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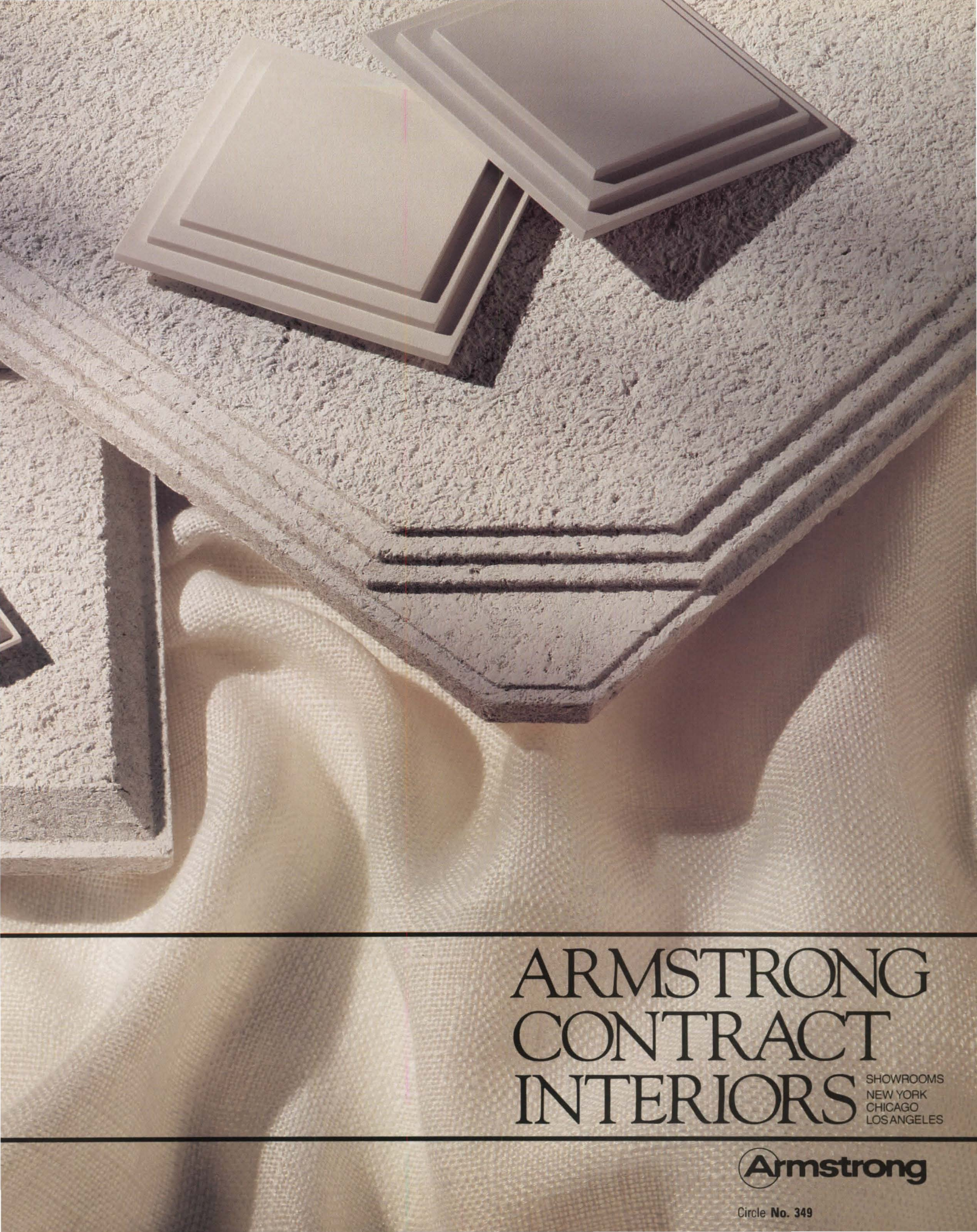

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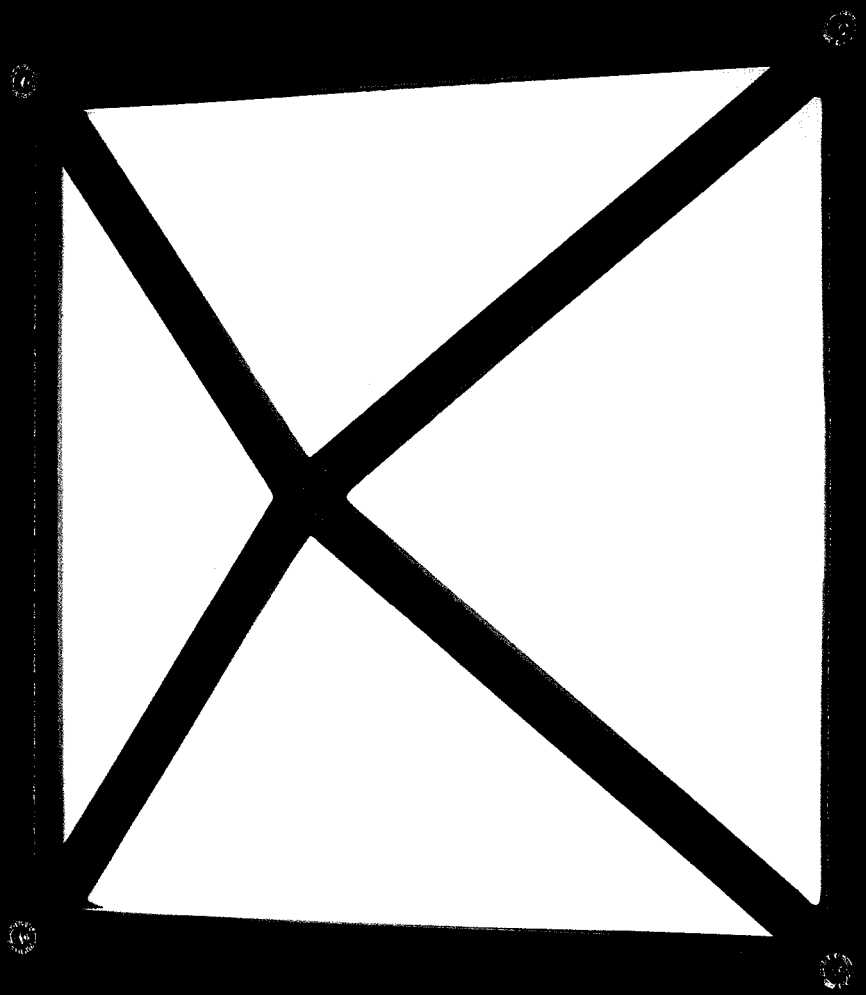

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# Editorial
## Our Oil Addiction



**Events in the Persian Gulf emphasize questions as to the cost and long-term feasibility of our dependence upon oil.**

The psychologist Anne Wilson Schaef argues in her recent book *When Society Becomes an Addict* that our social system often behaves in an addictive manner not unlike that of a drug abuser. That certainly seems to apply to recent events in the Persian Gulf. Whatever the political reasons for our involvement there, the war shows how addicted to oil the industrialized world has become. Conflicts among less strategic countries may barely rouse our attention, but when our supply of oil is threatened, the West fights with the intensity of an addict about to be deprived of a fix. Meanwhile, an oil-producing nation such as Iraq – once one of our dealers – will battle over turf, killing without mercy to get a bigger piece of the action. Whether right or wrong, the war in the Gulf is like the drug-induced crime in our streets writ large, all part of a seamless web of addiction that has entangled the West.

Many may reject this analogy, but such denial is also part of addiction. Besides, the West has already admitted to having a dependency problem during the oil crises of the 1970s. We, unfortunately, did not set our goals high enough back then; rather than attempt to end our reliance upon oil, the West accepted a reduction in demand. But addictions are difficult to control, and in the 1980s we suffered a relapse, increasing our oil use and helping our dealers in the Middle East – both friend and foe – to rearm themselves. As we look back on the last 20 years, the current situation in the Persian Gulf seems almost inevitable. Addiction breeds violence.

Still, we have even more cause to end our oil dependence now than we had 15 years ago. Not only would we partly defuse the Mideast situation, but we would begin to curb the even more ominous changes to the earth's climate that have recently come to light. The widespread combustion of oil and gasoline is a major suspect in the mounting evidence of global warming, while hydrocarbons in the fuels of high-altitude jets play a part in the depletion of ozone.

Apart from denial, the frequent response to such threats has been to seek out (or hope for) technological solutions: keeping jets at lower altitudes, for example, or more efficient automobile engines and building mechanical equipment. But, just as methadone is only a palliative to heroin addiction, these technical "fixes" leave intact our seemingly unlimited craving for the finite and increasingly vulnerable supply of oil.

We in the West must, instead, begin to address the underlying reasons for our oil dependence, having first to do with the way we live. Here, the architectural community can make a real contribution. While the professions of architecture and urban design, obviously, cannot change the world, they can begin to offer visions of what an existence much less dependent upon oil might be like.

This issue features some notable efforts to that end. While the visionary projects included here may differ in detail, they have an important trait in common: the creation of more self-reliant and self-sustainable communities. They make clear that the weaning of the West away from oil must be accompanied by a broader questioning of mass production and consumption, large-scale bureaucratic organization, and natural resource exploitation. As with most addictions, the cure usually demands a change in one's way of life.

Such talk may be viewed by some as either hopelessly idealistic or outright unAmerican. That criticism, however, stems from a near-sighted view of history. The West's absolute dependence upon oil is less than a century old and is the result of conscious choices to pursue certain technologies, such as the gasoline engine or central heating, over others, such as the electric engine or solar heating. With enough conviction and the right leadership, we can begin to make other choices.

As to the unAmerican quality of the projects shown here, they are anything but that. America is still the "New World," a place where visionary ideas and utopian proposals have not only been heard, but built, from New Harmony, Indiana, to Greenbelt, Maryland. If, as our President is suggesting, we are on the verge of a new world order, let the design professions help make it truly new: socially responsive and environmentally safe. **Thomas Fisher** ■

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### Disney Goes to Paris

I wish to take issue with Mr. Miller's essay (P/A Oct, 1990, p. 92) on the hotel district at Euro Disneyland. Any discussion of American popular culture and its exportation in the form of architecture and site planning must address itself to the popular landscape of the United States.

Our popular landscape is full of exactly the juxtapositions, densities, and diversity that is represented in the hotel district's thematic development. In fact one could argue, and contemporary writers from Venturi to Stilgoe have, that much of what is most vibrant and imaginative in popular culture, and accepted by most Americans with charmingly few second thoughts, occurs in the streets and strips of our cities and towns. It is these resonances that the site plan of the hotel district artfully taps into: The hotels cannot be viewed as artifacts separate from their surroundings. Kitsch is not a descriptor of familiar American landscape expression.

One must also distinguish "resort" from "Magic Kingdom." The special environments of the latter have particular criteria to set them apart from normal experience: They draw on aspects of art and myth as well as popular culture. A resort has different purposes and must respond to needs unkown in the Magic Kingdom. The hotel district at Euro Disneyland must provide for the comfort and relaxation of its guests and create a respite from a "hard day" at the Magic Kingdom while maintaining some resonance with the experience that visitors have come to enjoy and clear connections with cultural expectations of American images. The role of landscape setting and site organization in creating resort character is clear to anyone who has stayed at one. Surely, this common experience has historically had class associations, but these exclusivities have reached the greater masses, as disposable income, mobility, and popular interest have all grown.

Popular culture, as Mr. Miller points out, is always in the process of redefining and reinterpreting itself, but he seems to reflect rather nostalgically on the early aspects of Walt Disney's interpretations, while totally ignoring the broader landscape implications to unify as well as to express resort purpose and thematic symbol. I suggest that we might allow this new experiment in popular landscape to grow in, before we take the Mickey out of it.

*Roger Courtenay*
*EDAW, Inc.*
*Alexandria, Virginia*

### World Bank Credits

The existing Skidmore Owings & Merrill building for the World Bank in Washington, D.C. (P/A, Jan. 1991, p. 106) was not designed by Gordon Bunshaft. The building was designed out of S.O.M.'s Chicago office, with Bruce J. Graham as partner in charge of design, Natalie de Blois as project designer, and Pao-Chi Chang as senior designer.

### P/A Award Winner Photos

In the "Profile of Winning Firms" (January, p. 134), some photos were mislabeled. The photos for Jim Jennings Arkhitekture should be identified (l. to r., top to bottom) Jennings, Holmes, Stott. The lower photo for Machado & Silvetti should be labeled (clockwise from lower left) Machado, Lofgren, Silvetti, Perez.

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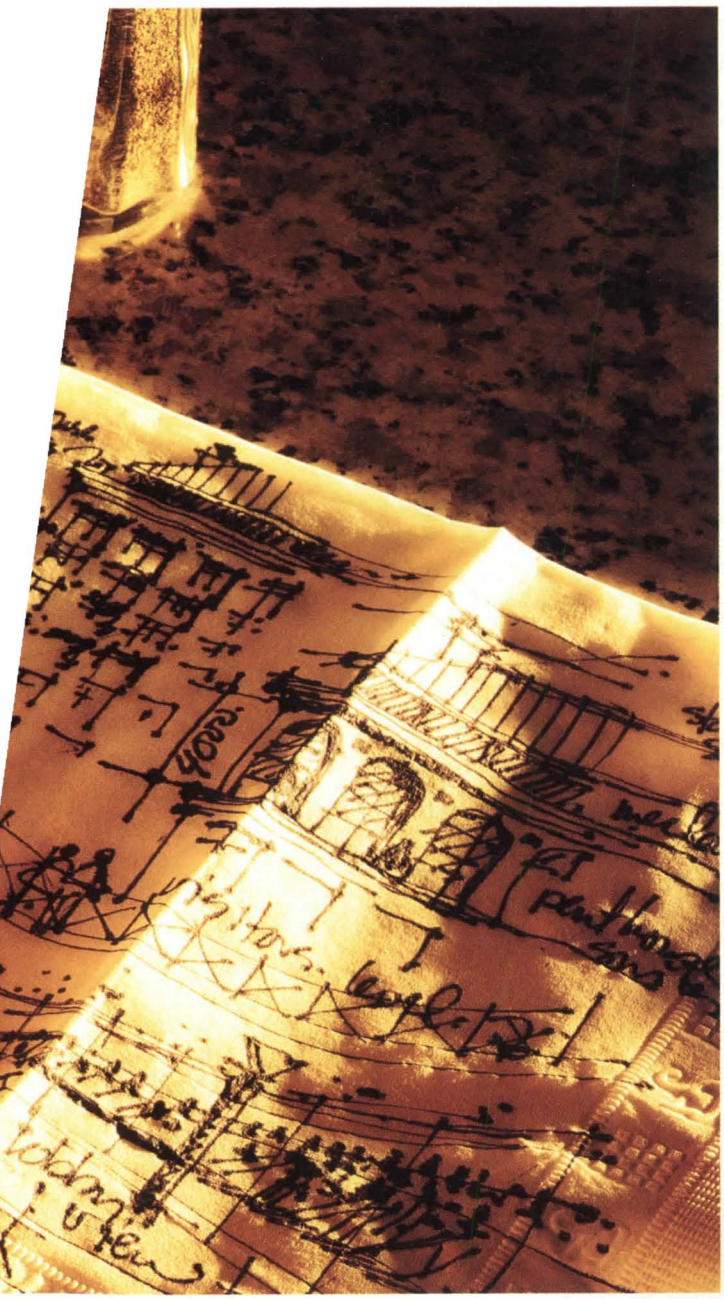

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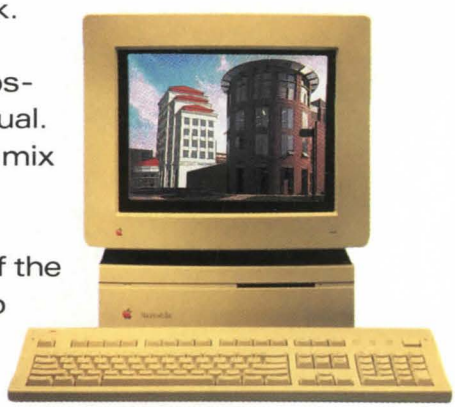

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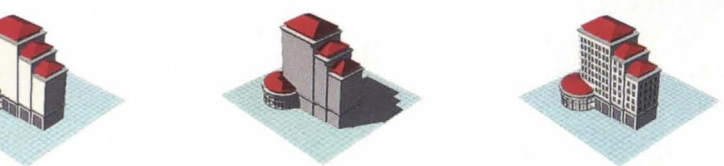

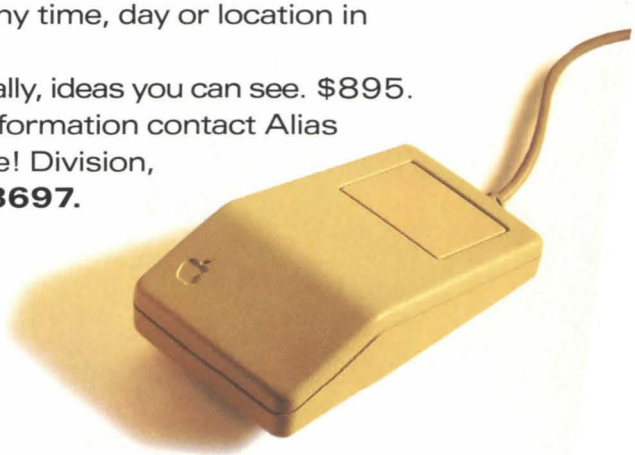

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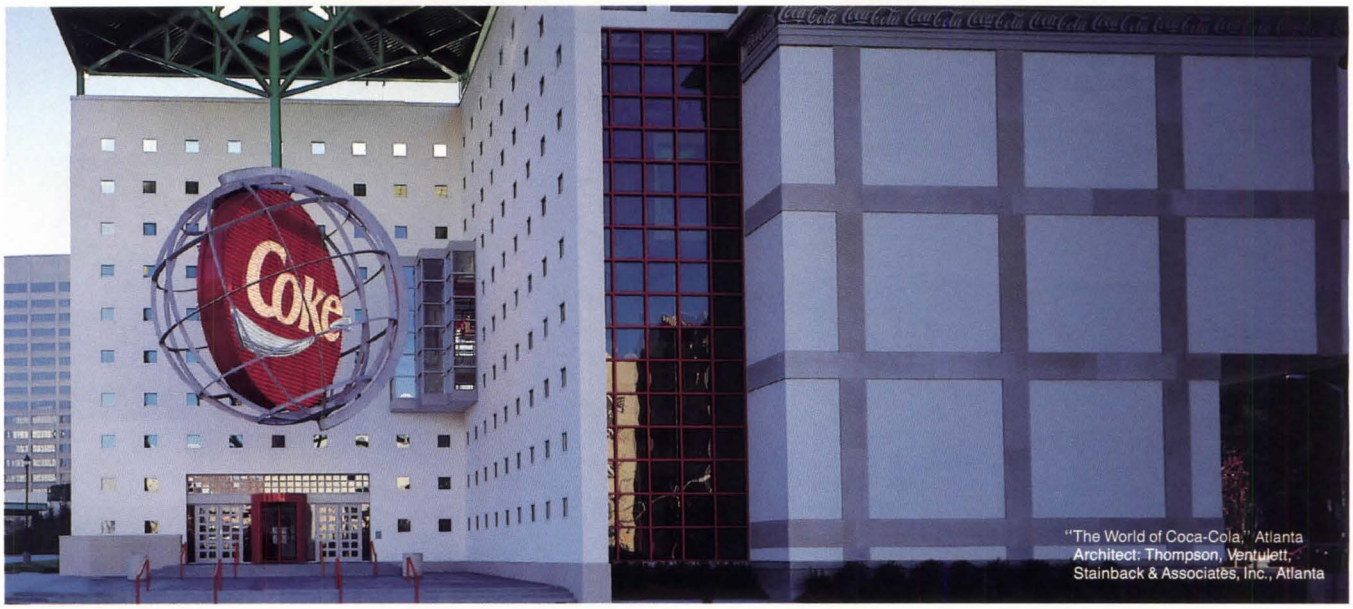


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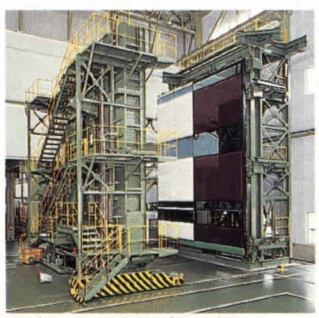

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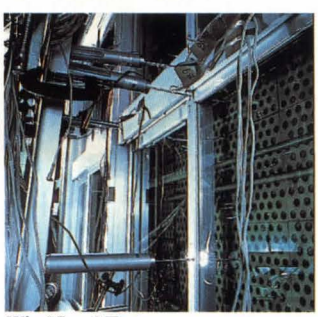

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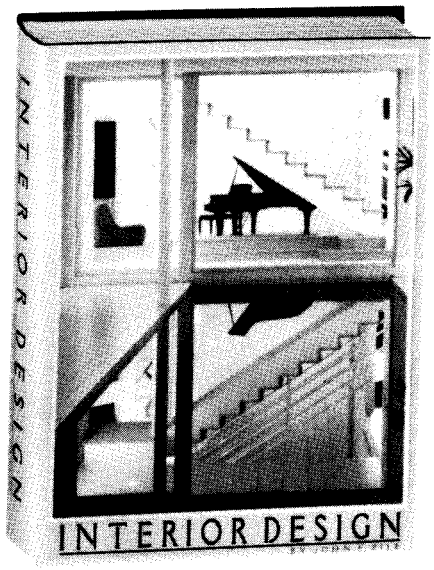
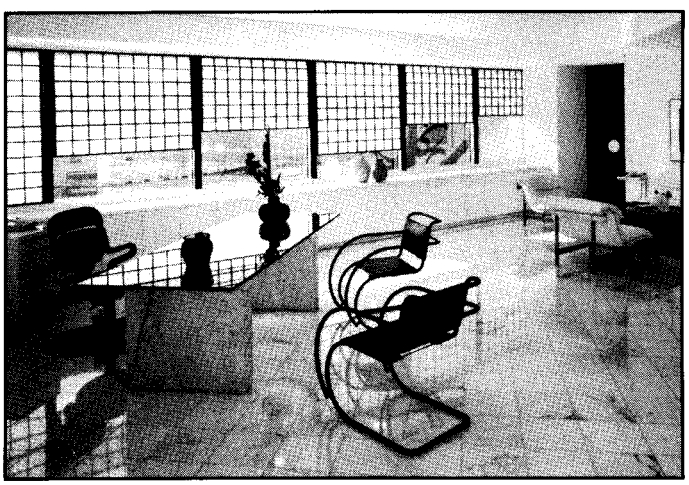
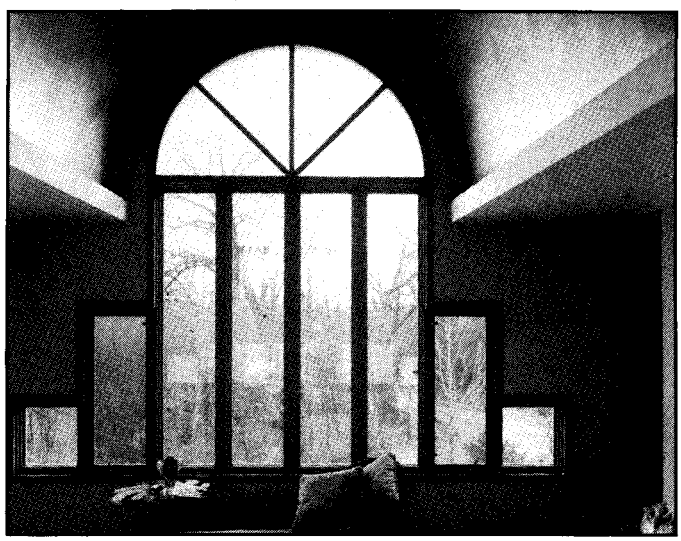


Page 93: Executive office in San Diego (Louis Frye, Designer)



page 128: Bedroom window (Tigerman Fugman McCurry Architects)

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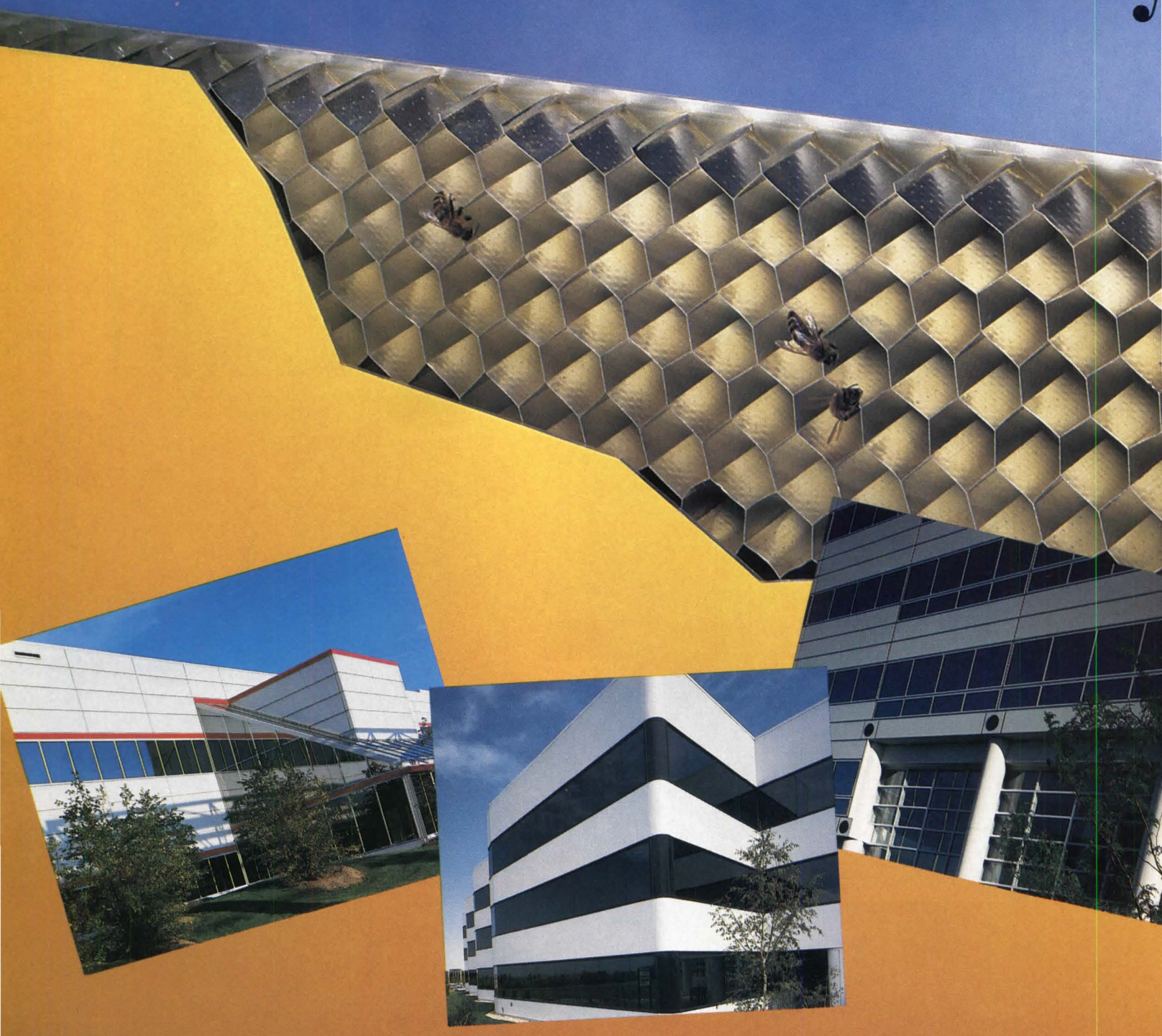

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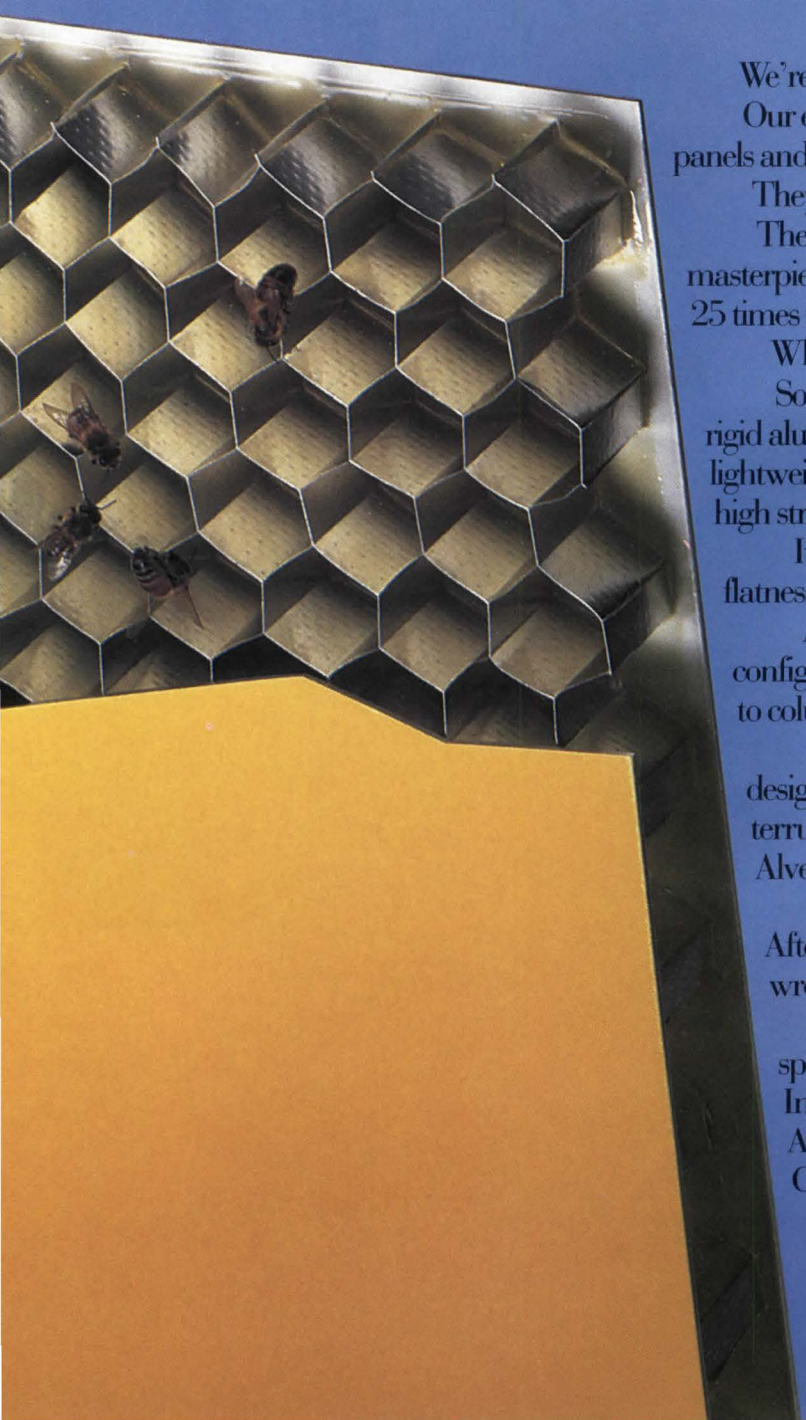

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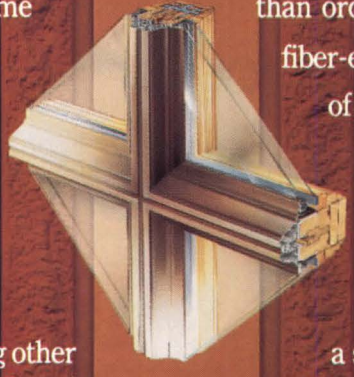

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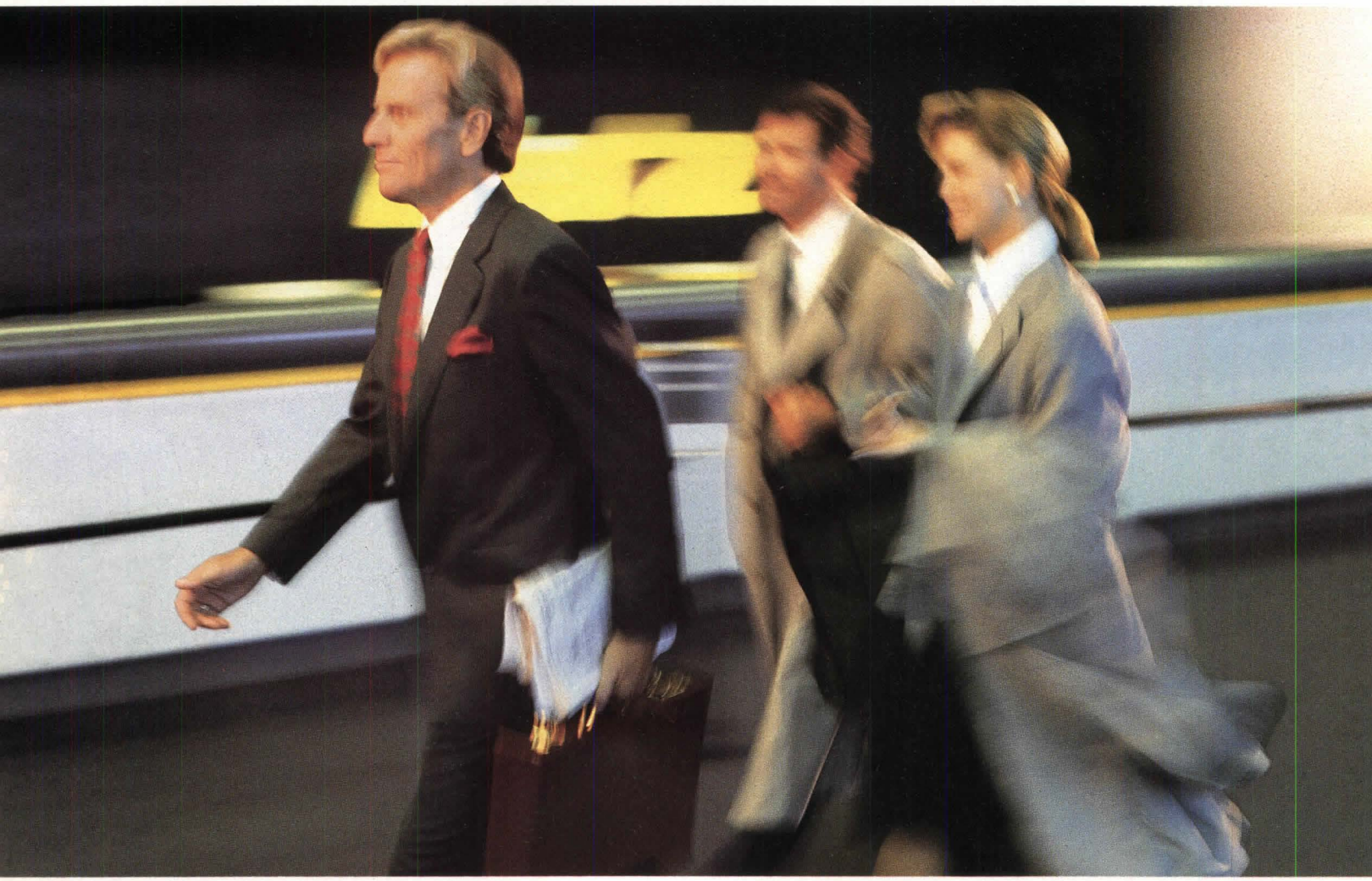


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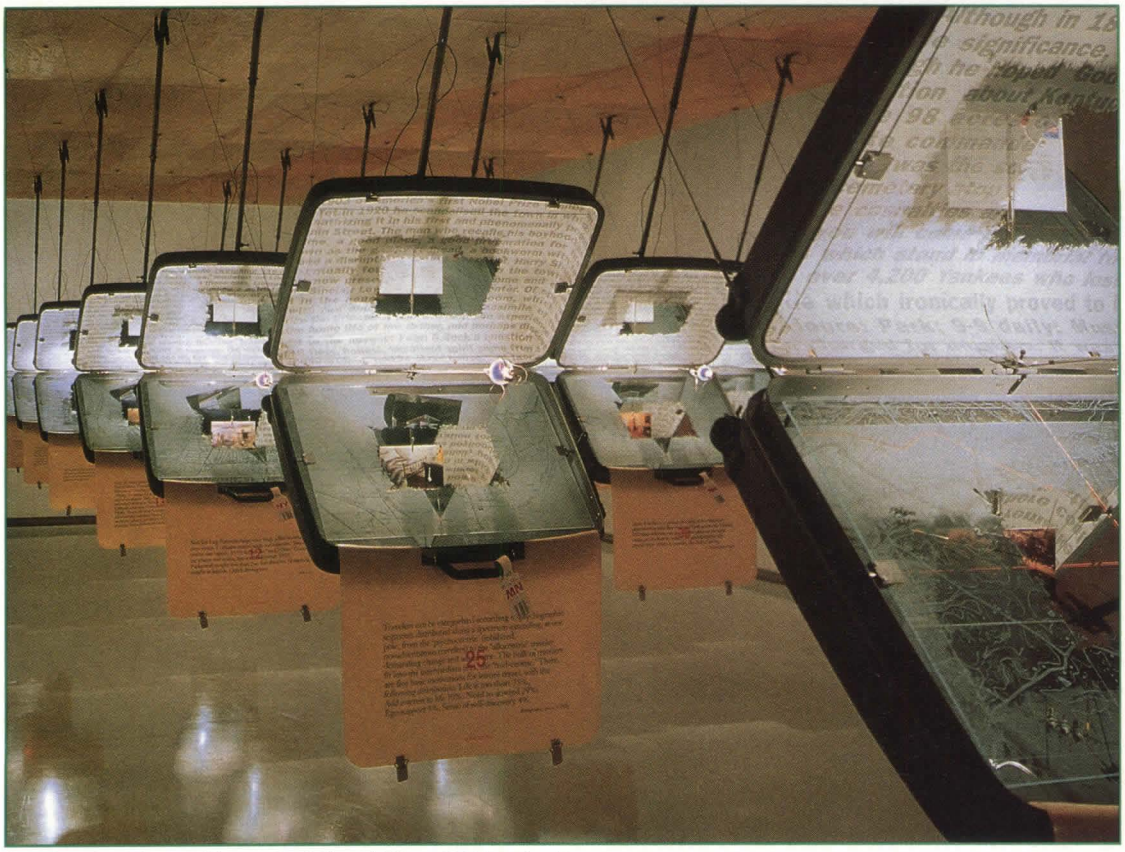


Walker Art Center

*See America First: Diller + Scofidio exhibit at Walker Art Center.*

### Postcards from Diller + Scofidio at the Walker

Continuing the series of provocative architecture exhibitions at the Walker Art Center in Minneapolis (P/A, Aug. 1988, p. 25, July 1989, p. 19, Feb. 1990, p. 24), "Tourisms: suitCase Studies" by Elizabeth Diller and Ricardo Scofidio – winners of a recent P/A Award (Jan. 1991, p. 88) – opens up new territory. The show, organized by Walker design curator Mildred Friedman, broadens architectural inquiry to include the cultural artifacts we enshrine and their attendant commerciality. "We are interested in the embodiment of auras that are found in the relationship between site and construction," says Diller. For "Tourisms" this takes the form of postcards from tourist sites in each of the 50 states.

A grid of 50 identical gray suitcases, open and canted at 45 degrees, is suspended at eye level by rods and cables from a plywood ceiling. Stenciled in clear varnish on the ceiling is an elongated map of the United States with lines that connect each state to its respective suitcase. Hanging from the handle of each suitcase is an airline luggage tag stamped with a red two-letter abbreviation of the state. A rubber flap hangs down to reveal a quote that "explicates" tourism, travel, or vacationing — 50 states, 50 quotes. Sticking straight out from the middle of each open suitcase like a tongue, is a postcard of a site from the state it represents.

Through an ingenious arrangement of lights and mirrors, Diller and Scofidio have provided us with simultaneous views of both sides of the postcards – following deconstructionist guru Jacques Derrida's belief in the indeterminacy of importance between picture and text.

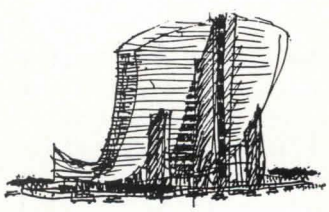
Postcards vary from bedrooms of famous people (as in "George Washington-slept-here") to famous battlefields. New Jersey's depicts the Delaware River where Washington crossed, Connecticut's the Mark Twain House bedroom, Tennessee's shows Elvis' bed in his private airplane at Graceland. New Mexico's is the grim Trinity Monument commemorating the site of the first atomic bomb experiments.

This statement from Michel Foucault on the Maryland flap: ". . . Certain spatial metaphors are equally geographical and strategic, which is only natural since geography grew up in the shadow of the military. The region of the geographer is the military region (from *regere* to command), a province is a conquered territory (from *vincere*). Field evokes the battlefield. . . " The image is Maryland's battlefield of Antietam.

The exhibition runs through March 17 at the Walker, then travels to the MIT List Visual Arts Center, Cambridge, Massachusetts, the Henry Art Gallery, Seattle, and the Wexner Center for the Visual Arts, Columbus, Ohio. **Bruce N. Wright** ■

*The author is editor of* INFORM Design Journal *and teaches at the Minneapolis College of Art & Design.*

**What is the AIA doing about the environment? See Perspectives, page 101.**



**Projects: Designing ecologically, with varied results. See page 95. (Above: solar bowl collector by Joel Goodman.)**

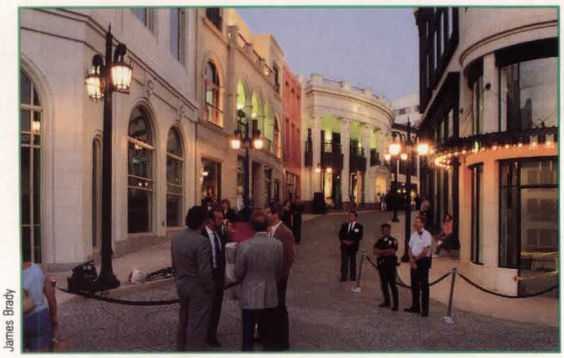
## Pencil Points

**AIA Institute Honors, given annually "for significant contributions to the environment and the architectural profession" by non-architects, have been awarded to: glass sculptor James Fraser Carpenter, New York; *architecture* critic Allan Temko, San Francisco; artist Lebbeus Woods, New York; Danish Design Centre, Copenhagen; Foundation for Architecture, Philadelphia; J.M. Kaplan Foundation, New York; developer Maguire Thomas Partners, Santa Monica, California; the book *Native American Architecture* by Peter Nabokov and Robert Easton; Princeton Architectural Press, New York; and the town of Seaside, Florida.**

**The AIA's 1991 Citations for Excellence in Urban Design have been awarded to: Banfield Transitway in Portland, Oregon by Zimmer Gunsul Frasca Partnership; Canada's Parliamentary Precinct in Ottawa, submitted by the National Capital Commission; Battery Park City in New York, submitted by Cooper Robertson & Partners and Ehrenkrantz, Eckstut & Whitelaw; Chicago River Urban Design Guidelines, submitted by the City of Chicago planning department; and Paseo Portuario in San Juan by RTKL Associates and Milton M. Ruiz & Associates.**

**The World War Two Japanese American War Memorial Competition, sponsored by the 100th/442nd/MIS World War Two Memorial Foundation, has been won by Roger Yanagita of Roger M. Yanagita Associates, Los Angeles. The memorial will be sited in the Little Tokyo area of Los Angeles.**

**After years of neglect, a 1931 steel-framed, stucco-clad house in New Hartford, Connecticut designed by William Howard Lescaze – considered the first International Style house built in America – is now being restored by New York architect Gary Morgenroth.**



James Brady

*New "Via Rodeo" by Kaplan McLaughlin Diaz.*

### Historicist "Via Rodeo" for Beverly Hills

It's hard for architects to get a reaction in greater Los Angeles, the birthplace of "Googie" diners, the Brown Derby restaurant and Deconstructivist bungalows. What is left to do? Nothing, perhaps, except build a shopping mall in Beverly Hills that resembles a 19th-Century European street scene.

Few recent projects in L.A. have focused more debate on fundamental architectural issues than Two Rodeo Drive, a 130,000-square-foot project by architects Kaplan McLaughlin Diaz, San Francisco, that outwardly appears to be 26 separate buildings. Although both wit and skill are in evidence in the project, reactionaries and highbrows alike seem taken aback by the outcropping of ornate buildings on the highly visible corner of Wilshire Boulevard and Rodeo. "Contrived," says one Beverly Hills resident. "It looks like the 20th-Century Fox studio backlot," says another. Admirers, on the other hand, praise the very qualities that make its detractors hate Two Rodeo Drive: fantasy and artificiality.

KMD principal Herb McLaughlin says he views the project as an exercise in detail. "I am very sympathetic to the notion of buildings having detail. I think we need to evolve new vocabularies." One local critic scorned the project's lack of irony; he complained that the project fails to "wink" at observers and cue them that Two Rodeo is a present-day building in *fin-de-siècle* drag. The architect, however, says he "hates" irony. "The only thing we want to make clear is that we are taking history seriously," he says. But historicism is not an end in itself for McLaughlin. Two Rodeo, he says, "is least successful where it is a straight rip-off of historical façades. It is most interesting where we have evolved and changed the details," such as the keystone arches that bulge menacingly toward Wilshire Boulevard.

Such surface elements distract from other ingenious aspects of the Beverly Hills mall. Working with a limited site, developer Doug Stitzel maximized ground-level retail spaces by cutting a new street, called Via Rodeo, down the center of the retail block. To assure pedestrian traffic inside the project, the developer made Via Rodeo the arrival point from an underground parking garage. Stitzel managed to further "max out" his retail frontage by raising the pedestrian street, thus allowing storefronts on Rodeo Drive to rest under those of the Via Rodeo.

If purists can fault the façadism of Two Rodeo, urban designers might give points to the project. McLaughlin says he has created a public space – Via Rodeo – in a region starved for plazas and pedestrian streets; and the mall fits in comfortably with its well-heeled neighbors, particularly the Regent Beverly Wilshire hotel across the street.

