Development.
Circle 94.

Hoover Treated Wood Products

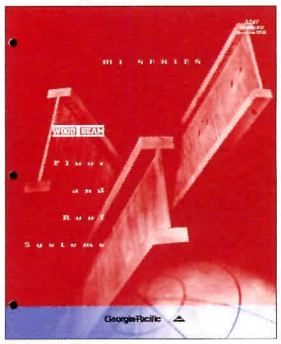


New video from Hoover Treated Wood Products Inc. shows how treated wood is produced and tested, and describes Hoover's complete line of treated wood products including **PYRO-GUARD** interior type fire retardant treated lumber and plywood, **EXTERIOR FIRE-X** exterior type fire retardant treated lumber and plywood, and **CCA KDAT** preservative treated lumber and plywood that's kiln dried after treatment.
Circle 84.

Louisiana-Pacific

Louisiana-Pacific's wood windows and patio doors are available with three exterior finishing options: aluminum-cladding, fully-primed wood, or a high performance factory-coated finish (51 colors). Available in all the basic styles, plus complementary round-tops and custom shapes. Double insulating glass is standard, with high performance glass available. Full line of vinyl windows and doors also available. For a free brochure, please call (800) 299-0028, ext. 309.
Circle 88.

Georgia-Pacific



Georgia-Pacific Engineered Lumber—Georgia-Pacific offers brochures detailing three engineered lumber products. G-P Lam® LVL (laminated veneer lumber) beams and headers are specially designed and constructed for stability and high strength. WI Series and GPI Series Wood I Beam® joists, primarily used as a structural component in floor and roof systems, also may provide support as window, door and garage door headers.
Circle 92.

Case Window and Door

Case Window and Door combines German durability and engineering with US architectural millwork finishes to manufacture windows, doors, window walls, and rolling glass walls for luxury residential and commercial projects. Wood products are custom made with any appropriate wood species. Metal-clad options are available. Hardwood accessories are virtually unlimited. **1-800-227-3957.** 301 Green St, Schenectady, NY 12305.
Circle 96.

Windows by Pozzi®

There's something special about Pozzi Windows. Perhaps it's our reverence for wood. After all, our heritage is in millwork. But there's more to windows than wood and glass. Great windows start with a great design. That's where you come in. Give us a challenge, something really special. We take pride in creating windows that will illuminate your design. Just think of Pozzi as the "Designer Window" company.

We know you want choices, lots of choices. That's why we offer such a wide variety of divided lite options. Want custom clad colors? We'll match the color of almost anything...even the Ferrari in the driveway.

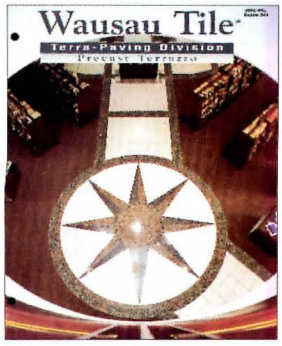
For a free catalog and the name of the Pozzi distributor nearest you, please call Pozzi at 1-800-821-1016. We'd be delighted to hear from you!

POZZI
WOOD WINDOWS
A Division of JELD-WEN.

Pozzi Window Company
P.O. Box 5249
Bend, Oregon 97708

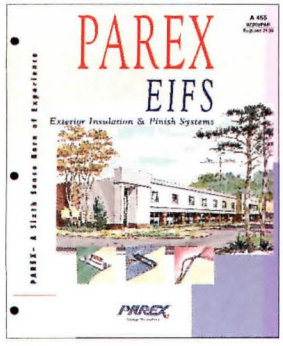
Circle 228 on information card

Wausau Tile



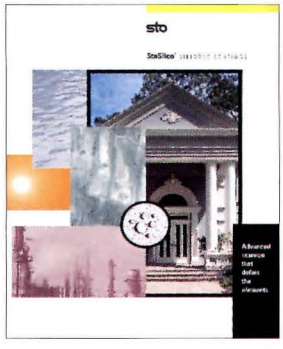
About Wausau Tile—Wausau Tile, Inc. manufactures concrete pavers, precast terrazzo flooring, site furnishings, recreation equipment and precast architectural specialties, including screen printed and cast-in concrete signage. Wausau Tile combines the skills of its more than 200 employees to manage projects from start to finish: product design, process engineering, pattern building, mold making, manufacturing, technical service and shipping.
Circle 98.

Parex, Inc.



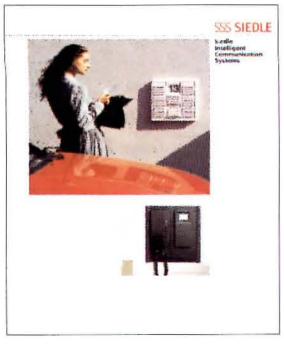
Versatile? Customized? Durable? Cost Effective? If you seek any combination of these for your next exterior cladding project, make it a point to explore the array of Parex Exterior Insulation and Finish Systems. Whether residential or commercial, new or a retrofit, this brochure will walk you through EIFS, system by system, to insure the right choice. Get answers to your technical questions by calling 1-800-LEPAREX (537-2739).
Circle 102.

Sto Corporation



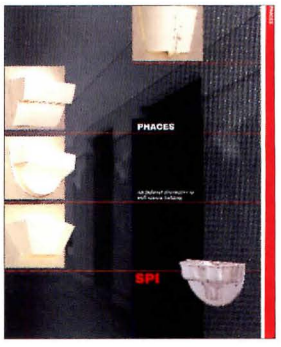
Sto's technologically-advanced, silicone-enhanced coatings are engineered to protect a building from common environmental hazards, such as humidity, water, air pollution, and sun exposure. StoSilco coatings are water repellent, vapor permeable, non-thermoplastic, and UV resistant. They stay cleaner and drier, reducing surface degradation and the need for constant maintenance.
Circle 106.

Siedle



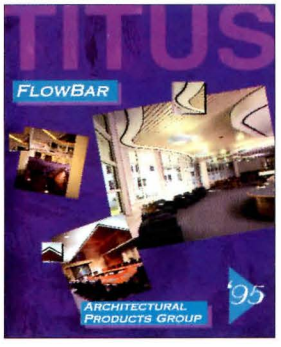
Siedle Intelligent Communication Systems—Featuring Siedle Vario® Intercom Lobby Units—Video Security for apartments, residences and offices . . . Easikey, the Intelligent Key-Letterbox System—and the System telephone HT 611-01—the fastest way to the house door and around the house, complete with watchdog, doorman and nameplate. For full catalog, set up information and architecture specs, call toll free 800-874-3353 or 610-353-9595.
Circle 110.

SPI Lighting Inc.