Even if Two Rodeo looks antique, it is definitely a 1990s piece of real estate: Last year, prior to completion, two Japanese retailers bought a majority interest in the mall for a reported $1500 a square foot, a record price for retail space in Southern California. That alone should give the ironists something to chew on. **Morris Newman** ■

*The author, a former real estate editor of the* Los Angeles Business Journal, *is a freelance writer in Los Angeles.*

Chuck Choi

*Karen Van Lengen and Peter Samton at housing charrette.*

### Hope For Housing: A Dialogue Continues

Last fall, the New York Chapter of the AIA and Women In Need, a New York not-for-profit organization, cosponsored "Hope For Housing By Design," a two-day panel discussion and design charrette. "Hope" brought together a group of architects, students, and individuals in an effort to understand both the needs and the desires of the homeless and to design housing for 20 women and their families on a 50′ × 150′ infill site owned by WIN in the Bronx.

The Friday night discussion, held at the Urban Center with a group of panelists from essential sectors of the community, produced a mix of statistics and passion in its search for housing solutions. The panelists were architect Theodore Liebman of the Liebman Melting Partnership; Philip Aarons, president of General Atlantic Realty Corporation; Grizel Ubarry, a consultant in community economic development; Charles Buki, director of the AIA Search For Shelter program; and Rita Zimmer, founder of WIN. Ubarry called for a real "social services infrastructure"; Aarons for "cost-effective. . . long lasting projects"; Buki for housing that is more than "adequate"; and

Zimmer called on charrette participants specifically – though the words resounded beyond the task at hand – to design "a place that is safe, dignified, supportive, and private."

Charged with designing permanent drug- and alcohol-free housing for 20 women with one to three children each – with space for parent workshops and self-help groups – six architect-led teams of students from six New York area schools of architecture produced a variety of schemes. The one element incorporated into each, as pointed out by charrette critic Michael Mosteller, professor at NJIT, was a courtyard. Though it was not part of the program brief, each team envisioned this space as a vital element for a feeling of community, a playground, and a way of directing light into the apartments.

In the end, small-scale projects, designed for individuals with their own input of needs and desires, not for the homeless *en masse,* seemed to be the most feasible. Liebman's final plea was meant for the local audience but worked on a universal level as well: "Anyone who sees a future for this city has to see its people housed." As for "Hope's" future, says Zimmer, finding "money is the next step." **Abby Bussel** ■

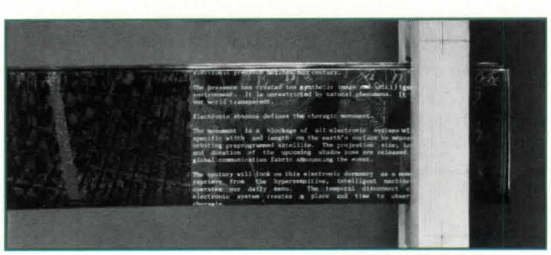
Everett & Soule

*Colonial façade of NAHB house by Berke & McWhorter.*

### Split Personality for NAHB House

By designing a model house for the 1991 National Association of Homebuilders (NAHB) Convention in Atlanta, Deborah Berke and Carey McWhorter have ventured into the spec housing market, an area long dominated by contractors, rather than architects. Instead of simply complaining about house builders' fondness for *tchotchkes* on "Colonial" homes, Berke & McWhorter, commissioned by *Builder* magazine in collaboration with the NAHB and *Home* magazine, designed their own austere adaptation of a Williamsburg prototype. Acknowledging that traditional rooms and façades are standard equipment on the real estate market (buyers believe they ensure a high resale value), the architects designed the front half of the house along the lines of 18th-Century models, but oriented the back half to the garage and back yard, the principal points of entry in the modern household.

To their credit, Berke & McWhorter kept the front/back duality from overwhelming their understated design: A change from brick to clapboards and a slight setback on the sides align with the plan shift within the house. While these subtleties may elude drive-by home buyers, the clarity of the plan ought to be an asset on the marketplace. Thoughtful houses like this one would be a welcome intrusion in the spec housing industry. **Philip Arcidi** ■



© Carol Bates

*Winning "Choragic Monument" entry by Cowan and Davis.*

### Competition Yields Monument to the Century

Can a monument be built to commemorate the "vast array of creative flux" in the architecture of this century? The New York City chapter of the AIA recently held a competition with a $3000 first prize courtesy of Olympia & York for the design of a "Choragic Monument" that would best epitomize the "century-identity" of Western architecture. In the ancient Greek tradition of tragic or comic performances at annual Dionysian festivals, a choragic monument was erected to capture in stone the nature of the best performances. In this modern version of the competition, participants were required to use computers rather than choruses for their entries. With this requirement the NYC/AIA stressed a conceptual, rather than graphic, application of the technology.

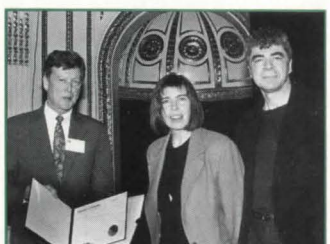
Competition Jurors architect Peter Eisenman, Alice Aycock (an artist and art critic at Yale), Donald Wall (a professor of architectural history and theory at the New Jersey Institute of Technology), and P/A's executive editor Thomas Fisher, decided that among the entries, the best monuments were those that involved the media, rather than those that could be constructed. The winning entry by Marti Cowan, a New York architect, and Felecia Davis, who teaches architecture at Penn State, was a satellite programmed to block all electronic systems in a 100-mile-long X ½-mile-wide strip of New York for 52 minutes. With this proposal Cowan and Davis recognized that the use of electricity is the one major difference between this century and those that preceded it: If "Elec-

*(continued on next page)*

### Luncheon Honors P/A Award Winners

The winners in the 38th Annual P/A Awards competition (P/A, Jan. 1991, pp. 77–135) were announced publicly at a luncheon at the Plaza Hotel in New York on January 11. The 25 winners in architectural design, urban design, and research were presented with their awards at the luncheon, which was attended by over 300 architects and allied professionals. The winners were selected last October from among 824 entries by a jury of eight professionals.

The luncheon was also the occasion for the announcement of P/A's Affordable Housing Initiative (P/A, Jan. 1991, p. 51), an open competition to design an affordable single-family house for a site in Cleveland. P/A Executive Editor Thomas Fisher outlined the competition, which was made public for the first time earlier that week at a press conference in Cleveland. ■



Photos: Paul Friend/Astro

*P/A's Jim Murphy presents awards to Elizabeth Diller and Ricardo Scofidio (top); Mark Alden Branch congratulates John Hightower, Eric Thorkildsen, Lori Geissenhainer, and Michael Dennis (center); Kenneth Labs with Witold Rybczinski and Vikram Bhatt (above).*

## Cedar Design Awards Announced

Two Grand Awards and six Merit Awards were conferred in the 1990 Architectural Design Awards of the Western Red Cedar Lumber Association. The awards program, held for the *first time last* fall, is to be a biennial competition. The Grand Award winners are:

- Camp Tweedale, Lower Oxford Township, Pennsylvania, by Susan Maxman Architects, Philadelphia;
- St. Andrews School Boathouse, Middletown, Delaware; by Richard Conway Meyer, Philadelphia.

Merit Award winners are:

- Indian Rock Residence (renovation), Berkeley, California, by Ace Architects, Oakland, California;

Russell Barnes

Frederic Schwartz

*Cedar winners: Indian Rock residence (top) and Goldman house (above).*

- Goldman House, East Hampton, New York, by Anderson/Schwartz Architects, New York;
- Moses Studio, Venice, California, by Steven Ehrlich, Venice;
- McLaughlin Residence additions, Essex, Connecticut, by J. Whitney Huber, Essex;
- Quivira Vineyards Winery, Healdsburg, California, by Rubenstein Architects, Santa Rosa, California;
- Thom residence, Woodside, California, by Robert Swatt, San Francisco. ■

**Monument** *(continued from previous page)*

tronic presence defines our century," they reasoned, "electronic absence defines the choragic monument." Cowan describes it as a "*non*ument – when people know that the city will be shut down for business in a certain location at a certain time, they can prepare for their own celebration."

Second-place winners Hilary Bryon, William Galloway, Joseph Obritz, and Heinrich Schoendt of Blacksburg, Virginia, proposed a stone structure in which a cacophony of performances take place on moving stages that are suspended by cables. And third place was awarded to Ahmet M. Ozguner, Can F. Aker, and Aysen Savas, architects from New York, Istanbul, and Cambridge, Massachusetts, for a matrix of light particles called *Res Gestae* (the course of human events) that bounce off the human body to create voids in space.

What is striking about the winning monuments is that they are "performances" that interact with a population to create meaning. Where the ancient Greeks used an architectural monument to capture the meaning of a play, these contemporary architects have created a script to signify the built form. **Julie Meidinger** ■

## New Use for L.A.'s "Assyrian Wall"

One of the most familiar landmarks in the Los Angeles area, the "Assyrian Wall" in the City of Commerce area, has been resurrected as a mixed-use commercial center. Situated south of downtown Los Angeles, the 1700-foot-long bas-relief façade in Babylonian style is well known to motorists on Interstate 5. With its regular bays and time-warp imagery, the Assyrian Wall is a freeway building *par excellence*. Little beyond the freeway wall remains, however, of the 600,000-square-foot Samson (later Uniroyal) Tire Factory built in 1929. The 35-acre site has now been divided among retail, office, and hotel uses, all newly built.

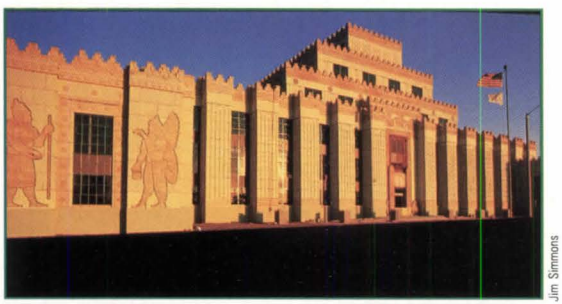
For the retail portion of the site, Los Angeles-based Sussman/Prejza & Co., the project designers (with architects-of-record The Nadel Partnership of Los Angeles), decided not to emulate the Mesopotamian imagery of the freeway elevation, but to play off the historic associations of the site. "The original building was a factory, not a Babylonian palace," says project architect Fernando Vazquez.

With a spartan budget of $32 a square foot, the mall behind the Wall attempts to make a virtue of simplicity. "We wanted to collide and juxtapose factory components. . . with the Cecil B. DeMille quality of the Assyrian Wall," says Sussman/Prejza principal Deborah Sussman. Simple stucco buildings are painted in brilliant colors and arranged around small courtyards in a scheme that recalls the work of Luis Barragán. The storefronts in the open-air mall are angled toward each other to form forced perspectives.

Playing off the industrial memories of the site, Sussman/Prejza architects created two gates of welded I-beams to guide pedestrians from the rear parking lot to the 150,000-square-foot mall, a factory outlet center. Above the food court, a 20,000-square-foot portion of the original sawtooth ceiling trusses remains in place, with a bay removed to expose a view of the ziggurat tower atop the Assyrian Wall.

The industrial metaphor is extended by the use of a freeway sign for the shopping center fashioned after an oil derrick. The 140-foot tower stands at the center of a courtyard in the mall, where the monumental tripod legs define an intimate urban space.

The former Samson plant had stood empty since the 1970s while city officials debated what to do with it. The white knight turned out to be the Trammell Crow Company of Dallas, which has been the most active developer in Commerce. Taking a 99-year ground lease on the site, Crow agreed to be the "fee" developer for the City, which retains nominal ownership of the site.



Jim Simmons

*"Assyrian Wall" of former LA tire factory . . .*

The plan to save the much-admired Assyrian Wall, however, rattled preservationists when first announced, since it involved the demolition of 150 feet of the wall to make room for four lanes of traffic. San Francisco landscape architect Martha Schwartz planted the automobile entrance with 450 palm trees that sit in tire-shaped planters, an arch acknowledgment of the site's former use.

The Nadel Partnership is the architect of the four conventionally boxy office buildings, which lie directly east of the shopping mall. A 200-room hotel, currently under construction, is the work of in-house architects at Trammell Crow.

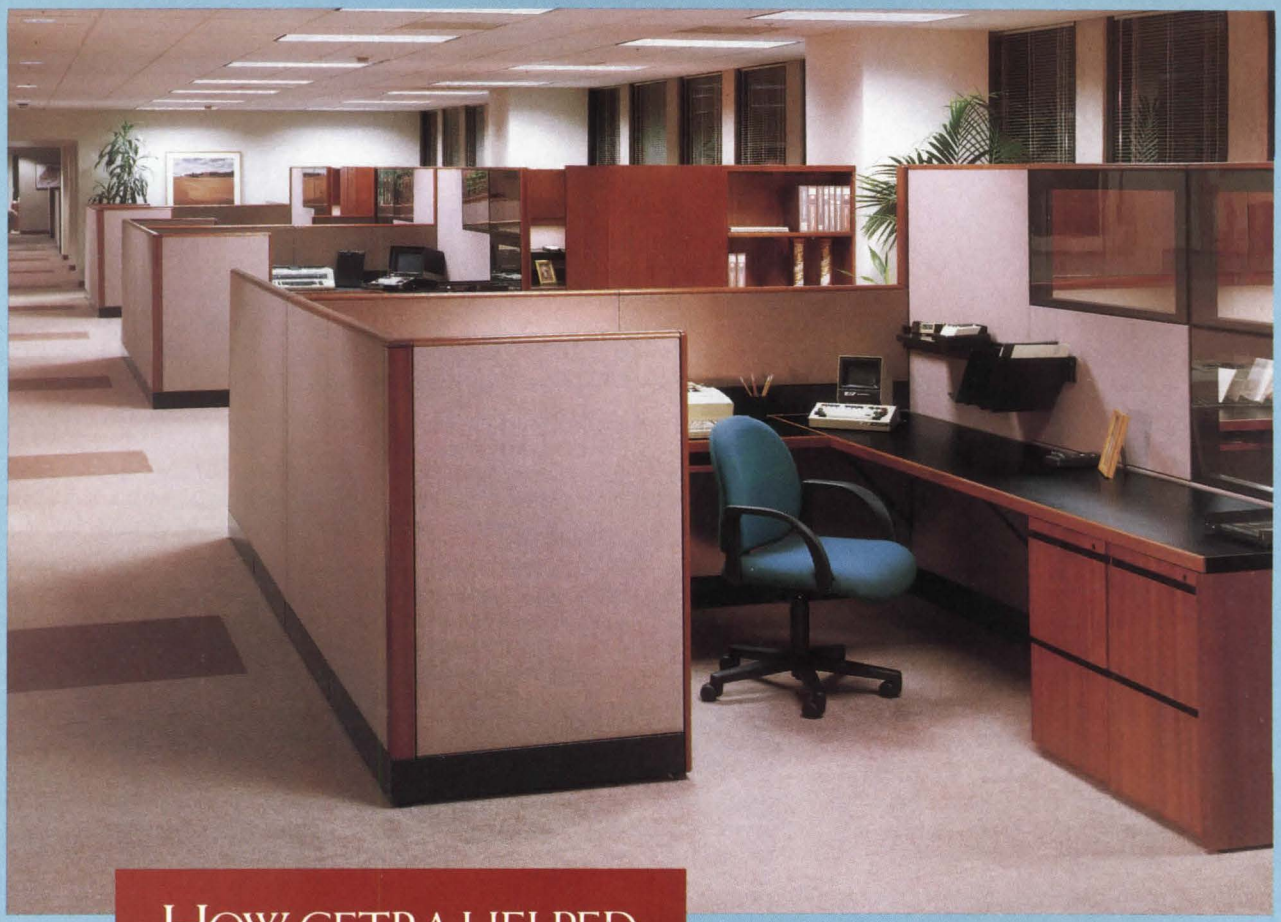
**Morris Newman** ■

*The author, a former real estate editor of the* Los Angeles Business Journal, *is a freelance writer in Los Angeles.*


Jim Simmons

*. . . and courtyard by Sussman Prejza behind the wall.*

Interior Architects, Inc.
San Francisco, California



# HOW CETRA HELPED SECURITY PACIFIC MAKE THE CORRECT CHANGE.

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C E T R A G O E S E V E R Y W H E R E

# Housing Initiative Questions

## Competition Questions: P/A's Affordable Housing Initiative

*The following are questions that have been asked regarding the affordable housing competition P/A is sponsoring. The competition brief was published in the January 1991 issue of P/A (pp. 51-54) and can be obtained by calling Pam Gillmor at 203-348-7531 or by fax 203-348-4023. The deadline for submissions is March 29th, 1991.*

**Q Is this structure to be seen as a prototype or simply as one possible idea in a field of many?**
**A** Ideally, both. The design must fit the particular site and program, but also should have a broader applicability, enabling it to work on other sites in other places.

**Q Both my colleague and I are architectural graduates working for an engineering firm. Do we qualify?**
**A** Yes. The competition is open to architects or people trained in architecture or design who are over 18 and who work in the U.S. or Canada.

**Q Must submissions be in the form of boards only?**
**A** Yes. Exceptions will make the judging too difficult.

**Q Is the entire submission to be on one 30"x40" board?**
**A** Yes. We recognize that, for some schemes, those dimensions may be tight, but we also did not want the judging process to become unwieldy with too many boards.

**Q Does the architect or inventor of components shown in the design have exclusive rights beyond the limited use of P/A as stated in the competition program?**
**A** Yes. Apart from P/A's right to publish submitted schemes and build one of the winners, all further rights to the material will remain with those who submit.

**Q Should the final presentation reflect full build-out (with future expansions) or simply the initial scheme?**
**A** Both. We would like to see the initial scheme and - say dotted in or shown in a smaller scale sketch - the expansion potential.

**Q Who will own the house upon its completion and how frequent will the occupancy turnover be?**
**A** We intend to sell the house through a local housing agency to a moderate-income family or unrelated group. We have no idea what the turnover will be, although the neighborhood is fairly stable, with many long-time residents.

**Q Does the site have more than a one-foot change in grade in either direction on the site?**
**A** The slope has a slight fall in grade of less than one foot from south to north and appears to be well drained. We will be replacing much of the debris below grade with fill and will ensure that adequate drainage is maintained.

**Q What are the security requirements in the neighborhood? Is it feasible to have a greenhouse or sliding glass doors or should there be bars at ground floor windows?**
**A** The area is not an extremely high crime area. Bars are not necessary, and a greenhouse and sliders are probably fine. Outdoor space, however, should be defensible, widely visible, and easily lighted.

**Q What is the dimension of the entire block?**
**A** The block is roughly 325 feet wide and 800 feet long, with a center alley running the length of the block.

**Q How close is the site to shopping or a transportation route such as a highway or railroad?**
**A** Clinton Avenue runs between two parallel streets that contain a mix of residential, commercial, and institutional buildings. The area's main shopping street is four blocks away. One block to the north also is a highway that runs along Lake Erie into downtown Cleveland, about one mile away.

**Q What means of transportation are available?**
**A** Buses run along the parallel streets to the north and south. There also is an entrance to the highway two blocks away from the site.

**Q Would you consider a submittal based upon multiple dwellings, such as a rowhouse configuration?**
**A** Submittals should focus on the design of a single-family house, which can stand alone and meet the budget whether or not it also works as one of several rowhouses. Indication of the rowhouse configuration will certainly not disqualify a submittal.

**Q Elaborate on your statement that priority will be given to design that work on mid-block sites as well as on the corner site.**
**A** Because we are hoping for schemes that have wide applicability, we do not want designs that absolutely depend upon being on a corner to work. Projects should also be adaptable to the more common mid-block site.

**Q Are garages typical in the neighborhood?**
**A** Yes, although there is also a fair amount of surface and street parking.

**Q What is the actual depth of the existing foundation?**
**A** We have not conducted a full site survey with borings, but we know that the former apartment had a single-story basement partly above ground. Assume, then, that the basement slab is five feet below grade with the bottom of the footing a couple of feet below that.

**Q What are the conditions of the existing foundations, will they support structural weight, and what is the position of the tops of the foundations in relation to the grade?**
**A** Having been buried for a number of years, the existing foundation is probably quite deteriorated. It may be possible to reinforce it and reuse it, although you should plan on building new basement walls. The tops of the existing foundations appear to be located just below the existing grade.

**Q Can basement area be built beyond the required above ground setbacks?**
**A** Although costly, that approach is probably allowable within the zoning code. As the site plan shows, the buried foundation of the apartment does extend beyond the setback lines, so there is precedent for this.

**Q Is the maximum exterior wall height of 35 feet also the maximum building height?**
**A** No, that refers only to the height of walls, not the ridge of the roof. As far as we know, there is no maximum roof height.

**Q Are enclosed porches considered habitable space and does the 3'6" foundation depth requirement apply here?**
**A** If enclosed enough to be heated and secured, porches can be considered part of the habitable space. If so designed, then their foundations should go the full 3'6".

**Q For open porches, does the 20 percent maximum façade requirement apply, and is the 20 percent maximum area a total overall for the project or is it to be considered for each building side?**
**A** Open porches are not part of the 20 percent maximum, which applies to each façade and not the overall project.

**Q Has the city adopted an energy code?**
**A** They have adopted the CABO code, including the CABO Model Energy Code (S 26.700) which is available under separate cover from CABO.

**Q Does the $45/sq.ft. cost for living spaces include finishes?**
**A** Yes.

**Q Is the 950 sq.ft. minimum for the total floor area or the first floor only?**
**A** The total floor area.

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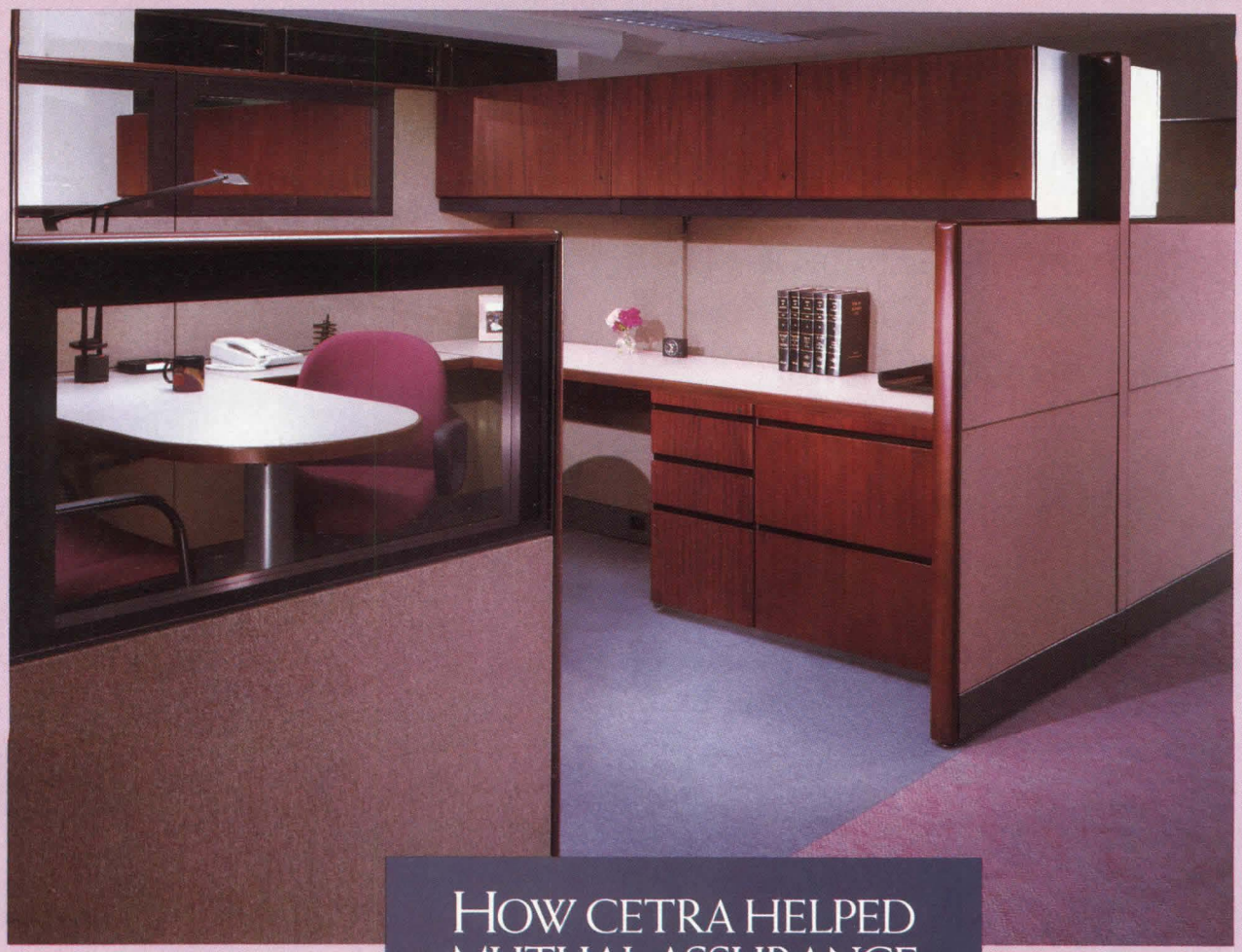

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# Calendar

## Exhibitions

**Kazimir Malevich**
Through March 24

**New York.** Paintings, drawings, and architectural models by the early 20th-Century Russian artist are exhibited. Metropolitan Museum of Art.

**Architectural Toys**
Through March 31

**Montreal.** "Buildings in Boxes: Architectural Toys from the CCA" takes a look at the profession's fascination with the toy as representative of the real world; a 19th-Century wooden German village, Lincoln Logs, and a variety of American construction toys dating from the 1920s to the 1950s are among the objects exhibited. Canadian Centre for Architecture.

**Architects + Artifacts**
Through April 14

**Pittsburgh.** Curators of "Architects + Artifacts" have charged themselves with questions such as "What do architects do?" and "What does architecture do?," focusing attention on a group of "new" architects – Bausman-Gill, Holt Hinshaw Pfau Jones, Maya Ying Lin, Morphosis, and Douglas Darden among them. The Society for Arts in Crafts, Strip District Gallery.

**The Grand Louvre**
Through May 21

**Washington, D.C.** The Louvre's architectural and historic significance will be explored from its origins as a fortified castle through the most recent additions. The Octagon.

**Isozaki Retrospective**
March 17-June 30

**Los Angeles.** The work of Japanese architect Arata Isozaki will be celebrated in a 30-year retrospective. Museum of Contemporary Art.

**John Russell Pope**
March 17-July 7

**Washington, D.C.** To help mark the 50th anniversary of the National Gallery of Art, a two-part exhibition of work by the museum's architect, John Russell Pope, will include original drawings and archival material from the design and construction of the West Wing and an audiovisual program on Pope's career. National Gallery.

**Bank Architecture**
March 23-July 28

**Chicago.** "Money Matters: A Critical Look at Bank Architecture," a traveling exhibition originating at the Museum of Fine Arts, Houston, includes 175 photographs of 56 banks, historical and modern, in the U.S. and Canada. Historical Society.

## Competitions

**Affordable Housing Initiative**
Submission deadline March 29

**Stamford, Connecticut.** With Penton Publishing and Bank One of Cleveland, P/A is sponsoring a design competition and building program for a structure for a moderate income family to be sited in the Ohio City section of Cleveland. (See January P/A, p. 51, for program information and entry forms or contact Pam Gillmor at (203) 348-7531, FAX (203) 348-4023.)

**PC GlassBlock® Awards**
Entry deadline April 26

**Pittsburgh.** Architects, interior designers, and architecture students are invited to enter exterior or interior, commercial, residential, institutional, or specialty construction projects using PC GlassBlock® products as "a central design element" in Pittsburgh Corning Corporation's PC GlassBlock® Design Awards competition. Categories are: Existing, Work-in-Progress, and Conceptual. Contact PC GlassBlock® Products Hotline (800) 992-5769 (in Canada, (416) 222-8084.)

*(continued on page 33)*

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## Calendar *(continued from page 31)*

**Western Home Awards**
Application deadline April 30, entry deadline May 30

**Menlo Park, California.** *Sunset* magazine and the AIA have announced a call for entries in the 35th biennial awards program. Houses designed by architects registered in Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming, completed since 1987, may be entered. Contact Western Home Awards, Box 92345, Menlo Park, California 94025 (415) 324-5438.

**Furniture for the Year 2001**
Entry deadline May 1

**New York.** *Metropolis* magazine and Parsons School of Design have announced an invitation to design furniture or furnishings that are environmentally appropriate for the year 2001. Approximately 100 designs (in drawing form) will be exhibited at the *Metropolis* co-sponsored International Contemporary Furniture Fair (May 19–22, at the Jacob Javits Convention Center in New York). Twelve of the entries will be developed into prototypes. Contact Competition/*Metropolis*, 177 East 87th Street, New York 10128 (212) 722-5050.

**John Dinkeloo Fellowships**
Application deadline May 1

**New York.** Three 1991 Traveling Fellowships in Architectural Design and Technology are being sponsored by the National Institute for Architectural Education, John Dinkeloo Bequests/American Academy in Rome. Any U.S. citizen who has received or anticipates receiving a first professional degree in architecture between June 1988 and June 1991 is eligible. Contact NIAE, 30 West 22nd Street, New York 10010 (212) 924-7000 or FAX (212) 366-5836.

**AIAS/Age of Discovery**
Submission deadline May 11

**Washington, D.C.** "The Next Age of Discovery" is a design competition sponsored by the American Institute of Architecture Students and the Sheet Metal Workers International Association. Architecture students and interns (judged separately) are asked to design a 90,000-square-foot U.S. pavilion for Expo '92 in Seville, Spain, with exhibition spaces, a theater, visitors facilities, administrative offices, and an outdoor performance area. Contact The Next Age of Discovery, AIAS/SMWIA Design Competition, 1735 New York Avenue, Washington, D.C. 20006 (202) 626-7455 or FAX (202) 626-7421.

**Santa Clarita City Center**
Submission deadline May 17

**Santa Clarita, California.** The City of Santa Clarita has announced an open two-stage design competition for a city center masterplan; a new city hall will be the first building designed. Contact William H. Liskamm, competition advisor, City Hall, 23920 Valencia Boulevard, Suite 300, Santa Clarita 91355 (805) 259-2489.

**Waterfront Center Awards**
Submission deadline May 17

**Washington, D.C.** Completed waterfront projects and comprehensive waterfront plans for any site in the world may be entered in the fifth annual awards program. Contact Waterfront Center, 1536 44th Street, N.W., Washington, D.C. 20007 (202) 337-0356 or FAX (202) 626-1654.

**Fulbright Scholar Awards**
Application deadlines June 15 and August 1

**Washington, D.C.** Over 1000 grants for research, combined research and lecturing, and university lecturing are offered in the 1992–93 Fulbright Scholar Program sponsored by the Council for International Exchange of Scholars. Applicants must be U.S. citizens and hold a Ph.D. or comparable professional qualifications. Deadlines apply to different overseas locations. Contact CIES, 3007 Tilden Street, N.W., Suite 5M, Washington, D.C. 20008–3009 (202) 686-7877.

*(continued on page 35)*


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## Calendar *(continued from page 33)*

### Conferences

**Urban Ground**
April 6–7

**Cambridge, Massachusetts.** "Urban Ground. Re-examining Landscape Architecture in the City" will "critically assess the ways in which contemporary landscape architecture has altered and been altered by the environmental (ecological and architectural) and social ground of the contemporary city." Works by Paul Friedberg, Lawrence Halprin, Robert Hanna/Laurie Olin, and Carol Johnson will be analyzed in this context. Contact Landscape Architectural Symposium, Harvard University Graduate School of Design, Department of Landscape Architecture, 48 Quincy Street, Cambridge, Massachusetts 02138.

**Architectural Practice**
April 19–21

**Cincinnati.** A symposium on the "changes in the sponsorship, design and production of buildings, on emerging responses in architectural practice, and on the future implications for practice and research" is being sponsored by the University of Cincinnati. Research scholars, practitioners, management consultants, and educators will be among the participants at "Emerging Forms of Architectural Practice." Contact David G. Saile or Gordon Simmons, Center for the Study of the Practice of Architecture, School of Architecture and Interior Design, University of Cincinnati, Cincinnati, Ohio 45221–0016 (513) 556-3415/4.

**Architectural Historians**
April 24–28

**Cincinnati.** The 1991 annual meeting of the Society of Architectural Historians, to be held at the Omni Netherland Plaza Hotel in Cincinnati, will include a reception, symposium, local bus and walking tours, and a series of talks on local architecture. Contact SAH, 1232 Pine Street, Philadelphia, Pennsylvania 19107–5944.

**ACSA/European Schools**
April 25–28

**Paris.** "Educating or Training Architects? Pedagogic Models," organized by the Association of Collegiate Schools of Architecture and the French government, is the second annual ACSA/European Schools of Architecture Conference. Design, Urbanism, History and Theory, Technology, Computers, and the Profession will be discussed. Contact Professor Spyros Amourgis, ACSA International Relations Committee, c/o College of Environmental Design, California State Polytechnic University, 3801 West Temple Avenue, Pomona, California 91768 (714) 869-2691 or FAX (714) 869-4516.

**AIA Convention**
May 17–20

**Washington, D.C.** The 1991 AIA National Convention and Design Exposition, with the theme "Issues 1991," will be opened by Senator Daniel Patrick Moynihan on Friday, May 17 (the Senator's attendance is not confirmed). Each day will have a "special focus" and a keynote speaker: Design Day with Robert Venturi; Community Day with Rod Hackney, Charles Correa, and Andres Duany; and Environmental Day with Amory Lovins, Rocky Mountain Institute. Over 40 one-hour consultation sessions, 4 specialty breakfasts, and 30 professional programs are planned. Contact AIA Convention Department (202) 626-7395.

**NOTICE**

In order to provide timely Calendar information to our readers, listings information should be submitted one and one-half months prior to publication (March 15 for the May issue, for example). For possible inclusion, please send relevant information to Abby Bussel, P/A, 600 Summer Street, Stamford, Conn. 06904 or FAX (203) 348-4023. ■

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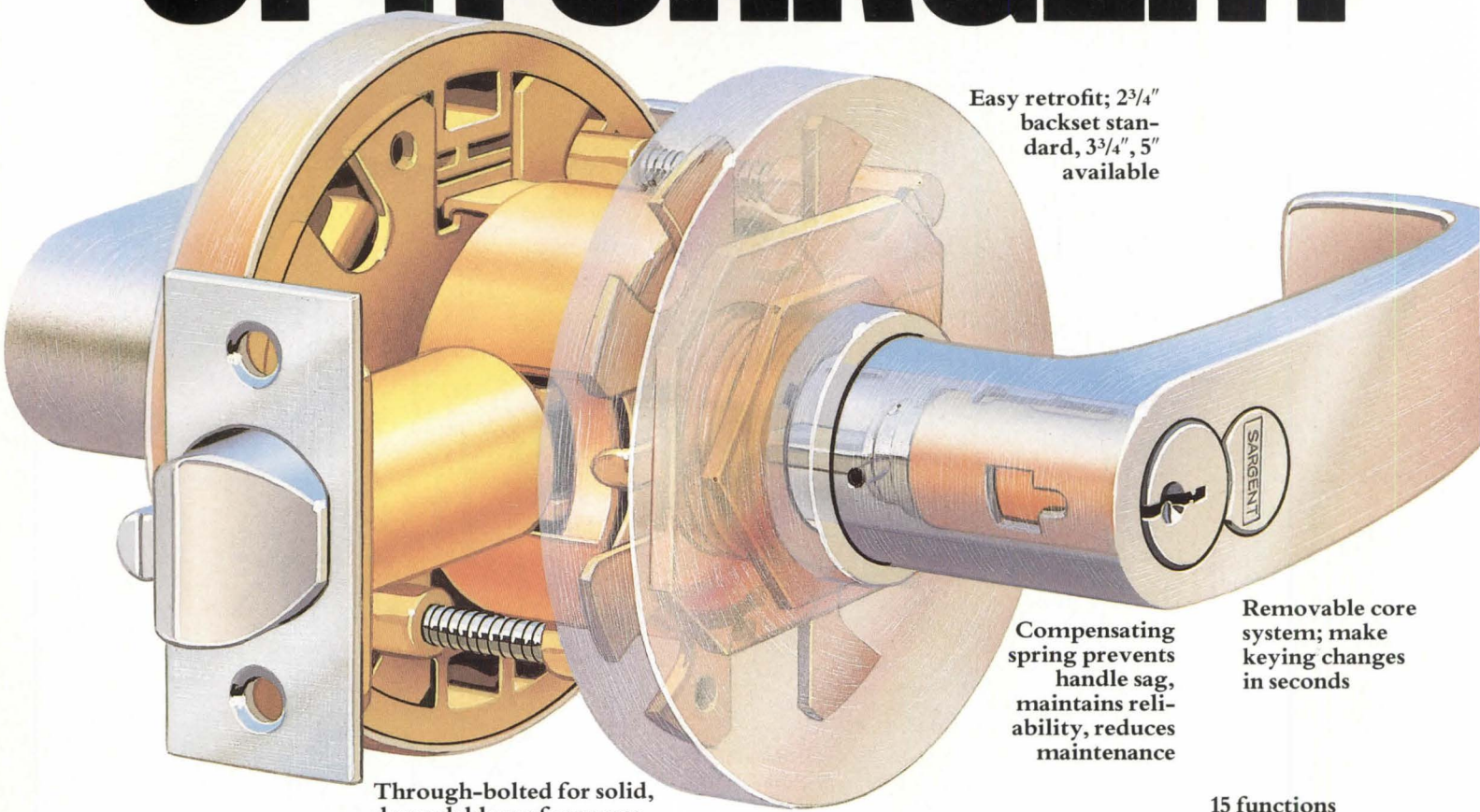


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# Practice

This special Practice section features an article by **Natalie Shivers** and **Douglas MacLeod** on how some architects donate services to good causes and why others do not.

## Pro Bono Publico

There is no doubt that the social problems that cry out for architectural assistance have increased. Estimates of the number of homeless people vary widely from 250,000 to 3 million people, but all sources agree that the number is increasing. Over the past decade there has been a sharp decline in government assistance to the poor and this has been coupled with reductions in Federal Housing assistance: The budget of the Department of Housing and Urban Development has been slashed from $35.7 billion in fiscal year 1980 to $7 billion in fiscal year 1988. These cuts have limited the number of people eligible for assistance and have forced even eligible tenants to spend a larger share of their income for rent. The same economic pressures also have created an increased demand for shelters and services for the disadvantaged and have strained the resources of programs such as community design centers, through which architects have traditionally tried to meet these design needs.

Indeed, architects may be contributing more to the problem than to its solution. Urban gentrification, by which inner-city houses and apartments are renovated and put back on the market at a higher price, is a mainstay for many architectural firms, yet this practice is to a great extent responsible for the displacement of thousands of low-income people.

While the notion that architecture can save the world is long dead and few architects today see themselves as social visionaries, the increasingly severe shortage of shelter for the poor and indigent is forcing the profession to confront its obligations to a public beyond that of clients who can pay for their services. The concept of *pro bono* work – work for reduced or no compensation for nonprofit or not-for-profit groups – is not alien to architects. However, a review of architects' efforts compared with those by other professions indicates that lawyers and doctors make many more comcerted amd systematic attempts to provide *pro bono* services to the poor.

According to a 1990 ABA survey, at least 18.8 percent of all attorneys participated in *pro bono* or reduced-compensation programs organized or directed by local bar associations. That number would be much higher if it included attorneys who take on individual cases on a *pro bono* basis outside of organized programs, according to Beverly Groudine, *pro bono* consultant for the ABA. The ABA Model Rules explicitly encourage public service at no fee or reduced fees for people of limited means or for public service or charitable groups; and the ABA Young Lawyers Division officially adopted a recommendation that all attorneys devote at least 50 hours per year to *pro bono* and other public service.

Physicians, too, historically have made a concerted effort to donate services to people without the ability to pay. A 1988 Socioeconomic Monitoring System core survey indicated that 62 percent of all physicians provided charity care (services at reduced or no fee), averaging 6.6 hours per week or 11 percent of their weekly hours.

No such study of architects and *pro bono* work has yet been undertaken by the AIA. Discussions with architects and nonprofit community groups around the country, however, indicate that many feel architects could and should do much more.

The reasons for the shortfall are many, ranging from ambivalence within the profession about work for reduced fees to severe cuts in government funding for community development programs to the very nature of architectural work and the structure of the profession.

When asked about the dearth of *pro bono* contributions, architects have pointed out that while some doctors and lawyers may be able to help *pro bono* clients over the course of several appointments, the design of buildings requires not just an architect, but the coordinated efforts of a team of professionals who together must put out a large and concerted volunteer effort. Also, the process of programming and designing a structure, as well as seeing it through the various community and city approvals, can represent an enormous time commitment.

Another issue is liability, as Christopher Clark, Director of Practice Programs for the AIA, points out: "Architects must demonstrate a reasonable standard of care regardless of how much they're compensated for their work. Insurers will include such work as an added risk and it could increase your premiums." Other architects who were interviewed suggested that most firms' profit margins are too slim to allow the donation of billable services. Still others claimed that they do too much work free already, in the form of proposals, competitions, and design

work not covered by fees. There is also the feeling among many practitioners that their services are already undervalued by the public, and giving away their services would confirm that.

In any case, there is little consensus within the profession about how or what the nature of architects' public service obligations may be. And, although the AIA's Code of Ethics and Professional Conduct provides that "members should render public interest professional services and encourage their employees to render such services," some nonprofit architectural groups have claimed that members of the AIA have accused them of undercutting the profession by reducing their fees – even for nonprofit clients.

Despite this charge, the American Institute of Architects does offer a range of programs through which architects can contribute their services for the public good.

### Search for Shelter

The AIA's Search for Shelter program was developed five years ago by architects serving on the AIA's Housing Committee. Its formation was motivated by the feeling that architects should take responsibility for providing for people displaced by urban revitalization. This program fosters an understanding of these problems through roundtable discussions, symposia, and charrettes that bring together politicians and shelter and service providers. Architects taking part in these sessions do so on a *pro bono* basis, although any work which may result from the program can run the gamut from no charge to full fees.

### R/UDAT

Among the most visible programs operated by the AIA is the Regional/Urban Design Assistance Teams or R/UDATs, which function as planning and design SWAT teams. According to the AIA's Clark "R/UDATs are something we encourage a community to do for itself."

Through the R/UDAT program, the AIA assembles a multidisciplinary team to help suggest solutions. A typical program consists of three phases: a six- to twelve-month planning stage; a four-day intensive workshop with the team; and subsequent follow-up visits. Since 1967, the AIA has conducted over 100 R/UDATs across the United States and Canada. In any given year, Clark estimates that four to six workshops will be held, with another five in development.

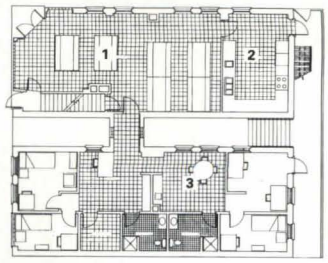
Clark emphasizes two important conditions for professionals participating in the R/UDATs: "First, they must donate their time and, second, they may not accept any commission that may result from the process." And although team members volunteer their time to the program, local communities themselves pay for the expenses of a R/UDAT.

Both the R/UDAT and the Search for Shelter programs represent mechanisms for architects to contribute to the public good in a manner that doesn't place undue demands on their time. The AIA points out, however, that they are facilitators in these programs only, and the teams contribute advice rather than building designs.

REHABILITATED CORNER BUILDING

Photo: John Tomasi

VIEW OF SAN JOSE OBRERO MISSION

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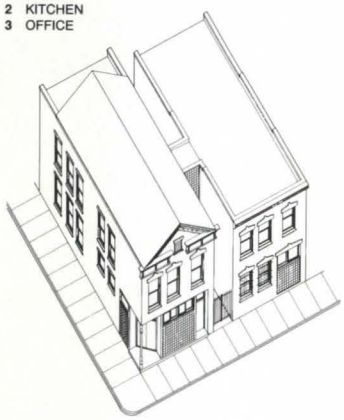

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**San Jose Obrero Mission, Chicago**
Architects: The Chicago Architectural Assistance Center (CAAC)

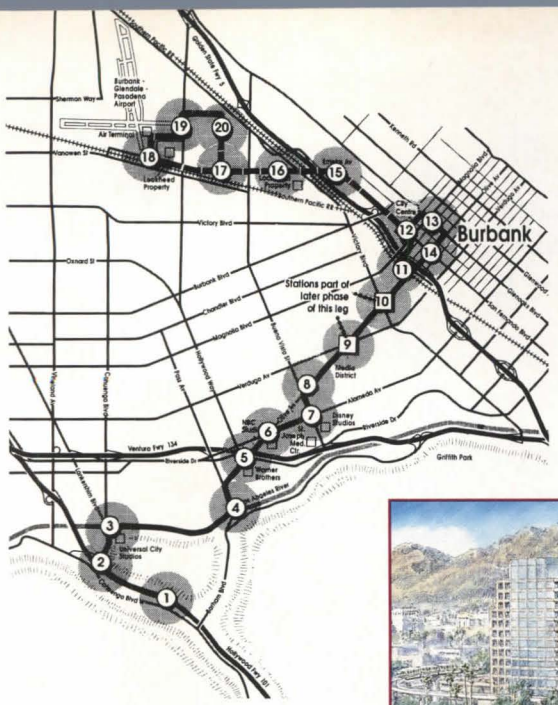
The CAAC has provided architectural services for a number of housing renovations in Chicago, including a mission that provides daytime services and treatment facilities for homeless people, a transitional living center for single mothers and their children, and an affordable infill housing prototype. A residential training center for the San Jose Obrero Mission, shown here, has dormitory-style sleeping quarters on the second floor and meal service facilities and staff quarters on the first floor. The center trains residents to work as custodians, kitchen help, and support staff for local businesses. This remodeling allowed the mission to expand into the adjacent building and to meet code requirements.