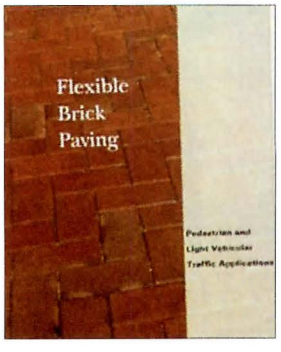
PHACES WALL SCONCES—Phaces is a series of low-profile ADA-compliant wall sconces. Housing styles include scoops, quarterspheres, triangles, arcs and wedges. Metal, acrylic and alabaster Phaces can be accented with brass, chrome, aluminum, acrylic or a combination of trim elements. Phaces incorporates halogen, metal halide or fluorescent lamping, and is offered with electronic ballasting. For more information contact SPI Lighting, Inc, 10400 N. Enterprise Dr, Mequon, WI 53092. Phone (414) 242-1420, Fax (414) 242-6414.
Circle 100.

TITUS



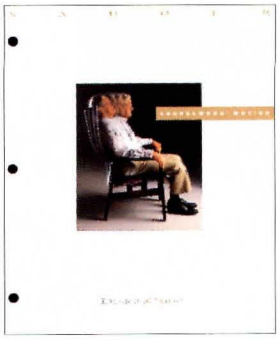
FlowBar Architectural Products Group. TITUS, a leader in air distribution products for over forty years, now offers a unique line of architectural linear type diffusers. This new line of diffusers allows the architect to fully participate in the selection of ceiling components. The FlowBar system provides maximizing engineering performance as well as aesthetic considerations for the designer.
Circle 104.

Brick Institute of America



Flexible Brick Paving: Light duty Application 16-page, four-color design and installation guide for light duty flexible brick paving covers applications such as driveways, plazas, walkways and patios. Originally published as an insert in *Architecture* Magazine in 1992. Cost: $3.50 per copy less professional courtesy discount of 20%. Publication #531. Brick Institute of America, 11490 Commerce Park Dr, Reston, VA 22091-1525 (703) 620-0010, Fax (703) 620-3928.
Circle 108.

Sauder Manufacturing Company



The *Laurelwood* Motion chair epitomizes the sincerity and practicality for which Sauder healthcare seating is known. Its smooth, broad plybent wood armrests offer ample support, while the rocker box provides relaxing and therapeutic motion. For more information on the DesignCare Series, contact Sauder Manufacturing Company, 930 W. Barre Road, Archbold, Ohio 43502-0230, 1-800-537-1530 or FAX 419-446-3697.
Circle 112.

THE ARGUMENT FOR USING WOOD IS GROWING EVERY DAY.

Get the facts and one thing is clear. There isn't a tree shortage. There's an information shortage. First off, wood is the only renewable building material we have. In fact, the total volume of wood in the U.S. and Canada has actually increased over 25% since the 1950s.[1] What's more, America's timber volume is projected to be greater in 2040 than it is now--even with increasing uses for housing, furniture and similar needs.[2] And there's more. Consider manufacturing. It takes 21 times more energy to produce a concrete floor than a raised wood floor.[3] We urge you to learn more about your material choices by sending for your copy of "Wood Is Growing" to: Wood Works, 522 S.W. Fifth Avenue, Fifth Floor, Portland, Oregon, 97204-2122 or faxing (503) 224-3934.

WOOD WORKS™

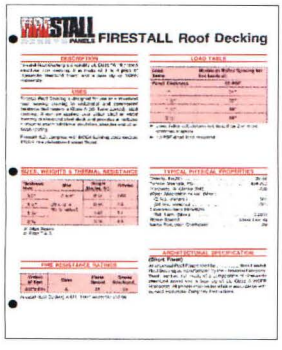
A message from U.S. and Canadian wood products industries: American Forest & Paper Association, APA-The Engineered Wood Association, Canadian Wood Council, National Particleboard Association, Southern Forest Products Association, West Coast Lumber Inspection Bureau, Western Wood Products Association.

1. Salwasser, H., MacCleary, D., and Snellgrove, T. "New Perspectives on Managing the U.S. National Forest System": Report to the North American Forestry Commission Sixteenth Session. 1992. USDA Forest Service, Washington, D.C. 2. USDA Forest Service, RPA Timber Assessment Update, 1993. 3. Hoch, Peter. Wood Science Laboratory. "Wood vs. Non-wood Materials in US Residential Construction: Some Energy-Related International Implications" Working Paper #36. October 1991. for the Center for International Trade in Forest Products, University of Washington.

Landscape Forms, Inc.

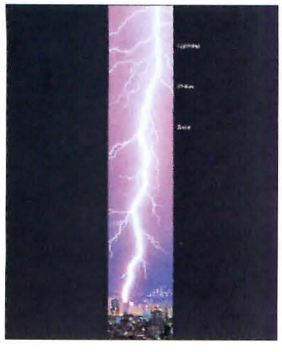
The distinctive Pi Rack provides a safe harbor for bicycles. Holds bike by the frame, not delicate wheel. Accommodates all bike styles. Durable metal construction with tough polyester powdercoat finish; selection of colors. May be specified embedded or surface mount. Call 800/521-2546 for brochure.
Circle 114.

Homasote Company



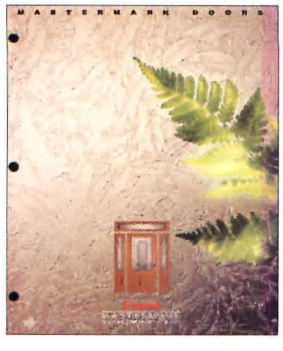
FIRESTALL ROOF DECKING—Firestall Roof Decking, manufactured by Homasote Company, is a nailable UL listed Class "A" flame spread load bearing roof deck. Can be applied to wood or steel framing to provide the structural decking and nailbase surface for finish roofing. Also ideal for use as a nailbase applied over sloped metal decking.
Circle 118.

Versico Incorporated



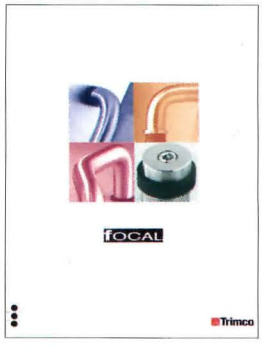
Versiweld™ Premier single-ply roofing is an advanced technology thermoplastic membrane made from inert polymers. The Versiweld™ Premier sheet is heat-weldable and features a tough polyester scrim to increase puncture resistance. Roofing warranties are available for commercial installations of Versiweld roofing. Versiweld brochure by Versico Incorporated.
Circle 122.

Simpson Door Company



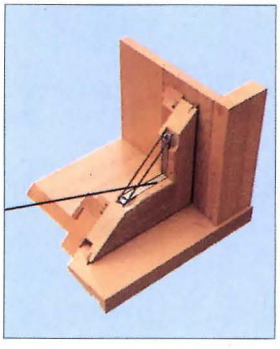
For the latest designs in entry and interior doors, call for our brand new catalog. Distinctive, dramatic styles. Wood and glass artfully balanced in exacting proportions. Everything you're looking for is showcased inside. To order, call 1-800-952-4057.
Circle 126.