Other organizations also run programs that allow architects to provide services to their communities. A review of activities around the country shows a number of ways that architects contribute their skills on a voluntary or reduced-fee basis to nonprofit or not-for-profit groups.

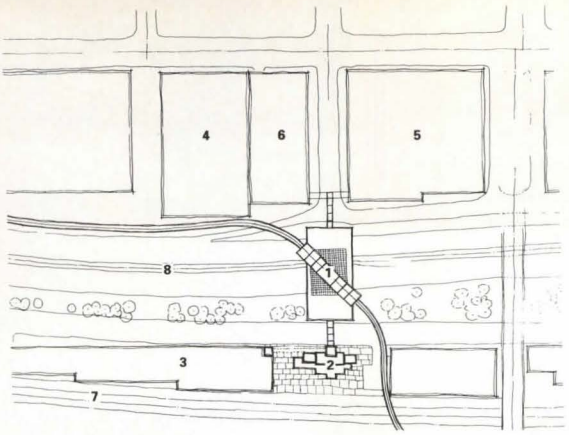
### Community Design Centers

Outgrowths of community-directed activism of the 1960s, community design centers (CDCs) continue today to provide *pro bono* architectural services to community groups – although in many fewer numbers and on a diminished scale from their heyday in the 1970s. CDCs are essentially nonprofit organizations that provide technical assistance (design, administrative, and financial planning) to community groups for facilities and services such as day-care centers, low-income housing, schools, community centers, and playgrounds, as well as advocacy planning and alternative development proposals.

Some, such as the Neighborhood Design Center (NDC) in Baltimore and the East Tennessee Community Design Center in Knoxville, offer conceptual design services on a *pro bono* basis, usually as part of feasibility studies or alternative development proposals in local communities. Design services are generally offered in conjunction




MAP SHOWING EXTENT OF PROPOSED SYSTEM




PROTOTYPE TRANSIT STATION OVER HIGHWAY

RENDERING OF PROTOTYPE STATION

**Burbank Metrolink, Burbank, California**
Architects: *Gensler & Associates, Los Angeles*

Conceived and proposed by the Los Angeles office of Gensler & Associates, the Burbank Metrolink comprises a monorail transit system and parking intercept program to link business and transportation centers in an effort to mitigate the traffic problems generated by continued development. The preliminary design, funding, and policy model were developed by Gensler on a *pro bono* basis, resulting in a formal feasibility study funded by the City of Burbank and the County of Los Angeles. Gensler has developed similar proposals for the communities of West Los Angeles and Irvine in an effort to team up private and public initiative to solve public problems. The first leg of the Irvine monorail is currently under construction.

with assistance in putting together building programs, cost estimates, and financing packages in order to "jump start" projects so they may obtain funding. These groups have pools of volunteer planners, designers, landscape architects, cost estimators, and engineers, from which teams for each project are assembled. If a project is funded, the group will often go to a private architectural firm for further architectural services. Firms may provide construction documents on a *pro bono* or full-fee basis. Volunteers for the Baltimore NDC contribute at least 40 hours to a project and sometimes hundreds of hours, more often on a moonlighting basis than as an employee in a firm.

Other CDCs, such as the Pratt Architectural Collaborative in Brooklyn, New York, and the Chicago Architectural Assistance Center (CAAC), have architects on staff who can provide full architectural services. Fees can vary depending on the client's and CDC's resources, but says Joan Byron, Architectural Director at Pratt, they charge the same fees as private architectural firms for contract documents. In many cases, contracts with city agencies or project funding covers these fees, so often there is no cost to the neighborhood groups for architectural services. Still, most of the start-up work and project packaging in order to get funding is done on a *pro bono* basis, and the CAAC uses both staff architects and volunteers to help with this phase.

### University Sponsored Groups

Many universities also have a tradition of public service. In return for academic credit and experience, students become involved in public service projects under the supervision of faculty members. Since 1968, SIGUS, the Special Interest Group in Urban Settlements at the Massachusetts Institute of Technology, has been conducting programs to explore affordable housing for low-income communities. The original focus was in Third World countries, but now SIGUS has begun to work in the United States and, recently, Poland. The department conducts both field-based workshops and field research projects in any number of locations from Boston to Sri Lanka. Past workshops have teamed students with clients such as UNICEF to confront actual urban design and housing problems.

There is often an overlap between the universities and other public interest programs. Many community design centers were founded under the auspices of schools of architecture. The Center for Environmental Change, a community design center at the University of California, Berkeley, was founded in 1972 to allow students and faculty to provide services to the surrounding communities in a variety of ways. Projects by the Center have included housing (both new and renovated), day-care centers, and parks.

"Architectural students in a graduate studio did all of the design and construction drawings," says Mary Camario, a professor at the University and a principal in the firm of George Miers and Associates, who was associated with the center at Berkeley. "There was even some money to provide some students with part-time jobs."

The program was funded through a combination of grants from diverse sources such as the Action Agency, the National Endowment for the Arts, and the university itself. After 1987, however, there was no more funding from the federal level and, although the center still exists, there is no longer a graduate studio. Camario feels that changing social attitudes were also partially responsible for the demise of the Center, noting that, in the 1980s, "people were more interested in real estate than in social issues."

### ADPSR

One group formed in the 1980s and still active is the Architects Designers and Planners for

Social Responsibility (ADPSR). The group, which now counts over 3000 members worldwide, with 13 chapters in the United States, was founded in 1980 out of concern for the arms race. Other than arms control, its major goals have been environmental protection of the built and natural environments and responsible development.

According to Rose Marie Rabin, a founding member of the ADPSR and the Director of Special Projects at the Southern California Institute for Architecture, the group "has become the conscience of the architecture and planning professions." In recent times the group's focus has shifted from arms control to local domestic issues and housing in particular.

In Southern California, the ADPSR organized a charrette for the design of low-income housing by students from a number of architectural schools throughout the area. Faculty members also donated their time as advisors and resource people. The group has launched similar projects in locations across the country, including New York City and Grand Rapids, Michigan.

### Private Practitioners

Many of the private practitioners who are providing *pro bono* services outside of organized programs say they were asked to become involved with a nonprofit group prior to a project's funding, typically offering a conceptual design and/or technical advice for a proposal or feasibility study that the group would use to obtain financing. They would often provide these services with the expectation that they would get the job if the project was funded. Alan Wanzenberg of New York City, who is currently working with Housing Works Inc. and the Pratt Architectural Collaborative to develop a conceptual design for a day treatment center/residential facility for homeless people who test HIV-positive, describes his involvement as "a calculated risk." While he thinks it is important for architects to help address the vast shelter needs facing communities and is strongly committed to the success of the project, Wanzenberg does not expect to produce construction documents on a no fee basis, nor does he think architects should. His *pro bono* involvement at this point is primarily to help make the project happen.

Another example is Hellmuth Obata & Kassabaum's involvement in a multidisciplinary team put together by the federal government, to advise the Soviets on the design and construction of a hospital in Russia for AIDS patients. The travel and advice by HOK staff are entirely *pro bono,* although there is clearly a chance that the effort may, at some future date, lead to work.

Rarer is the firm that provides the full scope of architectural services from schematic design through contract documents without compensation. The Los Angeles firm, Widom Wein Cohen, has provided full architectural services *pro bono* for two projects, the Venice Family Clinic, a medical center providing medical and social services to the poor and homeless in Venice, California, and the Kaufman Center for the Arts for Camp Max Straus, a Big Brothers of America camp in Glendale, California, completed in 1988. Fees covered liability insurance and minor expenses only for the clinic and, for the camp, about 10 percent of employees' time. Engineers and the landscape architect/contractor also worked for reduced fees.

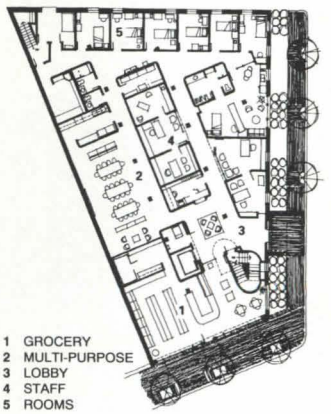
Other exceptions are Samuel Mockbee and Coleman Coker of Mockbee Coker Architects of Jackson, Mississippi. Although they bill themselves as "the poorest architects in the poorest state in the Union," they and members of their office have donated their time, at no cost, to design and, in one case, to build houses for the rural poor in Mississippi. As Mockbee points out, most assistance programs focus on urban projects and many of the rural families who might qualify for such assistance are reluctant to leave land they have lived on for years and move to a housing project in a nearby town or city.

Some larger firms, such as Gensler & Associates, have taken a proactive stance towards *pro bono* work. According to Ed Friedrichs, managing partner of the Los Angeles office, each branch of the firm has focused on a particular public initiative that it has identified for its attention and advocacy. The Houston office has directed its attention to activating downtown streets via the design of street furniture and

VIEW OF MCADOO HOTEL

Photos: Jonathan Reynolds


LOBBY OF HOTEL

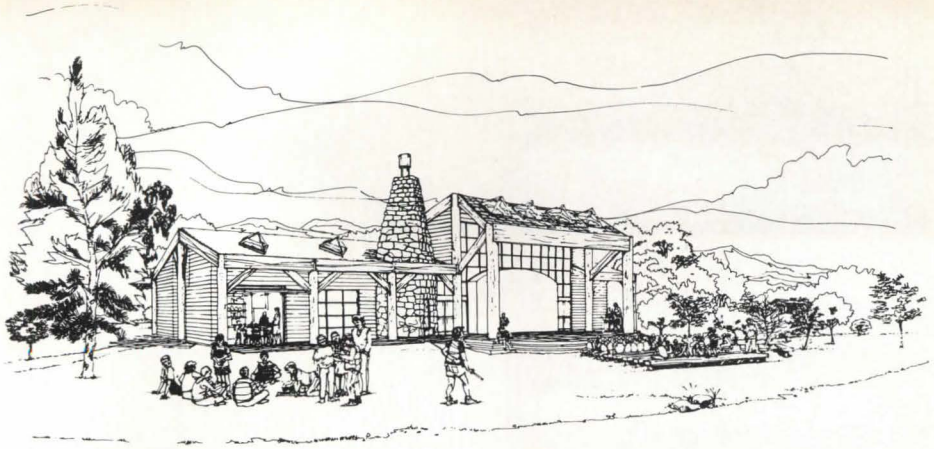



FIRST FLOOR PLAN

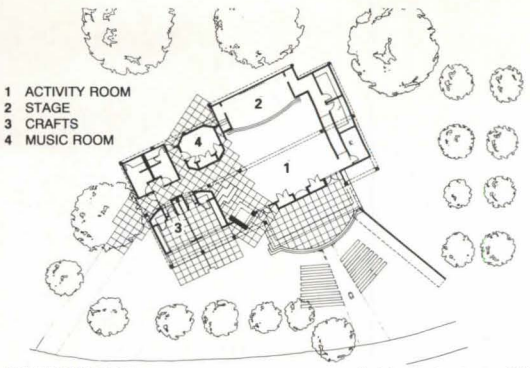
**The McAdoo Hotel, Shreveport, Louisiana**

Architects: *Morgan, Hill, Sutton & Mitchell, Shreveport*

This renovation of an existing building into a 45-room single-room-occupancy hotel emerged out of a workshop cosponsored by the AIA's Search for Shelter program in 1987. The McAdoo Hotel was selected as a pilot project to house low-income single elderly and deinstitutionalized mentally ill. Completed in 1988, the building provides residential facilities on the upper floors and support services on the first floor, including a referral center for homeless people, health care facilities, a grocery store, and a library/classroom. Architect Kim Mitchell of Morgan, Hill, Sutton & Mitchell, worked closely with the developer, Nesbitt Management, and with government and community groups to program and assemble financing for the project on a *pro bono* basis. Design and construction documents were completed on a fee basis.



PERSPECTIVE OF STAGEHOUSE




FIRST FLOOR PLAN

Photo: Russell Abraham

PHOTO OF STAGEHOUSE SHOWING TIMBER CONSTRUCTION

**Kaufman Center for the Arts, Camp Max Straus, Glendale, California**
Architects: *Widom Wein Cohen, Santa Monica, California*

Designed by Widom Wein Cohen, Camp Max Straus was developed by the Jewish Big Brothers of Los Angeles as an art and music camp for underprivileged children. Located in the Angeles National Forest, the camp provides residential and dining accommodations, as well as facilities for craft classes and theatrical and musical events. Architectural services were provided for a nominal fee, which covered approximately 10 percent of the firm's regular fee. Engineers and the landscape architect also worked for reduced fees.

trees, while the Denver office has worked with both the Natural History Museum and the Children's Museum to provide conceptual planning. The Los Angeles office of Gensler & Associates has addressed issues of public transportation and traffic mitigation in and around Los Angeles.

### Motivations for *Pro Bono* Contributions

Reasons architects have cited for their efforts include commitment to help causes they felt were important to them, and outreach to groups who otherwise would not be able to afford architectural services. Some architects see their involvement with nonprofit groups as a means of meeting people and making contacts or of expanding their repertoire to different types of work. Others see it as good public relations. Younger members of the profession regard their *pro bono* work, often via groups such as community design centers, as good practical experience – a way to expand their skills and take design and management responsibility for whole projects, something that is not available to them as employees in firms. They also speak of their desire to educate communities about the benefits of good design and what architects can do.

Nevertheless, while many architects profess an interest in public service, few feel they have the time or financial ability to commit to projects in a meaningful way without compensation. Some have raised the question of whether reduced fees actually make a project more viable. As Rex Curry, President for the Association for Community Design and Assistant Planner at the Pratt Institute Center for Community and Economic Development (PICCED) states, "Fee cutting does not impact affordability." He notes that the reduction of fees averages out to saving only a fraction of the cost of a housing unit, while creative financing, – cutting the cost of money – can have a significant effect on affordability.

However, many nonprofit groups attest to the value, indeed the necessity, of donated architectural services in putting a project proposal together to obtain support and financing. With the severe cutbacks in housing and community development funds, increasing demands are being placed on private initiative to package projects and coordinate efforts to provide services and shelter for those unable to afford them. The role of architects in helping to prepare conceptual designs and feasibility studies is often critical to the successful funding of projects. Once a project is funded, however, few architects feel the need or have the financial security to continue to donate services.

Another issue that both practitioners as well as nonprofit groups have pointed out is that the most successful *pro bono* efforts are those where the architect functions as a member of a larger team that may include marketing strategists, financial planners, lawyers, service providers, and community representatives. Rare is the architect now who initiates public service projects. Indeed, as Robert Gutman notes in his book, *The Design of American Housing*, "It is probable that when the national call for non-market housing reemerges, sponsors will prefer the model of production developed by the private home-building industry to the model represented by the public programs of the past. In the latter, architects were major, often principal actors, but in the model that prevails in merchant-building, they are, as we have seen, one among many decision makers on an integrated building team."

**Natalie Shivers, Douglas MacLeod** ■

*Natalie Shivers is manager of design and construction projects at Paramount Pictures. She edits the* Los Angeles Forum for Architecture and Urban Design *newsletter and is the author of* Walls and Molding. *Douglas MacLeod, currently with Barton Myers Associates in Los Angeles, has worked professionally as an architect, musician, graphic artist, computer programmer, and writer.*

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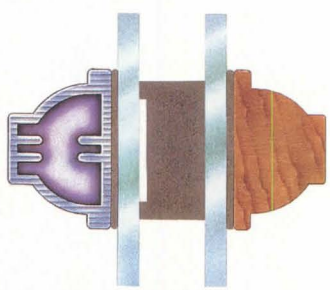

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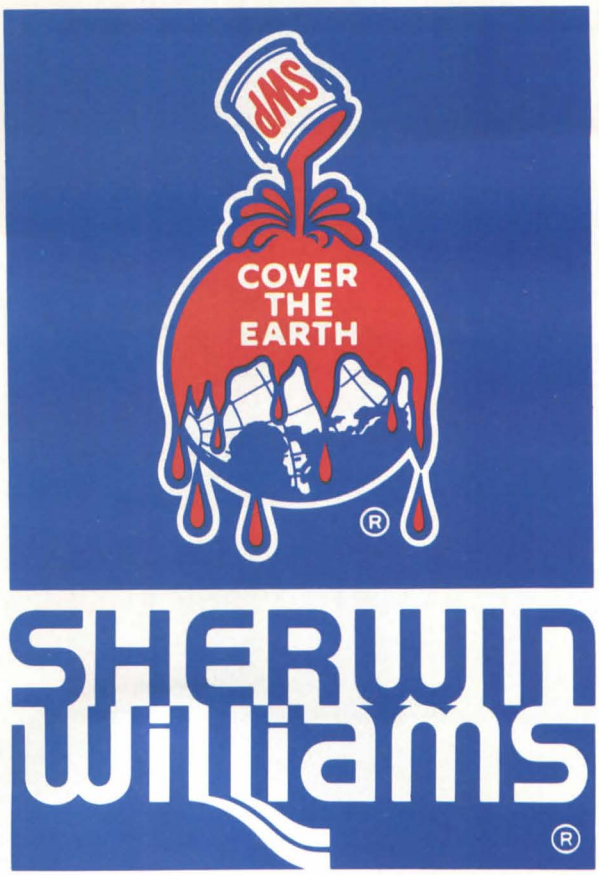


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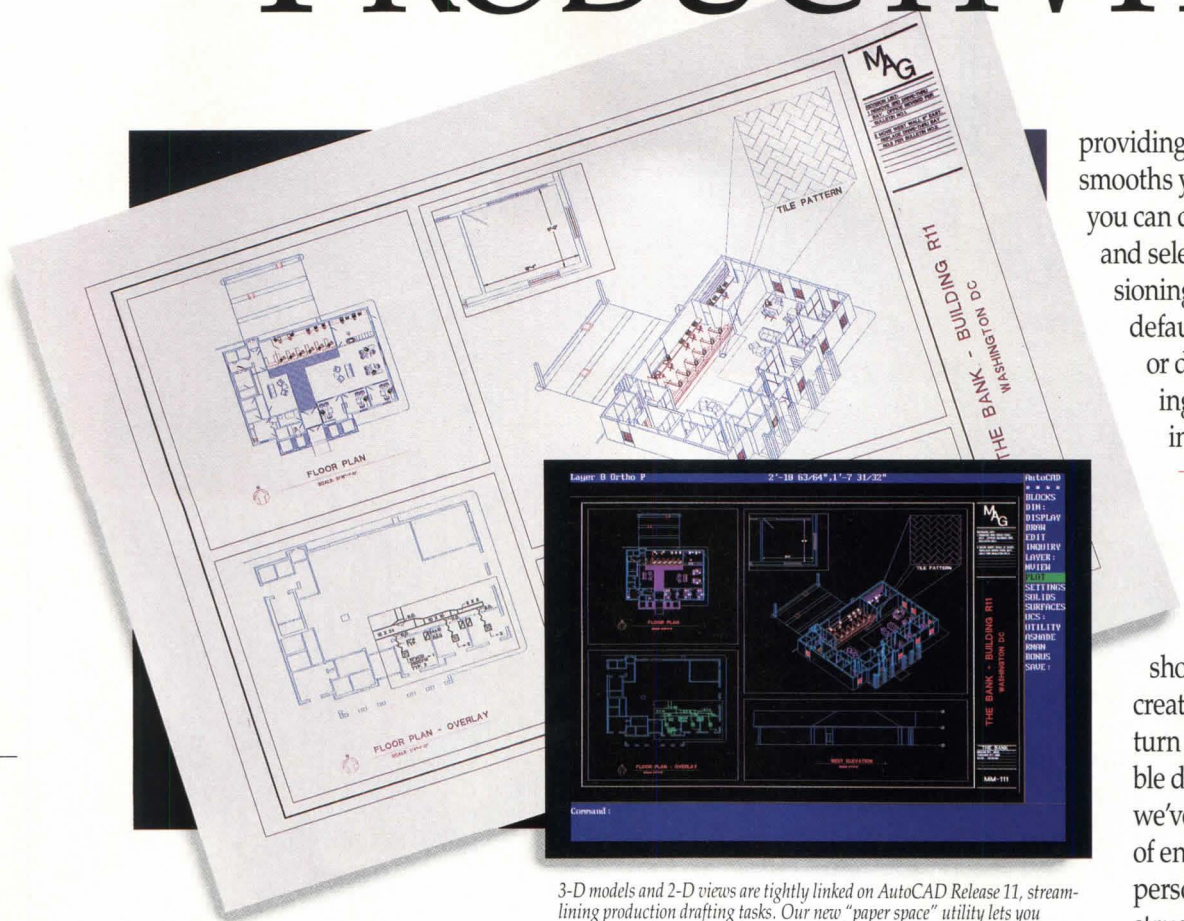


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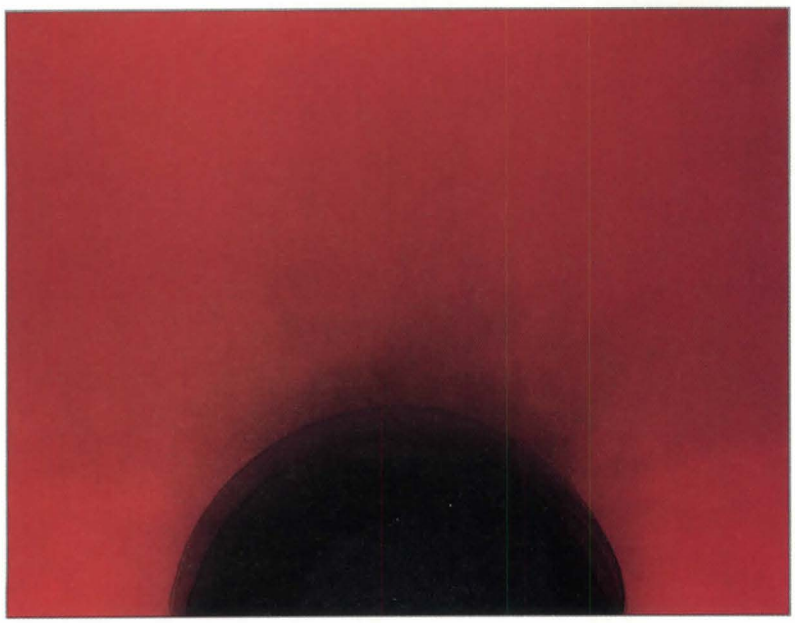
# Technics: Here We Go Again?



*Otto Piene,* The Sun Burns, *1966, Kunstmuseum, Düsseldorf, Germany.*

I suspect that many architects who were either practicing or preparing for the profession during the last "environmental crisis" (which some date from the Santa Barbara oil spill of 1969) may, like me, feel some impatience and some uneasiness with the proclaiming of a new environmental crisis. The impatience comes from broadcasts on television and weekly news magazines that seem too familiar – solid waste disposal, recycling, the greenhouse effect, ozone holes and toxins in the land, sea, and air. Didn't we learn anything from the last one? The uneasiness, I suppose, derives from a sense that, if we didn't, why bother now? And for those of us who have emphasized the "environmental" side of the profession, have our efforts been wasted?

I think not. Most of the discussions about the environment last time around were about large ecological systems and land planning, and were symbolized by Bucky Fuller's catchword, "Spaceship Earth." In the world of practice, environmental concerns got no closer to the building than the site outside, except for a few architects like Malcolm Wells, who challenged us to rate on-site environmental impacts, and to marry architecture with the site by building underground (P/A June 1974, pp. 59–63). It was not until after the 1973 oil embargo/energy crisis that architects found an arena in which they could practice on their own turf – but this was a different crisis, a different agenda, different people, and a different time. By 1978, when the watershed *Second National Passive Solar Conference* was held in Philadelphia, an entire decade had passed since the environment began to make headlines, and the work spawned by the 1960s crisis was already beginning to mature.

In the end, ecological environmentalism meant activism, and the basic principles of ecologically sound site development were codified in wetlands ordinances, soil sedimentation and erosion control requirements, and the stormwater management provisions of land development regulations. These routinely require retention and detention basins and drywells to control runoff from parking lots and roofs – devices that only the most environmentally sensitive architects would have dared advocate to clients two decades ago. Today, these and flexible zoning tools that allow designers to work around steep slopes and woodlots are commonplace. They are part of the legacy of the preceding environmental crisis.

So, I think we did learn from the last crisis. And I think that we're going to learn a lot more this time around, because architects are focusing on the environment inside the building. The catch phrase of the broader sustainable development movement is "think globally, act locally." It's not an expression one hears much in the architectural literature, but it is exactly the ethic of a growing body of architects, whether they are avoiding the use of tropical hardwoods, specifying finishes low in air-polluting volatile organic compounds, or favoring materials that contain recycled constituents. Technics authors Kevin Teichman and Hal Levin remind us that Levin introduced the term "building ecology" in P/A in 1981 (April, pp. 173–175), and that the concept is especially apropos today: A building comprises a complex set of systems, and we all need to learn more about them, and about our relationships and responses to them. **Kenneth Labs** ■

# Technics
# Indoor Air Quality – for Architects

*Indoor Air Bulletin* editor **Hal Levin** and **Kevin Teichman**

of the Environmental Protection Agency review the scope of issues, concerns, and measures that architects can take to improve indoor environmental quality.

**1 Phases and Subcategories of Healthy Building Design**

**Site planning and design**
*Ambient outdoor air quality*
*Local source control*

**Overall architectural design**
*Vehicle access*
*Building openings*
*Operable windows*
*Pollutant generating activities*
*Mix of users in building*
*Envelope and structural materials*
*Penetration of volumes*
*Basement dehumidification*
*Smoking lounges*

**Ventilation and climate control**
*Dilution by outside air*
*Air intake locations*
*Exhaust locations*
*Air cleaning options*
*Space air distribution*
*Heat recovery*
*Microbial control*
*Standards development*

**Materials and specifications**
*Low VOC emitting materials*
*Preventive installation procedures*
*In-place curing*

**Construction process and initial occupancy**
*Design documentation and commissioning*
*Special ventilation*
*Initial occupancy period*


**References**

1 *Indoor Air Quality Research*, EURO Reports and Studies 103, World Health Organization, Copenhagen, Denmark.

2 "Sick Building Syndrome: Addressing a Real Problem?" K.Y. Teichman, *16th Energy Technology Conference*, 1989.

3 *Ventilation for Acceptable Indoor Air Quality*, Standard 62–1989, ASHRAE, Atlanta (404) 636-8400, 26 pp.


Indoor air quality (IAQ) has become a major concern because people spend up to 90 percent of their time indoors, where pollutant levels frequently exceed those outdoors. New building materials and energy conservation measures affecting ventilation rates can contribute to elevating indoor pollutant levels and associated exposures. Indoor air quality is also a complex issue, involving multiple pollutants, building types, and sources. There are many confounding factors (for example, thermal comfort and job stressors) and only a limited understanding of the potential health effects associated with low-level exposures to pollutants, both individually and in combination.

Indoor air quality is influenced by energy conservation, product technology, renovation and adaptive reuse, cost of construction, operation and maintenance, and the awareness of building owners, managers, and occupants. For example, building ventilation rates have been reduced, and recommended minimum rates are used more frequently as design maximums. As a result, reduced building ventilation has helped raise pollutant levels from indoor sources.

### Buildings with IAQ Problems

Buildings with IAQ problems can cause various health and comfort complaints, and damage building contents and the building fabric itself. Occupant health problems reduce productivity and increase absenteeism, costing building owners, tenants, and occupants valuable time and resources. Contaminants can increase the rate at which building components (for example, sealants, glazing assemblies, and surface coatings) deteriorate, increasing operation, maintenance, and replacement costs.

Health effects resulting from IAQ problems include acute and chronic symptoms such as (1) headache, (2) eye, nose, or throat irritation, (3) dry or itchy skin, (4) dizziness and nausea, (5) difficulty in concentrating, (6) fatigue, (7) cough, and (8) sensitivity to odors. While most building occupants experience one or more of these symptoms occasionally, IAQ problems cause large numbers of building occupants to complain of such symptoms.

If there is no clearly identifiable cause, and symptoms diminish or disappear after occupants leave the building, the problem is often called "sick building syndrome" (SBS). A World Health Organization Committee estimates that up to 30 percent of new and remodeled buildings may have such problems.[1] In fact, almost every building may at some time experience IAQ problems. Frequently, the problems result from the building's being used, operated, maintained, or altered in ways unforeseen by its designers. Specific, clinically-defined illnesses and diseases such as Legionnaire's Disease, Pontiac fever, and hypersensitivity pneumonitis are associated with IAQ problems and are considered "building-related illnesses" (BRI). When BRI occurs, the source of the pollutant must be removed. In some cases, it is necessary to temporarily relocate affected individuals.

### Causes and Solutions

Pollutants may be emitted from sources both inside and outside the building. Inadequate ventilation is frequently cited as a factor that may aggravate other complaints, such as inadequate temperature, humidity, or lighting. Indoor pollutants include both chemical and biological contaminants. Volatile organic compounds (VOCs, including formaldehyde and toluene) come from building materials, cleaning solvents and tobacco smoke. Biological contaminants (including mold and fungi) are associated with improperly maintained HVAC systems and wetted building materials. Combustion products (carbon monoxide and particulates) are generated by combustion sources both inside and outside the building, including smoking. Most occupant complaints are associated with acute symptoms. This does not mean, however, that the chronic health effects associated with radon and asbestos do not pose an important potential health risk. Radon and asbestos should be included in any comprehensive effort to evaluate a building's indoor air quality.

Solutions to IAQ problems usually include combinations of the following: (1) pollutant source removal, modification, or substitution, (2) time of use adjustment of a pollutant source, (3) increased ventilation rates, (4) air filtration and purification, and (5) education.[2] Pollutant source removal, modification, or substitution is the most effective way to resolve an IAQ problem. This approach reduces or eliminates the emissions from a pollutant source, and may be used in combination with increased ventilation to dilute the indoor pollutant level. Examples of this method include cleaning or replacing contaminated filters in the HVAC system, removing water-stained ceiling tile and car-

**"Dramatic increases in ventilation do not result in correspondingly dramatic increases in total annual energy and initial construction costs."**

peting, restricting or prohibiting smoking, and using and storing paints, adhesives, solvents, and pesticides in well-ventilated areas.

### Incentives for Healthy Buildings

Rather than focusing on fixing buildings with IAQ problems, we prefer to emphasize the incentives for providing all building owners and occupants with healthy buildings. We define "healthy" buildings as those that address both energy efficiency and environmental concerns (indoors and outdoors) throughout the life of the building, in relation to building design, construction, commissioning, operation, maintenance, renovation, and demolition. The incentives for designing and maintaining healthy buildings include enhanced building occupant health and comfort, energy and cost considerations, and potential liability.

To promote building occupant health and comfort, ASHRAE recently promulgated a new ventilation standard, ASHRAE 62–1989, *Ventilation for Acceptable Indoor Air Quality.*[3] In brief, ASHRAE 62 raised the minimum ventilation rate from 5 to 15 cubic feet per minute per person (20 cfm/person in office spaces). What are the energy costs of providing this increased ventilation to promote acceptable indoor air quality? Using building simulation, researchers at the Lawrence Berkeley Laboratory have shown that the increased annual energy costs associated with increasing the minimum outside air ventilation rate from 5 to 20 cfm/person is only about 5 percent of the total annual energy cost of operating a typical office building.[4] They also showed that the increase in first costs would be of a similar magnitude. This permits us to draw two important conclusions. First, *dramatic increases in ventilation do not result in correspondingly dramatic increases in total annual energy and initial construction costs.* Second, *buildings should be designed, constructed, commissioned, operated, and maintained to optimize energy conservation and indoor air quality.*

Let's examine the benefits of healthy buildings in light of the trade-off between slightly increased energy costs for ventilation and enhanced building occupant health and comfort. Assume that the total energy costs for an office building are $2 per square foot per year, that an average employee salary is $20,000 per year, and that a building occupant density is 100 square feet per person. With these assumptions, an energy conservation measure that saves 25 percent of the building's annual energy costs (i.e., $0.50 per square foot per year) represents only about 1 minute per day or 5 hours per year of the building employee's time. Therefore, we conclude that energy cost savings at the expense of acceptable indoor air quality are less than the resulting costs associated with reduced worker productivity and compromised employee health.

Finally, recent years have seen an increase in the number of indoor air quality cases being litigated. For example, in a recent court case in California, Call et al. versus Prudential Insurance Company of America et al., the plaintiffs claimed that indoor air pollution resulted in personal injury, including temporary and permanent health problems, and business damages involving loss of revenue. After the case went to trial, the parties settled for what some sources believe was a seven figure settlement. Among the many lessons this case offers for architects is that *everyone involved in the design, manufacture, construction, and operation of a building is responsible for ensuring that the building is appropriate for its intended use and meets the expectations of the building occupants.*

### Healthy Building Design

Many important building design changes have occurred in recent years that significantly improve indoor air quality. The changes fall in the four major categories: (1) site planning, (2) overall architectural design, (3) ventilation and climate controls, and (4) materials selection and specifications. Additional responsibilities related to commissioning of newly constructed or renovated facilities have also developed.

Not all of the control methods described below are used by even the most air-quality-conscious designers. In fact, some of them are no more than proposals and have not, to our knowledge, yet been used (although each has been developed within the design process of an actual building). More complete description of the critical building design factors for healthy buildings are discussed in the references.[5]

### Site Planning and Design

Some sources of indoor air contaminants occur outside the building. They include: (1) gaseous and particulate contaminants generated by motor vehicle, power generation, and industrial process

**2 Major Elements of IAQ Control: Site Planning**

**Pre-design site evaluation**
*Analyze regional and local air quality*
*Analyze local pollutant sources:*
- *Vehicular traffic*
- *Industrial sources*
- *Commercial sources*
- *Agricultural sources*

*Analyze soil and groundwater sources*
- *Radon and other radioactive decay products*
- *Volatile and semi-volatile organic compounds*

*Determine prevailing weather and wind patterns:*
- *Diurnal variations*
- *Seasonal variations*
- *Microclimate*

**Site planning**
*Site selection for suitability*
*Building location and orientation*
*Vehicular circulation*

**Local source control**
*Landscape and architectural buffers*
*Soil depressurization*
*Drainage*
*Site preparation and imported soil*

4 "The HVAC Costs of Increased Fresh Air Ventilation Rates in Office Buildings," J. Eto and C. Meyer, *Transactions*, vol. 94, part 2, ASHRAE, Atlanta (404) 636-8400, 1988.

5 "Critical Building Design Factors for *Indoor Air Quality and Climate," H. Levin, Indoor Air* , c/o University of Minnesota, 330 Wulling Hall, 86 Pleasant Street SE, Minneapolis, MN 55455

6 "Indoor Air Quality Requirements," H. Levin, in *U.S. EPA Pre-Design Master Study, Headquarters Facility*, Viking Systems International and Gruzen, Samton Steinglass, 1988.

**"Buildings should be designed, constructed, commissioned, operated, and maintained to optimize energy conservation and indoor air quality."**

**3 Categories of Overall Architectural Design**

**Location of vehicle access:**
*Separate from air entry points*

**Vehicles in buildings:**
*Provide air supply ,exhaust removal, negative pressure to building*

**Building openings facing clean air:**
*Consider sources, wind, building pressure*

**Operable windows for backup ventilation:**
*Occupant-controlled for comfort*

**Isolate pollutant generating activities:**
*Separate rooms, negative pressure, no recirculation*

**Durable envelope and structural materials:**
*Minimize emissions, maintenance, refinishing*

**Basement dehumidification, pressurization:**
*Prevent microbial contamination, pests, soil gas entry*

**Separate smoking lounges:**
*Exclude smoking from general space*

combustion, (2) particulate matter from agriculture, road dust, and wind-generated soil erosion, and (3) ozone. Soil gas containing radon and organic chemical compounds can enter buildings through joints or cracks in the foundation or by direct migration through semipermeable building materials.

### Architectural Designs

The schematic building design embodies basic decisions about building shape and size, orientation, layout of floor plans, location of pollutant-generating activities, envelope and interior materials, fenestration, and general ventilation concepts. Experience shows that many IAQ problems derive from decisions made at this stage of a project. Although such problems can be mitigated by subsequent control measures, it is cost effective to begin consideration during the schematic design phase.

Operable Windows. In a reversal of the trend toward sealed windows that dominated from the 1960s into the 1980s, buildings designed recently often include operable windows. In some instances, operable windows are provided as an "emergency ventilation" system in the event of inadequate ventilation by mechanical means. In many such instances, occupants are not actually permitted to open the windows, which are locked in the closed position.

When mechanical ventilation is operated to create positive pressure inside a building, opening windows may not necessarily provide additional outdoor air. In fact, natural ventilation frequently is not adequate to deliver and distribute outside air to building occupants, even when not competing with mechanical ventilation systems. Moreover, air admitted through windows bypasses the HVAC filtration system.

Some designers provide operable windows to allow occupants psychological benefits. Installation of a sensor "interlock" for window operation and the ventilation system controls can maintain "balance" in the ventilation system while permitting operation of windows. The sensor sends a signal to the ventilation system controls, which then compensate for the change in pressure. Such a system has been proposed for the new U.S. Environmental Protection Agency headquarters.[6]

Envelope and Structural Materials. Designers should specify materials that are known to have low pollutant emissions characteristics. When such materials are not suitable, contamination of air in the completed building should be controlled by temporary ventilation, in-place curing, and encapsulation or isolation of materials from the building occupants' air.

Vehicle Access. Garages, loading docks, and pedestrian drop-off points should be located away from air intakes and building entries. Where openings occur near vehicle access areas, positive building pressure should be maintained inside the opening to keep exhaust fumes out. Spatial relationships of vehicles and occupied building areas must also be considered. This addresses one of the most widely recognized sources of IAQ problems.

Special Provisions for Polluting Activities. Printing, cooking, art and hobby activities, and other common building functions can be sources of indoor pollution. They should be located where their emissions can be isolated and controlled. Dedicated exhaust systems and spaces with direct exhaust ventilation affect the flexibility of interior space planning and require rethinking of the definition of building core. Public awareness and new laws have resulted in the design of separate spaces for smoking in some public buildings. One-pass ventilation with no recirculation is usually provided to eliminate exposure of non-smoking occupants to environmental tobacco smoke (ETS). The strong trend in the United States is to limit smoking to designated areas or prohibit it within the building. Nevertheless, there are still many buildings in which designers have not addressed the issue in planning public spaces.

### Ventilation and Climate Control

Many view ventilation as an essential design strategy for IAQ control. They argue that there are too many sources and that the sources are too diverse and change over time, making it impossible to avoid them by design. In particular, contaminants emitted from occupant activities, personal hygiene products, clothing, and other sources are outside the control of the designer. Dilution of contaminants with cleaner air (either outside air or filtered, recirculated air) should be planned for. The quantity of outside air used for this purpose is the subject of much investigation and is a driving criterion of ventilation system design. This is the primary, if not the only, means of controlling indoor air quality in the majority of building

7 "Building Materials and Indoor Air Quality," H. Levin, in *Occupational Medicine: State of the Art Reviews*, J. Cone and M. Hodgson, editors, vol. 4, no. 4, Hanley and Belfast, Phila. (215) 546-7293, 1989, pp. 667–694.

8 "Volatile Organic Compounds and Building Bake-Out," J. Girman, in *Occupational Medicine: State of the Art Reviews*, J. Cone and M. Hodgson, editors, vol. 4, no. 4, Hanley and Belfast, Philadelphia (215) 546-7293, 1989, pp. 695–712.

**"The concept of building ecology requires applying a systems approach to designing and operating environmental control systems in buildings."**

designs. Even so, delivery of the required quantity and quality of outside air to the occupants' breathing zone as required by ASHRAE 62 has not been addressed explicitly in a majority of projects.

Ventilation standards based on outside air supply per occupant have not been shown to be sufficient to control unusual or strong contaminant sources. Ventilation rates must be based not only on the human occupant density but also on the activities that will occur, the types and strengths of contaminant sources, the ventilation system distribution scheme, and the volumetric dimension of the building's spaces. These are explicit requirements of ASHRAE 62, but they have been vigorously applied in very few buildings. Since it is often difficult to identify most or all of the sources during the early stages of design, a review at the time the actual occupancy is known might be necessary to implement the requirement.

Air intakes. The known sources of potential contaminants for outside air intakes include exhausts from other buildings, motor vehicles, industrial and agricultural processes, and exhausts from the building itself, including plumbing stacks and kitchen and toilet exhaust air vents. In large buildings, cooling towers should be located away from air intakes, to avoid entrainment of drift containing water treatment chemicals or microbial contaminants.

Air Cleaning. Where outdoor air is contaminated, designers should require their engineering consultants to specify air cleaning and filtration as appropriate. While efficient media filters and electronic air cleaners to reduce particulate matter are being used, gaseous contaminants have been largely ignored. There is, nevertheless, growing interest in adsorbents.

When indoor air is recirculated with little outside air introduced, air cleaning and filtration are used to remove contaminants picked up indoors. Particles and gases are removed by the means mentioned above. These air cleaning and filtering devices have been used both in central HVAC components and locally (within or near the occupied space).

Air Distribution. Adequate distribution of air to building occupants requires that air be delivered to supply diffusers and that diffusers and return registers be properly located within occupied zones. Some designers are specifying tighter sealing of supply ductwork to ensure the delivery of supply air to building spaces. This is especially true when the supply ductwork runs through return air plenums.

Many researchers and engineers disagree about the extent to which ventilation supply air distributes itself within building spaces. Some designers have begun introducing supply air through the floor, at desk tops, and from sidewall diffusers to improve space air distribution. Return air registers should be carefully placed to avoid short-circuiting of supply air to the exhaust system. Partial-height partitions in open space offices can block circulation, especially under low volume and velocity flow. Some designers raise partition bottoms above floors to improve air flow and distribution.

Microbial Control. Considerable attention has been focused on reducing potential microbial amplification through selection of HVAC system materials to minimize absorption of dirt and moisture that provide niches for microbial colonization. Control has been achieved by eliminating or reducing the use of exposed fibrous materials for acoustic control, by placing thermal insulation outside of ductwork, and by thoroughly sealing insulation from circulating air.

Drip pans for cooling coils should be designed for positive drainage to eliminate standing water. Ductwork, mixing chambers, and plenums should allow easy inspection and cleaning. Humidifiers can be specified that use "dry steam" rather than cold water sprays to minimize the likelihood of microbial contamination.

**Materials Selection and Specifications.**

Many designers believe that source control is the most effective strategy for controlling IAQ, and emphasize careful selection and installation of building materials and furnishings. Some data are available for comparison of emissions from various products. No comprehensive set of data exists however, nor is it likely to in the foreseeable future, because of the large number of products and the variations in them over time. Some designers and their consultants have attempted to evaluate the toxic and irritating properties of emissions in order to choose less harmful or irritating chemicals. [7,8] These can be controlled in part through the specifications package.

Some designers are requiring submission of emissions data by manufacturers before specifying or approving the product. This has been done for

**4 The Major Ventilation Design Considerations**

**Dilution by outside air ventilation**
*Outside air per occupant (cfm)*
*Outside air exchanges per hour (ach)*
*Ventilation based on contaminant source strength*
*Direct exhaust from polluting activities*

**Air intake locations, design**
*Avoid plumes from suspected sources*
*Avoid standing water and cooling tower drift*
*Prevent bird roosting or animal entry at intakes*

**Building exhaust locations**
*Avoid contamination of ventilation air intake by re-entrained exhaust*
*Increase height/distance from intakes*

**Air cleaning and filtration**
*Outside air meets standards for:*
*Particles (media, electronic filters)*
*Gases (chemisorption, scrubbers)*
*Recirculated air meets standards*

**Space air distribution**
*Prevent stratification*
*Ventilate occupant breathing zone*
*Maintain effective pressurization*
*Balance supply and return systems*

**Heat recovery**
*Energy conserving outside air ventilation/heat recovery devices*
*Transfer air for high ventilation rate areas*

**Microbial control**
*Avoid fleecy materials in airstream*
*Eliminate standing water in drip pans*

9 *Indoor Air Quality Update,* H. Levin, editor, vol. 3, no. 2, Cutter Information, Arlington, MA (617) 648-8700.

10 *Indoor Air Sources: Using Small Environmental Test Chambers to Characterize Organic Emissions from Indoor Materials and Products,* B. Tichenor, Environmental Protection Agency, #PB90–110131, NTIS, Springfield, VA (703) 487-4650.

11 *Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials and Products,* Standard D 5116–90, ASTM, Philadelphia (215) 299-5400.

**"Everyone involved in the design, manufacture, construction, and operation of a building is responsible for ensuring that the building is appropriate for its intended use and meets the expectations of the bulding occupants."**

**5 Material Selection and Specification**

**Specify IAQ concerns in bid:**
*Health, safety, and comfort of occupants*
*Manufacturer's reponsibility for review and assurance*

**Require manufacturers' submittal of product contents, emissions tests**

**Select low-emitting materials and products**

**Criteria for evaluating emissions :**
*Minimize odorants;*
*Minimize irritants;*
*Minimize systemic toxins;*
*Minimize carcinogens, teratogens.*

**Minimize required use of adhesives**

**Minimize use of fleecy materials**

**Preventive installation procedures:**
*Ventilation during/after installation*
*In-place curing: ventilation, bake-out*

several highly "visible" government projects that have stimulated the development of testing in laboratories and the writing of standards for the conduct of such testing.[9,10,11]

Authorities have proposed guidelines for maximum emissions for low-emitting materials and products.[12] Some researchers are now planning to evaluate emissions in terms of various biological responses to them.[13] Others have used sensory responses of the anticipated occupants as a screening technique. In one case, the occupants of a home included two chemically sensitive children. After chemical screening, the children judged the products on the basis of brief exposures.[14]

The maintenance requirements and projected life cycle of materials have important IAQ implications that are seldom considered in design. Cleaning solvents and solutions are an important source of VOCs, and a short service life may mean more frequent replacement of carpets or other finishes with VOC emissions. Attention to these issues can help improve indoor air quality.

Problems remain in adequately characterizing emissions from the thousands of available products. Testing is expensive, time-consuming, and not standardized. Interpretation of results is difficult due to lack of knowledge regarding health effects. Trade-offs between the significance of toxicity and irritation must be determined. Nonetheless, the concern of designers is leading to the development of cleaner products and the elimination of some of the strongest emitters from the market.[7,9]

Controlling Emissions During Installation. Ventilation can be used to reduce the adsorption of VOCs emitted from building materials during installation. These procedures involve one pass, continuous, all-outside-air ventilation during installation of strong emitting materials. This reduces the contamination of "fleecy" materials by adsorption of the solvents and other volatile components of adhesives, caulks, sealants, and plastics. Painting and carpeting should be specified to be done under maximum ventilation conditions.

### Construction Process and Initial Occupancy

Designers wishing to control IAQ should document design assumptions thoroughly and provide clear, detailed descriptions of building systems. This documentation is used to evaluate the completed construction during the commissioning phase before occupancy. The building is tested against the design criteria to assure its suitability for occupancy.[15] This procedure is rapidly being adopted by more designers and owners to provide assurance of good IAQ and other building design specifications.

Special Ventilation. Many designers have begun to specify extra ventilation immediately before and during initial occupancy of newly- constructed or renovated buildings. Continuous, outside-air ventilation can be used to minimize occupant exposure to emissions from new materials and furnishings. This might be from three to six or eight weeks after installation. Such extra ventilation also reduces the potential for underventilation by incompletely balanced HVAC systems, which often characterize new buildings with poor indoor air quality. In addition, special ventilation can be used to flush buildings thoroughly before reoccupancy after any period of vacancy and reduction of ventilation (evenings, weekends, holidays).[6]

"Bakeout" has been used in many buildings. This involves raising building temperature for 48 hours or more while maintaining at least minimal ventilation. The elevation of temperature results in more rapid emission of VOCs and a correspondingly reduced contaminant load. The research results indicate that (1) the method has potential to reduce contaminant air concentrations, (2) the process is not a trivial one in terms of technical requirements, and (3) there are some significant additional costs associated with its use. Pretreatment of materials prior to installation appears to be a more efficient approach. However, for adhesives, paints, sealants, and other products applied in the field, it may not be possible to reduce emissions adequately in a reasonable time period without the use of a procedure like the "bakeout."[8]

Construction During Occupancy. Construction during occupancy is common both in newly-completed buildings and during renovation, relocation, or adaptive reuse in older buildings. These situations challenge designers, constructors, and building management to avoid exposing occupants to fumes and dusts from construction. The problem is especially challenging when the construction area cannot be easily isolated from the occupied areas and when contamination migrates directly or is circulated by the ventilation system.

12 "Regulating Indoor Air," B. Seifert, *Indoor Air 90, the Fifth International Conference on Indoor Air Quality and Climate*, vol. 5, Indoor Air '90, Ottawa (613) 737-2005, 1990, pp. 35–50.

13 "Building with Low-Emitting Materials and Products: Where do We Stand?" W. Tucker, *Indoor Air 90, the Fifth International Conference on Indoor Air Quality and Climate*, vol. 3, Indoor Air '90, Ottawa (613) 737-2005, *1990, pp. 251–256.*

Sources of contamination should be identified and controlled. This can be accomplished, at least in part, by providing temporary ventilation in the construction area while thoroughly isolating it from the occupied zone. Management strategies can reduce occupant exposure by carefully scheduling both construction and occupant activity as well as temporary occupant relocation. Asbestos or lead abatement projects provide examples of the types of barriers, temporary ventilation equipment, and management strategies that can be employed.

### The Need for Building Ecology

Most design professionals give little consideration to IAQ issues. Neither codes nor legal actions have created the necessary awareness and changes in practice. Part of the problem originates from the fact that there is inadequate communication between building science researchers and design professionals.

Many actors are involved in the process of making and using buildings. We identify four major groups with different perspectives, needs, and relationships to the buildings they affect (or that affect them): (1) owners and occupants, (2) building managers and operators, (3) designers, product manufacturers, and builders, and (4) institutional interests (codes and standards organizations, lenders, and insurers). Controlling energy consumption, indoor air quality, and other environmental factors involves coordinating their diverse in-puts and resolving differences in their needs and means.

The absence of a useful general body of knowledge, theory, and practice regarding building-environment-occupant interactions impedes developing the necessary design tools and practices to create and operate low-pollution and energy-conserving buildings. Design professionals and facilities operators are not equipped to analyze buildings as dynamic entities with important effects on occupants and a dependence on the outside environment.

Borrowing from the approach of the science of ecology, we suggest that researchers and practitioners develop a systems approach to understanding building-environment-occupant interactions. We reintroduce the term "building ecology" to describe this concept or approach to understanding buildings [P/A, April 1981, pp. 173–175]. The concept of building ecology requires applying a systems approach to designing and operating environmental control systems in buildings. It also requires consideration of the building as a dynamic and complex entity that continually changes in response to external conditions, occupant activities, and operator interventions. Finally, it requires understanding a building's complex chemical, physical, and biological processes that affect occupant health and well-being.

### Conclusion

Much progress has been made toward improving environmental quality and energy conservation through building design and operation. Contributions have been made in site planning, architectural design, ventilation, materials selection, and commissioning. Yet many technical problems still challenge researchers and professionals in achieving and maintaining desirable indoor environments.

An overall approach to healthy building design is needed, one that considers the interrelationships between the building, the larger environment, and the building occupants in a complex, dynamic system. This overall approach, called "building ecology," can provide the foundation for needed advancements in the design of healthy buildings and, indeed, the building design professions.

**Hal Levin and Kevin Teichman** ■

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### 6 Construction and Initial Occupancy Considerations

**Prepare design documentation and commissioning plan**
*Document design assumptions*
*Document systems characteristics and function*
*Plan commissioning process*

**Special ventilation**
*During and after installation of strong sources:*
*Ventilate continuously with all outside air*
*Seal return air plenum and ducts*

**Commissioning process**
*Complete operation and evaluation of HVAC system*
*Challenge system under various loads*

**Initial occupancy period**
*Ventilate for extended hours with all outside air*
*Monitor occupant responses to reduced ventilation*

14 "Design, Construction, and Ventilation of a Low Pollution Home," V. Salares, G. Allen, and O. Drerup, *Indoor Air 90, the Fifth International Conference on Indoor Air Quality and Climate*, vol. 3, Indoor Air '90, Ottawa (613) 737-2005, 1990, pp. 245–250.

15 *Guideline for Commissioning of HVAC Systems*, Guideline 1–1989, ASHRAE, Atlanta (404) 636-8400, 1989.

# Technics: Mercury, et al.

**Peter Retondo** of Sim Van der Ryn Associates offers one architect's view of recent developments involving domestic indoor pollution and what designers can do while we wait for more evidence.

If you thought that the health hazards from mercury additives in indoor paints had been resolved by their highly publicized removal last August, take a closer look. Nothing is as simple as it seems in the Gordian tangle of pollution research, overlapping agencies, risk assessment, and fear of litigation. The history of mercury regulation reveals succinctly how our system works – or fails to work – to detect health hazards inherent in building practices, and how attentive we architects must be to drive home real results.

Students from an earlier, more permissive era can remember rolling beads of mercury around with pencils on their high-school chemistry lab tables. Mercury has had a long history of usefulness and scientific inquiry. Its toxicity has been well established, as is implicit in its architectural role as a constituent in four organic fungicides[1] used since the early 1960s in latex paints. Because mercury is liquid at room temperature it can become a gas, and thus presents an indoor air hazard. As early as the 1940s, mercury had come to the attention of the medical community as a cause of a previously unexplained, rare, but serious, childhood disease.[2] It was an instance of that disease (Acrodynia) in a four-year-old boy last year, linked to a new paint job in the family home using latex paint with mercury additives,[3] that finally brought about a consensus against the use of mercury in paints.

There is a disturbing parallel between the cases of mercury and asbestos. The facts concerning disease in asbestos workers had first been exposed in the 1930s – 40 years before we finally took regulatory action and industry was shocked by the liabilities imposed on the Johns-Manville Corporation. Similarly, it took 30 years to bring mercury under regulatory control. The poisoning of Japanese towns by the consumption of shellfish contaminated with methyl mercury had made world news in 1956 and again in 1965. A 1963 article in the *New England Journal of Medicine*[4] exposed mercury paint additives as a cause of Acrodynia, and investigators discovered the mechanism whereby the mercury compounds in paints were transformed into free mercury vapor in indoor air. But an attempt by the Environmental Protection Agency (EPA) in 1972 to ban mercury's use in paints failed, as industry technicians piled up 4000 pages of testimony, supported by studies such as that published in 1965 in the *Journal of Applied Chemistry*,[5] which concluded that the amount of mercury released into the air by paints was likely to be far below the recommended minimum dose for industrial workers.

Although higher than in outdoor air, indoor concentrations of pollutants associated with building products are generally much lower than those associated with the industrial workplace. It must be realized, however, that effects on susceptible people (the elderly, children, fetuses), accumulation over longer periods of time, and the political reality that industrial standards are compromised by pragmatics, have been neglected. In retrospect, these low indoor levels have fostered complacency. So it was not until 1990, in an atmosphere of growing concern over indoor pollution in general, that a voluntary removal of mercury mildewcides from the market was negotiated by the EPA.

That removal, though, is not complete, and this is where architects can make a difference in helping ensure the health of the occupants of their buildings. As part of the deal, paint manufacturers have been allowed to sell their existing inventory of mercury-containing paint. In addition, they are still allowed to manufacture *exterior* paints containing mercury compounds, and because it is reported that painters may prefer using mercury-treated paints,[6] the possibility exists that – without pointed specifications to the contrary – such paints may be used indoors. It is, therefore, recommended that architects specify mercury-free interior paints, and the EPA has a mercury hotline (800-858-7378) to help specifiers determine whether a particular brand is mercury-free. This is especially important now, while distributors are anxious to reduce their inventories of mercury-containing paints. The hotline is also a source for information about termite chemical soil treatments and other pesticides.

Mercury is the latest in a series of construction materials to be regulated by the government, and will certainly not be the last. As a senior researcher for the EPA has pointed out, "It will be prudent for architects. . . to be alert to substances that rather suddenly attract the attention of the public and public health officials."[7] Architects can do more, however, than just pay attention to government regulations concerning hazardous building materials (see sidebar).

### Seeking Higher Standards

Some have argued that formaldehyde emissions are no longer an issue after the banning of

**References**

1 PMA (phenylmercuric acetate) CMPA (3-chloromethoxypropylmercuric acetate); PMDS (Di-phenylmercury-dodecenylsuccinate); and PMO (phenylmercuric oleate).

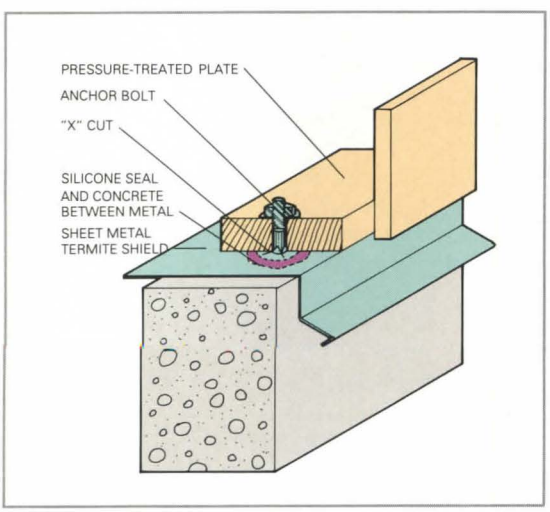
2 "Mercury – an Element of Mystery" (editorial), Thomas W. Clarkson, *New England Journal of Medicine*, Oct. 18, 1990, pp. 1137–39.

3 "Mercury Exposure from Interior Latex Paint," Mary M. Agocs et al, *New England Journal of Medicine*, Oct. 18, 1990, pp. 1096–1101.

4 "Mercury in House Paint as a Cause of Acrodynia: Effect of Therapy with N-acetyl-D. 1-penicillamine," S.Z. Hirschman et al, *New England Journal of Medicine*, 1963, 269: 889–93.

5 "The Loss of Mercury from Fungicidal Paints," C.G. Taylor, *Journal of Applied Chemistry*, May, 1965, pp. 232–36.

6 Personal communication, Bruce Tichenor, Chief, Hazardous Air Technology Branch, Air and Energy Engineering Research Laboratory, EPA.



TERMITE SHIELD

urea formaldehyde foam insulation (UFFI), the major source of formaldehyde poisoning in mobile homes that made the problem a *cause célèbre*. The fact remains, though, that there are no U.S. regulations concerning acceptable formaldehyde levels in domestic indoor air. The EPA's industrial threshold value is 1.0 parts per million (ppm), whereas Germany, for example, requires a standard of 0.1 ppm,[8] and some researchers argue for domestic levels as low as 0.03 ppm[9] (at the upper end of the average range for outdoor air[10]). In this atmosphere of confusion, some members of the wood-products industry – major users of urea- and phenol-formaldehyde resin binders – have argued that the trend towards phenol formaldehyde (the binder used in typical exterior plywood products), is enough of a step in the right direction, since its formaldehyde emissions are much lower than ureaformaldehyde's. Louisiana Pacific, however, is pioneering the use of an isocyanate binder, which, as far as is known, poses no toxic emission hazard.[6] Their Inner Seal® oriented strand board products and exterior sidings use isocyanate as a binder in a process that no other U.S. manufacturer has yet duplicated. Although they still use a phenol-formaldehyde coating at the surface of some of these products, the formaldehyde emission rate is significantly reduced. Architects are in a position to encourage such efforts in innovation through the power of specifications.

Higher standards can similarly be applied to other materials. According to recent studies, the constituent in latex carpet backings, 4-phenylcyclohexane (4-PC), is not known to be toxic,[6] yet it has an extremely annoying odor, and is detectable in concentrations much lower than most volatile organic compounds (VOCs).[11] If we follow a standard based on human senses and occupant comfort, we would seek to eliminate this unpleasant agent (see table for recommendations)

### Environmental Illness

People with multiple chemical sensitivities (MCS) have been reduced to lives of misery – in some cases confined to their homes with special sanctuary rooms equipped with air purifiers and free of all materials producing VOC emissions or odors. Their syndrome is typically acquired and associated with a specific toxic exposure incident. The American Academy of Environmental Medicine comprises 500 physician members with practices specializing in the disease. Architectural strategies have centered on assiduous exclusion of materials containing VOCs, especially finish materials such as carpet, particle board, plywood subfloors, adhesives, and paints. Dr. Jeffrey Anderson, a specialist in environmental illness, has witnessed the regression of symptoms in over 70 cases of MCS after material-minded remodeling of patients' homes.

Subjective testing (by sniffing) by MCS sufferers is often the only way of assessing the acceptability of some materials. Four paint companies, three of them West German, have gained acceptance by the MCS community: Livos®, Biofa®, Auro®, and AFM®. The first three are part of an environmental consumer movement in Germany that has been gaining strength for 25 years. "Organic" or "citrus base" paints, the chemistry of which is based on dissolved natural resins, have captured 15 percent of the market there. The fourth is a U.S. manufacturer who has specialized in providing for the environmentally ill, and who has used a chemistry based on water emulsions of inorganic polymers. Our firm has been unable to locate scientific studies that compare these paints with conventional U.S. products; our recommendation is based on anecdotal evidence from the MCS community. These paints raise the cost of coatings, but because most of the cost of painting is in labor, the increase is not particularly significant. U.S. painting contractors have reported satisfactory experience with application and durability of the products.

7 "Research Overview: Sources of Indoor Air Pollutants," W.G. Tucker, EPA report 600/D-87/207, 1987.

8 Solplan Review, *August-September 1987.*

9 *Air Quality,* Thad Godish, Lewis Publishers, Chelsea, Michigan (800) 272-7737, 1985.

10 *Exposure to Formaldehyde from Indoor Air,* Elizabeth Ota and Elliot Mulberg, California Air Resources Board, 1990, p. 9.

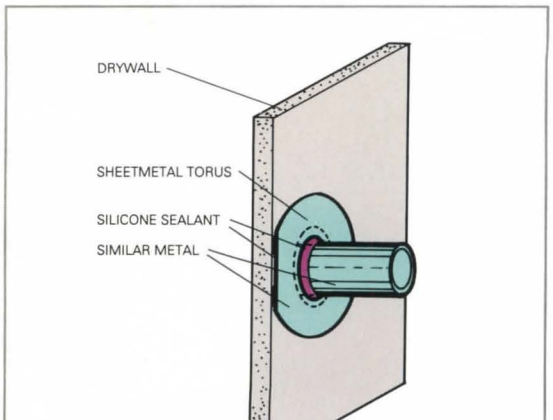
11 *Emissions of Air Pollutants from Indoor Materials: An Emerging Design Consideration,* G.W. Tucker, EPA Report 600/D-88/191, 1988.

12 "Building Materials and Indoor Air Quality," Hal Levin, *Journal of Occupational Medicine,* Vol. 4, No. 4, Winter 1989, pp. 667–693.

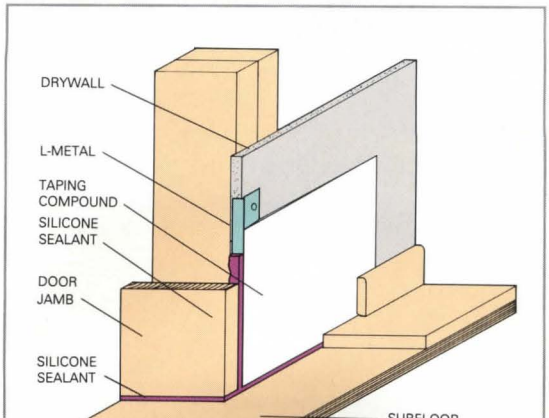
| MATERIAL/FEATURE | PROBLEM | RECOMMENDATION |
|---|---|---|
| **Topical biocidal solutions** (Cuprinol, pentachorophenol, etc.) | Contact poisons | Use is typically superfluous; use redwood, cedar, cypress, or alternative masonry materials (pressure treated wood okay unexposed). Avoid outdoor use of susceptible woods like oak, provide adequate separation from ground, and detail maximum ventilation to evaporate rainwater. |
| **Copper water supply tubing** | Lead solder now banned by UPC, but still available; flux runs into pipes during soldering. | Specify lead-free solder; require steam or superheated water back-flush of system before installation of fixtures |
| **Plastic water supply tubing** | Tubing and glues leach solvents and chlorinated hydrocarbons into water. | Do not use plastic for supply water. |
| **UFFI** (urea formaldehyde foam insulation) | Severe emissions of formaldehyde, a moderately poisonous gas. Unobtainable for most applications. | Do not use UFFI. Alternatives for retrofit: blown-in cellulose or Air Krete®, a non-toxic cementitous foam with R-value of about 4 per inch, pump-applied on-site for about $1 per square foot for R-13. |
| **Fiberglass insulation** | Glass wool dust is a possible carcinogen[1]; Phenol-formaldehyde resin binder (minor problem). | Epidemiological studies of industry workers give ambiguous results. Caution advised! Seal finished installation from contact with indoor air. There should be no possibility of contact with building occupants. Excellent alternative: Air-Krete®. |
| **Plywood, particle-board** | Formaldehyde emissions from urea-formaldehyde and phenol-formaldehyde resins. | Avoid products with urea-formaldehyde binder: MDF (medium density fiberboard), particle board, interior rated plywood, hardwood plywoods (typically). Phenol-formaldehyde less of a problem. Alternative for structural applications: Louisiana Pacific Inner Seal OSB with isocyanate resin (see text), especially important for subfloors. |
| **Forced-air heating systems** | Poorly maintained filters breed molds; cold air returns and AC cooling coils are condensation sites, breeding aeropathogens; duct work harbors dust; system distributes contaminants[2]. | Think in terms of building conditioning rather than air conditioning for thermal comfort. Radiant systems, especially in-slab, are preferable and save energy as well. Passive solar heating and cooling measures are healthier and more pleasant. |
| **Garage** | Exhaust fumes from car warm-up, find ways into the house[2]. | Detach garage; breezeway connection okay. |
| **Indoor paint** | VOC emissions; see text for mercury emissions | Specify mercury-free paints; bake out and ventilate completed building to avoid initial high VOC levels; alternative paints with low toxicity, especially for persons with MCS (multiple chemical sensitivities) include Livos, Auro, Biofa, and AMF. Good scientific comparisons on paints are not available, but anecdotal information indicates the four mentioned above have comparatively low toxicity. |
| **Plastic foam insulation** | VOC (volatile organic compounds) emissions; highly toxic smoke in fire. | Avoid. Alternative: Foamglas (Pittsburgh Corning) is an acceptable but expensive substitute where compressive strength is required; Air-Krete is a good substitute otherwise. |
| **Gas stoves and unvented gas heaters** | Air pollution from combustion products: $CO_2$, CO, nitrogen oxides, formaldehyde | Do not use unvented gas heaters. Electric stoves are preferable to gas from an air-quality point of view. For gas stove installation, specify electronic ignition and always provide exhaust hood with maximum size blower, exhausted outside the house. |
| **Carpet** | Harbors dust, molds, and adsorbed VOCs. Latex backings emit VOCs, including 4-PC (4-phenylcyclohexane). Glues outgas. | Best to avoid carpets altogether, especially in areas where they might become damp. If they must be used, do not glue down, use jute pads, specify carpet without latex backing (woven backing). |
| ***Vinyl flooring*** | Material and adhesives outgas. | A linseed oil/cork linoleum from Holland (Forbo) is available as a substitute, especially for those with MCS. Price is comparable to typical commercial vinyls,and reputation for durability is good. AFM and Auro make low VOC adhesives. Ceramic tile is a totally non-toxic |

[1] *Indoor Pollutants,* Committee on Indoor Pollutants, National Research Council: 1981, p. 130.

[2] "Role of Ventilation in the Causation of Building-Associated Illnesses." Philip R. Morey and Douglas E. Shattuck: *Occupational Medicine State of the Art Reviews,* vol 4, no. 4, Winter 1989, pp. 625-42




INSECT BARRIER DETAILS




INSECT BARRIER AT PENETRATIONS

### Post-construction Contamination

Insect problems are habitually dealt with after the problems have occured, through the application of toxic insecticides. Because pesticide use is a consumer issue and is not a part of the design or construction process, we tend not to think of it as an architectural issue. On the contrary, however, the architect can play an important role in the prevention of unnecessary pesticide use through preventive measures. The principles of prevention are simple: Good fences make good neighbors – detail the building to provide physical barriers. Where gardening is expected adjacent to a foundation, increase the code clearance (from ground to wood) from 6″ to 12″. Termite shields add protection at little extra cost. Stucco should not extend to the ground, as is common practice, but should also be kept away from contact with earth. A fence post sunk in the ground next to the building and in contact with the siding is an example of a common peripheral invitation to termites (the same is true for trellises, and other appurtenances).

The logic of detailing to avoid invasion by ants, silverfish, roaches, etc., flows from the question, "When was the last time you saw an insect crawl through a taped drywall corner?" Applying the same level of attention to create a preventive envelope at drywall and subfloor joints, and door and window jambs, will prevent most insect intrusion. This means that areas left unfinished by most builders should be taped out, including those behind cabinets and bathtubs. It also means sealing the wall at pipe stub-outs and sealing electrical boxes. Where caulking is used for this purpose, we recommend silicone caulk because it holds up better and outgasses less than most others.[12]

This kind of detailing points out another barrier to improving indoor environmental quality: The building industry resists changing standard construction practices, which favor visible results and the lowest cost. Many contractors and their subs ignore fine-level details called out in the plans until the job is under construction, and then raise objections to any unanticipated extra work; it would be a good idea to draw attention to this material in your bid invitations, and to include a separate section in specifications. With patience and persistence, architects can take a leading role in bringing about improved practices.

**Peter Retondo** ■

*The author is managing associate with Sim Van der Ryn and Associates, Sausalito, California, an architectural and consulting firm specializing in environmentally conscious architecture and ecological design.*

### Acknowledgment

The author would like to acknowledge the assistance of Therese Peffer, researcher for the Farallones Institute.

### Recommended Reading

*Indoor Air Pollution Control,* Thad Godish, Lewis Publishers, Inc., Chelsea, MI (800) 272-7737, 1989, 400 pp., $65.

*Indoor Air Quality Update,* a monthly newsletter edited by Hal Levin, Cutter Information Corp., Arlington, MA (617) 648-8700, $267 per year.

*Problem Buildings: Building-Associated Illness and the Sick Building Syndrome,* Occupational Medicine State of the Art Reviews, vol. 4, no. 4, James Cone and Michael Hodgson, editors, Hanley and Belfast, Inc., Philadelphia (215) 546-7293, 1989, 240 pp., $34.00.

*Residential Indoor Air Quality and Energy Efficiency,* Peter Dupont and John Morrill, American Council for an Energy Efficient Economy, Washington, D.C. (202) 429-8873, 267 pp., $24.50.

*Ventilation for Acceptable Indoor Air Quality,* Standard 62–1989, American Society of Heating, Refrigerating, and Air Conditioning Engineers, Atlanta (404) 636-8400, 1989, 26 pp., $42.

### What Architects Can Do

Recognizing that regulatory minimum dose standards are keyed to serious health consequences, architects can strive to maintain a higher standard, based on occupant comfort and sense of well-being. This goal will have the beneficial side effect of putting the profession ahead of regulatory machinery and litigation liability.

Architects should be aware that a special group, those with "environmental illness" or MCS (multiple chemical sensitivities), requires special consideration, both in their homes and in public buildings. The percentage of the U.S. population with chemical sensitivity has been estimated as high as 15% for mild effects, and 1–5% for serious cases.

Architects can design details to reduce post-construction contamination due to extraneous agents. In other words, look beyond the immediate task of building and assume greater responsibility for the ecology of the building.

# Technics Topics

According to **Stewart Mosberg** of Walter Dorwin Teague Associates, "Manufacturers are jumping on the bandwagon – or are they jumping the gun?"

## What Do We Mean By "Green"?

Concern for the environment has opened the eyes of the marketing industry. One of the great marketing challenges of the 1990s is "green marketing." Environmentally friendly, or "green," products are being introduced on a seemingly daily basis. The trend is destined to be short-lived, however. Products are being prematurely marketed as "green," and establishment of their "friendliness" is a long way off. The push has been faster and stronger in marketing to consumers than to professionals, but there are parallels – and lessons to be learned.

In a society where trash and toxic threats keep piling up, environmental problems are spurring the introduction of increasing numbers of products that are biodegradable, photodegradable, low in toxins and in emissions of volatile organic compounds, contain recycled constituents or are in themselves recyclable, and are derived from renewable resources (ruling out rare woods from tropical rain forests). All of these lay claim to "greenness," and this characterization has been packaged and presented just as neatly as the products themselves. Do American manufacturers and consumers – and product specifiers – understand the implications and responsibilities in the decision to "go green"?

Our firm commissioned a Gallup poll of Fortune 500 packaging decision-makers in the U.S. The TEAGUE-Gallup poll reflected the respondents' environmental awareness and concern, as well as their readiness to apply that concern to the package design process. In reviewing the results of the survey, it is clear that the problem does not lie with interest or intent – it lies with application. We suspect the same is true in the building industry.

### Four "Rs" of Friendliness

Many consumer products marketed as "green" are unworthy of the title. Although a detergent may be packaged in an environmentally safe container, the detergent itself is still harmful to our soil and water. Although a manufacturing industry assures us that its products are "recyclable," what does this mean if there are no mechanisms to collect the material after its service life is over – or when it has gone out of style? What responsibility does a manufacturer who claims to be "friendly" have for recycling its own materials?

Recycling is a valid technique that has yet to be fully explored and used. A package is recycled – in the most literal sense – when it is brought back to the point of origin, cleaned, refilled, and returned to the market in its initial form. A package is reclaimed when it is crushed, melted, or ground, and then reformed into its original shape, or for some other use. Reduction refers to the amount of material (particularly toxic material) used in manufacturing products. Recovery is salvaging the package's most usable components for reuse. While recovery has long been part of the demolition end of the construction industry, it is limited to materials of unusual value that are easy to extract – like copper plumbing.

The technology exists to implement the four "Rs" mentioned above. For instance, plastic lumber made from discarded milk containers is a technological advance wherein commingled plastics are blended and formed into a new synthetic material. It doesn't rot, can be submerged in water, and won't deteriorate or develop barnacles. It is excellent for outdoor use in park benches, stadium seats, and highway stanchions. But "green" products and materials – like any other – require a considerable capital investment, both at the developmental stage and in production, to cover the costs of new plant and manufacturing processes.

### Labeling

Many manufacturers of consumer products have approached this complex state of affairs by introducing "green" labeling. Labels tell consumers that products have not been tested on animals, or that they are recommended by organizations like Friends of the Earth or Greenpeace. The product and package in question are not only environmentally safe, but they have been stamped with a green label to "prove" it. Proof beyond a reasonable doubt?

In the building materials industry, which relies so heavily on standards and specifications, labeling could be a boon to manufacturers and specifiers alike – if all segments of the construction industry participate in the process and all the right questions are addressed. Perhaps the first of these – and an exemplary model – is the window labeling program of the National Fenestration Rating Council. With members from the glass and window industries, architectural and engineering professions, government agencies, utility companies, and public interest groups, the Council is chartered to develop a common basis for rating energy, condensation, acoustical, and other performance criteria for window products. Even so, NFRC was hastily organized in response to the imminent creation of separate labeling programs by several different states and Canada.

Will other industries respond only if government threatens to intervene? Ultimately, some governmental control is needed to ensure that the time and money spent on manufacturing, marketing, and labeling are worth the effort. But the broader point is that by educating our society about "greenness" – through which labeling can play a role (as it has in the food industry) – building owners, users, and designers no longer have to pay the price of ignorance.

### Teague's Green Guidelines

"Green" marketing of building materials – like that of consumer products – can be a genuine service if it is truthful and educational. Standardized regulation or clear voluntary guidelines about what it means to be "friendly" to the environment is a first step. If no guidelines are followed, manufacturers face a terrific backlash from the pub-

lic in general, and environmentalists in particular. Ultimately, manufacturers must realize that "greenness" must pervade all corporate thinking and planning. Industry itself will increasingly be the most powerful lobby for enforcing "green" marketing standards. A market with strict rules will provide a secure foundation for building a healthy environment in the new decade.

Our office suggests the accompanying list of guidelines for "what it means to be green." Unlike the consumer marketplace, architects routinely have contact with manufacturers through their sales representatives, and are in position to query them directly about their claims to environmental friendliness. Our guidelines are a good place to start.

New criteria and requirements will no doubt create new opportunities for architects, builders, and designers. Those who understand the problems and solutions will not only help maintain a friendly relationship with the environment, but may be able to expand their professional service offerings as well.

**Stewart Mosberg** ■

*The author is senior director of client services for Walter Dorwin Teague Associates, Inc., an industrial design firm specializing in transportation, environmental space planning, and exhibit design. He is a member of the Congressional Office of Technology Assessment's Advisory Panel on "Materials Technology: Integrating Environmental Goals with Product Design."*

## TEAGUE'S ENVIRONMENT-FRIENDLY GUIDELINES

Materials from which the product or package are manufactured should be both abundant and replenishable.

The process by which the raw material is derived should employ a minimum of energy.

The resulting by-products should be reusable.

The finished product should comprise the fewest number of components possible.

The discarded product should be recyclable or reclaimable, or disposed of in an environmentally-sound fashion — for example, destroyed by an incinerator that does not release toxic fumes or ash.

### An Additional Proposal

Products that do not meet environmentally-sound prerequisites should be heavily taxed, if not outlawed.

The taxes that are collected should be used to help build waste-management facilities, such as municipal incineration systems.

The energy derived from these systems could be used to generate power for the plant itself, as well as provide light and heat for the surrounding community.

All trash should enter waste-disposal networks via a "separation channel" specific to the materials used.

These channels would be linked to a source-separation facility where air filtration, magnets, grinders, and shredders would separate and break down the refuse into reusable material.

The technology for the above-mentioned waste management techniques already exists, but has yet to be widely implemented.

### Tech Notes

**The Illuminating Engineering Society's *Recommended Practice for Lighting Offices Containing Computer Visual Display Terminals*, RP-24, is well illustrated, easy to understand, and an important document for all designers. IES, New York (212) 705-7916, 25 pp., $38.**

***Development of Thermal Envelope Guidelines for Federal Office Buildings* by A. Persily reviews research and design literature for roofing and cladding systems. While not proposing new details, it documents current theory and practice. NTIS, #PB 91112839, (703) 487-4650, 58 pp., $20.00.**

**The symposium *Indoor Environment '91* will be held April 14–16 in Chicago by the Chicago Committee on High Rise Buildings and the Illinois chapter of ASHRAE. Issues include standards, policy, productivity, POEs, and systems commissioning. Call Richard Hegberg, Bell and Gossett (708) 966-3700.**

***Energy-Efficient Window Design*, Technical Data Bulletin vol. 6, no. 2, contains 11 papers presented at ASHRAE's February 1990 meeting. Recommended to solar and solar control specialists. ASHRAE, Atlanta (404) 636-8400, 83 pp., $44.**

***The Second Conference on Tall Buildings in Seismic Regions* will be held May 16–17 in Los Angeles by the L.A. Tall Buildings Structural Design Council and the Council on Tall Buildings and Urban Habitat. L.A. TBSDC (213) 688-3014.**

# Technics Topics

P/A looks at a new material of recycled fibers looking for a manufacturer.

## Closing Some Circles

1 *Everything is Connected to Everything Else.*

2 *Everything Must Go Somewhere.*

3 *Nature Knows Best.*

4 *There is No Such Thing as Free Lunch.*

Barry Commoner's Four Laws of Ecology (*The Closing Circle: Nature, Man, and Technology,* Knopf, 1972) are derived from serious science, despite their casual phrasing. Commoner's theme is that human technology has broken natural cycles of energy and resource recovery, reclamation, and reuse, and that the consequences are unavoidable. The consequences are costly, too, as escalating fees for dumping at landfills and the extraordinary burden of cleaning up chemical and nuclear waste disposal sites are beginning to show.

Systems ecologist Dr. Mark Brown (an M.Arch. in an earlier life) at the University of Florida's Center for Wetlands has been continuing the work of his colleague Howard Odum (*Energy Basis for Man and Nature,* McGraw-Hill, 1981) in computer modeling of natural systems. Their work shows that what we pay for energy and materials does not represent their true cost, because the costs of depletion of non-renewable resources and disposal are not embodied in the purchase price. But pay them we must, whether in local and federal taxes, utility bills, or health insurance. Where does this lead? Back to the 1970s, when resource recovery was on everyone's lips – but with the urgency of 1990s economics.

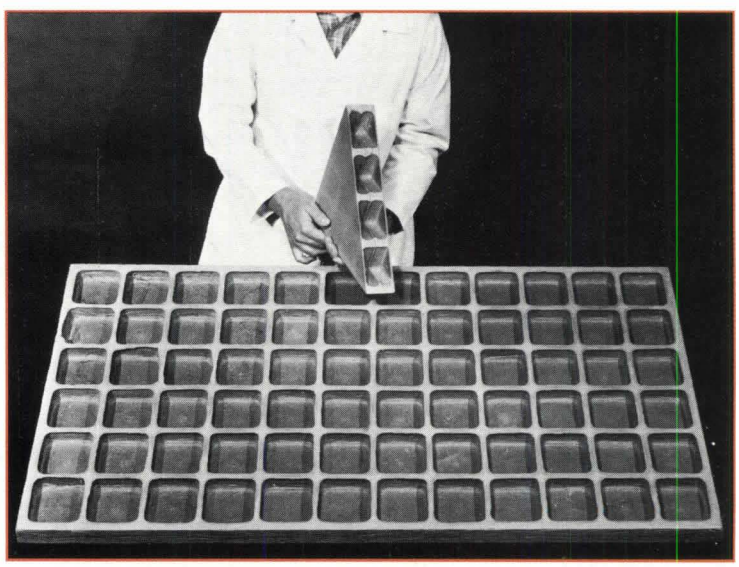
Spaceboard was recently developed at the Forest Products Laboratory (FPL) – an agency of the U.S. Department of Agriculture. It derives from efforts begun in the early 1970s at FPL to find uses for recycled wood fiber too low in quality for making paper and corrugated cardboard. Where do you put recycled fiber that has been dried or contaminated beyond the limits for recycling back into traditional paper products? Buildings are a good resting place: Even though they don't last forever, buildings offer a lengthy "short-term" alternative to landfills.

FPL imagines Spaceboard as a structural wall, floor, and roof panel material. FPL should know, as they've been the driving force behind development of wafer, strand, and laminated veneer lumber and panel products that are the mainstay of much light frame construction today.

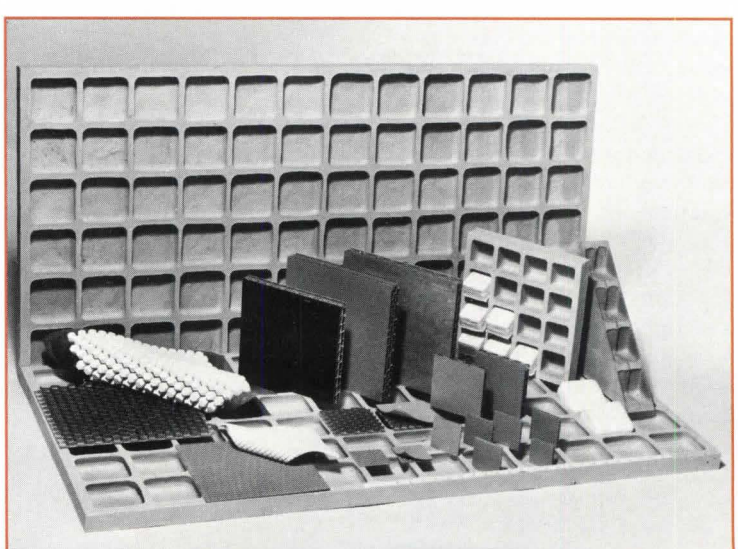
Spaceboard is molded from pulp in panels with a smooth skin on one side and open cells on the other. Bonding identical sheets together produces a sandwich ranging in thickness from ⅛″ to 3″, with an internal rib structure that gives it compressive strength and stiffness as great as solid wood – without the inherent growth defects and other irregularities. FPL envisions molding structural features and fasteners into an integral assembly, creating a panel suitable for rapid on-site erection.

The mission of the Department of Agriculture's FPL is, in part, to conserve forest resources through better use of forest products. While fiber recycling research and material development falls within this charge, product development and manufacturing do not, so FPL welcomes inquiries from industry about putting Spaceboard to use. Questions should be directed to Theodore Laufenberg, Supervisory Research General Engineer, Forest Products Laboratory, Madison, Wisconsin (608) 231-9480.

**Kenneth Labs** ■



*Spaceboard can be made in 3″ thicknesses by bonding together two waffle slabs, creating a unit with many possible structural applications.*



*Thin panels are suitable for furniture, packaging, and other applications requiring stiffness and light weight.*

Forest Products Laboratory

Knoll **design.** Westinghouse **engineering.** Shaw|Walker **value.** Reff **style.** One company. Dig in.

# The Knoll Group

Circle **No. 308**

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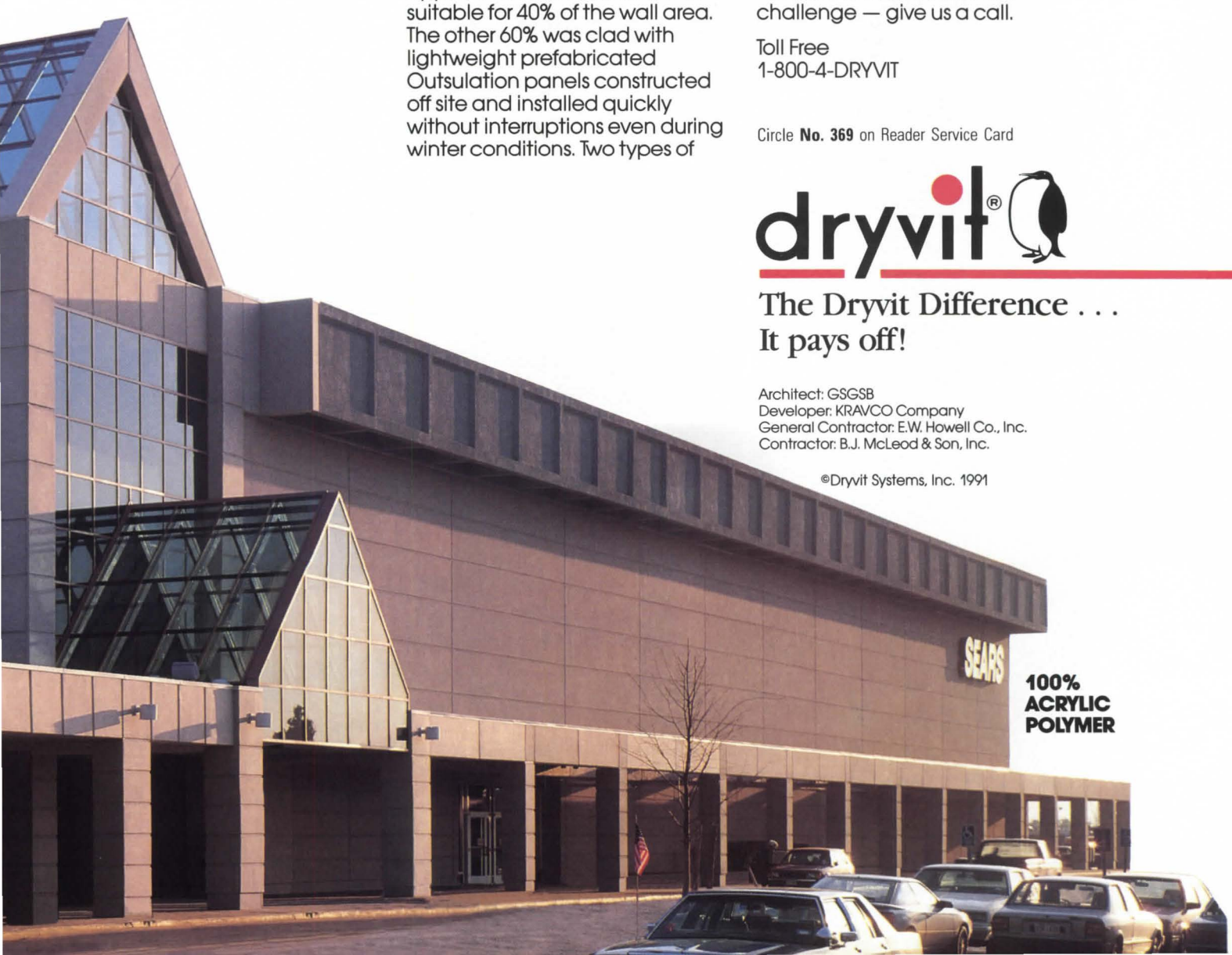

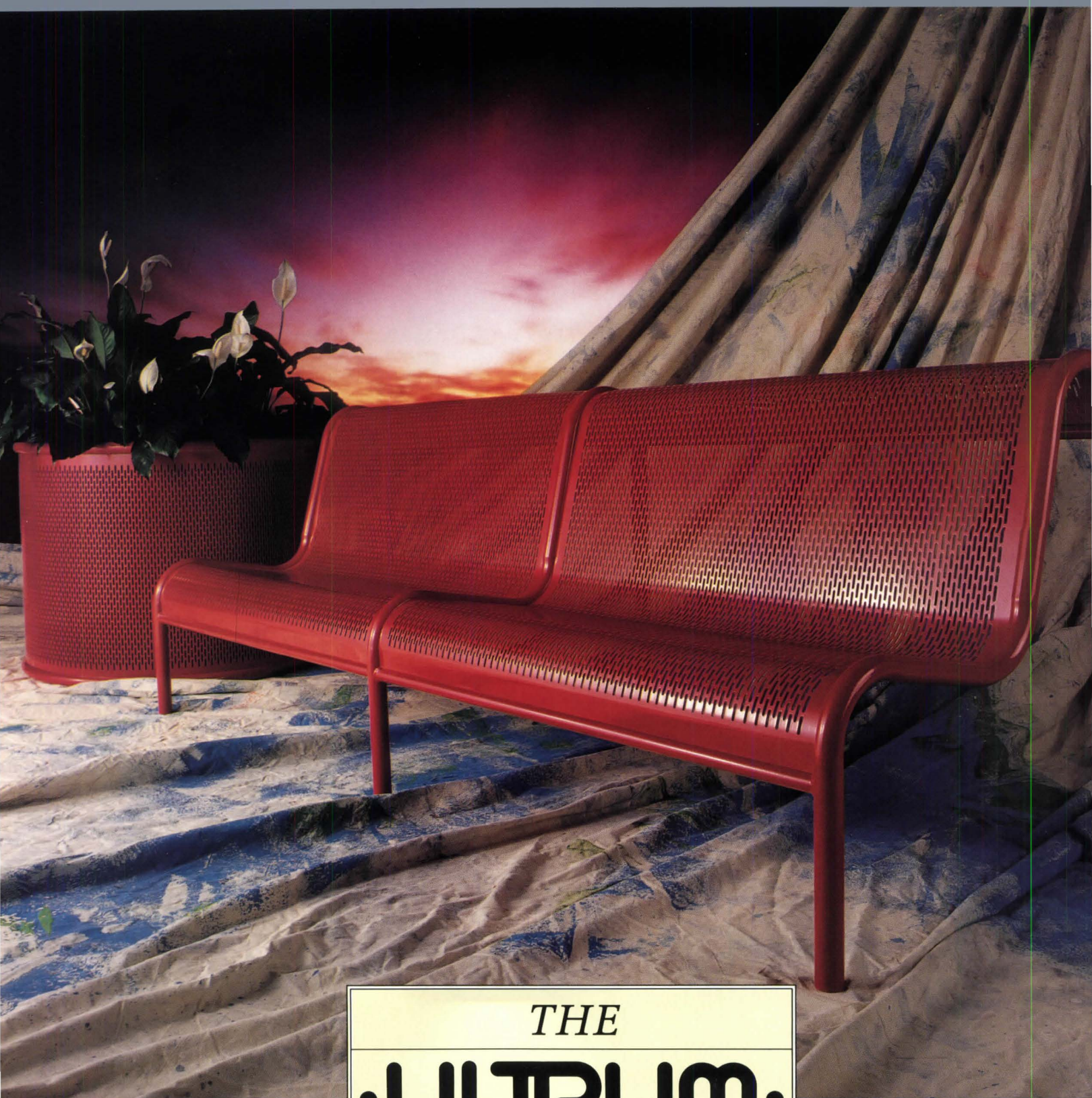

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# Design:
# To Dwell on the Earth



How can we make communities, buildings, and landscapes more socially and environmentally responsive? That is a question asked by all of the architects whose work is featured on the following pages. At one level, their answers to the question differ widely. Some call for the reform of the urban infrastructure, increasing population density and conserving open space by reusing existing road and rail lines, as in the case of Peter Calthorpe (p. 84), or by building new vertical cities, as in the case of Paolo Soleri (p. 76). Others look to natural processes as a model of human action, in efforts such as Christopher Alexander's participatory design and construction method at Mexicali (p. 79) or Erik Asmussen's expression of organic growth and human movement in his buildings in Jarna, Sweden (p. 70).