Trimco



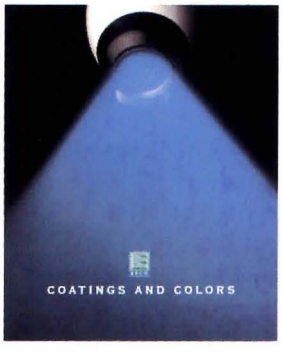
Focal by Trimco/BBW. Designed by Architects for Architects. Focal blends fundamental forms, functions and materials into inspired contemporary shapes and accents that will add distinction to any project. Quality of form, proportion and detail are all qualities of Focal, a full line of affordable, architectural door trim hardware. Manufactured in Los Angeles. Trimco/BBW: 213-262-4191.
Circle 116.

Bergerson



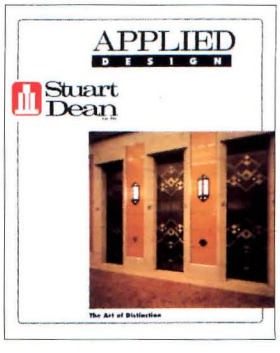
Specializing in cedar for the past 17 years, Cedar Windows & Doors By Bergerson has responded to a market demand for their quality, in handcrafted custom windows and doors in other woods besides cedar. All materials are milled to a four thousandth of an inch tolerance from clients specifications. Bergerson also offers a distressed look cedar window. For more information, call 1-800-240-4365.
Circle 120.

EFCO Corporation

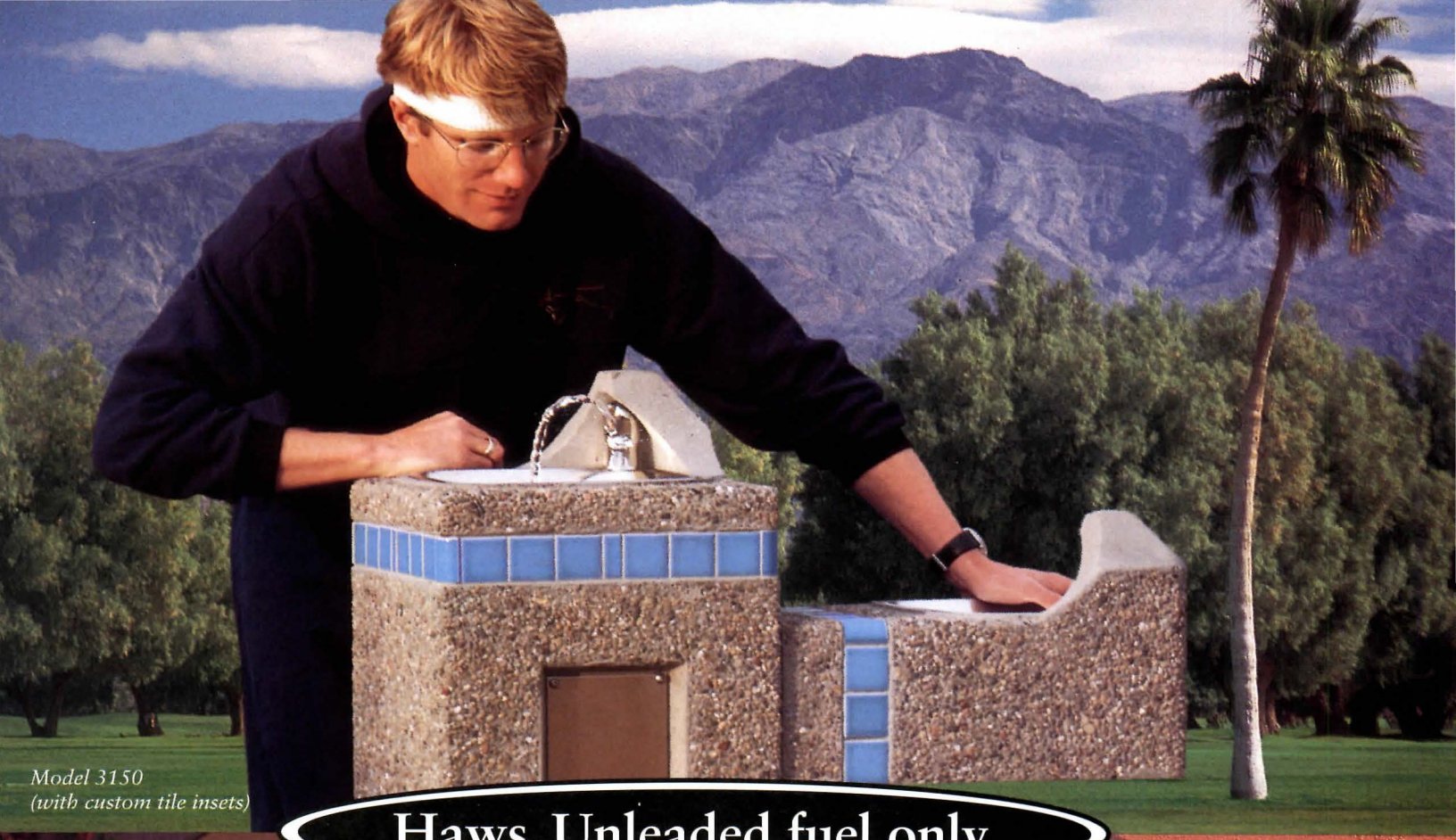


EFCO Introduces Four New Standard Colors—EFCO, a national manufacturer of windows, doors, storefronts and curtain wall systems, is adding Cardinal Red, Teal, Charcoal and Blue Sky to its spectrum of standard colors, bringing the total to 21. All EFCO colors are available in Fluroplon® fluoropolymer and Vitrasil® silicone-polyester paint coatings. Contact your local EFCO representative or call 1-800-221-4169 for a Coatings and Colors brochure with the complete selection.
Circle 124.

Stuart Dean, Inc.



Applied Design by Stuart Dean. Stuart Dean's Applied Design was specified by Pei, Cobb, Freed & Partners and Frank Williams and Associates for use at the Four Seasons Hotel in New York. At only half the price of etching, it's catching everyone's attention. It is a versatile method for decorating elevator doors, metal or glass. It can be applied **on site**, overnight. 1-800-322-3180.
Circle 128.



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Circle 232 on information card

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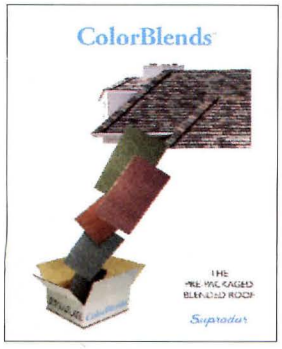
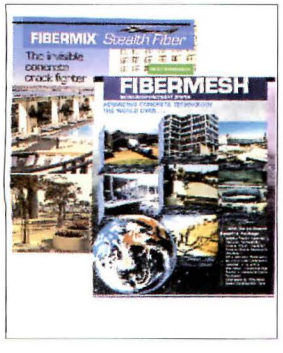


ColorBlends™ The Pre-Packaged Blended Roof—Enhance the value of your project with a Supra-Slate® ColorBlends roof. Pre-packaged in each bundle for ease of installation, these fiber-cement shingles provide the appearance and durability of a slate roof but cost less and weigh less! Free literature and samples. Supradur® 800/223-1948 or FAX 914/967-8344.
Circle 130.