Some see an answer in the tradition of American utopian communities. Sim Van der Ryn's Zen Center (p. 88) is a community based upon common religious beliefs and practices, while David Sellers' Lindisfarne (p. 86) is grounded more upon communitarian ideas of shared property and cooperative labor. And others, such as Edward Mazria (p. 74) and Malcolm Wells (p. 82), seek to reestablish the intimate and often spiritual connection many traditional cultures had with nature.

While the differences are real, this work nevertheless shares a common motive and sensibility. It is all, to varying degrees, phenomenological, carefully scrutinizing the essence of our relationship to the natural world. It also is, in the broadest sense, ecological, attempting not only to respect and preserve the land, but to learn from and apply some of the principles of ecology – the interrelatedness of all things, for example, or the beauty that comes from simple function – to the problems of architecture and urban design.

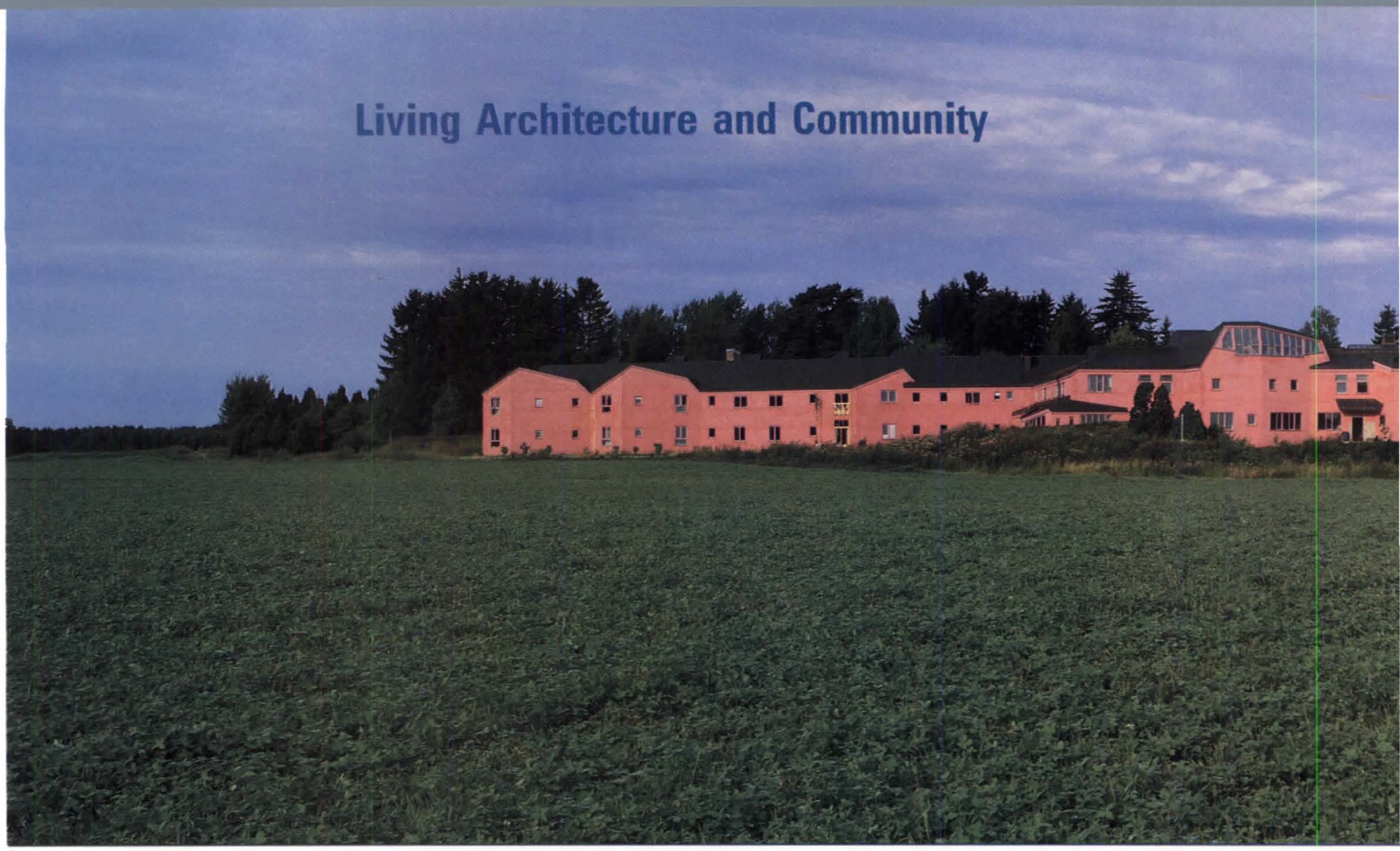
In short, the following projects are not just about saving energy or preserving open space. They address a question that, amidst our growing social and environmental problems, has become increasingly urgent: How can we dwell more lightly and more fully upon the earth? **Thomas Fisher** ■

*George Inness,* The Lackawanna Valley,

*1855, National Gallery of Art, Washington,*

*D.C. Gift of Mrs. Huttleston Rogers.*

# Living Architecture and Community



1

The work of architect Erik Asmussen in Jarna, Sweden,

explores the possibilities of Spiritual Functionalism



*The central complex of buildings at Jarna includes the healing center (1,2), the Seminariet (3), a Waldorf school, and a biodynamic farm. These were conceived by Asmussen and his collaborators as an integrated work of art that weaves together architecture, sculpture, painting, agriculture, and garden design. This complex also serves as the residential, cultural, and spiritual center for the outlying farms, curative homes, and businesses.*

Rudolf Steiner (1861–1925), an Austrian philosopher, artist, and "spiritual scientist", was the founder of anthroposophy and the Waldorf school movement. According to Steiner, the proper role of the architect is to find for every structure a unique form that expresses the essence of the building's function while sustaining every activity that takes place within it.

Erik Asmussen, born in Copenhagen in 1913, has long been influenced by Steiner's ideas and, since the early 1960s, has practiced architecture as a spiritual discipline, designing only for anthroposophical communities in Scandinavia, West Germany, and England. In 1977, Asmussen moved his practice and his family to the Rudolf Steinerseminariet, a small community and college near Jarna, Sweden, a village of about 7,000 people located on the Baltic, 50 kilometers south of Stockholm.

The anthroposophical community in and around Jarna, which began in 1935 and now totals about 1500 people, is a cooperative association of organizationally separate groups who operate biodynamic farms, curative homes, Waldorf schools, a healing center, a college, a mill and bakery, a performing arts center, and a growing number of businesses. Asmussen has designed most of the buildings in the community.

### Principles of Design

By "living into" the building's intended function through intensive involvement with client groups, by attempting to experience inwardly what Steiner calls the "organically-creating principle in nature," and by designing primarily with models, Asmussen attempts to create sculptural building forms that grow out of and express the inner spirit of function and place. As Asmussen says, "the goal of anthroposophic architecture is, through design and the whole form-language, to strive to create a stimulating environment, which through its special atmosphere can act as an inspiration to just the activity for which the building is intended."

There are four principles that help to explain how Asmussen seeks to achieve this goal.

Color: Perhaps the most striking impression upon seeing Asmussen's buildings is that they are painted in a variety of strong and non-traditional colors. In collaboration with colorist Fritz Fuchs, Asmussen paints building interiors with many

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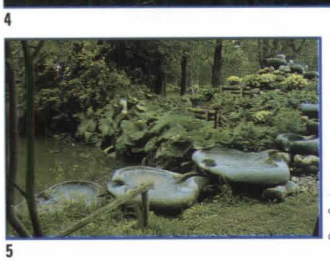
Photos: Max Plungor

Photo: Max Plunger

4



Gary Coates

5

*Jarna contains an aquatic garden made up of a series of connected settling ponds, each of which is home to a complex ecology of plants and animals. Waste water is purified naturally as it cascades down a series of sculptural bowls (called flow forms), moving in figure-eight vortices (5). The water is further aerated and purified as it recirculates through each pond. Paths wander through this gentle landscape, which not only rests eye and soul, but also transforms human waste generated by the community into luxuriant life and potable water.*

thin, transparent layers of paint made from vegetable and mineral dyes in a casein and beeswax medium. The effect is to impart to wood, plaster, and concrete a quality of luminosity and warm aliveness similar to human flesh. Upon entering any building one feels immersed in a subtle world of light-filled, transparent color capable of awakening what Steiner describes as the objective reality and soul-nurturing presence of the living world of color.

The Living Wall: Asmussen attempts to create walls as living membranes, plastically continuous surfaces that give expression to the play between the polarities of up and down, inside and out. Walls and windows, for example, make visible the forces of downward bearing load and upward striving support; sometimes it almost seems that Asmussen's buildings are inhaling and exhaling as they stand between earth and sky.

Metamorphosis: With Steiner, Asmussen believes that organic architecture must express the principle of metamorphosis, the law of ordered transformation in plants that was first discovered by Goethe. The purpose of such an architecture is, in Goethe's words, to create through art "a manifestation of the secret laws of nature, which without it would remain forever hidden."

Asmussen pursues this idea of metamorphosis in the relationship of forms in some of his buildings at Jarna. There is a low part, which is always used for living accommodations, and a higher part, which contains rooms for communal use – a basic volumetric pattern that Asmussen transforms into outwardly different forms expressing varied building sites and functions. This pattern of low volume/private, high volume/public in Asmussen's highly varied buildings is thus analogous to Goethe's view that the entire plant can be seen as the metamorphosis of the pattern of relationships that are described by the word "leaf."

Dynamic Equilibrium: Nearly everywhere in Asmussen's buildings one has the paradoxical but pleasant experience of movement-in-rest and rest-in-movement. As one moves through his buildings, constancy and change, symmetry and asymmetry, sheltered intimacy and expansive openness are held in a delicate and rhythmical balance created by the interaction of individual will and spatial possibility. Yet, whether in motion or at rest, one always has a sense of equilibrium in which

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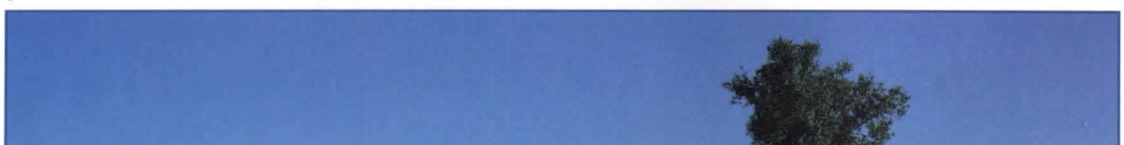

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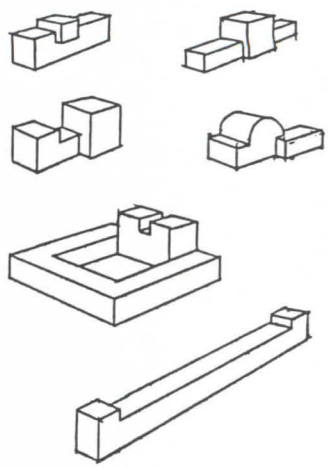
Photos by Max Plunger except as noted.

the seed of the next experience is contained within the present moment.

### Conclusion

Asmussen's organic architecture reveals an attitude toward design that speaks to our need to see through appearances and to find ourselves once again at home in a human community and in the natural world. Asmussen's notion of function is enlarged to include the building's role in serving the whole person as a being of body, soul, and spirit. By making visible the invisible forces present in a building and in the natural world, Asmussen turns the unseen spiritual dimensions of function into a generative source for an architecture that serves the purposes of life. In Jarna, Asmussen has had the rare opportunity both to live within and to design a whole community that gives architectural form to a way of living that is spiritually based, ecologically sensitive, and humanly benign. **Gary Coates** ■

*The author is a Professor of Architecture at Kansas State University and editor and author of the book* Resettling America: Energy, Ecology and Community. *This article is excerpted from his forthcoming book (with illustrations by Susanne Siepl-Coates) on the architecture of Erik Asmussen, to be published in Fall 1992 by Byggforlaget, Stockholm, Sweden.* *Research on Asmussen has been supported by The Graham Foundation for Advanced Study of the Fine Arts, the American Scandinavian Foundation, and the Bicentennial Swedish-American Exchange Fund.*



*Asmussen's buildings at Jarna accommodate private functions in low volumes and communal functions in the high volumes (4,6,7). This pattern of low volume/private, high volume/public is adjusted by Asmussen to express varied sites and functions – an approach to design influenced by Goethe's study of the leaf (above), where the same pattern of relationships is found in an almost infinite number of variations.*

# Sacred by Design

Edward Mazria looks to the buildings and sites of traditional, spiritually-based cultures as models for a more meaningful architecture in our time.

Today, our world view is undergoing a profound change. The crises of our times – the threat of nuclear holocaust, ecological disasters, population explosion, natural resource depletion – have set in motion a truly radical paradigm shift. We are moving from a Modern mechanistic view of the world to a new conception of reality: one that includes tradition and reintegrates the timeless principles of spiritual existence.

People have always sensed that there exists another "reality", one that gives meaning to our everyday lives. As we discover that science, technology, and consumer goods and services cannot of themselves provide this meaning, knowledge of the non-manifest world of spirit becomes of prime importance.

In architecture, this translates into a new model of the way we see our world, its underlying form, and the forces that give it shape. It relates architecture to the cosmic scheme of things and defines a symbiotic relationship between human beings, architecture, and the natural environment. This new model includes the traditional and timeless principles of sacred space, light, significant number and geometry, and dynamic balance.

### Sacred Space

In most traditional societies, living in the world is a sacred experience. It is living in a dwelling, village, town, or city formed in the image of the cosmos. This notion of sacred space breaks the homogeneity of undifferentiated Modern space. It allows the world to be founded and oriented because it reveals a fixed point, a center. To create a sacred space is to construct a universe, to repeat the primordial act of transforming chaos into order. The natural environment – its landforms and vegetation – becomes the background infrastructure in the making of sacred space. In this sense, the natural and built environments become interdependent.

### Significant Number and Geometry

The harmony inherent in number and geometry has been recognized by many traditional cultures as an expression of a divine plan which underlies the world. Since ancient times, number and geometry have provided keys to the understanding of the structure of the universe. They also have been a powerful symbol offering spiritual insight. Architectural form has been seen as inseparable from the symbolic content associated with number and geometry, which has also provided architecture with a source of beauty.

### Light

Light is the most changing natural phenomenon and it intimately connects us to the temporal rhythms of nature. When admitted through openings in a building, light assumes the added purpose of revealing the ever changing experience of interior form. It pierces the heaviness of matter; it is the revealer of architecture and is essential in exposing the dynamic quality of architectural form and space.

### Dynamic Balance

The underlying dynamic processes of life are also embodied in sacred structures. Buildings incorporating this principle interact with the environment. While most Modern buildings become uninhabitable if their machinery does not perform in a rigorously predetermined way, buildings modeled after living systems will adapt to changing conditions, regulating themselves in such a way that the overall stability of the building is maintained under a variety of changing environmental conditions. They tend toward a state of dynamic balance with nature, rather than domination over nature. Available sources of energy found at the site, rather than large quantities of conventionally supplied energy, are used to operate and condition much of the building .

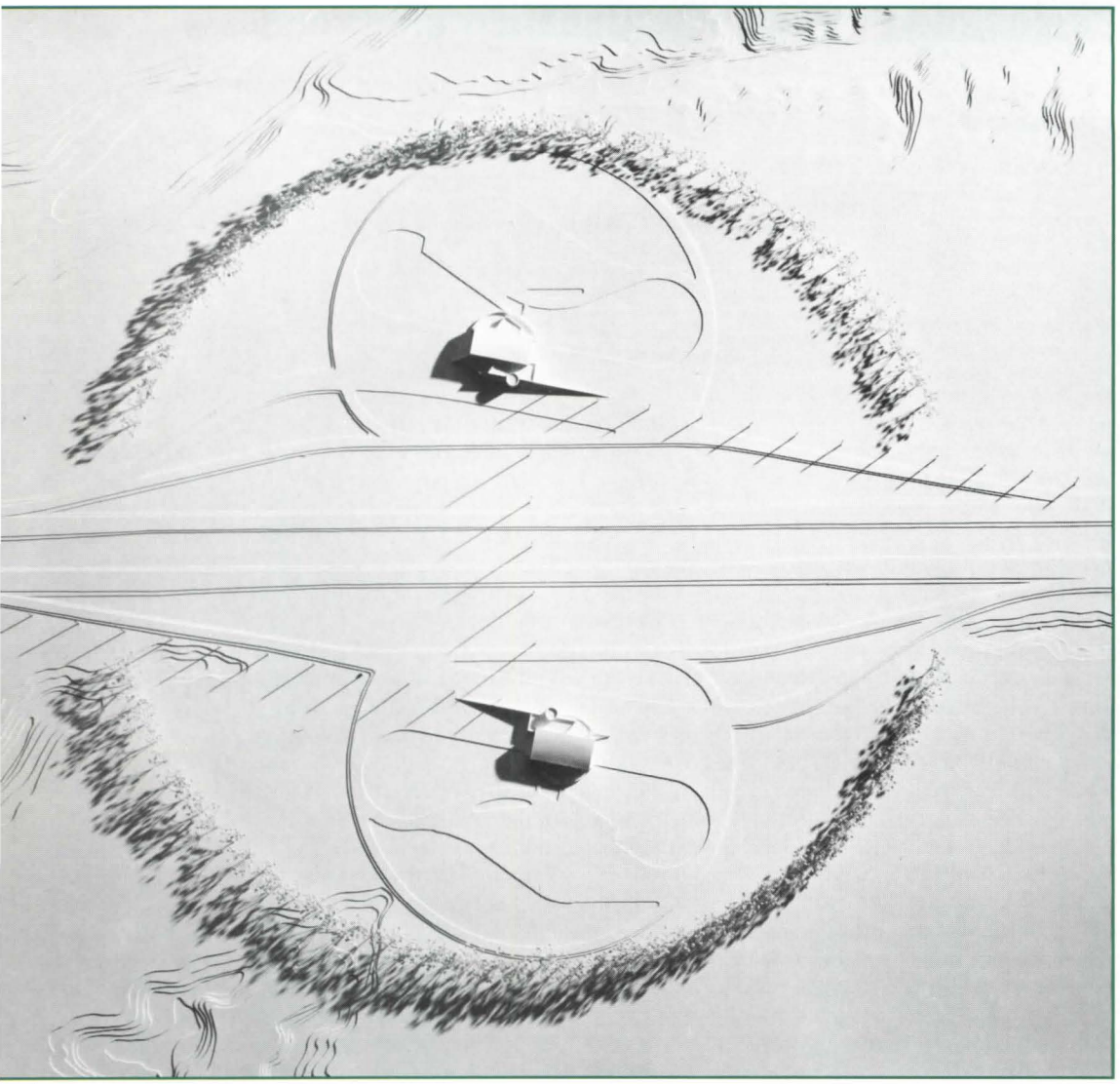
### Beyond Time

The human being is the embodiment of both the rational, objective, and measurable world and that which is immeasurable and of the spirit. In this period of great change, as we strike a balance between our past preoccupation with the material world and our forgotten roots in the spiritual world; we have a special obligation to explore and make known both worlds. The role of the architect is unique in that architecture can speak to that which is beyond time. **Edward Mazria** ■

*The author is an architect and principal of the firm Mazria Associates, Inc., in Santa Fe, New Mexico.*



*Mazria Associates have designed a series of reststops and weigh stations along a New Mexico highway (1,2) that also serve as "gateways" to understanding our place on the earth and under the heavens. Each place is defined by a circle inscribed in the land, a tree-lined depression that recalls the desert's arroyos. Within this boundary are other traditionally sacred forms such as circular paths, a spiral mound capped by a sundial, and markers oriented toward the cardinal points (3,4,5,6).*



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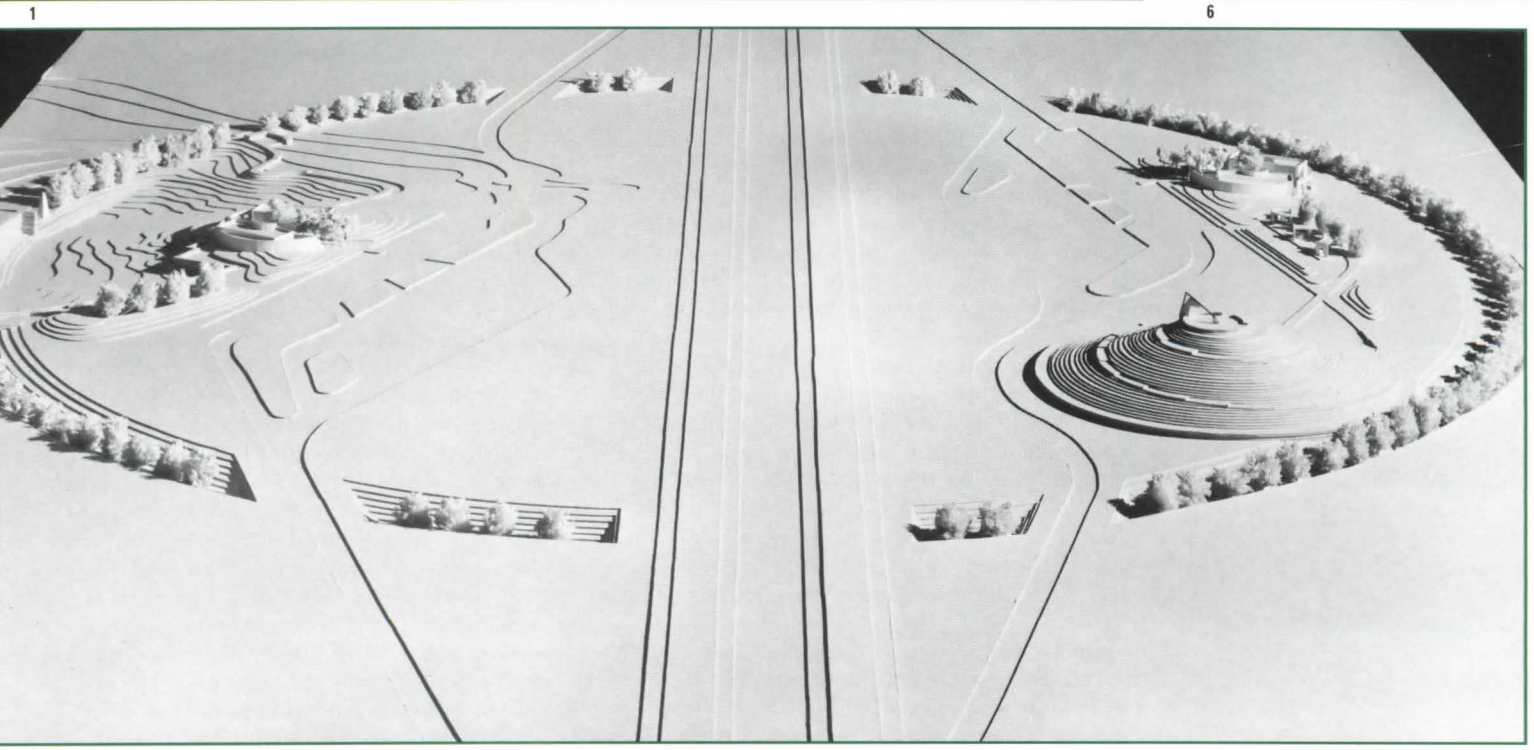

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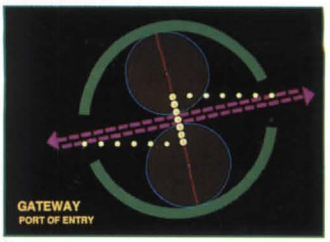
GATEWAY
PORT OF ENTRY

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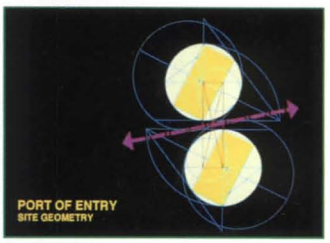
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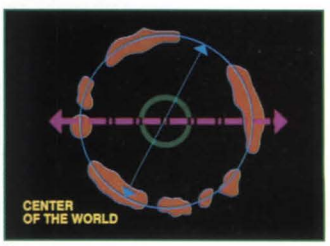
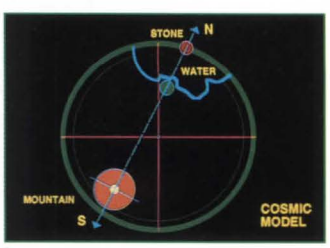

CENTER
OF THE WORLD

5


STONE
N
WATER
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COSMIC
MODEL

6

# Paolo Soleri's Arcology: Updating the Prognosis

While suburbia has grown exponentially, Arcosanti remains largely unbuilt.

Undaunted, Soleri stands by the vision he first proposed a quarter-century ago.

*Visitors to Arcosanti, outside Phoenix, find a small, not-so-young community and the first pieces of a stratified city in the otherwise untouched landscape. Paolo Soleri continues to adapt – but not compromise – his scheme. P/A editor Philip Arcidi interviewed him last year; excerpts follow.*

**P/A:** How would you describe the state of architecture today?

**Soleri:** The main failure is a myopia. . . . We are groping; our priorities are upside down . . . and we get trapped by things. Counter to current trends, I insist on a paradigm of complexity and miniaturization, because that is what every living thing is made of. If we looked at some of the basic tenets of life as revealed in biology and evolution, then as architects we could address problems that surround us today. . . . It would tell us why suburbia is catastrophic. We cannot keep building tiny little limbs scattered all over the planet without connections. We know that in biology a system is viable because it is rich in interwoven, cooperative subsystems. We're very good at making fingernails or toes or ears, and sometimes these turn out very beautiful. But if there's no conception of the animal itself those things become quite irrelevant, like an appendix.

**P/A:** How do you envision the stages of realization of an arcology? Can it emerge incrementally?

**Soleri:** To recognize the importance of environmental concerns was a great first step. We ought to realize that life is more difficult and harsh than we would like to believe. Basically, nature doesn't care about us. . . . This idea that there is a benevolence in nature is misleading. An arcology encompasses a change of mind and attitude – a realization that the way we live now is probably not sustainable and perhaps not ethical.

**P/A:** You wrote that "function follows form."

**Soleri:** Here I presented two things, but many people picked up only one of them. Nature seems to generate functions that follow form. We humans, with our intelligence, tend to do the opposite: We have a set of needs and we attempt to respond to them by coming up with a form. But I would challenge anyone to tell me that they design solely with the proposition that "form follows function." In fact, we all work with archetypal notions from the back of our minds. We need to design with a balance of the two approaches.

**P/A:** In your sketchbooks, humanity's construction is always distinct from the landscape. On the other hand, some architects describe humanity and nature as convergent.

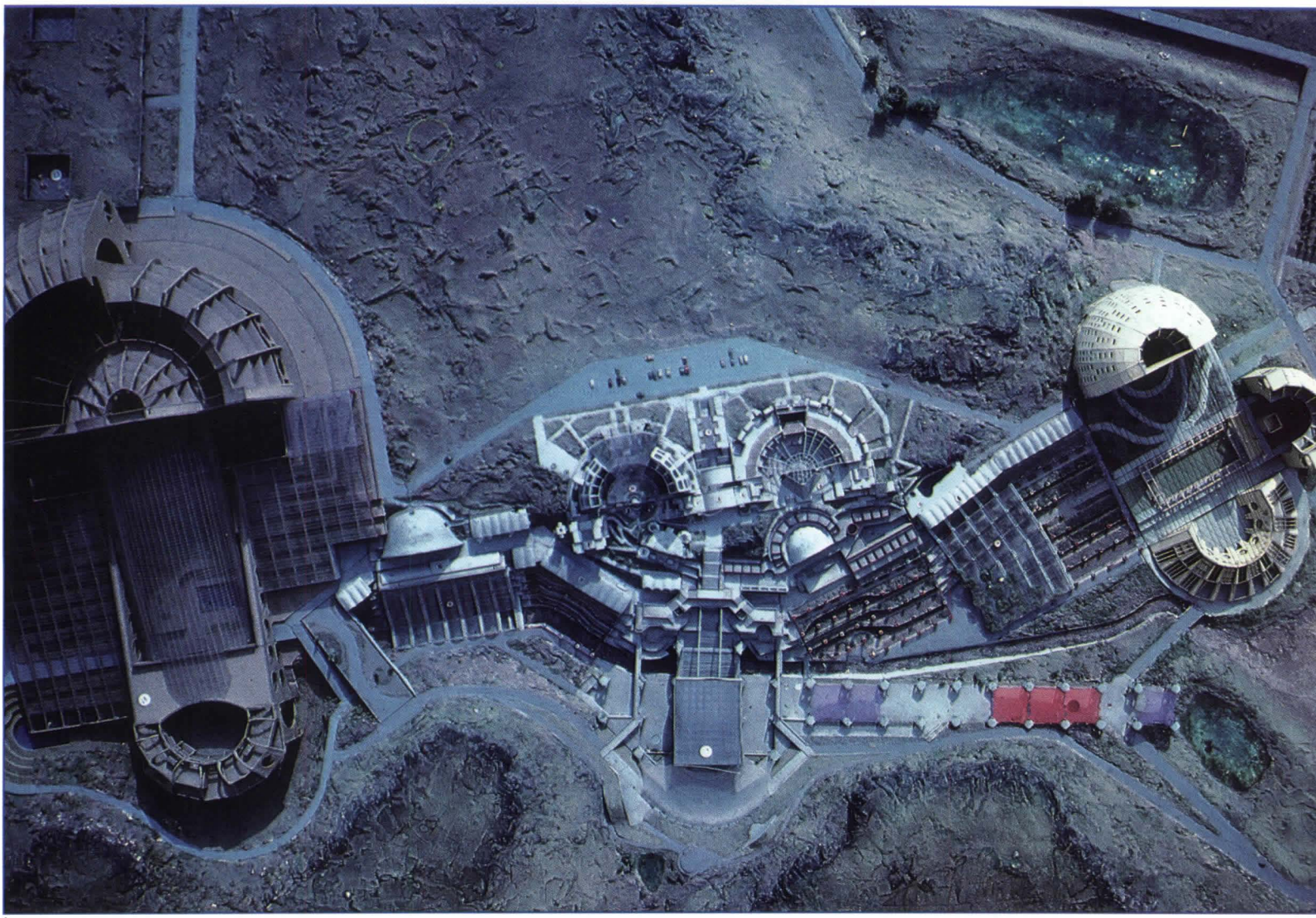
**Soleri:** We shouldn't disguise our presence on the earth. It's pointless to say that we shouldn't interfere with nature. We *are* interfering with nature anyway because we are consumers. Many of the greatest things mankind has made are a deliberate presence on the natural realm; they're not fuzzy little things.

To turn to the issue of megastructures: You know, I intend to build something that is physically a "mini," not a "mega." The city of Phoenix is truly a megastructure. I suggest that something as sprawling as Phoenix could instead be made of ministructures. If they happen to be more visible in the landscape because they're tall and stratified, that doesn't change the fact that they occupy only a fraction of the volume or consume a fraction of the energy used in Phoenix.

**P/A:** What are some of the lessons that Arcosanti has taught you over the past 20 years?

**Soleri:** In general, I've learned that the human animal is a very strange animal. Secondly, I can't ignore the challenges of working at Arcosanti. Here, where work and life are one, you can't put one aside for the other. In many ways the people who are working here are heroes; they're coping with a small and isolated setting. We can't easily go to a great urban setting for a respite. If we had a better flow of money it would solve many of the problems we have. We'd be able to separate the construction process from living.

Now we are again in the middle of a storm because of the environmental crisis. But today no one mentions that our energy problems are largely caused by suburban sprawl. Nobody even hints that this piece of the American dream is going to pieces. No matter how well we do the wrong things, we aren't going to solve the problem. We'll simply cushion it. The way we have apportioned the landscape in this country is, by definition, the most wasteful way it could be done. We're stuck with it in the present system, and it's going to be very difficult to get out of it. Most of the present environmental efforts are patch-up jobs: Increasing car mileage and recycling are important, but they don't touch the core issue. The source of our problems is that we've given ourselves the wrong pattern to build upon. The wrong pattern is the suburban pattern. And the American dream is unnecessarily chained to it.



Model and photos: Tomiaki Tamura

1

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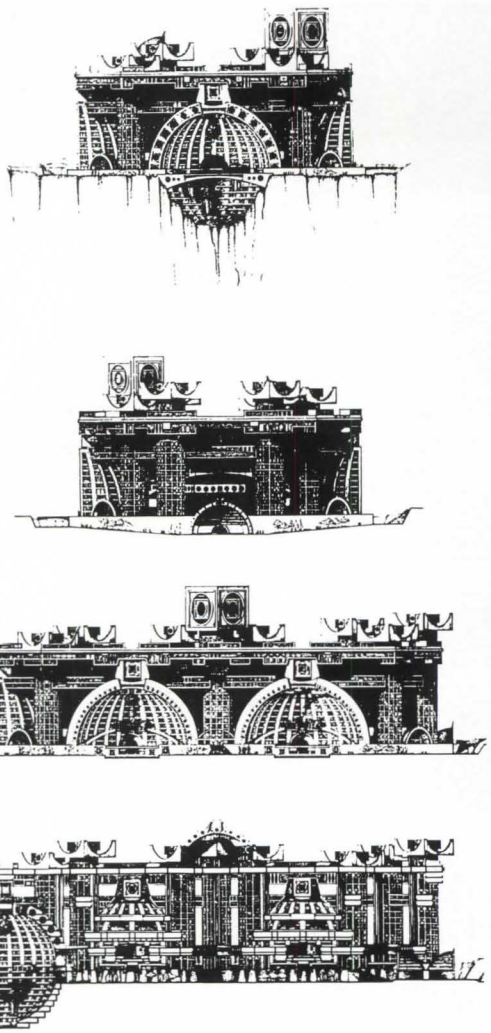
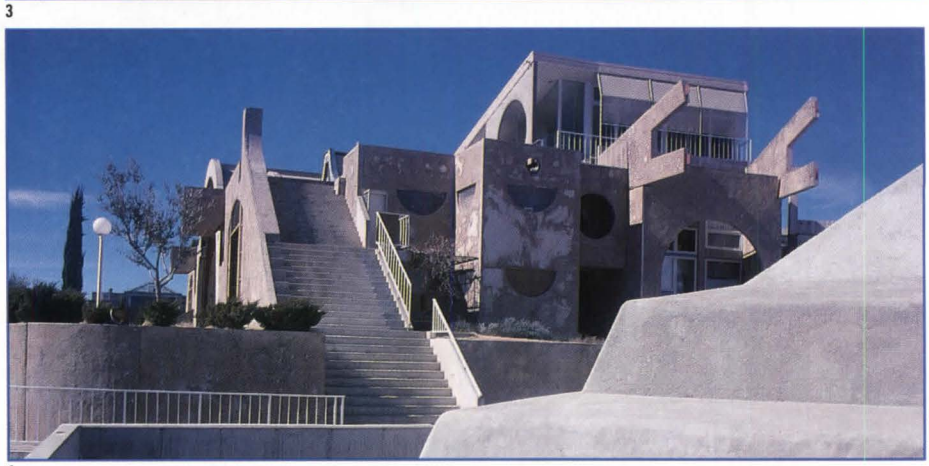
*Soleri's schemes for Arcosanti, a slowly developing arcology (the concept embraces architecture and the ecology), evolved from a city built with a single, all-encompassing structure to assemblies that could grow incrementally. The Critical Mass model for 500 residents (1) was proposed in 1979. One-tenth the size of Arcosanti 2000, this intermediary stage represents a self-sustaining and diversified city of vast, multistory apses and contiguous structures. The parts of Arcosanti that have been built (2) represent a small part of the Critical Mass model. The next phase of construction at Arcosanti will be the Energy Apron, a terraced greenhouse on the south-facing slope.*



ELEVATIONS, EARLY SCHEME FOR ARCOSANTI

Ivan Pintar

3



Jeffrey Cook

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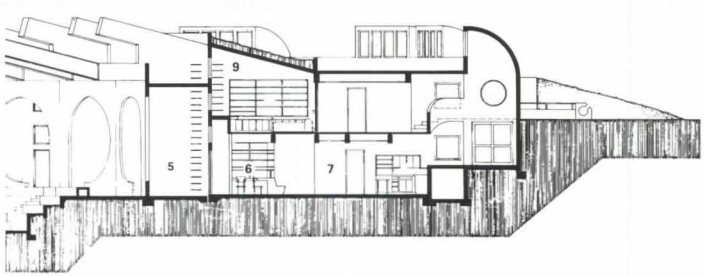
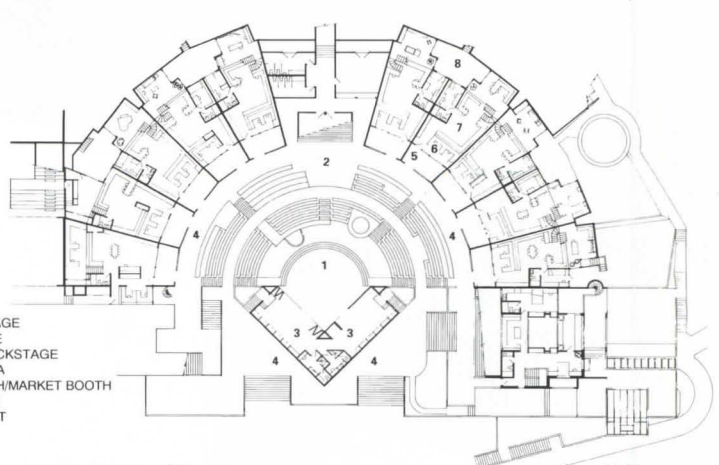



SECTION, EAST CRESCENT

20'/6m




1 THEATER STAGE
2 MINOR STAGE
3 NURSERY/BACKSTAGE
4 MARKET AREA
5 FRONT PORCH/MARKET BOOTH
6 WORK SPACE
7 HOUSING UNIT
8 COURTYARD
9 BEDROOM

FIRST FLOOR PLAN, EAST CRESCENT, ARCOSANTI

N ↑ 40'/12m

*The early scheme for Arcosanti illustrated here was intended for 1,500 residents (215 per acre); the 50-meter-high structure was to cover seven acres. One of numerous arcologies proposed by Soleri in the 1960s and 1970s, it augured a densely stratified city that was compelling to some but overwhelming to others. In retrospect, Soleri's vision seems more potent as an inspiration than as a precise model to be executed. He had a broad following in the 1970s, when Arcosanti was a popular destination for those who wanted to help build an alternative city (3). The East Crescent, a multifunctional structure that won a citation in P/A's awards program (P/A, Jan. 1979, p. 81), is rising slowly. Several housing units (4) are occupied by Arcosanti's long-term participants, and concerts and seminars in the theater bring new visitors to the site.*

# Revisiting Mexicali

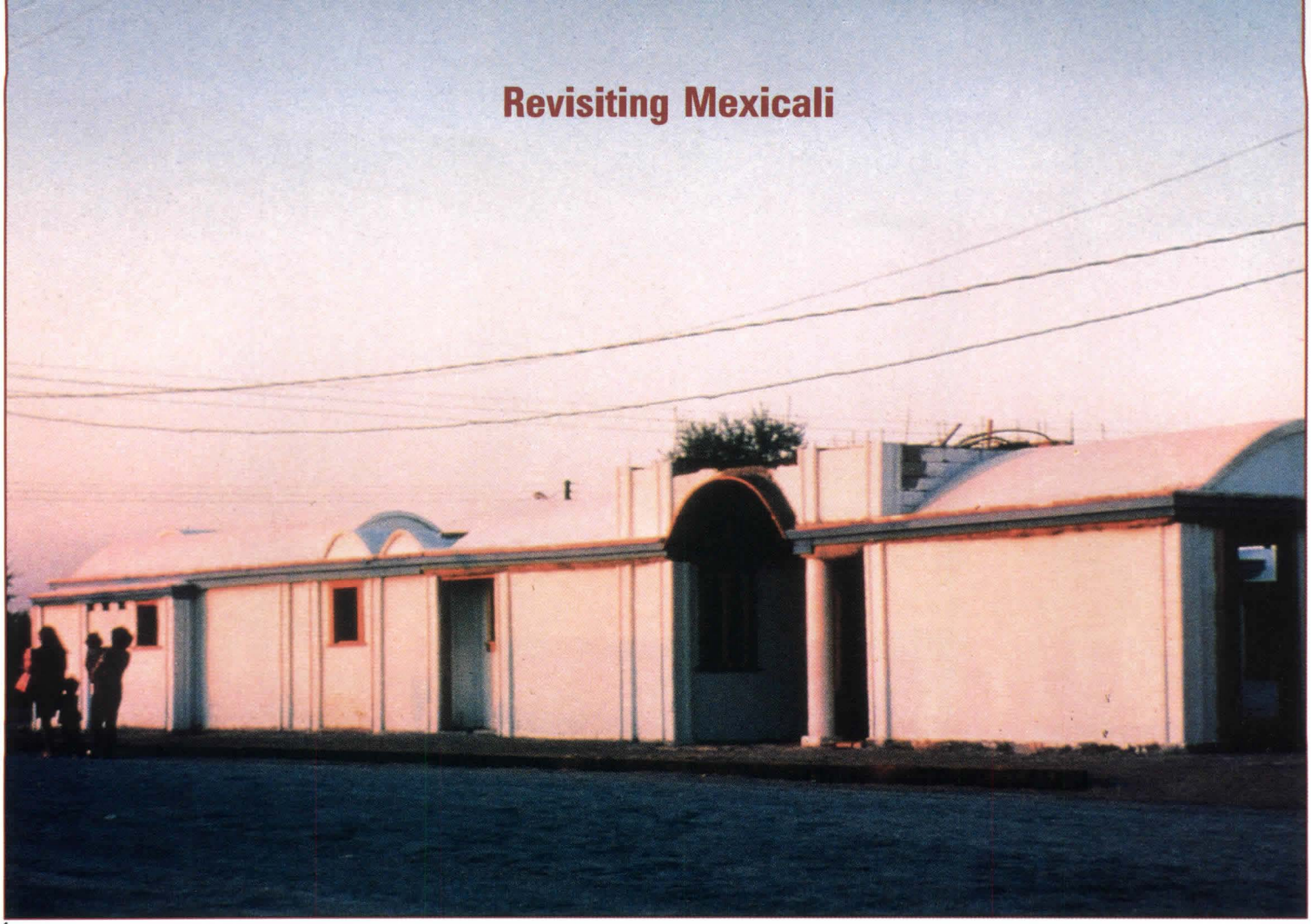


Photo: The Center for Environmental Structure

1

In an interview, Christopher Alexander discusses the implications of his 15-year-old Mexicali project to today's environment.

The book, *The Production of Houses,* although published in 1985, reported on an innovative Mexican housing project begun ten years earlier by Christopher Alexander's Center for Environmental Structure. The goal of the project was not just to build low-cost housing and extensive communal buildings for a group of five families in the northern Mexican city of Mexicali, but to show how, by altering the design and construction process, people everywhere can attain shelter that is more attuned to the local climate and to individual needs. To achieve this, the authors – Christopher Alexander, Howard Davis, Julio Martinez, and Don Corner – served as both architects and builders. Renouncing the typical design and building process, they aided the five families in laying out the community and the individual houses on the site, operated a local builder's yard to supply mostly indigenous materials, innovated new construction methods as they went along, and helped the families construct their houses and control their costs. The houses were built for $3500 each. P/A sent a photographer to document the Mexicali project as it appears today and interviewed Christopher Alexander about the changes that have been made to the 15-year-old project and about its relevance to the social and environmental dilemmas we face today.

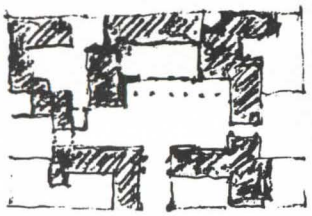
**P/A:** What are your thoughts about the changes the residents have made at Mexicali, such as painting the houses different colors or adding window grilles?

**Alexander:** It might make some architects uncomfortable for their work to be changed. For me, the alterations – colors, grilles, added rooms, even the graffiti on the street walls – make the place look more comfortable, more dug-in. When first completed, the housing there didn't have the same quality of fitting in that it has now. Now, it has achieved a level of ordinariness that is integrated better with life and makes me very happy. That is the quality which is my real aim any way. New buildings are usually too raw, too remote and disconnected.

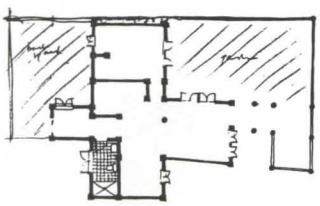
**P/A:** What relevance does Mexicali have for our situation today?

**Alexander:** A few years ago, one reviewer of the book said that it was useful to anyone interested in hippie or Third-World housing. He completely

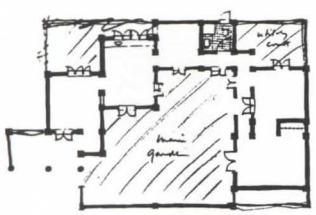
*This view of the housing at Mexicali (1) shows the project nearing completion almost 15 years ago. The area around it has become more built up and apparently more impoverished.*



SKETCH OF FINAL SITE PLAN



LILIA DURAN HOUSE



JOSÉ TAPIA HOUSE

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Photos: The Center for Environmental Structure

*The design process at Mexicali involved the participation of the residents. In lieu of finished drawings, rough sketches of the site plan and house plans (above) were made and adjusted as the construction went along. Several technical innovations were made, including the use of locally fabricated soil/cement blocks and the creation of vaulted concrete roofs, with bent wood lath and burlap providing the support, and chicken wire, the reinforcing (2). The completed buildings were mostly painted white, with colored trim (3).*

missed the point. The process we invented in Mexicali, and then described in the book, is about the *kind* of process we need in order to create an organic world in the field of housing. This applies to us, as it does to the Third World, and as much to high-cost construction as to so-called hippie construction. Our own environment has been ruined by the current architectural process, with its extreme separation between client, architect, and contractor – the same process that we were criticizing in Mexicali. It is not a matter of aesthetics or technology, but of fundamentally changing the process by which we design and build housing. The project offers hope because it showed one of the first examples of a new kind of process, which, in another form, can help to rebuild an organic world, at our own level of expectation.

**P/A:** That includes using indigenous or locally made building materials?

**Alexander:** Yes, technical innovation is essential, but the technical innovations we made at Mexicali were really only a part. What was important were the changes we made to the human process, giving people more control over their housing. And this *requires* certain changes in technology. For example, it is impossible to integrate housing harmoniously into its environment when using large prefabricated panels. In the newly invented technology we introduced in Mexicali, our emphasis was not on using more indigenous materials, but on finding techniques that would lend themselves to an entirely different way of building in which the building can become whole as it evolves, and in which subtle and harmonious adaptations can be made during construction and after.

**P/A:** How do you break through people's expectations about housing to make this new process possible?

**Alexander:** It is extremely difficult. I had to tell one client group in Japan to pretend that they were in a dream world, to close their eyes, and to tell me what their most pleasant memories and experiences had been and "what your project would be like if it was wonderful, the most beautiful you can dream of." Then, finally, after pressing this kind of question, people do give realistic answers, which go to the core of their experience. Then I can tell them that we really will build these impossible-seeming, but ordinary dreams, into the buildings we are going to make for them. I think most

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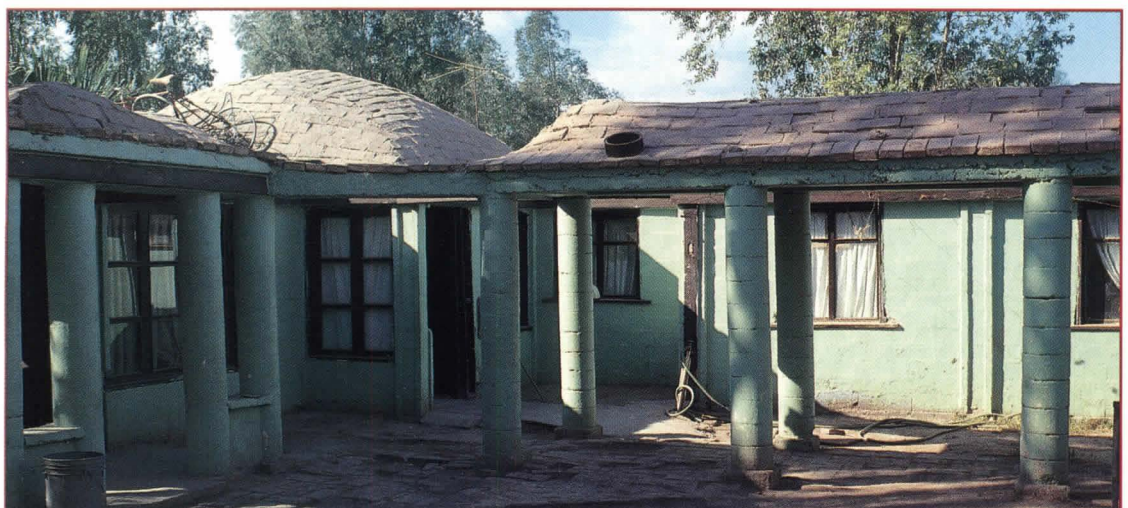

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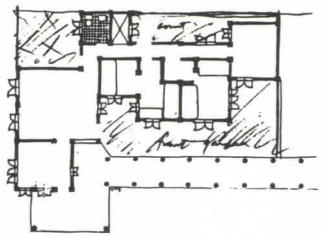
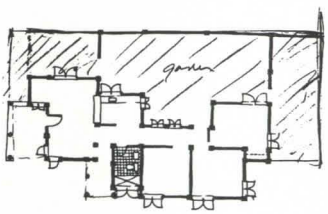
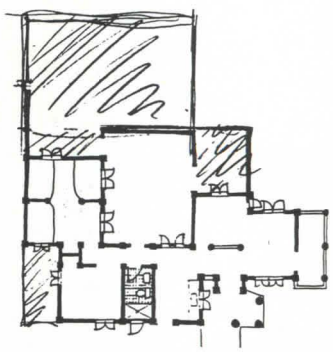
Photos: Mark Darley



EMMA COSIO HOUSE



JULIO RODRIGUEZ HOUSE



MAKARIA REYES HOUSE

*Today, the houses at Mexicali have been painted various colors and have had window grilles and other security-related items added (4). The courtyards also have become more shady and inviting. There is a certain monumentality to the complex despite its small scale (5). The interiors of the houses, too, have been painted and appear to be well maintained.*

people have given up hope for realizing beauty. They assume it is not available and yet paradoxically find it too painful to admit to this assumption. But it is possible. It is very straightforward and simple and it is sitting inside of all of us.

**P/A:** Was bringing that out of people easier to do in Mexico than in, say, more developed countries where the expectations might be higher?

**Alexander:** I think that is true. A bank official came to the Mexicali project as we were building it and said that clearly the people didn't know how to design housing since, in one, the bedrooms were too big and the living room was too small. I asked the woman whose house it was to come over and explain, and she told him that it was very simple. The bedrooms were big to give each of her children a place to study, since education was so vital to their betterment and to their lives. The living room was small because "our family all sit together on the same sofa anyway. We love each other. Why do we need more space?" Poor people, because of their distressed circumstances, tend to be more direct.

**P/A:** What are your thoughts on the solar housing built in the 1970s?

**Alexander:** Most high-tech solar housing simply exchanged one asinine technology for another. It didn't fundamentally alter anything, and might have made things worse by justifying the construction of ugly architecture for the sake of solar energy. What is needed is a process that allows people to put up beautiful buildings.

**P/A:** What affect will the war and the rising price of oil have on this?

**Alexander:** The war is a tragedy. We should not have gone to war. It would be far better to say, "Look, Hussein may be doing us a favor. If he wants to grab the world's oil supply, let him go ahead. The world's supply of oil is going to dry up in the next century anyway. Let's use this opportunity to escape our enslavement to this vanishing resource. I know it is idealistic, but if we were to take the billions of dollars we're spending on the war and use it to perfect batteries and other technologies, we would be free from this enslavement and ahead of other nations . . . a far better way to spend the hundreds of billions, and one that would not involve killing. It would greatly reduce our reliance upon oil; we would truly be leading the way in the world. ■

# Being Perfectly Clear

Long an advocate of earth-covered buildings, architect Malcolm Wells relates some of his experiences.

It was all P/A's fault.

If the editors hadn't encouraged me back in 1965, I might never have gone underground at all. But no, they had to go ahead and publish my treatise ("Nowhere To Go But Down," P/A, February, 1965) for all the world to see, and the rest is history: underground architecture is still virtually unknown. Only a small band of architects think the earth should be covered with living plants rather than concrete and asphalt.

Twenty-six years ago, underground architecture became my meat, even though, then and now, clients were, if you'll excuse the expression, medium rare, and few of my buildings have been well done. But I'm starting to get the hang of it even though a few good details continue to elude me. The basic premise, however, is rock solid:

> The surface of the earth is meant for plants and animals, not for shopping centers and roads, and not for naked buildings full of VCRs, LCDs, and VDTs.

At first, before they'd thought carefully about underground design, most architects dismissed it as non-architecture, not recognizing its huge potential for dramatic expression. Then they called it artificial, wondering what kind of natural world we'd have if mounds of earth were piled over buildings and then planted. The fact that plants and animals obviously loved the reshaped terrain quickly sank that argument.

Next, they said they didn't want to live like moles, and were amazed to see sunny interiors and sweeping views from the sides of hills. That's when the 1973 Arab oil embargo came along. That's when a lot of skeptics, remembering all that sunlight, suddenly got converted. The late 1970s and early 1980s saw a rash of solar earth shelters. They were some of the ugliest buildings imaginable. Built in the name of energy conservation, they expressed that name well, but architecture? Forget it. Having failed to express a reverence for life, they fell on their faces. . . and managed to conserve an impressive amount of oil.

Now we're moving into Energy Crisis II, and the practice of underground construction is starting to awaken from its Reagan-induced sleep. Whether such construction will be worthy of the name architecture this time around remains to be seen. But the world environmental disaster has finally worked its way into our consciousness, needing only a short step into a recognition that the surface of this planet is not the best place for us architects to be doing our thing.

It's expensive to build underground. Look at the structure you need to carry three or four hundred pounds of extra weight on every square foot of roof surface. Look at the retaining walls. Look at the expensive waterproofing – and insulation – you need to be sure those materials will remain stable after they've been buried for generations. Yes, it's very expensive, almost as expensive as not doing it. The cost of environmental destruction is turning out to be much higher than we'd dreamed but, hitting as it does from other directions, it often seems unrelated to architecture. Medical bills and higher taxes, inflation and rising food prices are directly linked to the land abuse for which we are to some degree responsible. We're as guilty, in our way, as any toxic waste sneak when we do awful things to the land.

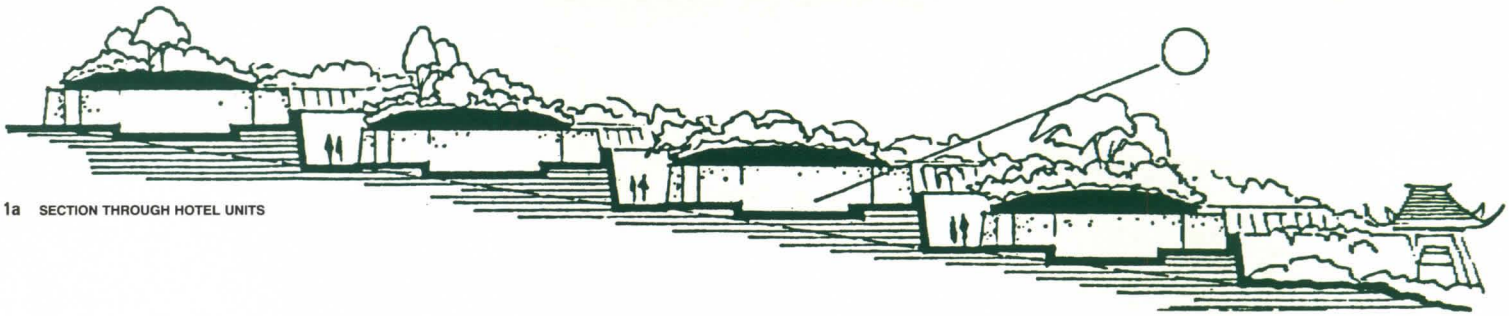
I've built 15 or 20 underground buildings in the past 26 years. Hundreds of others have been built from designs I've done for other architects around the country, and from drawings published in my books. Underground construction has been virtually trouble-free, and my god, the benefits: Living wildgardens instead of asphalt overhead; Rainwater conservation; Silence; Sunlight; Low fuel bills; Little maintenance; Slow temperature changes; Freedom from vibrations; Dry air; and perhaps best of all, A feeling of having done something right for once in my life.

Of course you have to be careful about radon in an underground building, but you have to be just as careful about it in the other kind. Of course you have to make sure the structure and the waterproofing are done with great care. But that's an attitude problem, not a technical one. Everything about underground architecture is simple and straightforward. All it requires is the right motive, one that must be communicated to every member of the design and construction team, not just to the chiefs. There has to be at least a little sense of mission, of moving up (as you go down) onto the next stage of life on earth. My only regret is that I didn't get to this sooner. But then I was living in another world. **Malcolm Wells** ■

*The author is an architect practicing on Cape Cod. His latest book,* Underground Buildings, *is available directly from him ($14.95) at P.O. Box 1149, Brewster, MA 02631.*

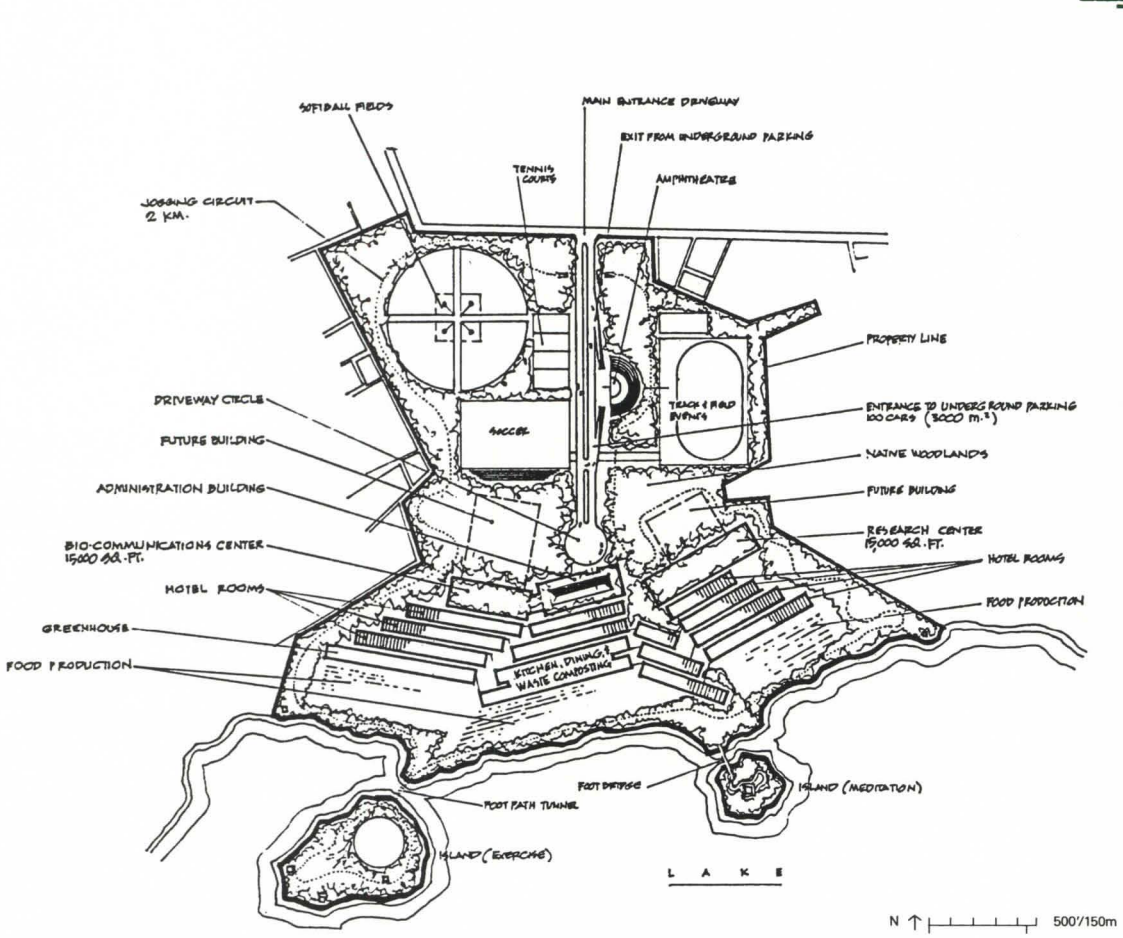
*A 1985 project for an organic health center in China (1a, 1b) was an exciting prospect for Wells. It was to have comprised hotel rooms, a bio-communications center, food production fields, a greenhouse, a research center, a meditation island, and many forms of exercise, including an island for that purpose. As seen in the section, each row of hotel units was earth-covered, stepping down the hillside to disappear from the view of adjoining uphill units.*

*Another project was Wells's answer to a developer's threat to build a large amount of low-income housing adjacent to Wells, possibly lowering his land value. The developer received this design suggestion (2) as his answer, a proposal for earth-covered low-income housing. Wells laments that it is not likely to happen for a long time, on this or any other site, because of economic considerations. His only hope is that his more affluent clients may be able to help be getting the "bugs" out of below-grade construction to prepare the way for more modest applications.*

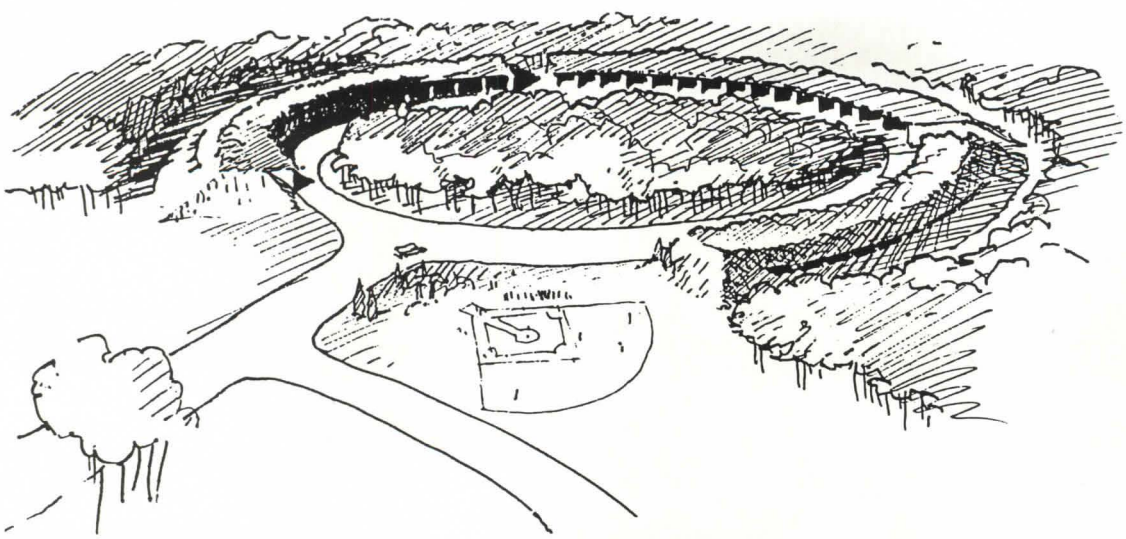


1a SECTION THROUGH HOTEL UNITS

20'/6m




1b PLAN OF COMPLEX



2 AERIAL PERSPECTIVE OF HOUSING

## A Troublesome Detail

If I could find the solution to one last nagging detail, I think I'd have made real progress. Background: Earth-covered buildings function best, thermally, when the insulation is applied to their outer surfaces. It not only insulates, it protects the waterproofing membrane. Earth-covered solar buildings tend to have big fat overhangs because of this required insulation-wrap.

I want to bring the rooftop earth down to a knife edge, to make the earth float above the glass as if a great piece of landscape had decided to rise up and shelter some human beings for a time. I want to do it without sacrificing any of the thermal benefits of building in the earth. But how do you accomplish that when a massive overhang dominates the façade?

I achieved a knife-edge look on my latest building, a 1200-sq-ft experimental structure in which my wife and I exhibit our paintings, but I had to pay a price: heat loss. The carrying structure is a ¼″ steel plate supported by gussets, the whole thing welded to the building frame. The indoor steel near that wall feels frigid. And when warm weather returns, the cold surfaces bead with water until the roof-edge earth mass warms above the dew point.

Ever since I built this building I've searched for successful variations of the knife-edge detail – carrying the overhang on freestanding columns, carrying it on bolts projecting through blocks of insulation, building the knife-edge of insulating material – but they all generate more problems than they solve, and the search goes on.

# The Post-Suburban Environment

Peter Calthorpe questions our reliance upon the automobile and its demand for ever increasing quantities of gas, oil, roads, space, and time.

The car is the defining technology of our built environment. It sets the form of our cities and towns. It dictates the scale of streets, the relationship between buildings, the need for vast parking areas, and the speed at which we experience our environment. More important, the auto allows the ultimate segregation of our culture: old from young, home from job and store, rich from poor, and owner from renter. It has come to dominate the public realm.

Perhaps, like Louis Kahn, we should ask what the car wants the environment to be, or for that matter, what the pedestrian or transit system wants it to be. The car, in all cases, wants to go fast. Speed has many implications for the built environment; it defines a street system with few intersections and many lanes, it requires wide lanes and streets with soft sweeping turns, and it wants ever more freeways and ever larger parking areas. The car also wants lots of pavement and the low-density development that preserves plenty of space for it.

The wants of a transit system, such as a light rail or express bus line, are quite different. Its fundamental desire is for more riders. This calls for high-density land uses (housing at 10 units per acre at a minimum), dedicated right-of-ways (for easy movement), infrequent station stops (one-mile minimum), frequent arrivals (no more than 15-minute intervals), and mixed-use destinations (like city cores). Its destinations, if in the suburbs, also need to be walkable so that riders are not stranded when they arrive.

The wants of the pedestrian overlap and, in some cases, contradict these other system wants. Pedestrians want close destinations: shops, schools, services, and recreation. They want direct links to these destinations free of cul-de-sacs, parking lots, or massive intersections. They want safe, interesting, and comfortable streets to walk on: tree shaded, with houses and shops fronting directly on them for interest and security. They want detail and human scale in the edges and places of a community. And they want narrow streets lined with entries and porches leading to local shops, schools, and parks, not curving streets lined with garage doors leading to six-lane arterials. Pedestrians also like transit to extend their range of destinations. These wants can be satisfied in high-density urban centers or small mixed-use towns; the issue is not just one of density, but quality.

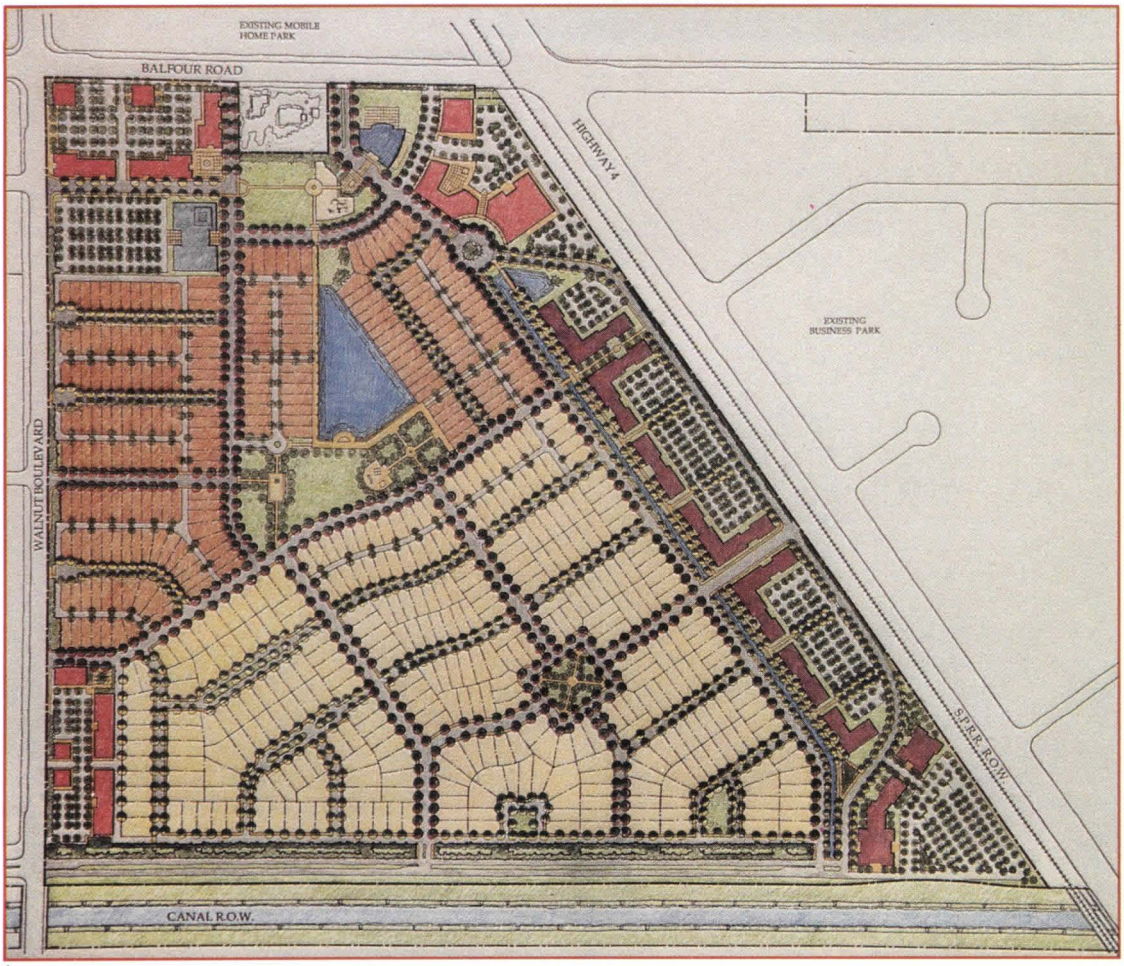
Various environments satisfy different combinations of these wants. The historic European city works for both the pedestrian and transit, but has great difficulty accommodating the car (hence the many movements throughout Europe to ban the car in old city cores). The traditional American town provided for both the pedestrian and the car (back when there was only one car per house), but rarely offered the density or focus needed by transit. The modern American city, violated by urban renewal, suburban flight, parking structures, and freeway interventions, seems to fully satisfy none of the wants: auto, pedestrian, or transit. The modern suburb, meanwhile, pleases only the car, leaving both transit and the pedestrian unsatisfied.

Given the social, economic, and environmental forces of our time, some new synthesis of these three systems is necessary. The problem is to introduce the needs of the pedestrian and transit into the auto-dominated regions of our metropolitan areas, not to return to the fiction of small-town America or to try to absorb a disproportionate percent of growth in our urban centers. Those centers will grow strong if their suburban areas deliver transit riders rather than cars to their core and if their internal development favors the pedestrian.

In the suburbs, pockets of mixed-use development with streets designed for both the pedestrian and the car would support expanded transit. A network of such developments would focus the suburban environment, draw traffic from the overloaded arterial system and city centers, support expanded transit, and balance the housing and job opportunities in a region. This metropolitan framework should be layered; an arterial grid for through auto traffic, neighborhood streets for pedestrians and slow cars linking homes with local destinations, a transit system reinforced by intensified suburban stations, and a pedestrian-dominated urban center. Such a metropolitan strategy would address simultaneously environmental, social, and formal concerns, rather than segregating them. It would define a context for an architecture of solutions rather than anecdotes. **Peter Calthorpe** ■

*The author is an architect and principal in the San Francisco firm of Calthorpe Associates.*

*Calthorpe Associates, in association with Mintier & Associates, has prepared transit-oriented development design guidelines that have been accepted for implementation by Sacramento County in California. These show how various mixed-use suburban centers might grow around transit stops (2) while protecting some existing open space. A project further along is Calthorpe's plan for South Brentwood Village in Brentwood, California (1), which places retail and office buildings along the edges of a mixed residential area centered around parkland and a daycare center.*

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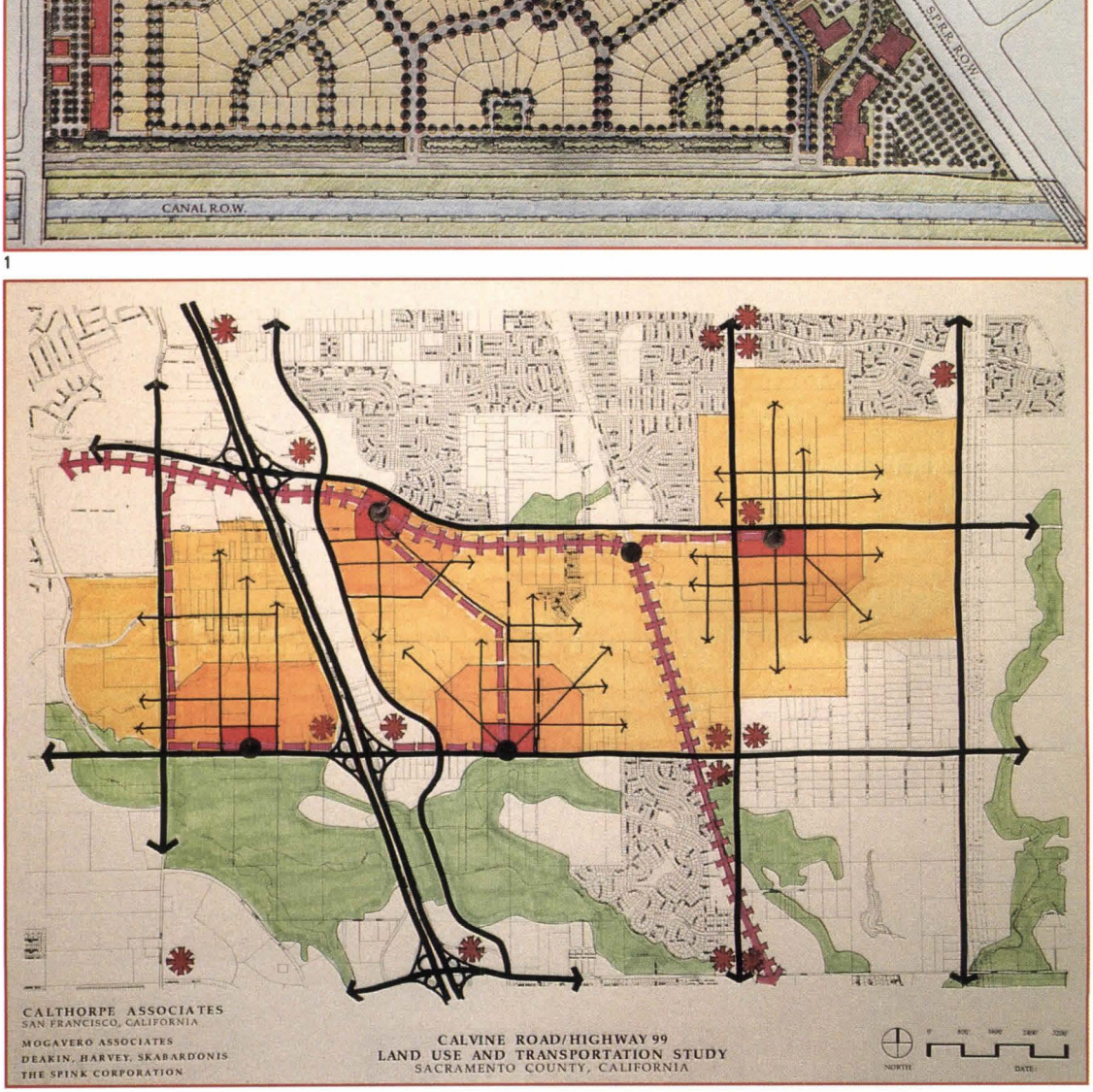


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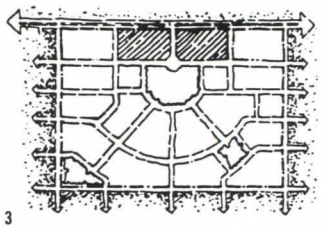

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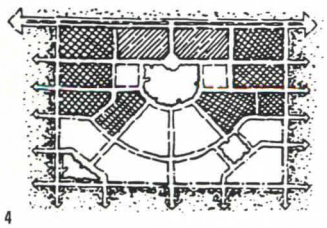

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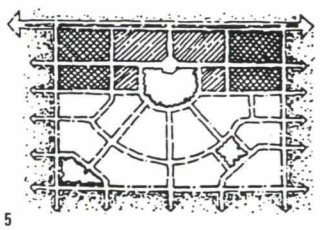

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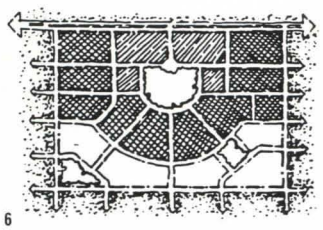


6




*These sketches suggest ways in which transit-oriented developments in the suburbs (3,4) and cities (5,6) might grow. In both cases, public open space would occupy a minimum of 10 percent of the land, and a mixed-use core, located at a transit stop along an arterial road or rail line, would occupy no more than 15 percent of the suburban development and 30 percent of the urban type. Extending from this core to a boundary point would be housing and/or employment facilities.*

# Settlement Patterns in America

David Sellers, practicing in Warren, Vermont,

expresses his philosophy on the need for suitable environments.

The quality of life in America seems to be affected more by the zoning ordinances and bank regulations than we would like to believe. When this country was young and we were searching for our various destinies in the expansion westward, our forefathers settled villages, towns, and cities by the hundreds. By and large, the challenge and the result weren't too bad. Common sense, a vision of permanence, and good old risk-taking seemed to prevail. Most of the U.S. was settled from 1820 to 1930. Planning since then has been largely filling out and adding to, with very little broad vision.

Now there is an opportunity to reopen the books on planning and have an impact on the longer view of America. The suburbs, isolated housing developments, single-use commercial spaces, and the commitment to the convenience of the car have left an impersonal and isolating physical structure which ignores energy conservation and healthy mixes of people, uses, and landscapes. The result is an interest in reconfiguring the settlement concepts which define living patterns and human experiences. Zoning regulations have failed to provide us with suitable environments in which to live, raise children, work, and carry on the dreams of an emerging culture.

Much of the work in new planning is done in spite of, and in opposition to, the zoning ordinances. The Renaissance Community had to declare itself a church in order to get around the zoning. The Lindisfarne villages are still unbuilt, so we don't know their fate. Another of our projects is a hospital. Efforts such as our Seattle Pedestrian communities and the Burlington, Vermont, master plan (P/A, Jan. 1988, p. 128) have been explored in order to evolve patterns of settlement. These, it is hoped, allow for a variety of infill and change but will subscribe to larger views of the structured environment. In each case there is an order that suggests that open space, pathways, and views have a higher priority than individual buildings; yet the overall image and design must have scale and proportion acknowledging the interrelation between the man-made and natural worlds.

### Community Designs

Satellite Village (not shown): This study, with Bob Small and students at the University of Washington, is for a pedestrian community on the rail link between Seattle and Tacoma. It comprises 5000 people, all within walking distance of central services and the transit link. This model is based on the crescent plans for Bath, England, and features a walk through the park as a necessary daily experience. The theory is that our culture is suffering from natural experience deprivation, and as a result, we cumulatively make poor life/planetary decisions.

The Renaissance Community Master Plan: This 250-acre village with houses, gardens, school, work space, and celebration/entertainment places, was studied with Bill Maclay and Jim Sanford. The plan is all pedestrian, with no roads provided other than for emergency service and access. Pathways connect all functions, and pathways for light through the trees mark the solar equinoxes. The community will contain 200 people and three community-owned businesses.

Lindisfarne Village concept: Stone walls enclose 10 acres, and contain all necessary mechanical systems such as water, sewer, telephone, and electric. The area will accommodate 150 people; this number can live off much of the enclosed land and be enough of a critical mass to enjoy social health and diversity. The principal idea is that there aren't any buildings at all, only landscape. The rock wall will be as varied as seems appropriate to the makers.

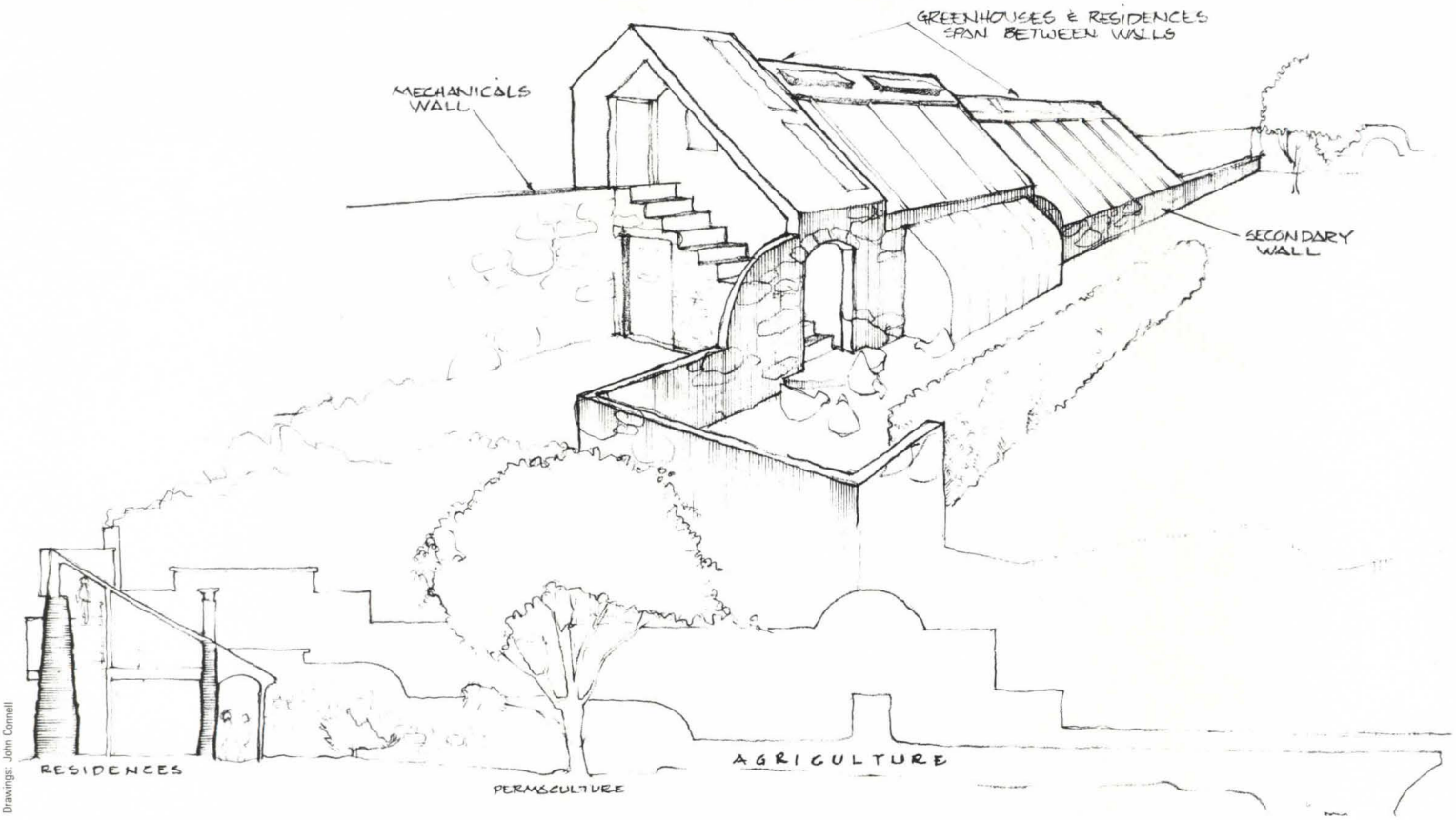
Gesundheit, a master plan (not shown) done with Bill Maclay, planner, is for a community of 400 acres in West Virginia; the orientation is toward health, and citizens will grow their own food. Solar greenhouses will be employed for waste recycling. Fundamentally a hospital, this facility is dedicated to the concept that humor is the foundation for all health. The organization of the land emphasizes special fields for games, exercise, ceremonies, and meditation. The hospital itself is intended to create the essence of man's connection to his world within the public spaces of the building. The expression includes full-scale body parts and element rooms (earth, air, water, and fire). It will also contain ways to move which extend our perception of choices: slides instead of stairs, secret passageways, lookouts, etc.

**David Sellers** ■

*The author is an architect practicing in Warren, Vermont, and his company was the winner of a 1988 P/A Awards Citation (with the Community & Economic Development Office, City of Burlington) for their Urban Design Study for Burlington, Vermont.*

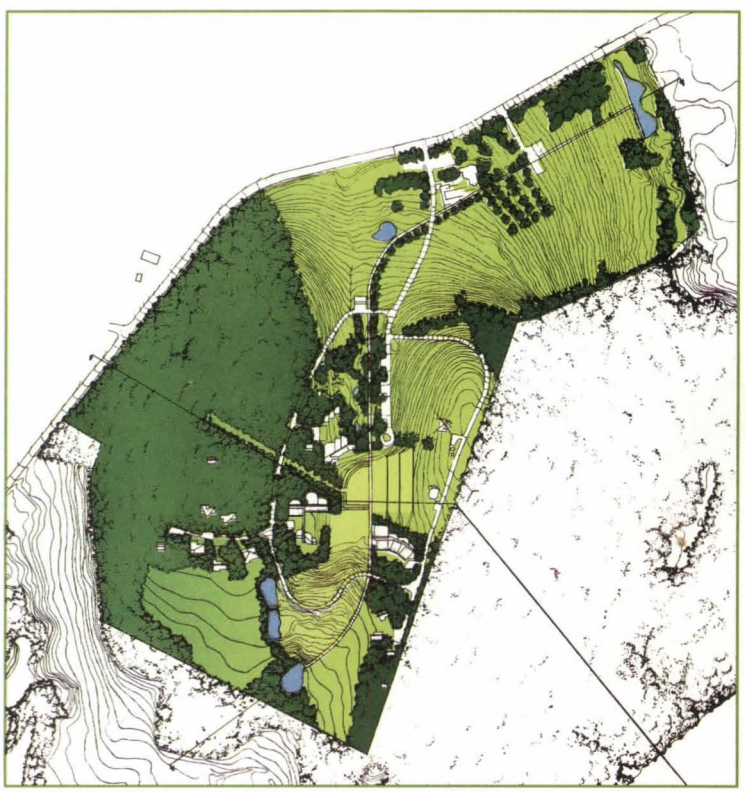
*Concept drawings for a Lindisfarne village (facing page) depict a 10-acre site enclosed by "thick" stone walls into which the residential units are built, and through which run all mechanical services. The compound is meant to provide 150 inhabitants with food, social diversity, and housing.*

*The Renaissance Community Master Plan includes a 250-acre pedestrian village with pathways connecting all functions – residential, gardens, school, work places, and recreational spaces. Light passages will be located to celebrate solar equinoxes.*



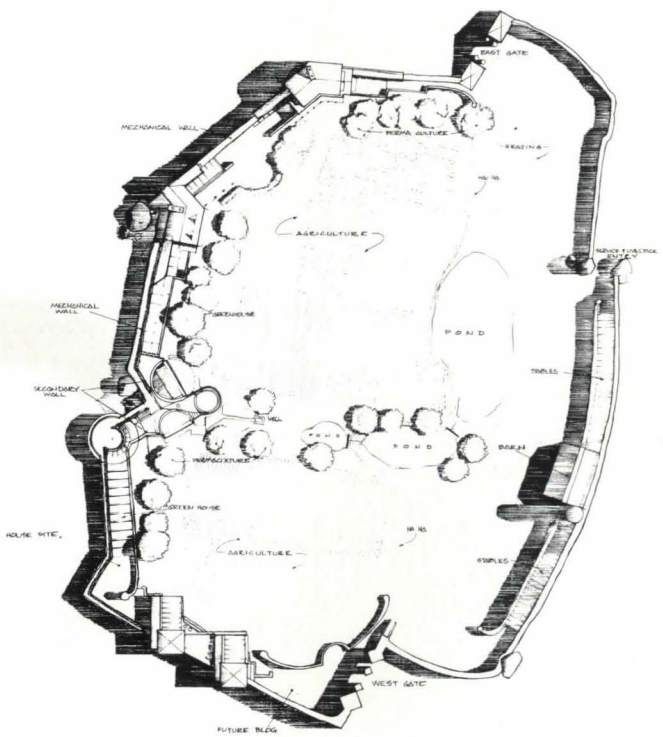

Drawings: John Connell

**PERSPECTIVE OF LINDISFARNE WALL**



Drawing: Bill Maclay

**SITE PLAN, RENAISSANCE COMMUNITY** N ↑ 400'/150m




**PLAN, LINDISFARNE VILLAGE** N ← 100'/30m

# Eco-villages: Toward Sustainable Architecture

Architect Sim Van der Ryn shares thoughts about making an architecture with ecological goals and ideals.

Students and architects searching for ecologically healthy ways to live often ask me how to translate their ecological values into practice. My answer is to find a client base among people and groups with similar values. A number of intentional communities grew out of the emerging new awareness of the late 1960s and early 1970s. As these groups matured in the last decade, some turned to creating architecture consistent with their visions and practices. For a number of years, we have been working with and learning from these groups in trying to put ecological principles and ideas into built form.

Three are illustrated here. The San Francisco Zen Center is a Buddhist community in Marin County. The Lindisfarne Association is a network of ecologically based thinkers and doers founded by cultural historian William Irwin Thompson. The Ojai Foundation school in Southern California is a center for spiritual studies. Each of these communitites has evolved into a unique "eco-village" that aims to integrate and balance human community with natural community. While each group, site, and project is different, there are common principles that shape the design and building process:

### Place

All of the projects illustrated are in places where the landscape is an active foreground to the building and its activities. Each place is a place of great beauty and power – a quality to respect but not to be intimidated by. The best information about place comes from the people who know it well – old-time residents – and our own well-developed intuitions, which usually are heard only when we get really quiet and listen to the land and our inner selves.

### Process

Creating an ecologically sound building means using a design process that reflects and incorporates the social ecology of the client community. In each case the community participated actively in the design and construction. The Zen Center Guest House was constructed by the Buddhist Center's building crew under the direction of Paul Discoe, trained in both the U.S. and Japan. Lindisfarne was built by a largely unskilled crew under the direction of Michael Ogden, a builder and member of the community. The Ojai community members express an interest in participating in the construction of their rammed earth village.

### Materials & Resource Conservation

Out of necessity, all of the projects use recycled and indigenous on-site materials. All were built without professional contractors by community labor. The elegant octagonal frame of Zen Center, put together using traditional Japanese joinery, is made of old bridge timbers. Lindisfarne is built of local stone rubble dumped into slip forms, and pine vigas from beetle infested stands. Ojai will be built of earth excavated on site and pneumatically rammed into forms. Of the projects shown, the Ojai project is the most complete example of "second generation" ecological design, integrating a variety of approaches to create an appropriate sustainable architecture.