Sternberg Vintage Lighting

NEW LARGE SCALE ORNAMENTAL POLE—Sternberg Vintage Lighting introduces a new, large scale pole for use on city streets, in parking lots, parks and other commercial installations. This informational sheet and several others showing new products will be sent with a 64-page full color catalog to specifiers requesting information.
Circle 134.

Fibermesh Division, Synthetic Industries

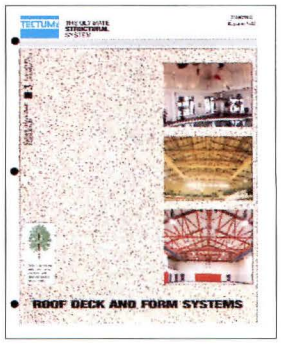


Two Brochures on Synthetic Fibers for Concrete—12-page Fibermesh® guidebook tells how Fibermesh fiber inhibits plastic shrinkage cracking, provides post peak residual strength, impact capacity, adds shatter resistance, lowers concrete permeability, alternate to wire mesh. New Fibermix® 8-page Stealth brochure covers newest polypropylene fiber for secondary reinforcement of concrete. Invisible in finished concrete surfaces. Residential, commercial applications. Fibermesh Division, Synthetic Industries, 4019 Industry Dr., Chattanooga, TN 37416.
Circle 138.

OSRAM SYLVANIA

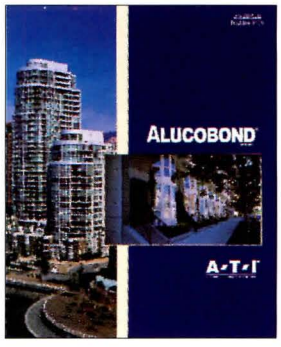
OSRAM SYLVANIA is firmly committed to the development of innovative lighting technologies that provide both greater energy efficiency and improved light quality. OSRAM SYLVANIA provides the industry's most complete information on EPACT and related legislation. Ask your OSRAM SYLVANIA sales representative for a copy of "Relamping America - A Guide to the Energy Policy Act of 1992."
Circle 142.

Tectum Inc.



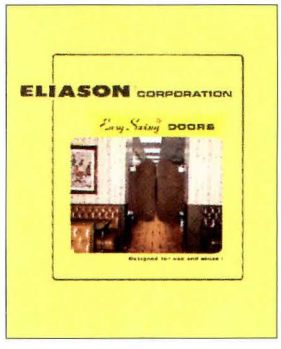
Acoustical Roof Deck Systems—Tectum, Inc. has published a new brochure of specifications for its line of Roof Deck and Form Systems. This brochure reflects Tectum's environmentally friendly roof deck product line, technical support data, specifications, options, installation steps, sound absorption levels and fire endurance testing. Since 1949, Tectum Inc. has manufactured acoustical roof and interior products at their headquarters in Newark, Ohio. Call 1-614-345-9691 for more information.
Circle 132.

Alucobond Technologies, Inc.



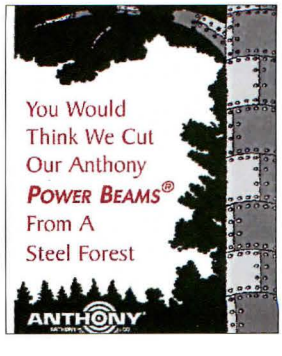
NEW ALUCOBOND™ MATERIAL CATALOG AVAILABLE—This new 12-page, full-color catalog illustrates recent applications in a wide range of new and retrofit applications plus provides complete general and technical information for Alucobond® Material and Alucobond 21® Material. A current color chart is also included plus a description of attachment methods.
Circle 136.

Eliason Corporation



Eliason has announced the release of their new 1995 Easy Swing Door Price/Spec catalog. Doors are illustrated in full color with complete specifications, technical and application data. They are double action, open to finger touch and close with a safe gentle time delay action. Doors can be specified and purchased direct. A hard bound catalog will be sent at no charge. Eliason Corporation, P.O. Box 2128, Kalamazoo, MI 49003.
Circle 140.

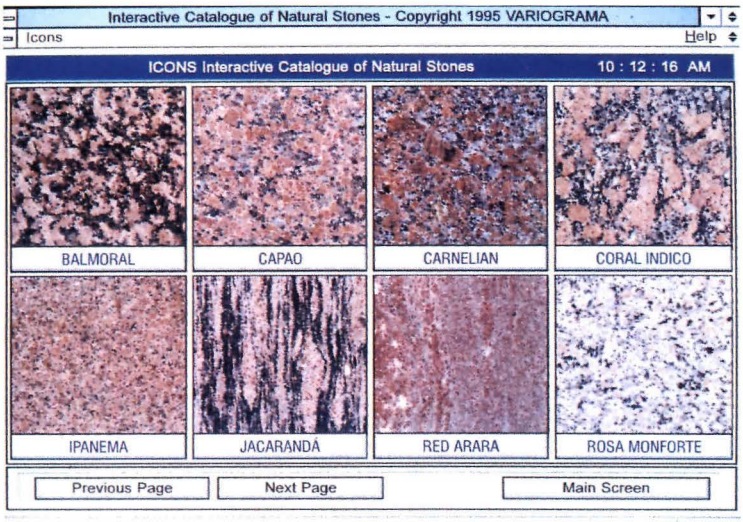
Anthony Forest Products

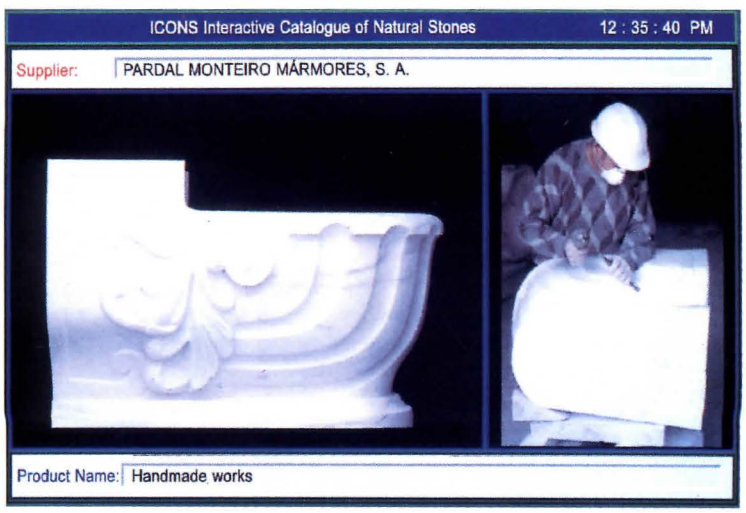


The newest product for the El Dorado, Ark. based company, is the **Anthony Power Beam®**, an engineered lumber product designed to offer dimensional stability and a consistent 12 percent moisture content. The Power Beam 3000F-2.OE, a southern yellow pine glue-laminate, is a strong and light weight lumber resource. For more information call 1-800-221-BEAM, P.O. Box 1877, El Dorado, Arkansas 71730.
Circle 144.

Products

A computerized catalog from Portugal helps architects select stonework and find suppliers.





A new electronic catalog now offers architects technical information about stone. The Interactive Catalog of Natural Stones (ICONS) from Lisbon-based Variograma comprises three linked databases that show the variety of the material in both raw and crafted forms, as well as suppliers.

TOP: A database of companies provides information on every organization that quarries or processes stone in Portugal. Suppliers can be searched by name, region, type of stone, or product. Information and statistics on each company are included, and selected production sites can be viewed.

ABOVE LEFT: A raw materials database contains information on stones from all over the world that are processed in Portugal. Samples of limestone, marble, and granite can be accessed by entering a type, color, or shade of stone. These samples can be exported to AutoCAD and 3DStudio files, along with scientific data about the makeup of each stone.

LEFT: The products database displays images of stonework created by each company, such as hand-chiseled ornamental pieces.

The catalog requires a CD-ROM drive and is developed for operation with PC Windows. Currently available in English and Portuguese, ICONS has already been exported to the United States and Germany. *Circle 401 on information card.*

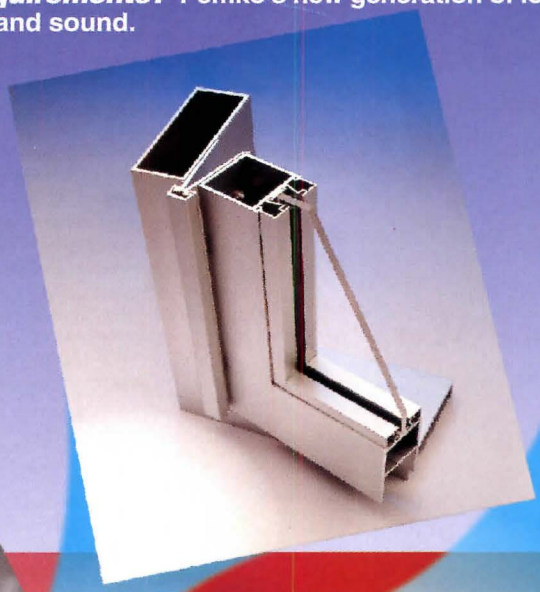
SOLUTIONS.

Special retrofit conditions? Pemko's ADA compliant modular ramp system answers the needs of architects, spec writers, installers, and most importantly, the physically challenged.

High traffic doors? PemkoHinge™ continuous geared aluminum hinges provide safety, security, privacy and are guaranteed for the life of the opening.

Code compliant door gasketing requirements? Pemko's new generation of low-closing-force automatic door bottoms are tested and labeled for fire, smoke, and sound.

Time-consuming drafting? PemCad™ drafting detailer offers over 150 dimensioned section drawings for quick and easy down-loading into architectural CAD programs.



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Products

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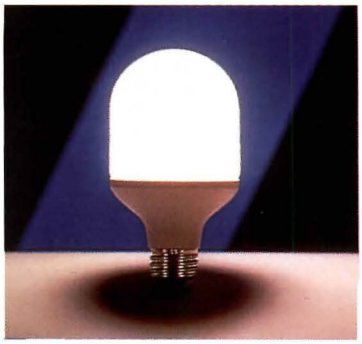

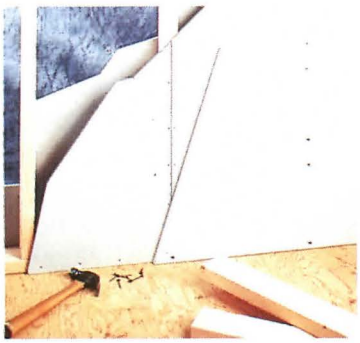

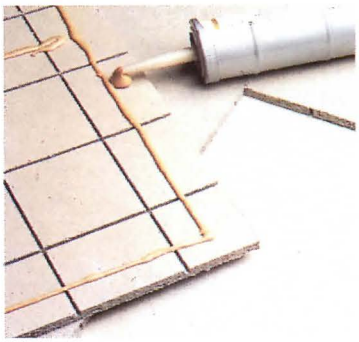

TOP: Infinity Initiative is a new recycling program introduced by Georgia-based Collins & Aikman Floorcoverings. The company mixes used vinyl-backed carpet with recycled plastics to produce consumer products ranging from parking space dividers to new industrial flooring. Through this program, more than 75 million pounds of used floorcoverings are recycled every year. *Circle 402 on information card.*

ABOVE AND ABOVE CENTER: Homasote's new Comfortbase floorcovering underlayment and 440 Sound-A-Sote sound control board are both manufactured of 100 percent recycled postconsumer wastepaper. Laid over concrete floors, Comfortbase insulates against cold, thus cutting energy costs. Each sheet measures 1/2 inch thick and 4 feet square. Sound-A-Sote—suitable for walls, floors, or ceilings—is manufactured in 4-foot-wide panels, measuring 8, 10, and 12 feet long, and is available 1/2 inch and 5/8 inch thick. *Circle 403 on information card.*

TOP RIGHT: Panasonic Lighting has recently expanded its Low Profile Electronic Light Capsule Collection with the addition of a tubular, lightweight 20-watt model, the EFT20. Compatible with standard fixtures, the lamp is available in two types, a warm light and a cool white light that simulates daylight. The EFT20 consumes 70 percent less energy than a 75-watt incandescent bulb while offering a competitive lumen output. It purports to have an average life of 10,000 hours, up to 13 times longer than many typical incandescents. The collection also includes two styles of 16-watt bulbs; a 28-watt model is planned. *Circle 404 on information card.*

CENTER RIGHT: Research Products Corporation's Space-Gard air cleaner traps airborne particles such as pollen and spores without using electricity or moving parts. The high-efficiency cleaner contains 78 square feet of pleated fiberglass filtration material in its plastic shell, which measures 23 3/4 inches high, 26 1/2 inches wide, and 9 1/2 inches deep. Mounted to a furnace return duct, the Space-Gard requires no maintenance other than an annual filter replacement. Research Products Corporation offers a lifetime limited warranty on the Space-Gard. *Circle 405 on information card.*

ABOVE: Both of MaxLite's new compact fluorescent lamps, the MiniMax and LongNeck Max, incorporate a triple-loop bulb that radiates more light than conventional models. The 15- or 11-watt MiniMax lamps are equivalent to 60- or 40-watt incandescent bulbs, but use up to 75 percent less energy. The 20-watt reflector LongNeck Max compares to a 140-watt incandescent bulb, with energy savings as high as 70 percent. The lamps screw into standard fixtures and purport to have an average life of 10,000 hours. Based in Palisades Park, New Jersey, MaxLite manufactures lighting upgrades for commercial applications. *Circle 406 on information card.*