### Geometry

The geometry of Lindisfarne follows from the optimal solar configuration for the harsh, sunny climate: the long east-west axis, offering maximum solar exposure on the south, and the bermed north wall. The Zen Center octagon also manages a solar orientation. Air collectors in the roof heat the air that is pumped into the concrete block plinth which acts as a hypocaust. The centering geometry and lack of acoustic privacy cause guests and students to be mindful of each other. Ojai is based on principles of sacred geometry, following the logic of the site, the nature of the community, and the strong precedents of indigenous architecture from similar bio-regions in the Southwest, Mediterranean, and Middle East regions.

These projects show possibilities for architecture and community design grounded in sustainability, implying a balance between the material needs of human habitation and the ability of the natural community to support human culture over the long term. The 1980s were truly a "Bonfire of the Vanities" – a decade whose architecture confirmed the greed, excess, waste and hubris of a clientele determined to flaunt its isolation from responsibility to society, the environment, and our shared planetary home. I hope the 1990s, through necessity, design, and changing values, will usher in an era of environmentally conscious, sustainable architecture.

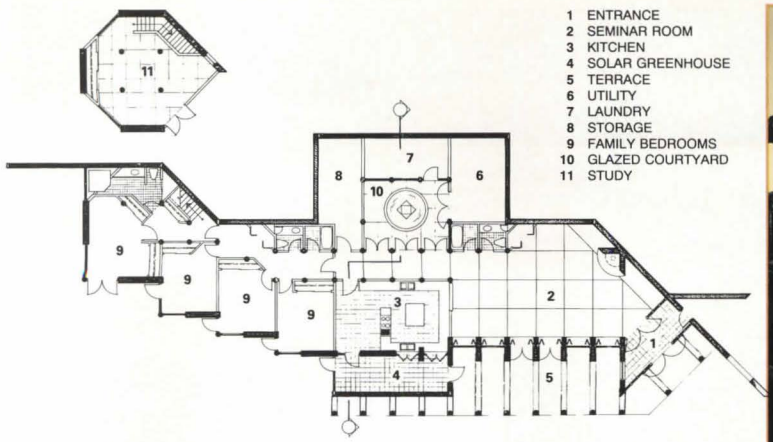
**Sim Van der Ryn** ■

*The Foundation School, Ojai, California (1) embodies many aspects of Van der Ryn's design direction. On the social ecology level, the design puts student housing closer than staff to the commons and other facilities; it provides a large commons for the community, for dances, rituals, and celebrations; it uses vertical separation and orientation to give privacy to dwelling units; it embodies private spaces and promotes spontaneous interaction. In ecological terms, it uses rammed earth walls, providing thermal mass and consequent summer cooling, in addition to reducing the daily temperature extremes; it provides "cool towers" to lower the temperature of air entering the complex; it provides for solar-heated radiant floor slabs for winter warmth; it uses photovoltaics for lighting; it provides summer shading and winter sun for units, shaded pedestrian ways, and a shade tent (commons); it includes rooftop water collection for delivery to cisterns, and a gray water system leading to orchard irrigation.*

*The author, a long-time advocate of ecological design, is a professor, Department of Architecture, University of California, Berkeley, and a principal in the firm of Sim Van der Ryn & Associates, Sausalito.*

1


FLOOR AND SITE PLAN




FLOOR PLAN

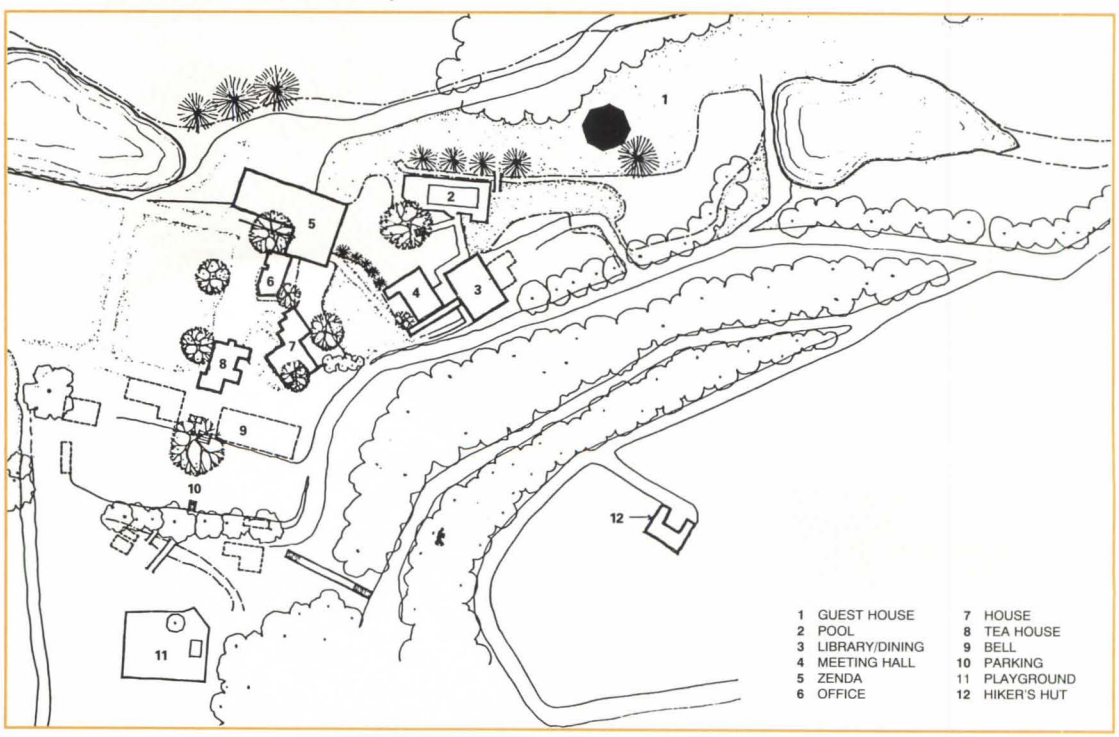
2

3

4

*Originally the Lindisfarne Mountain Retreat in Crestone, Colorado, this 5000-sq-ft house (2, plan above) now serves as the Dharma Sangha Buddhist Center. Built of stone and logs, it is constructed to provide passive solar heating, which the occupants say makes a 40-degree difference in mid-winter. Its greenhouse, running the length of the kitchen, "warms it and supplies lettuces and herbs all winter," according to the center's abbot.*

*An octagonal 4000-sq-ft house (3, 4), crafted in the Japanese wood-joinery tradition, serves as the guest facility for the San Francisco Zen Center in Marin County.*




SITE PLAN ZEN CENTER

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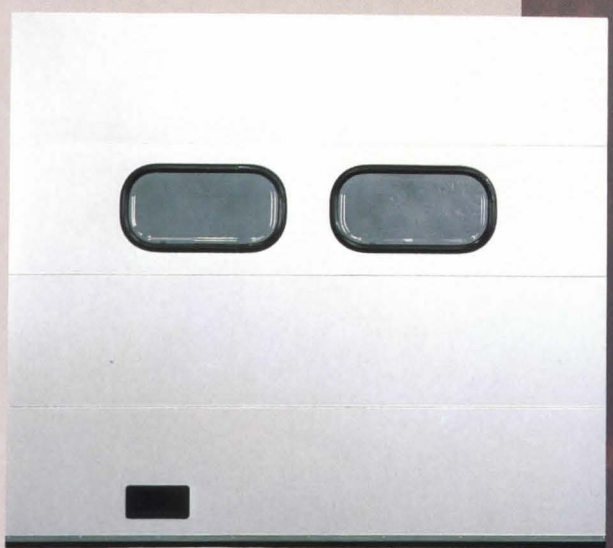

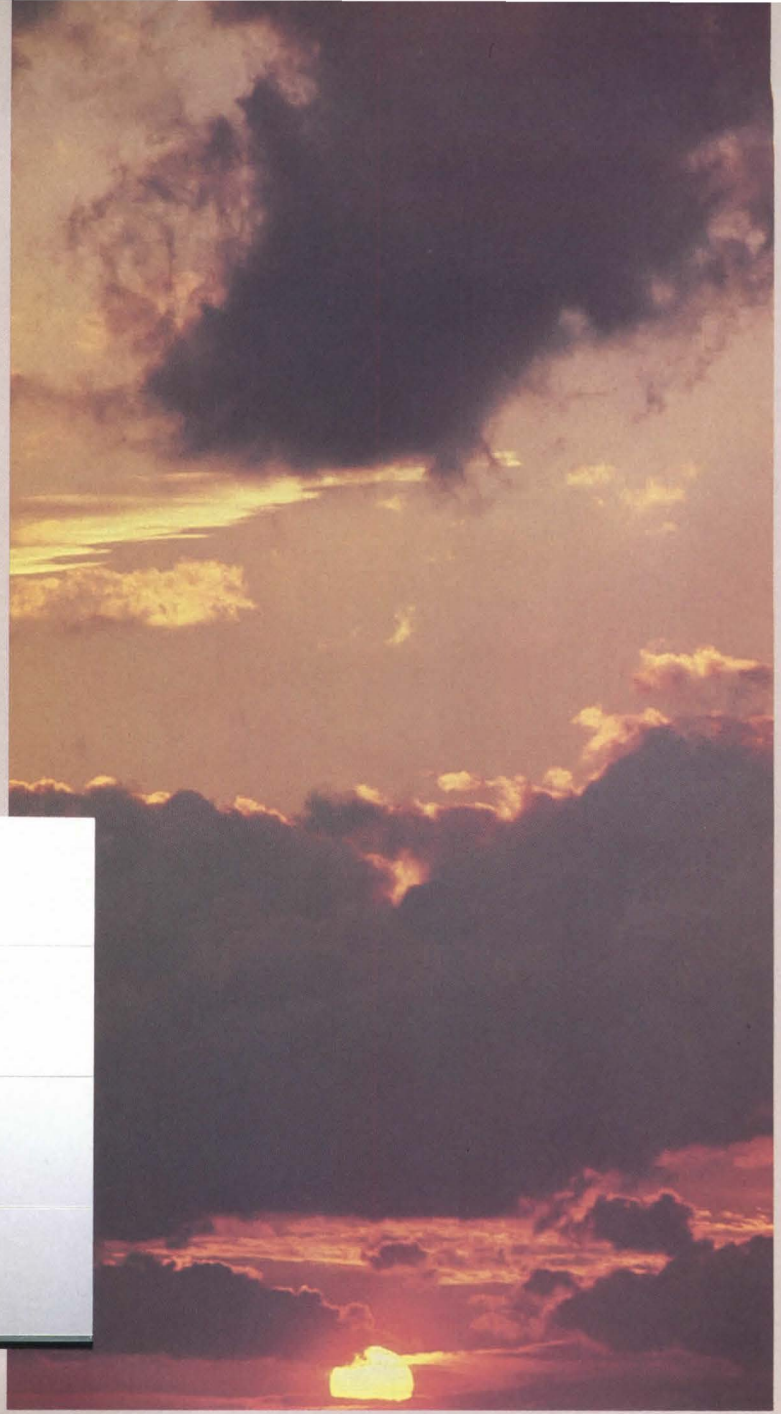

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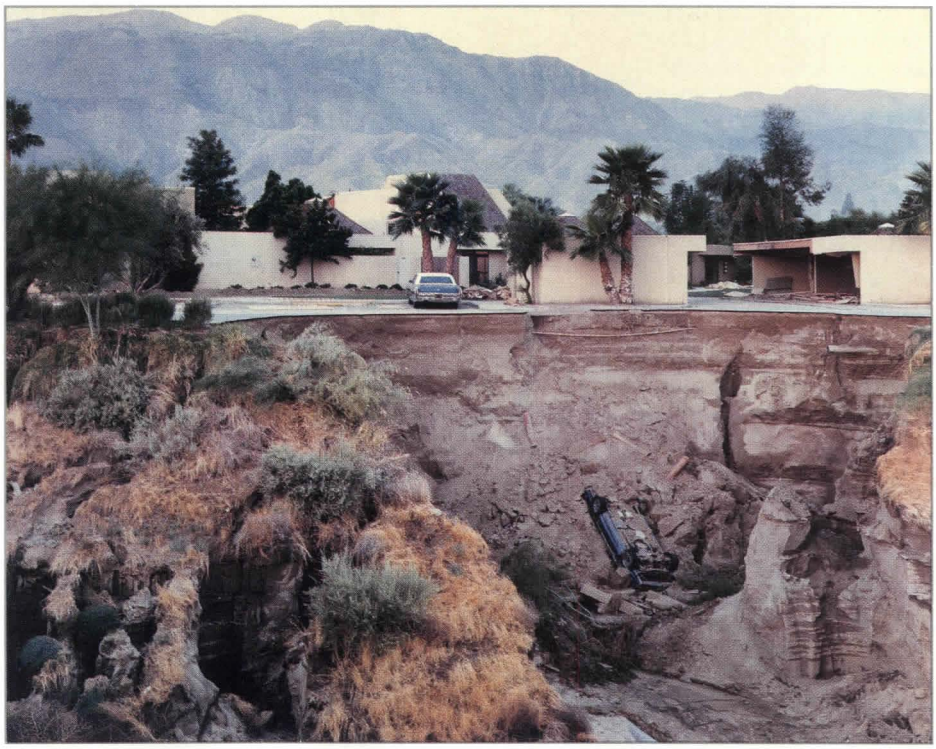
# Projects:
# Nine Proposals on Behalf of the Environment



Assembling the following projects was both inspiring and frustrating: We were heartened to learn about corps of designers committed to the welfare of the environment, but we are concerned about the volume of work yet to be undertaken. The scope of the problem came to light as we edited this issue. Good projects were hard to find: Environmentally responsive commissions are widely dispersed and often executed by people beyond the architectural mainstream. When our inquiries finally yielded a number of projects for consideration, their disparities made the selection process challenging, and we could not apply consistent criteria for their evaluation. The parameters were are as diverse as the architects involved: Some ecological veterans see their work as technical research, while many recent recruits describe the field as an amalgam of more diffuse concerns, from the response to a site's context to progressive programs or specifications that eschew tropical hardwoods. Given this broad spectrum of work, we offer a collection of projects, a reflection of the adolescent state of environmentally-driven design.



*Joel Sternfeld,* After a Flash Flood, Rancho Mirage, California, *July 1979. Type C color print, 13 1/2 × 17".*

Projects for a sustainable environment (to use today's nomenclature) represent a tiny fraction of architectural commissions; each of the ventures represents an exceptional alliance of clients and designers. The scope of work we surveyed is diverse: Budgets and programs are alternately generous and spare. Likewise, it is impossible to typecast the architects themselves: Some have international design reputations; others are isolated researchers whose schematic models and drawings were supported by a trickle of government funding. A number of architects have built large regional practices with residential clients concerned about sick building syndrome; others work with municipalities that support environmentally sensitive design. Developers, often maligned as opportunists, have begun to solicit environmentally-conscientious architecture, although reports of mass conversions to a new eco-religion would be premature.

"Think globally, act locally" applies to this field, albeit ironically: Because ecologically responsive projects are rarities, their impact on the environment is inherently limited. Visions of a healthy environment won't materialize unless this work is taken up by a broader cross section of architects. Because our ecological problems are pervasive, the rank and file are as crucial as the avant-garde: Without a large volume of competent (not necessarily cutting edge) solutions, our environment will continue to deteriorate.

Nevertheless, we hoped to find a broader range of visionary work for this special issue. There are no apparent heirs to the leaders who proselytized two decades ago (albeit with divergent voices and mixed success) – people like Paolo Soleri and Buckminster Fuller, or the-counter culture designers who emerged in the 1960s. We enter the 1990s with a surplus of intractable problems and a shortfall of radical proposals. Architects would justifiably respond that theirs is not an empowered profession: Money flows through industry, the media, and developers, who have more control over our resources than the architects they hire. Fortunately, we may find the public at large our strongest advocate in the drive to clean our environment: They are witnesses to (and victims of) our degraded ecology. Such an alliance is long overdue. We won't be able to forestall repair of the environment much longer. **Philip Arcidi** ■

*Collection, The Museum of Modern Art, New York. Acquired with matching funds from Shirley C. Burden and The National Endowment for the Arts.*

**Tree Houses, Lakeland, Florida**
Architect: *Lawrence Scarpa, Pugh + Scarpa, Santa Monica*

An ecologically sensitive site – a Florida swamp with year-round standing water on the land – was the principal inspiration for the design of this multiple residence by California architect Lawrence Scarpa. The composite houses occupy a cypress dome, a Floridian configuration where the matted roots of trees trap water that recharges the aquifer.

Now awaiting building approvals, this project for an extended family comprises four individual one-bedroom winter homes that branch off a central pavilion. Each 1000-sq-ft structure is raised 24 to 32 feet above ground to the level of the tree canopies, supported on four steel legs that minimize the structural imprint and visual intrusion of building masses on the ground plane, which remains largely unaltered.

The design refers also to the vernacular Florida Cracker house with its wood frame, cedar siding, tin roof, and screened porches that maximize cross ventilation and summer shade to cool the interiors passively. A windmill attached to one of the structures will provide energy for pumping water up to a storage tank above the roof. Scarpa is exploring methods to harness wind energy for limited electricity generation, as well.

Ironically, the project is having a hard time with authorities. While any number of cypress dome sites are routinely destroyed in the name of development by plowing and filling, Scarpa is required to seek variances on height restrictions, and permission to omit the compulsory two-vehicle carport (access to the houses is solely by foot, on a raised path). Since concrete piles would puncture the root matting, floating foundations are necessary.

Although the tree houses represent environmental design at its most site-specific, the project's consideration for geography, climate, energy conservation, and local building traditions amounts to an architectural strategy that may be transported anywhere.

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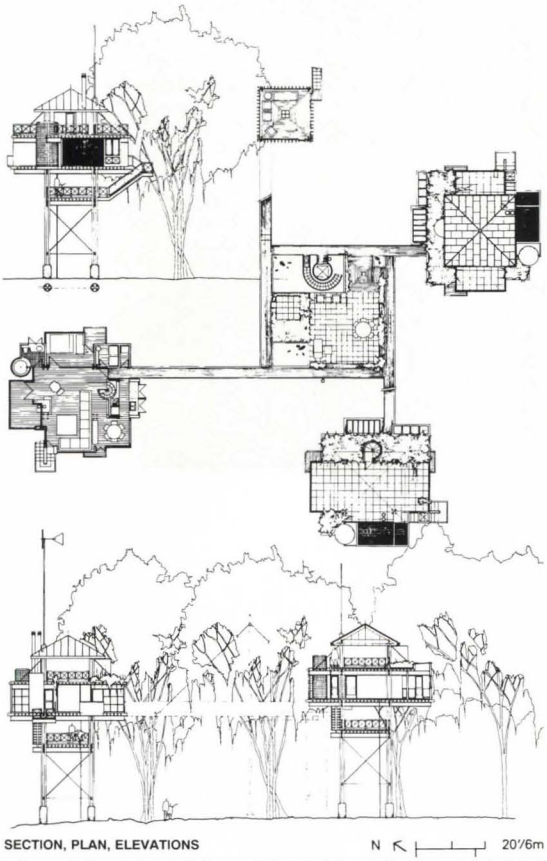
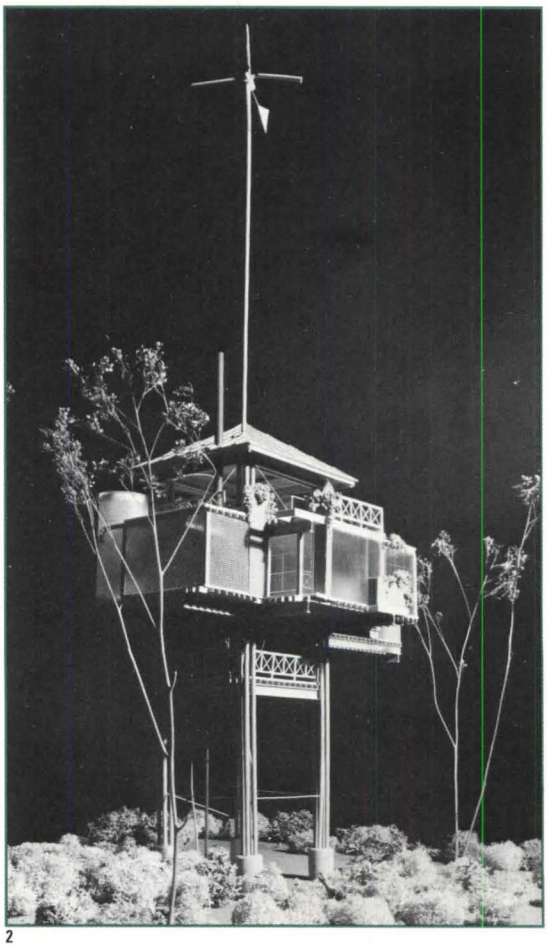
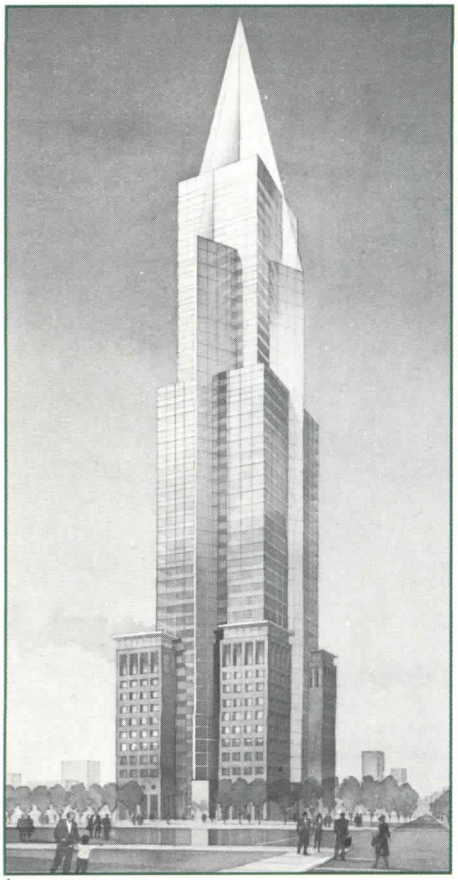


2

*Renderings of the tree houses project (1), executed while the architect was still in graduate school. A recent model of the unit with the windmill (2).*



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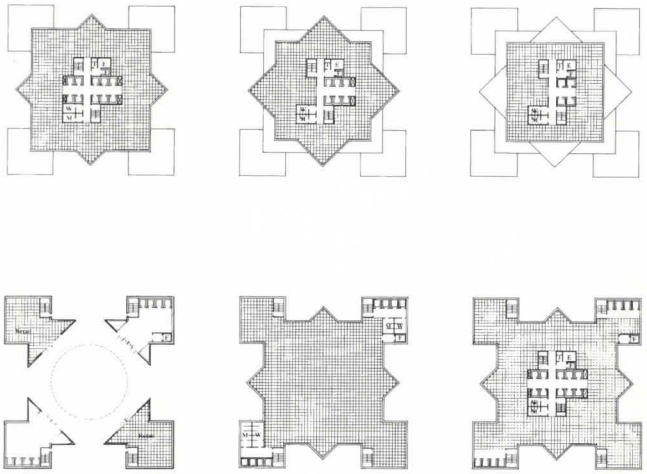


SIX REPRESENTATIVE FLOOR PLATES

*A rendering of the proposed Trade Center (1) shows a series of setbacks reflected in the six modestly scaled floor plates.*

### Warsaw Tower

Architect: *William McDonough Architects, New York*

Taking his commission for the Warsaw Trade Center as an opportunity for environmental design on an unprecedented scale, William McDonough has proposed a 70-story recycled aluminum and glass tower with the stipulation that a 10-square-mile forest be planted outside the city. Reforestation (as partial compensation for the building's energy consumption and atmospheric effects) is a plus, but the building itself is at issue: Specification of operable windows and floor plates with eight corners, for example, would employ natural sources for light and air; non-toxic materials, sustainable woods, glueless carpeting, and a biological waste-water system will also be used. But while its tenants may benefit, pedestrians may feel less obliged: This sleek American-style tower in central Warsaw leaves many problems of skyscrapers in the urban environment unattended.

*A view of the model with a monumental cooling tower in the foreground, which was conceived as a landmark.*

### Urban Oasis, Phoenix

Architect: *Jeffrey Cook, Tempe, Arizona*

This scheme, not to be realized, was conceived as environmental urban design, a functional and aesthetic model for transforming public spaces in desert communities. It was developed by a team at the Environmental Research Laboratory at the University of Arizona, Tucson, and is based on ideas generated by graduate architecture students working with Jeffrey Cook. Design elements include a vast tensile structure, with hot-air exhausts at its high points, which economically provides extensive summer shade and winter sun, facilitates the harvest of rainwater, and gives distinctive form to the principal circulation area. Cooling towers serve both as columns that define a civic space and as passive sources of cool air. Misting water at the top of the 60-foot towers creates heavy humidified air that sinks to plaza level where vents direct its flow to modify conditions in adjoining parts of the square.

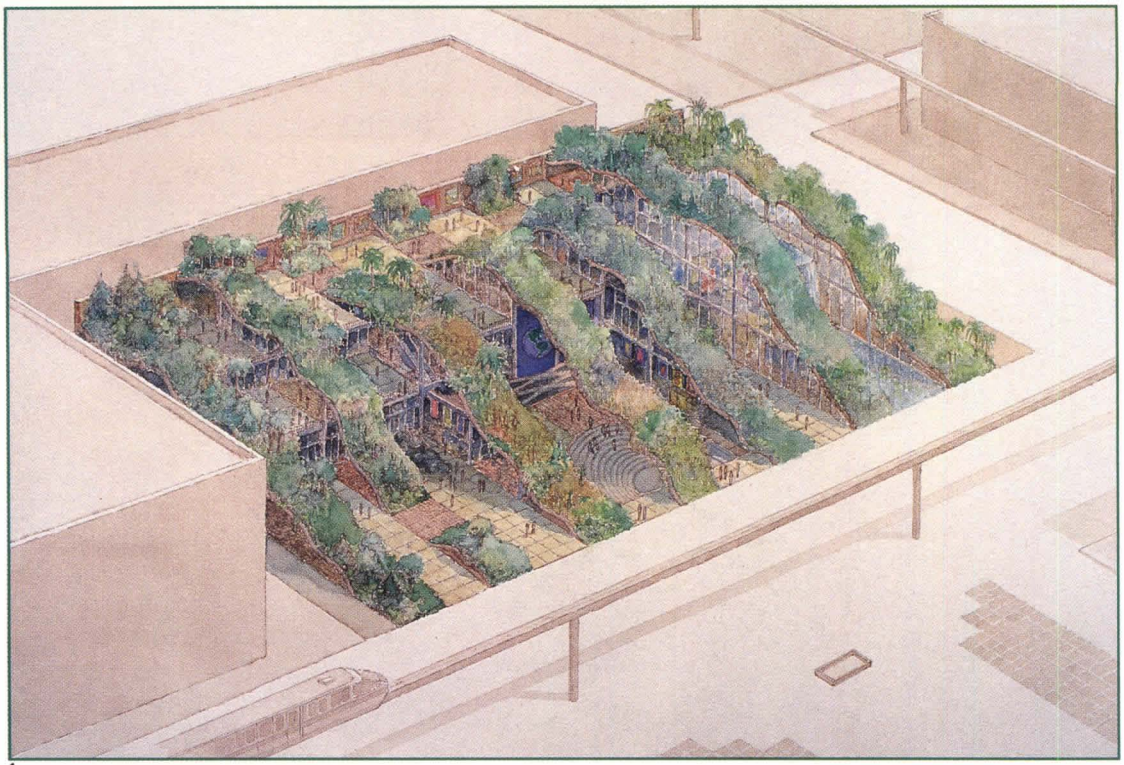
**World Ecology Pavilion, Seville**
**Speculative Retail/Office Complex, Hollywood**

Designers: *James Wines, Joshua Weinstein, SITE, New York*

In keeping with the global ecology theme of the 1992 World Exposition in Seville, the 75,000-sq-ft World Ecology Pavilion by SITE is being proposed as a showcase of seven microcosms, each representing a continent's characteristic vegetation and terrain. These "topographies" are supported on undulating ribbons of concrete, which function also as canopies over open plazas, enclosed exhibition spaces, and, at one point, as an acoustical bandshell for an amphitheater. Honeycomb coffers in the deep-joist concrete structures are designed to contain the landscape elements. In the 1,000-seat indoor theater, interior walls would display geological strata, sandwiched between layers of glass, to provide a glimpse of the planet's interior.

The proposed mixed-use speculative building on Sunset Boulevard is intended to echo Hollywood's hilly green terrain, with its staggered, tiered decks and courtyards heavily landscaped with indigenous trees and plants; the 130,000-sq-ft complex's amorphous contours allude to the serpentine boulevard itself. To call attention to the recessed commercial spaces, billboard-like façades would line the street.

Both projects, while different in their programmatic requirements and constraints, exemplify SITE's approach to "environmental" design. It is quite literal in its imagery and use of vegetation, and as such is necessarily limited as a universal architectural strategy – though James Wines, principal in charge of the World Ecology Pavilion, reports significant progress in the resolution of structural details and technical support systems for the designs. Beyond the question of their viability, the value of such projects is high as awareness-raisers that highlight the need for greater integration between the technological and aesthetic aspects of environmentally sensitive design.



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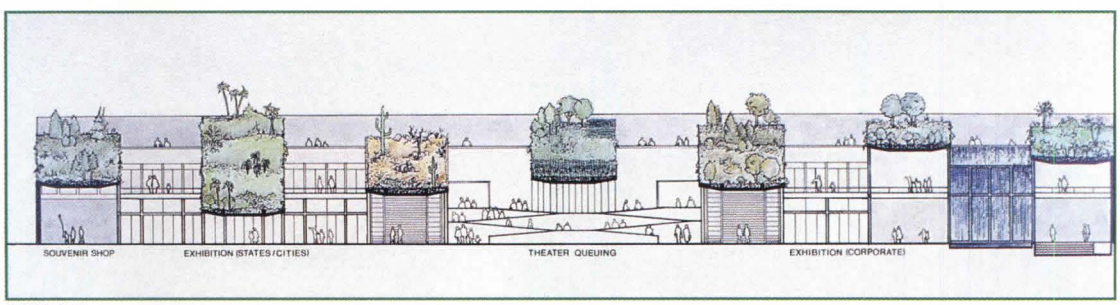
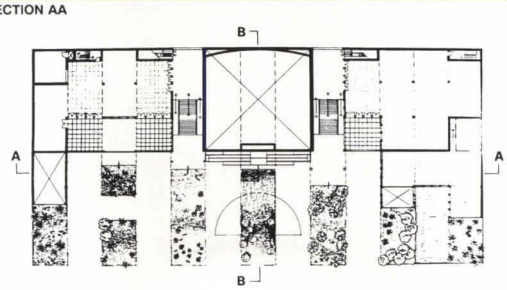
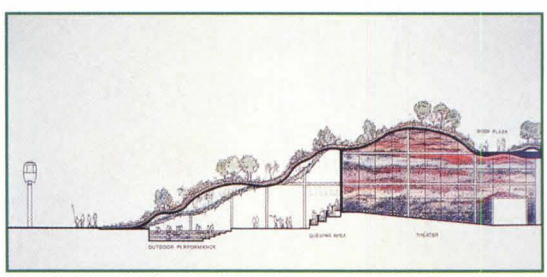



SECTION AA

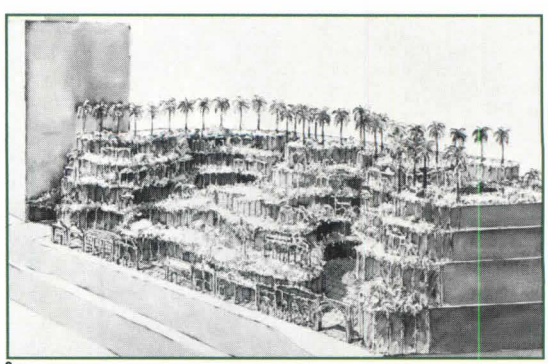



WORLD ECOLOGY PAVILION MEZZANINE PLAN N ↗ 100'/30m



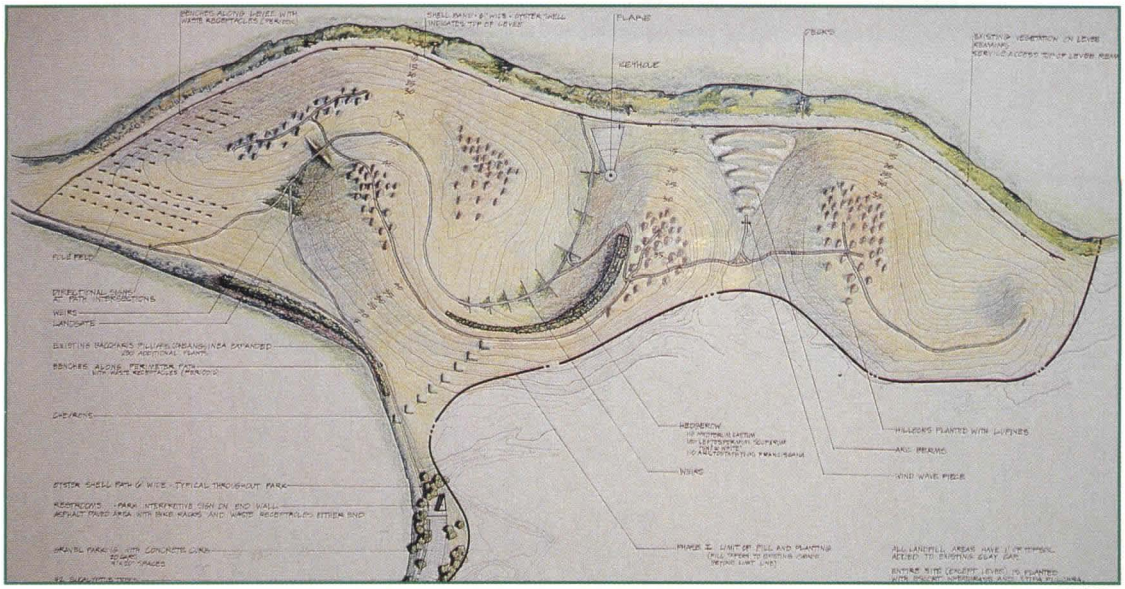
SECTION BB 40'/12m

SITE PLAN, SUNSET BLVD. COMPLEX N ↙ 100'/30m



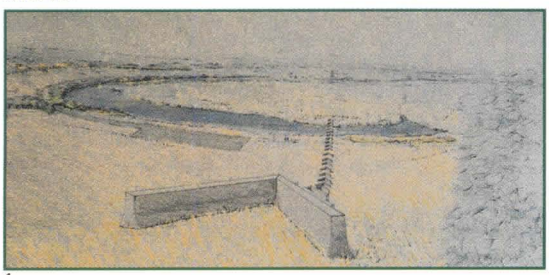
2

*Renderings of the rooftop gardens of the World Ecology Pavilion (1) and the Sunset Boulevard office/retail complex (2).*



SITE PLAN

N ← 300'/100m



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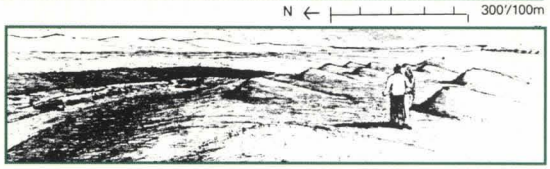


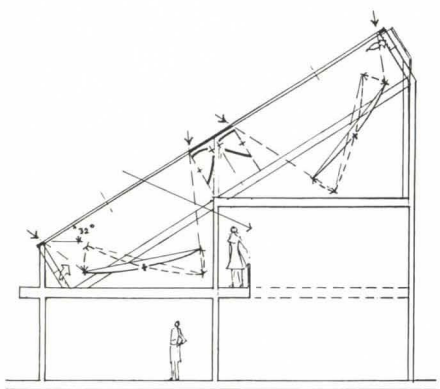
2

*Concrete chevrons (1) set on axis with a nearby airport signal "Don't Land Yet." Manmade hillocks (2) offer limited shelter from the wind.*

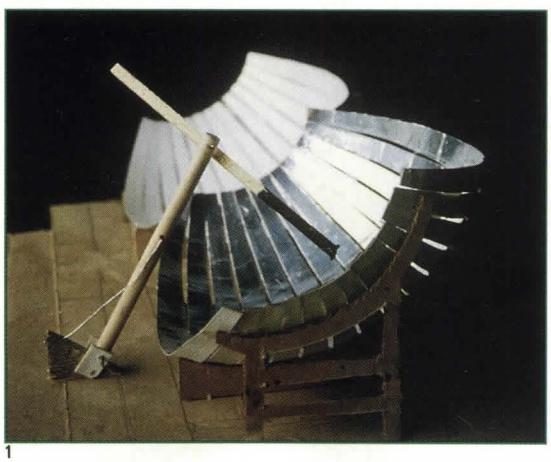
## Landfill Park, Palo Alto, California

Designers: *Hargreaves Associates, San Francisco*

The first 42-acre phase of the 150-acre Byxbee park is under construction above a sanitary landfill on the windy shore of San Francisco Bay. It is a collaborative effort among Hargreaves Associates and environmental sculptors Peter Richards and Michael Oppenheimer, with input from governmental wildlife agencies, the Coastal Conservancy, and Army Corps of Engineers. Conceived as an alternative to the rote picturesque approach, and constrained by technical aspects of the landfill, the design seeks to abstract natural processes in the area while responding to the manmade context. For example, drop-shaped hillocks reflect how earth forms respond to wind forces. Since the landfill can't be irrigated, a series of weirs is planned to trap rain and over time create moister soil.

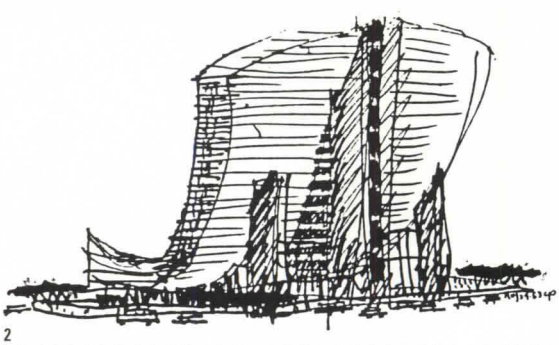


DIAGRAMMATIC SECTION, SOLARIUM ENVELOPE WITH PIVOTING HELIOSTATS



Joel Goodman

1



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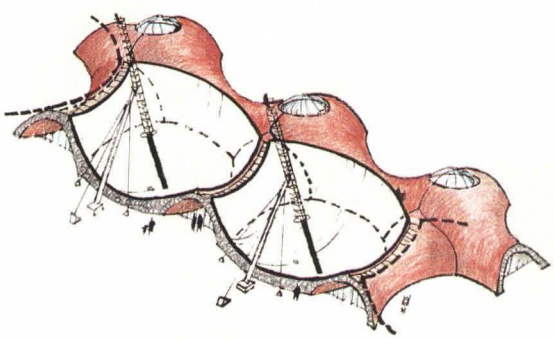


3

*Goodman's simplest proposal for pivoting heliostats accommodates a residentially scaled building. Solar bowl collectors (1), which focus heat on a tubular receptor, could tower over a city (2) or be set in grids of arced structures (3).*

## Solar Collectors: Their Architectonic Potential

Architect: *Joel Goodman, Avoca, Wisconsin*

To many, solar bowls and heliostats are technical curiosities that lie beyond the bounds of architectural propriety. To Joel Goodman, however, they are the basis of Post Fossil Architecture, his term for a new generation of buildings that produce more energy than they consume.

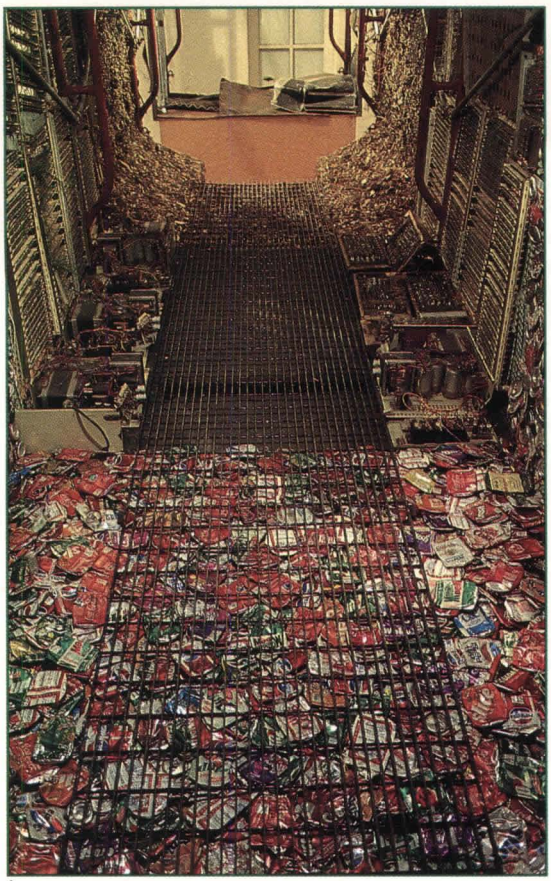
Goodman has explored the technical parameters of these collectors as well as their architectonic dividends: Bowl collectors, which must be at least 100 feet across, could be erected on top of multistory buildings or framed by arced structures. Heliostats, which use 10- to 20-foot dishes to track the sun, could be set beneath glass roofs of conventional structures. While both collectors would have urbanistic consequences that deserve scrutiny, they augur a welcome synthesis of technology and form.

### Walk-Through Observatory, Garbage Disposal Plant, New York

Artist: *Mierle Laderman Ukeles*
Architect: *Greeley & Hanson*
Associated Architect: *Richard Dattner*

"I am both a supplier and *client for the* Department of Sanitation; without them, I couldn't survive in this city." This is Mierle Laderman Ukeles's salvo for Flow City, her proposal for a public viewing corridor at the 59th Street Transfer Station, where trucks dump 3,000 tons of refuse daily into waiting barges.

Flow City will render trash disposal an educational opportunity: Heaped into a barge, garbage is an undifferentiated mass that, only hours earlier, was an array of valued commodities. To Ukeles, the noisome traits of trash render it a potent medium, "a pure philosophical investigation into the nature of material": Like everything else, trash is a renewable entity, readily transformed by those who see its latent value.



1

2

3

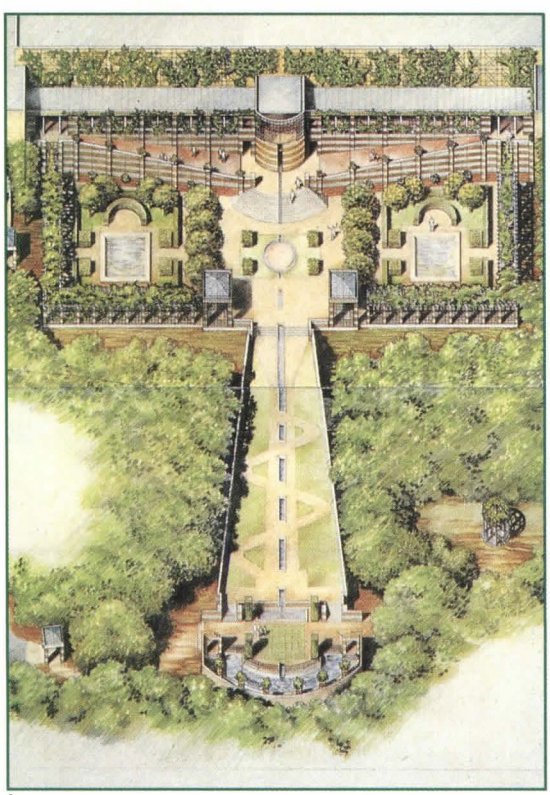
Photos: Courtesy Ronald Feldman Fine Arts, New York

*A mock-up the Flow City corridor (1) was lined with recyclable trash; the vista from the Transfer Station (2,3), shows the buildings that spawned the city's garbage.*

### Resource Recovery Facility

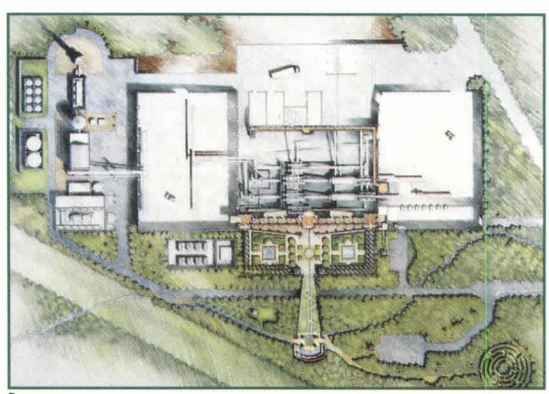
Architect: *James Stewart Polshek & Partners, New York*

In an unusual effort to "humanize" the proposed San Marcos Resource Recovery Facility, slated for an existing landfill site in a San Diego suburb, James Stewart Polshek & Partners produced a scheme (shown here, though a revised design is to be realized) based on an Italian palazzo garden. A prefabricated plant, with visitors' viewing galleries, is hidden behind a "trash" museum and surrounded – or disguised – by a heavily planted garden and eucalyptus forest. In this way, the private patron hopes to allay local concern about visual pollution. Industrial-strength insulation and negative air pressure will confine noise and toxic emissions within the plant itself. Proposed as a model facility, it may prove to be a feasible and desirable form of waste management.



1

J.S.P. & P./George Oueral, renderer



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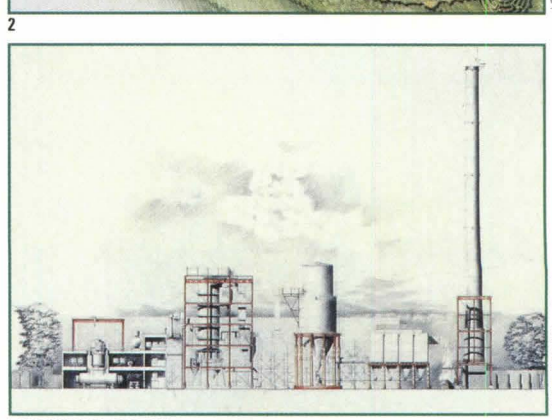


LONGITUDINAL SECTION

J.S.P. & P./Neil Denari, renderer

*The facility's symmetrical design, rather than the linear recovery system itself (2), is mimicked in the garden plan (1).*

# Perspectives

**Thomas Vonier** summarizes and appraises AIA activities on the environmental front.



## Report: The Greening of the Guild

Under a heap of recycled paper and the banner "Making a Difference," the American Institute of Architects has launched initiatives that could move architects into the practical forefront of the resurgent environmental movement.