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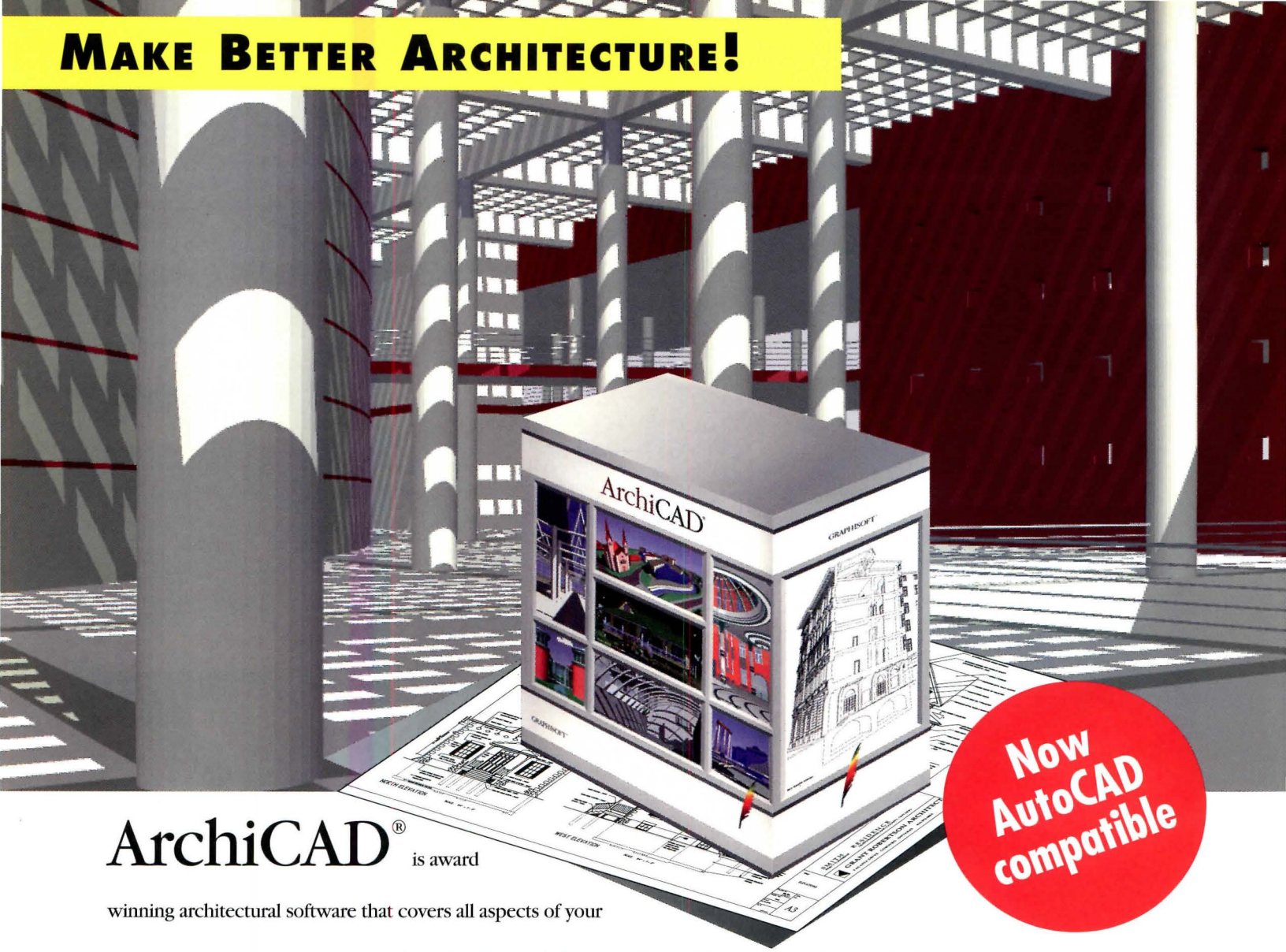

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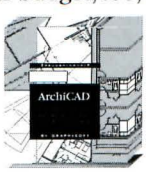

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GRAPHISOFT

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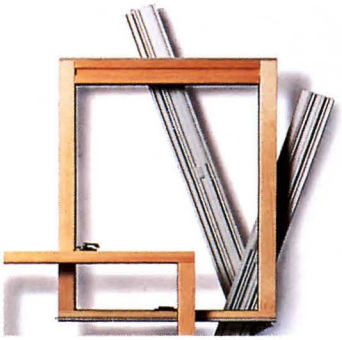
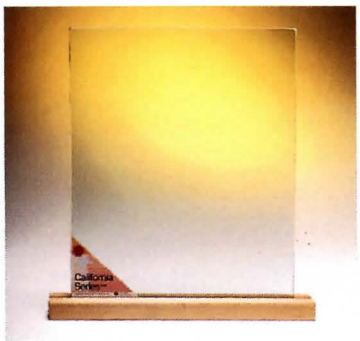
Circle 240 on information card

Products

Recycled seating
Kalamazoo, Michigan-based Landscape Forms, manufacturer of commercial furniture for exterior use, has added a new bench (above) to its Petoskey line, with a seat made of PolySite plastic. Composed of recycled milk containers, the high-density polyethylene is molded into timbers that purport to be moisture- and graffiti-resistant. The bench is also available in wood or steel.
Circle 409 on information card.



Window replacement
Caradco introduces the ZapPack window replacement kit (above), comprising jamb liners and a sash. The kit enables architects to preserve a window's original frame, plaster, and woodwork, replacing only problem components. Finish options include primed wood or aluminum cladding in a choice of five colors. Kits are available in 120 standard sizes and can be custom-fitted.
Circle 407 on information card.



Cool glass
An invisible, heat-reflective film laminated between two layers of glass allows Southwall Technologies' new California Series glass (above) to cut solar heat transmittal in half, while admitting more than 70 percent of visible light. Architects can specify larger expanses of glass, available in transparent or tinted versions, that will not incur higher energy costs.
Circle 410 on information card.

Table base
The 7100 Series Table Base (above) from Falcon Products is manufactured of recycled engine blocks. Available in 36 colors, the cast-iron base incorporates four plastic height-adjustment knobs to provide stability and prevent wobbling. The base is designed for 18- to 36-inch-wide rectangular and 18- to 42-inch-square or round tops.
Circle 408 on information card.

Lumber guide
The Western Wood Products Association's new *Western Lumber Guide for Architects and Specifiers* discusses the environmental aspects of wood construction compared with other building materials. The guide emphasizes wood as a renewable resource, its low-energy production process, and statistics on tree population and growth in the U.S.
Circle 411 on information card.

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Robert Hoover Production Director
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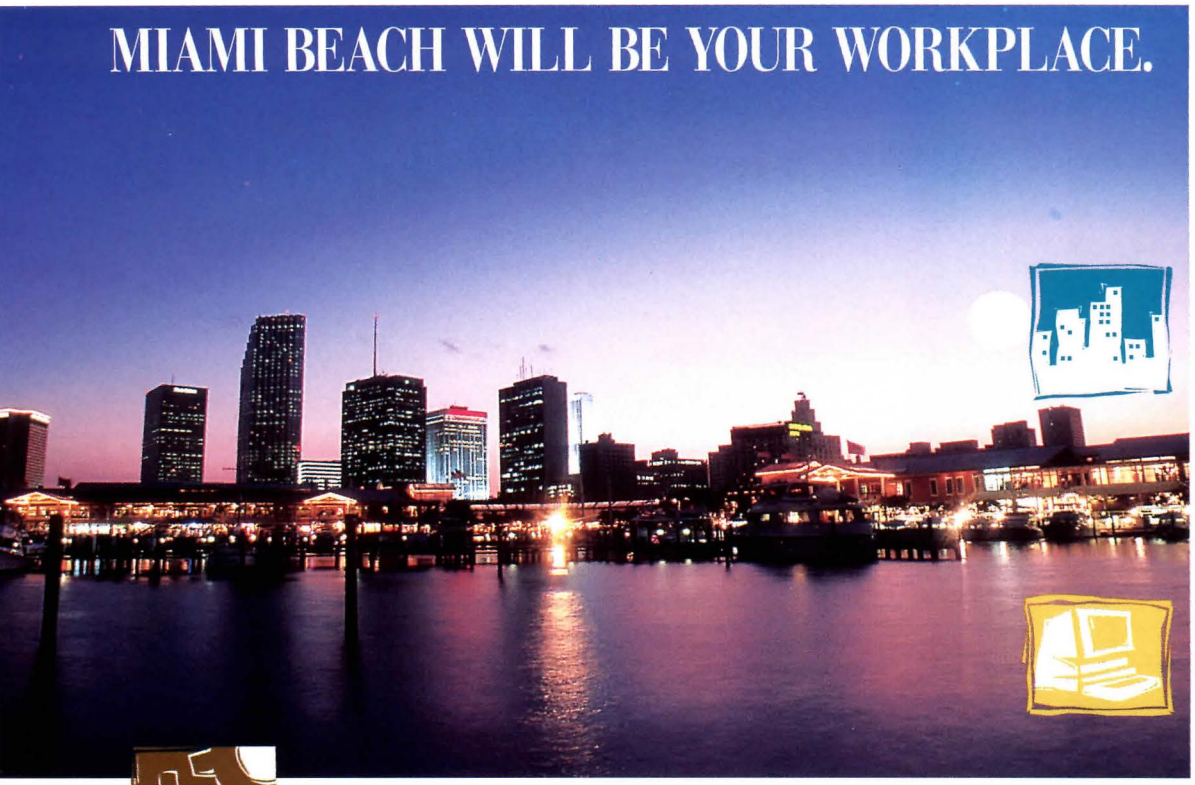

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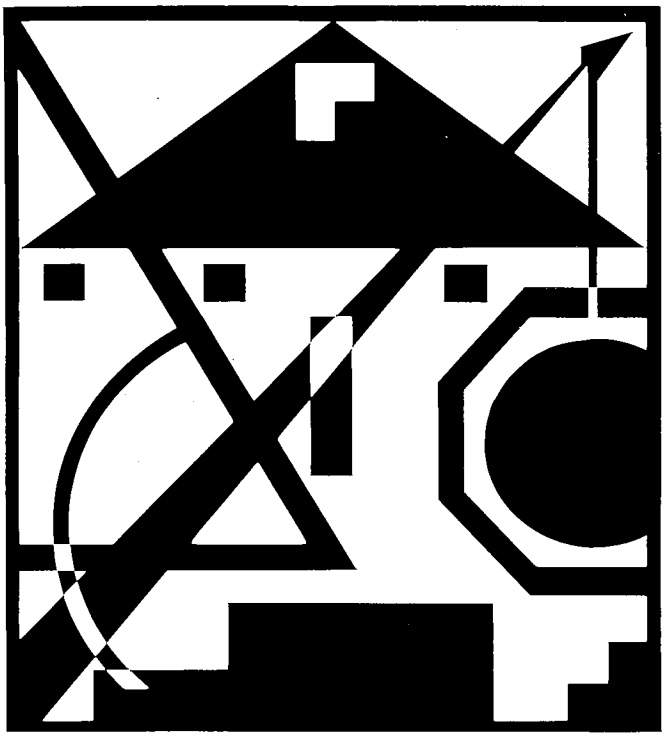

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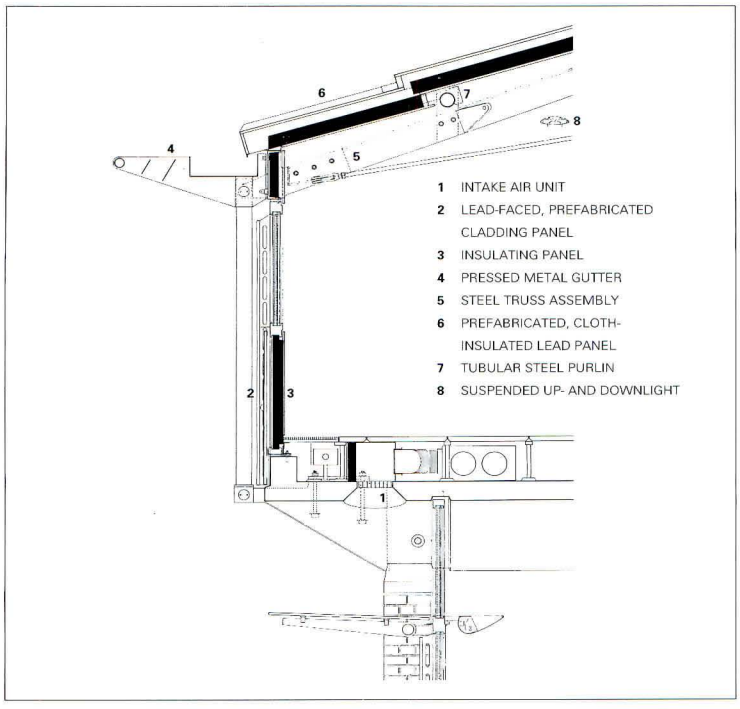
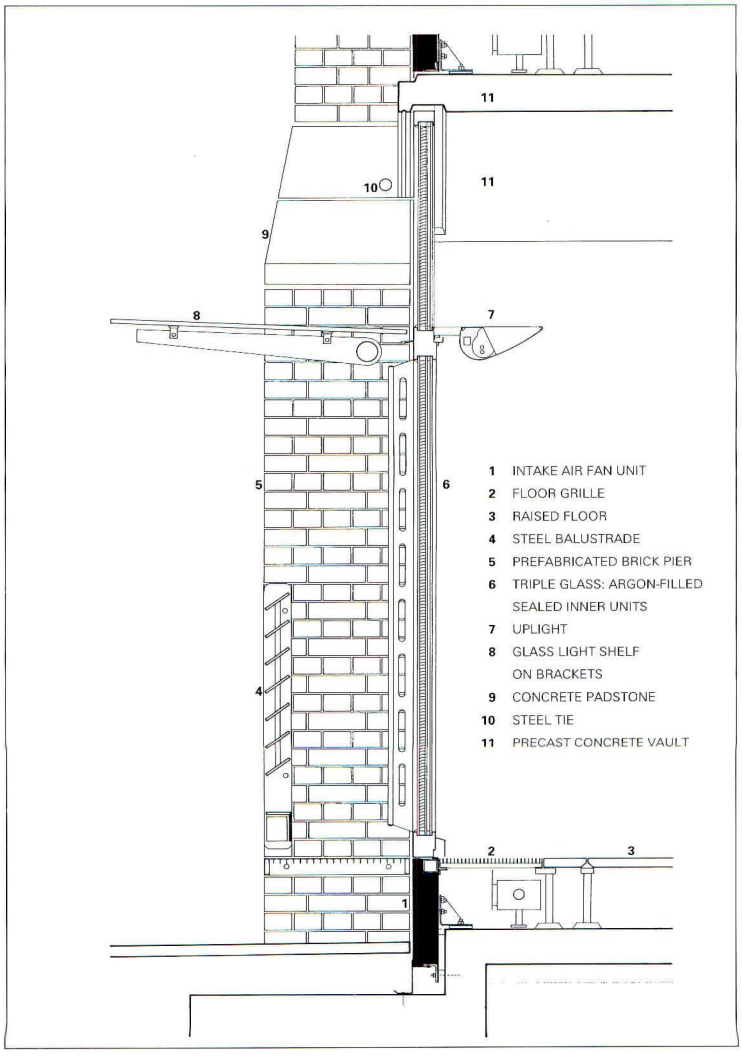
Details

A new British government building is naturally ventilated and shaded.





Inland Revenue Center
Nottingham, England
Michael Hopkins & Partners

In designing the headquarters of Inland Revenue Center (this issue, pages 76-83), London architect Michael Hopkins & Partners incorporated prefabricated structural systems and natural ventilation, which reduces energy consumption to one-third that of a similar-sized conventional office building. A typical wall section through the ground floor of one of the headquarters' four courtyard blocks (bottom left) reveals the energy-minded strategies of the buildings' construction.

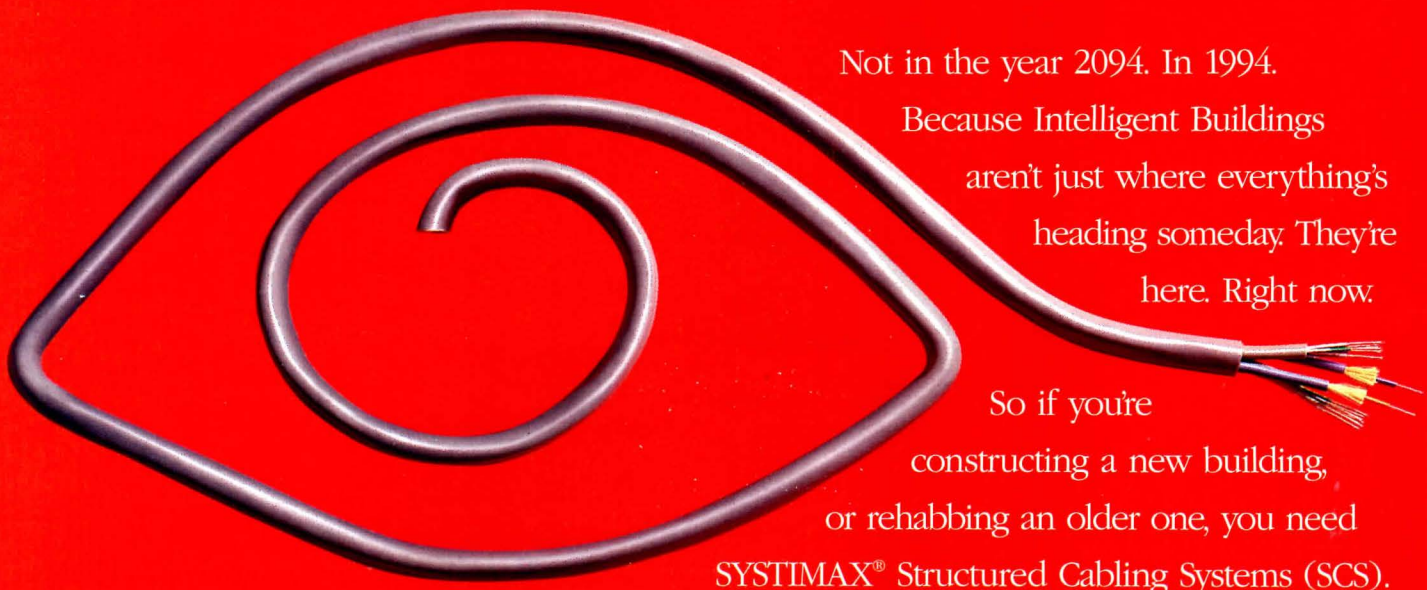
Hopkins selected materials that were low in embodied energy and easy to maintain. Prefabricated brick piers—which become shallower as building loads decrease, for greater structural efficiency—frame large, operable, sliding windows that naturally ventilate interior offices. The triple-glazed windows are composed of a single exterior pane of glass and a double layer of insulated glass inside. In the interstitial air space of each window, Hopkins inserted adjustable metal louvers that shade the offices.

Light shelves composed of semi-reflective glass are mounted on metal brackets above each window, to both bounce light into interior offices and shade the glazed openings below. Steel railings mounted between the exterior faces of the piers are fitted with louvers that also shade the interiors when the windows are slid open.

The cantilevered top floor of each building (top left) is clad in strips of operable, triple-glazed windows and prefabricated lead curtain wall panels. A metal gutter combined with a brise-soleil shades the uppermost windows of the buildings. A steel truss system atop this level supports a prefabricated lead roof. Insulated roof panels are supported by tubular steel purlins that hook into the ends of the panels. The purlins are then fastened to the roof truss.

At each level of the Inland Revenue Center, an efficient under-floor air-distribution system supplements the natural ventilation. Outside air is drawn inside by intake fans that are mounted below the windows and in the overhang of the top floor. Air is then distributed through ducts inserted beneath a raised floor deck, with supply vents placed just inside the windows.—*R.A.B.*

Imagine a building where the doors have eyes, the walls have ears, and the thermostat knows you get a little chilly around 4 p.m.



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