Shaped by the Institute's Committee on The Environment (spelled, the staff insists, with a capital T), the program took off at a Washington symposium last fall, featuring talks by – among others – conservation advocate Amory Lovins, tropical forest expert Thomas Lovejoy of the Smithsonian Institution, and Monsanto Company senior vice president Harold J. Corbett. The session reflected renewed professional commitment to matters of undiminished urgency, even if it produced nothing new. (One architect complained that he had heard the same things 20 years ago and still saw little evidence of change.)

In its first meeting the committee identified some 36 issues – from destruction of tropical rain forests to designing for recyclability – in which architects can make a difference. The Institute's major effort now will be to provide information on these issues to architects, building owners, and other design professionals.

### The Environmental Resource Guide

With $700,000 in support from the Environmental Protection Agency, the AIA has launched a three-year project to develop the *Environmental Resource Guide,* a publication intended to enable architects, engineers, and others to evaluate the environmental consequences of design decisions. The AIA describes the *Guide* variously as an encyclopedic reference, a bi-monthly or quarterly newsletter, a desktop resource, and a computer-based diskette service "that will update architects on the latest scientific research findings."

Whatever the format, deciding upon the *Guide's* content will be perplexing. Even in the limited cases where research exists on the environmental aspects of specific building products and materials, the scientific and technical communities do not necessarily agree on the substance and implications of the findings. The AIA has formed a scientific advisory group to help sort through such issues.

Initial attention is being devoted to topics on which more or less decisive research information is now available. Twenty-five topics are on the advisory group's first list; the *Guide* will eventually cover all of the Construction Specifications Institute's 16 construction divisions.

**"Even in the limited cases where research exists on the environmental aspects of specific building products and materials, the scientific and technical communities do not necessarily agree on the substance and implications of the findings."**

In areas where adequate research has not been completed, one wonders: How might it be accomplished, by whom, and what guidance can be offered before research is done? The AIA staff hopes that the *Guide* project will be able to encourage and direct needed research, which might be undertaken or funded by enlightened private industry acting from a new sense of environmental responsibility.

Enlightened or not, product and material manufacturers will doubtless take keen interest in what the *Guide* has to say. By admitting many points of view, as the AIA says the *Guide* will do, it should be possible to avoid the long, contentious, and often litigious process the EPA now faces when it proposes new rules or guidelines. But caveats and qualifications can dilute guidance; AIA staff members acknowledge – and some early drafts suggest – that the *Guide* might turn out to be more of an issues forum and information vehicle than a source of explicit design recommendations.

A background report entitled "Aluminum and the Environment," billed as a sample installment for the *Guide,* embodies some of the conundrums the compilers will face. The report provides a comprehensive account of aluminum's status in the building industry and pinpoints key issues, such as the enormous amount of energy expended in its manufacture and the difficulty of salvaging aluminum from buildings. At the same time, the report is too lengthy and is laden with technical detail unlikely to be of practical interest to architects.

A summary report on the same topic, while closer in content and length to what one expects of a document intended for architects, poses other problems: For example, in suggesting steel as the sole alternative to aluminum, it compares environmental "performance" (quotes are used in the summary) by such measures as pounds of waste produced and raw materials consumed in manufacture. The significance of these figures alone is difficult to assess; their direct effect on the environment is even less apparent. If – as the summary states – nearly 90 percent of recoverable steel is salvaged and reused each year na-

tionwide, while almost no aluminum is recycled from buildings, then one is left to wonder: Which material leaves the environment better off? Is it better to use steel, which is readily recycled, or aluminum, which is produced with less waste? Are there alternatives that are better on both counts?

The report concludes by saying that the toll taken on the U.S. environment by the manufacture of aluminum (through fossil fuel consumption and toxic waste generation) will be reduced because American companies are moving away from the primary manufacture of aluminum to the "shaping and engineering of semi-finished aluminum products." But where, then, is primary aluminum going to come from? Will that place (or The Environment) be better off?

It is probably not reasonable to expect definitive guidance on such complex matters. Yet, if this is the portion being bitten off – this is the portion that's got to be chewed.

The *Environmental Resource Guide* is scheduled to debut this month as a subscription-based newsletter and will develop in other forms as the work progresses. Those (including non-architects) who wish to obtain the *Guide* or participate in the work of the committee should contact the AIA professional programs division. Meanwhile, architects are taking action on other fronts.

### Search for Appropriate Designs

The Council on Architectural Research, a joint endeavor of the AIA and the Association of Collegiate Schools of Architecture, is sponsoring "Environmentally Conscious Architecture," a competition intended to collect and display actual building designs that are sensitive in areas such as resource conservation, recycling, and sustainability. The council has solicited some 2,000 firms by mail and expects a fair response, despite a stiff entry fee and tight timetable. The council will display selected entries in Washington this May at the AIA convention. Also, if expected support comes from the U.S. Department of Energy, the council hopes to develop an energy component for the *Environmental Resource Guide*.

### The American Institute of Architecture Students

The AIAS, representing thousands who are enrolled in architecture programs at North American colleges and universities, surveyed members on environmental issues during its recent annual meeting. Most respondents registered concern about resource conservation, waste recycling and toxicity of materials. In the highest positive response in the 17-question survey, 98 percent said they would "pay more for products that are environmentally safe."

**"One has to look beyond promotional literature and what people say to evaluate what is actually being accomplished.**

Very few students, however, gave high marks to the environmental aspects of architectural curricula. Asked whether studio professors typically express concern for environmentally conscious design, nearly a third responded "never" and more than half marked only "sometimes." Over one-third said that construction materials and methods courses "never" address environmental impact. And the schools themselves? Only one-fifth of the respondents could agree that their design studios were "environmentally healthy places to work and learn."

### McEnvironment

The environmental bandwagon, which seems to be rolling once again, offers few exceptions to the rule that one has to look beyond promotional literature and what people say to evaluate what is actually being accomplished.

Given the gush of public relations hype that has flowed from Madison Avenue in recognition of renewed popular concern about The Environment, one might be forgiven a tendency to mild skepticism at pronouncements like this one, from the current chair of the AIA's environmental committee: "Following the example of Native American culture, we must consider what impact projects will have on the next seven generations, or we will be making our future generations debtors for years to come."

Then again, maybe a little hype about architecture and environment won't hurt – provided promises are delivered upon. And it is good to see professional attention devoted to matters that have been set aside for too long in the course of. . . well, making our future generations debtors for years to come. **Thomas Vonier** ■

*The author is an architect practicing in Washington, D.C., and a regular P/A correspondent.*

According to **Donald Watson,** the paucity of environmentally sound design stems from a lack of integration between ecological and architectural principles.

## Commentary: Environmental Architecture

Our buildings consume nearly 40 percent of our national energy budget for heating, cooling, and lighting. Largely fossil-fuel based, building energy use contributes to acid rain, pollution, and global warming. These facts are well known. While emergent environmental concerns have refocused our attention on them, we should not have needed another energy crisis or the belated evidence of acid-rain damage and holes in the ozone to do so.

We don't have to agree on the fine points. Whether you argue that we have less than 10 years or more than 30 to solve our environmental problems, the response of the architectural profession should be the same, because the structures we are designing and building are supposed to last much longer in any event. All of our buildings should be energy efficient and environmentally benign.

A change in architectural design practice in order to address our environmental responsibility can be achieved through relatively easy and low-cost approaches to design and building – especially to design. Energy and environmental costs are most easily minimized by decisions made early in the design process, through siting, massing and orientation. If added only after the design is completed, energy efficient features are cumbersome and expensive. By intelligent design, architects can reduce the energy cost and negative environmental impacts of their buildings to levels from 50 percent to 90 percent below conventional buildings. Examples that do so are built and well documented. It is a simple matter for architects and engineers to learn from and to improve upon these examples.

Given these facts, that architecture does have a significant role in affecting environmental quality and that architects can easily incorporate energy-conserving principles into their design, why is it that every building designed and built today is not maximizing its energy-saving and environmental potential?

To this question, I have received a multiplicity of answers. That "it costs too much" is not an excuse. . . there are many examples where successful results are achieved within conventional budgets. There is a more reasoned but still insufficient excuse. . . "Energy is only one of the many design parameters that an architect must consider. I (or my client) considered it but gave it lower priority than. . . " There is also "It would cause me to change my design style," to which one might answer, "Then how good are you as a designer?" More often I try to show how energy efficiency has been and can be incorporated into any architectural style or convention, although clearly it carries its own formal demands and opportunities.

*The building as a natural heat exchanger: Champion International Headquarters, Stamford, Connecticut, by Ulrich Franzen, architect. Each side of the building has a different sun-shading system, optimized for its orientation. Horizontal louvers on the south admit winter sun and reflect daylight on interior ceilings.*

*The building as a natural light diffuser: TVA Headquarters Building, Chattanooga, Tennessee, by the Architects Collaborative. The cross-section and interior atrium are designed to maximize natural lighting.*

Photos: Donald Watson

*The building as a micro-climate: Longwood Gardens, Kennett Square, Pennsylvania. In a 19th-Century glazed courtyard, springtime conditions flourish in midwinter.*

There are several other, more elusive, explanations of why architects have not incorporated energy and environmental concerns in all of their work. The first is that energy and environment are seen as technology-based, in terms of both problem and solution. This then is used as the excuse why it's someone else's problem or "one for the engineer." The implication is that because it is "technological," it is outside of the architect's interest – a myopia that devalues both the architectural and engineering professions. The root meaning of "technology" is "knowledge gained in the making" and is thus inseparable from architectural design. The "technology vs. aesthetics" or "science vs. art" opposition only perpetuates their disjuncture, belied by many works of American masters from Jefferson to Kahn.

The second explanation is that architects have not yet been sufficiently inspired, that we do not yet have the necessary exemplars of what environmental architecture could be. To this I would counter that we have in fact explored a vast array of energy and environmentally responsive designs since the early 1970s, which has placed us high on the learning curve at this point in the 1990s, when we are once again impelled to address our energy and environmental problems.

Just how would I summarize the lessons learned in the past 20 years? Rather than supplying proscriptive or "how to" rules of design, let me attempt to convey how architectural design from its earliest conception can respond to energy and environmental opportunities.

Architects think in terms of "metaphors." The artistic imagination "sees" images as a function of "aesthetic knowing." Le Corbusier at one point gave us the metaphor of his architecture as a "machine for living." In the same way, but with quite different metaphors, an environmental architecture can be conceived as "ideas formed in

**"The 'technology vs. aesthetics' or 'science vs. art' opposition only perpetuates their disjuncture, belied by many works of American masters from Jefferson to Kahn."**

their making," that is, the design as the technology. The five metaphors suggested below are neither exclusive nor all encompassing, but simply illustrative of the potential.

Consider that you are designing a building. It has a site, which can be described in terms of its solar orientation, local climate, and ecology. Think of the building that you're designing in five different ways, each successively more complex, but following a logical progression of development.

**"If the genesis of architecture were to incorporate environmental principles to the same extent that it follows Vitruvian precepts... then all architecture would be 'environmental architecture.' "**

*The building as a natural heat exchanger:*

First, think of the design's relation to the sun, which will change its position above the horizon throughout the day and year. Develop the plan, orientation, section, and wall detail so that it blocks the summer sun, but welcomes the winter sun (assuming for this example a northern climate). This metaphor, which invites the imagination to configure the building in terms of solar geometry, will have any number of alternatives, uniquely dimensioned to its particular "place in the sun."

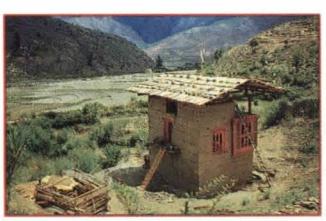
*The building as a natural light diffuser:*

Now manipulate the building design, particularly in section and wall detailing, to increase its capacity to provide diffuse natural light, which is over 100 times as plentiful as is needed inside for visual comfort. Louis Kahn talked of a building as a "natural lighting fixture," and this metaphor certainly stimulated his designs of the Kimbell Museum and the Yale Center for British Art. The design problem is made complex, but more challenging, by the fact that the light source is constantly moving, hour to hour and season to season.

*The building as a micro-climate:*

In the spaces near or within a building, the outside climate can be modified by design, for example, by a protected outdoor courtyard (which extends the seasons of its use) or by a glazed atrium. Developed in response to this metaphor, buildings and landscape become supportive of each other by mutually moderating effects of precipitation, wind, and temperature.

*The building as a biological system: Johnson Controls Office building, Salt Lake City. Douglas Drake, architect, with Donald Watson, Fred Dubin, and William Lam, Energy Design Consultants. The cross-section and mechanical/ lighting components work together as an integrated system to enhance natural lighting and airflow.*



Photos: Donald Watson

*The building as an ecological niche: Rural dwelling near Thimpu, Bhutan. The Himalayan tradition of building is attuned to local conditions and the agricultural economy. The house is placed on a slope to preserve flat arable land. All construction materials are indigenous; the first floor of the structure houses livestock; the cool attic is used for food storage.*

*The building as a biological system:*

By this time, your design has shape, form, and void. It admits sunlight and creates spaces for plants and people. Now, let the design be inspired by images from nature of integrated biological systems that supply air, water, and energy to its many parts. As with any biological system, there has to be a means of adjusting to changing use and outside climatic conditions through systems of energy flow of heat, cooling, and light. This metaphor could inspire dynamic elements in the architectural design, such as adjustable sunshades or heat-transfer mechanisms, and be the basis of environmental controls engineering that enhances the architectural features already conceived.

*The building as an ecological niche:*

Finally, this metaphor invites you to imagine the design as a functional and beneficial part of its surrounding landscape, one that returns to its environs various resources of vegetation, water, air, waste (which should be viewed as a nutrient resource) and contributes to the environmental quality of its setting through the provision of ecological diversity.

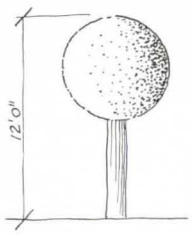
These metaphors should inspire architectural design to be energy- and resource-conserving at its very inception. This is not to supplant other generic notions of human need, structural soundness, or cultural continuity, but instead to integrate them in the thinking and making of architecture.

**"We have in fact explored a vast array of environmentally responsive designs since the early 1970s, which has placed us high on the learning curve at this point in the 1990s."**

If the genesis of architecture were to incorporate environmental principles – to the same extent that it follows the Vitruvian precepts of commodity, firmness, and delight – then all architecture would be "environmental architecture." Indeed, the two words would be synonymous. **Donald Watson, FAIA** ■

*The author is Professor of Architecture and Dean, School of Architecture, Rensselaer Polytechnic Institute.*

# THE TREE as seen by...




THE PLANNER...

THE PARKS DEPT...

THE PUBLISHER...

THE HIGHWAYS DEPT...

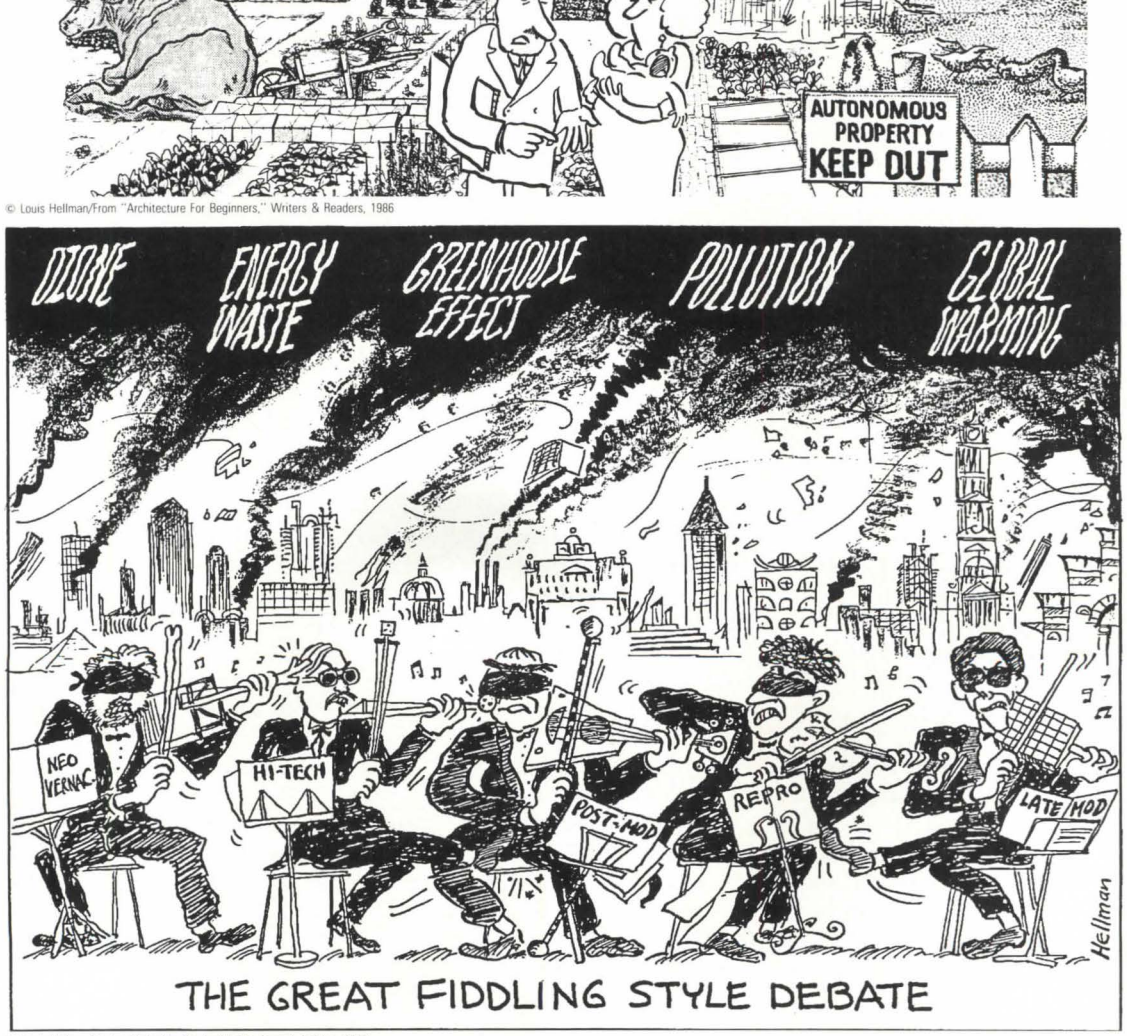

THE DEVELOPER...


THE LANDSCAPE DESIGNER.



**Punchline:** Louis Hellman clears the air on the environment.



# **Books:** Taking Stock of Solar Dividends

**Harvey Bryan** surveys an ambitious series on solar research, once a prominent beneficiary of federal support.

**Books of Note**

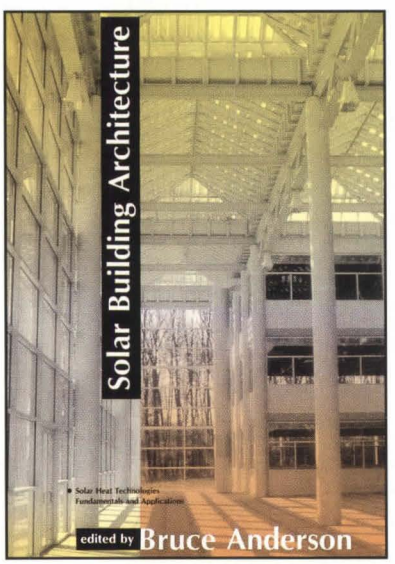
***Biologic: Environmental Protection By Design*** **by David Wann, Johnson Books, Boulder, Colorado, 1990, 246 pp., illus., $19.95, cloth.**
**This survey on preventive environmentalism (printed on recycled paper, to set an example) is written for a general audience, though architects should find it of interest.**

***Greenways for America*** **by Charles E. Little, Johns Hopkins University Press, Baltimore, 1990, 237 pp., illus., $22.95, cloth, $16.95, paper.**
**The Greenways Movement – advocating accessible, linear open space in rural, suburban, and urban areas – is positioned (with historical and contemporary examples) in ecological, social, and economic terms.**

***Topophilia: A Study of Enviromental Perception, Attitudes, and Values*** **by Yi-Fu Tuan, Columbia University Press, New York, 1990, 260 pp., illus., $37.50, cloth, $15, paper.**
**Originally published in 1974 in the wake of the last environmental movement, Tuan's essay on our (lack of) appreciation of the physical landscape is timely once again.**

***Frederick Law Olmsted: The Passion of a Public Artist*** **by Melvin Kalfus, New York University Press, New York, 1990, 415 pp., illus., $39.50, cloth.**
**Olmsted's pioneering ability to enhance urban life with a romanticized rural landscape is explored in this text.**

**(For more publications on the environment, see p. 154.)**




Solar Building Architecture *edited by Bruce Anderson, MIT Press, Cambridge, Mass., 1989, 368 pp. illus., $40.*

Passive Cooling *edited by Jeffrey Cook, MIT Press, Cambridge, Mass., 1989, 593 pp., illus., $50.*

*Both titles are part of* Solar Heat Technologies: Fundamentals and Applications (12 vols), *Charles A. Bankston, editor-in-chief.*

Few would disagree that solar energy, the fair-haired technology of the 1970s, has fallen on hard times. The field once had an annual budget of over $150 million, which has been reduced to approximately $15 million today. What irks its advocates the most is that solar energy was not done in by technical problems so much as by political ones. All indications today, however, show that solar energy advocates have learned their lesson: They have actively broadened their constituency and justify the application of solar energy on new grounds such as global warming and the national security consequences of unstable foreign energy supplies. It remains to be seen if such a strategy can convince federal policy makers, particularly those in the executive branch, that solar energy deserves renewed support. No matter how this is eventually resolved, the solar energy community has successfully documented the numerous technical advances the field has made through an ambitious 12-volume series called *Solar Heat Technology: Fundamentals and Applications.*

Published by MIT Press, this massive undertaking summarizes 11 years (1975–1986) of federally sponsored research, development, and demonstration of solar energy technologies. Under the direction of editor-in-chief Charles A. Bankston, the series embodies the collective efforts of over 200 of the most knowledgeable authors and editors in the field. The volumes (only 5 of the 12 have been published) have been clearly organized into topics that address fundamentals such as history, solar availability, collection and storage, and economic analysis; others focus on applications. The volumes read neither like texts nor handbooks. Instead they mark important advances and findings; together they allow for a clear assessment of the state of solar technology. Each volume can be used as a component of the series or as a stand-alone resource.

Of the five volumes published, the two that prove most relevant to a design audience are *Solar Building Architecture* edited by Bruce Anderson and *Passive Cooling* edited by Jeffrey Cook. It is appropriate that the editor of *Solar Building Architecture,* the most architecturally oriented volume in the series, also published *The Solar Home Book,* (1976) to which many attribute the start of the solar architecture movement. There Anderson took on the challenge of documenting the gradual integration of solar strategies into design and planning.

Anderson opens *Solar Building Architecture* by chronicling the field's successes and failures as only a veteran can. In "Site, Community, and Urban Planning," the first of six contributed essays, Layne Ridley carefully looks at the integration of solar techniques on the scale of the site and the community. The next three chapters are the technical heart of the volume. "Building Envelopes" by Donald Prowler and Douglas Kelbaugh shows how solar concerns have created a conceptual shift in our understanding of the building enclosure. In "Thermal Energy Storage," Bion D. Howard and Harrison Fraker explain the interactions that need to be considered to utilize solar-charged thermal storage. The converse principle is discussed in "Thermal Energy Distribution," where Gregory Franta outlines the physical forces involved in the release of stored energy. The

*(continued on page 164)*

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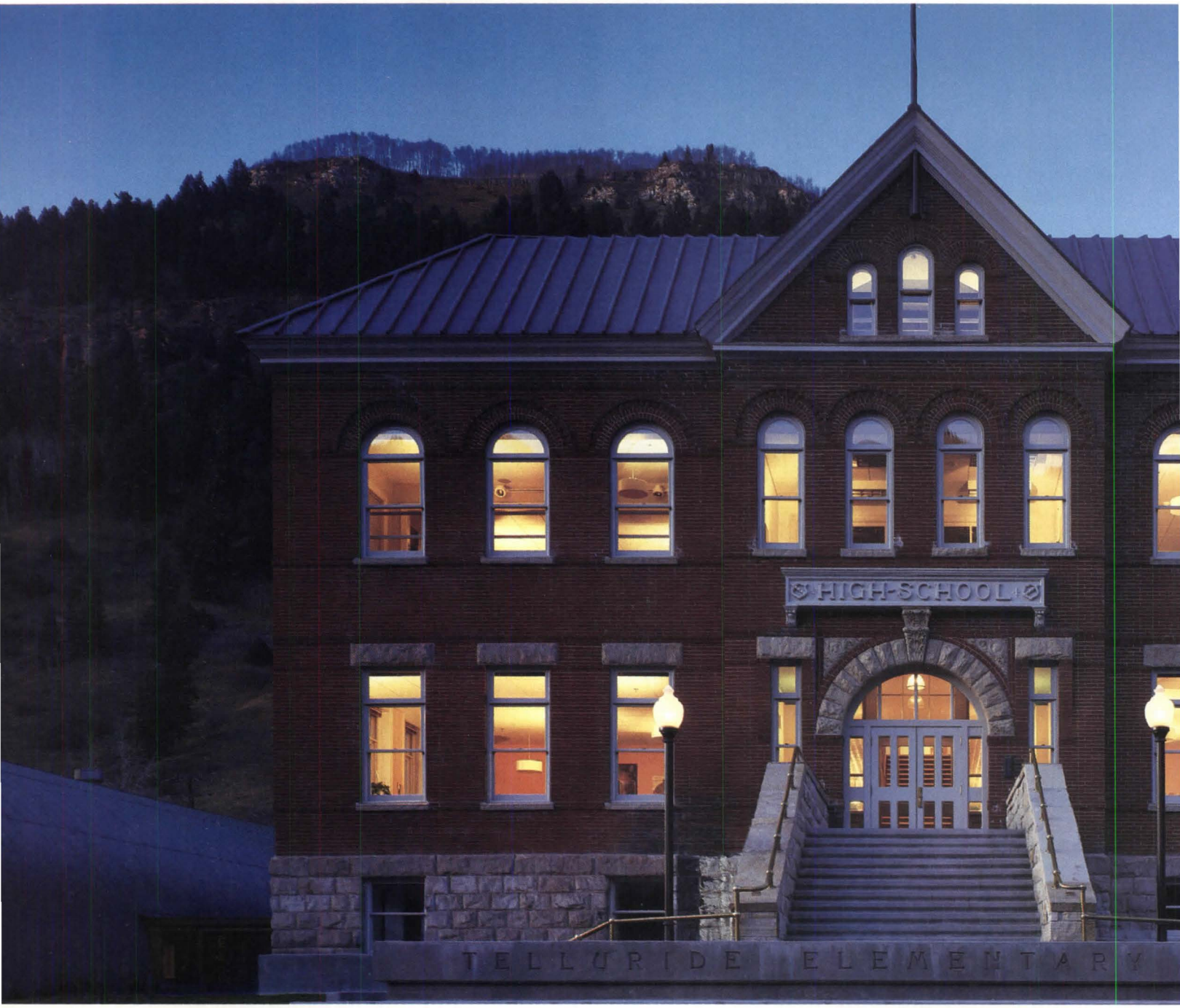

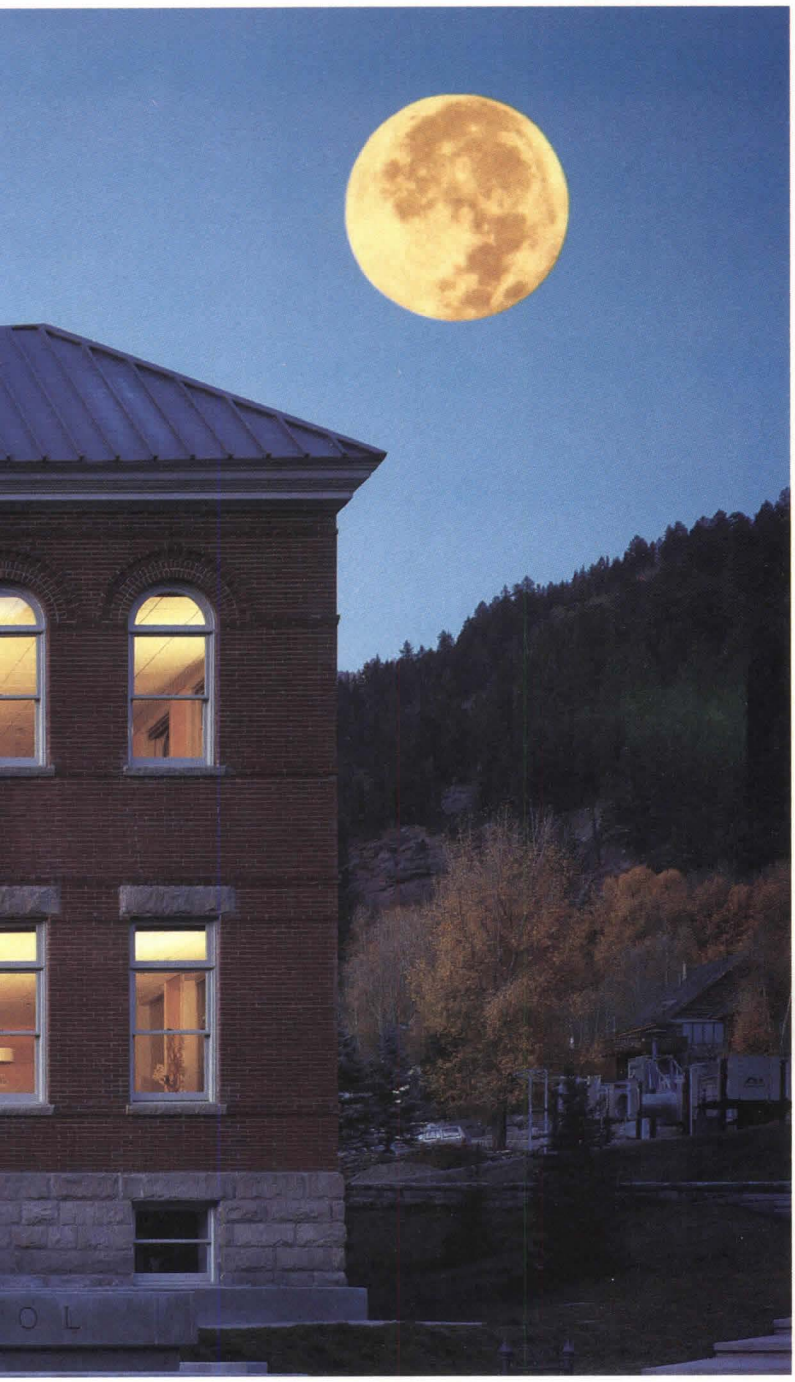

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# Technics Focus: Flooring

This month's Focus extends the indoor environments theme of Technics by exploring health, safety, and well-being performance of floor surfaces and systems.

**Contents**



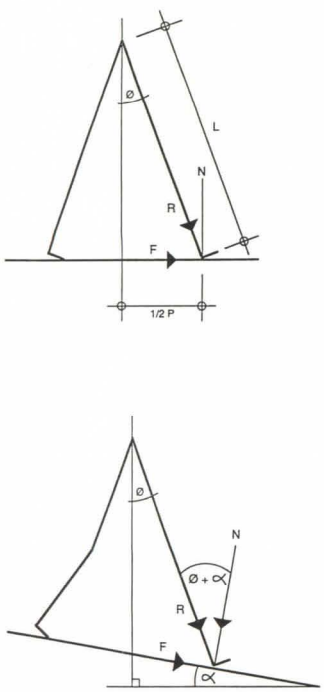
*Charles Sheeler,* American Interior, *1934, Yale University Art Gallery. Gift of Mrs. Paul Moore.*

# Controlled Slip Resistance

Researchers **Dr. Robert Brungrabe**r and **Dr. John Templer**

discuss various issues regarding

the slip resistance of floors.




**1** *Anthropometry diagrams of walking on level and inclined surfaces (from Templer[9]).*

Considering the number of serious accidents, injuries, and lost lives that result from slips and falls each year, the provision of slip-resistant floors is important – perhaps even more important than the provision of fire safety in buildings. For example, in 1989 there were about 5,000 deaths in the U.S. resulting from fires, and 12,000 deaths resulting from falls. If only half of those falls were slips, say 6,000, we see that slip-resistance is as serious as fire prevention. Also 75 percent of the deaths caused by falling were among people 65 and older, so we can anticipate even more injurious slip-induced falls occurring as the population ages.

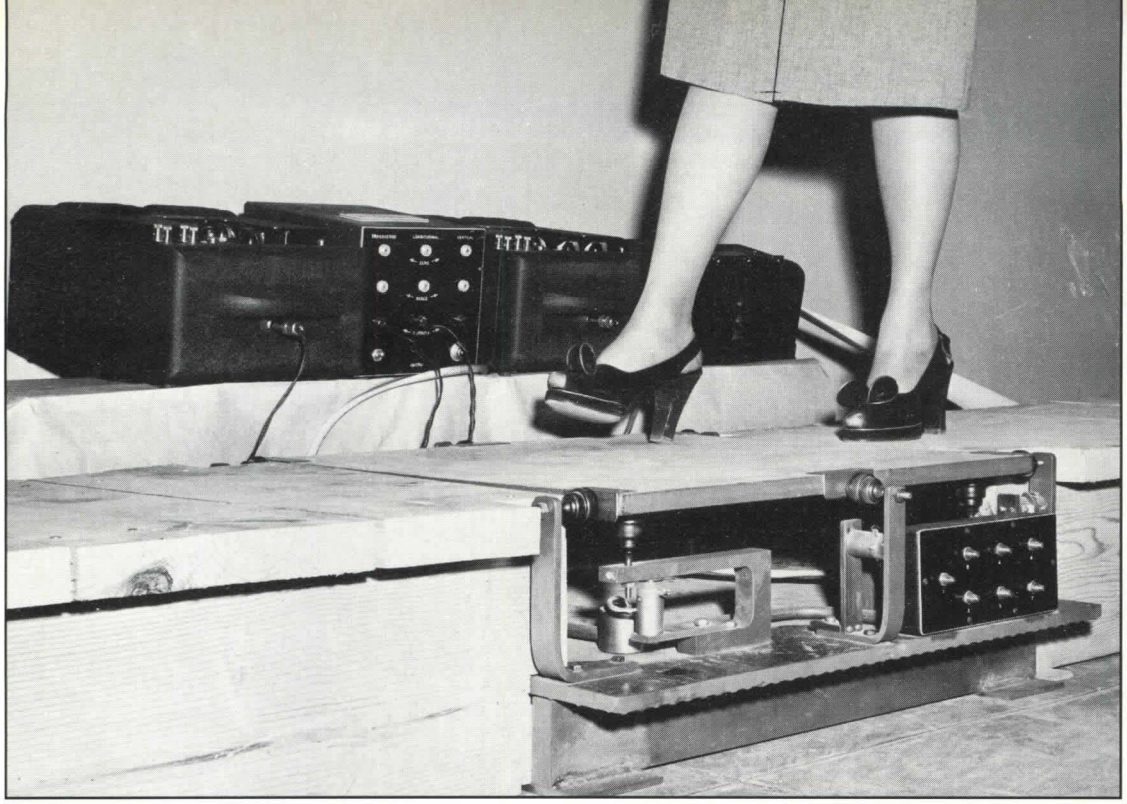
In spite of the similar number of deaths resulting from fires and slips we find that in a typical current model building code, the BOCA Code of 1987[1], there are only three brief references to slip resistance of walkways, stairs, and ramps, totaling less than a page, while there are at least 67 pages of a total of 477 pages devoted directly to fire safety and many more – such as the sections on egress – that are indirectly related to fire safety. Even the three cited references to slip resistance are not very useful, since they merely call for the use of slip-resistant surfaces without defining or specifying criteria for slip-resistance. Thus, any meaningful use of these provisions requires reference to other sources, such as ASTM standards, none of which are referenced in the BOCA Code.

Does the extensive coverage of fire safety by building codes reduce losses and liability claims, and could similar efforts help to reduce slip-induced falls and subsequent claims? The answer to both these questions would seem to be yes, so the next question arises, "Why haven't we addressed the problem?" The answer appears to be threefold: First, slips and falls occur individually; they do not get the press coverage of major fires. Second, the problem is in the province of at least three distinct groups: People slip because of the lack of slip-resistance of the floor, and this is the responsibility of the architect, the builder, the building owner, and the flooring product manufacturer; the lack of slip-resistance of the shoes is the responsibility of the shoe manufacturer and the person who wears them; and the presence of any contaminant – which is usually a question of housekeeping – is the responsibility of the owner or tenant. Further, a slip could be caused by the limited ability or carelessness of the walker.

Third, it may well be that an injudicious treatment of the problem of slip resistance could make it worse, or at least just transfer the responsibility. For example, workman's compensation laws for work-related accidents have limited the liability of the owner to paying premiums to cover the medical expenses of an injured worker. This has led injured workers to seek recovery of damages for pain, suffering, and loss of future income not from their employer – who may have been responsible for the sloppy housekeeping that caused the accident – but rather from a third party such as the supplier or installer of the floor.

### Coefficient of Friction, Static or Dynamic

What are the criteria for slip-resistant floors? The scientific property that controls slip is the coefficient of friction, which is the ratio of lateral or tangential force (tending to cause slips) to the normal or contact force between two surfaces, such as a shoe sole or heel and a walkway surface. There are two types of friction, static and dynamic, and two coefficients of friction, static and dynamic. Assuming a constant normal force, say the weight of a block resting on a surface such as the floor, the static coefficient relates to the tangential force needed to start the block sliding, while the dynamic



2

**2** *The force plate is a device that records the time variation of perpendicular (contact) and tangential forces of the foot on the walkway.*

coefficient relates to the tangential force needed to continue motion once it has started. Since it always takes more force to start motion than to continue it, the static coefficient of friction is always at least as high as and usually higher than the dynamic coefficient. No other formal relation has yet been found between the two, so if both are needed, then both must be measured. Investigators have found that in walking, a person's foot is not moving parallel to the floor except during a slip[2]. Thus, in order to slip, you must first start to slip, that is, overcome the static coefficient of friction. Once a slip has started, it depends on the dynamic coefficient of friction, which is always less than the static and is a function of a person's body geometry (anthropometry). For a slip to be controlled or stopped, there must be a rapid and significant change of the body geometry, which is difficult to accomplish. As a result, slips, once started, can seldom be controlled and usually result in a fall.

### Measurement of Coefficient of Friction

It is important, then, that slips not start, and this is a function of the static coefficient of friction. How should this be measured and how high a value is needed for safety? There are two fundamentally different ways of measuring slip resistance or the static coefficient of friction, with an articulated strut device such as the James Machine(4), the NBS/NIST-Brungraber Tester(5) and the Mark II Sliptester(8), or with a drag-type meter such as the various types of horizontal pull slip-meters (6, 7, and 9).

The articulated strut device consists of a known weight applying a constant vertical force to the top and bottom of a variably inclined strut. The bottom of the strut rests on a sensor of suitable shoe heel or sole material, which in turn rests on the floor. As the angle of inclination of the strut increases, the horizontal component of force at the bottom of the strut increases from zero until it becomes large enough to overcome the friction developed by the vertical force. The angle of inclination at the initiation of slip is then determined and the tangent of this angle is the ratio of the horizontal to the vertical force or the static coefficient of friction.

A drag-type meter consists of a known weight faced with a standard sensor material such as leather, some means of applying a force that will cause slip, and a device for measuring the value for the force at which slip starts. The ratio of the force needed to cause slip to the known weight of the tester purports to be the static coefficient of friction. However, unless care is taken to eliminate acceleration forces and to assure that the tangential force is parallel to the sliding surface, significant error can be introduced. Only one case has been reported where similar results have been obtained with a drag meter and an articulated strut device[3]. In this case, the drag meter was carefully driven and monitored to eliminate all extraneous force. This clearly demonstrates that when carefully measured, static coefficient of friction can adequately gauge the slip-resistance of walkway surfaces.

There is another testing device, however, that is simple, reliable, and that closely duplicates the mechanics of the human body, including the low dwell times that occur between the application of the normal force and the tangential force that tends to cause slip. Accounting for dwell time is most important in time-dependent circumstances, such as on wet surfaces. If the dwell time is very long, adhesion can develop, such as occurs with water between two pieces of glass, and an erroneously high static coefficient of friction will result[4]. Indeed, if one walks by placing the foot and then waiting an instant before applying a lateral force to either

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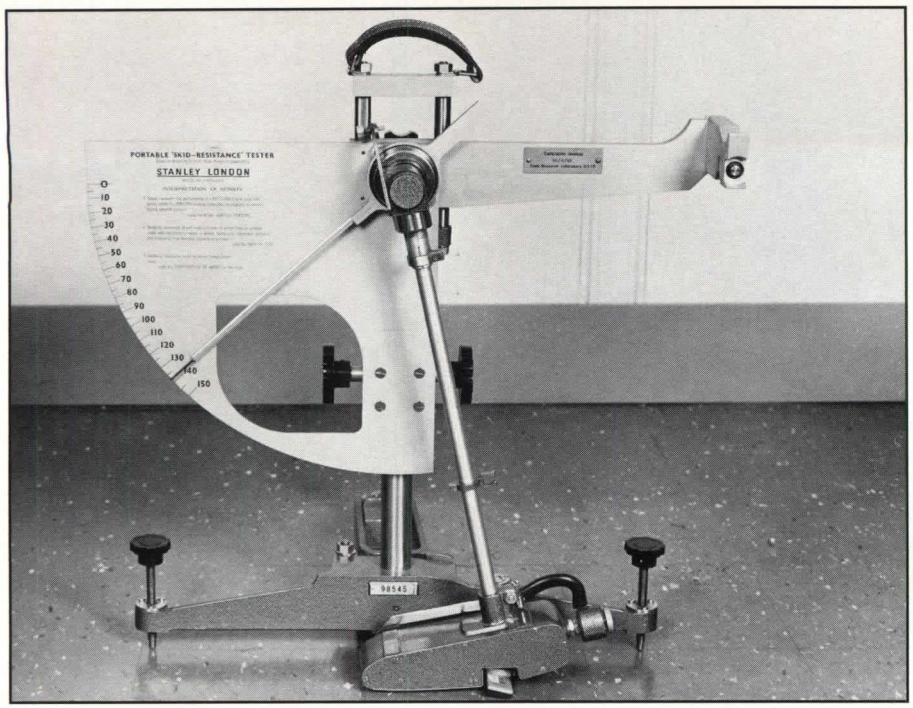
3 "A Comparison of Two Slip Resistance Testers," R. Braun and R.S. Brungraber, in *Walkway Surfaces: Measurements of Slip Resistance*. Carl Anderson and John Senne, eds., STP 649, ASTM, Philadelphia (215) 299-5585, 1987.

4 "Evaluation of some Factors Affecting Measurements of Slip Resistance of Shoe Sole Materials on Floor Surfaces," C. H. Irvine, *Journal of Testing and Evaluation*, 4, 133–138, 1976.

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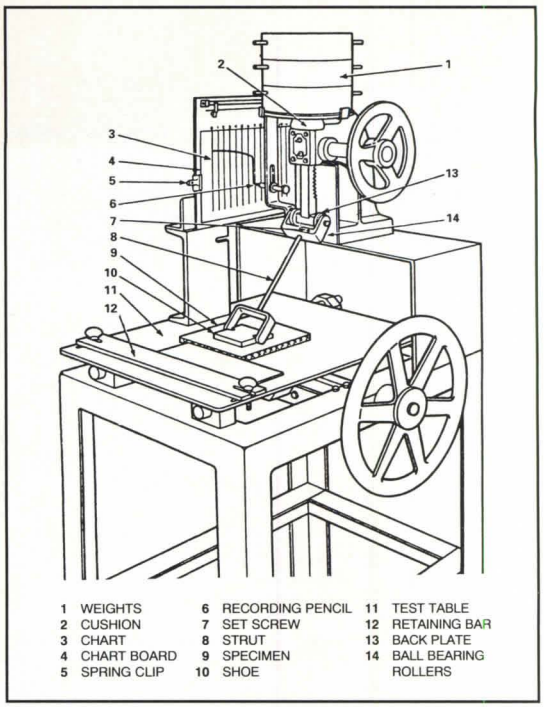


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5 *Guidelines for Stair Safety*, J. Archea, B. Collins., and F. Stahl, NBS Building Science Series 120, #PB 298787, NTIS (703) 487-4650, 1979, $23.00.

6 "Study of Factors Associated with Risk of Work-Related Stairway Falls," J. Templer, J. Archea, and H.H. Cohen, *Journal of Safety Research*, vol. 16, no. 4, Winter 1985, pp. 183–186, National Safety Council, Chicago, (312) 527-4800, ext. 5301.

7 *An Overview of Floor Slip Resistance Research with Annotated Bibliography*, R. J. Brungraber, Structures, Materials and Safety Division, National Bureau of Standards, Washington, #PB 248985, NTIS (703) 487–4650, $23.00.

8 *Injuries Associated with Selected Consumer Products Treated in Hospital Emergency Departments*, National Electronic Injury Surveillance System, U.S. Consumer Product Safety Commission, Washington, 1986.

decelerate or accelerate, wet surfaces such as skating rinks can be safely traversed. Unfortunately this is not how people usually walk, unless they are aware of the water and take appropriate actions. If a true indication of the slip-resistance of a wet surface is to be derived, some effort must be made to apply both the normal force and the tangential force simultaneously. The Mark II Sliptester(8) was developed to do this and it successfully shows that the presence of lubricants and liquids such as water decreases the slip resistance of floors.

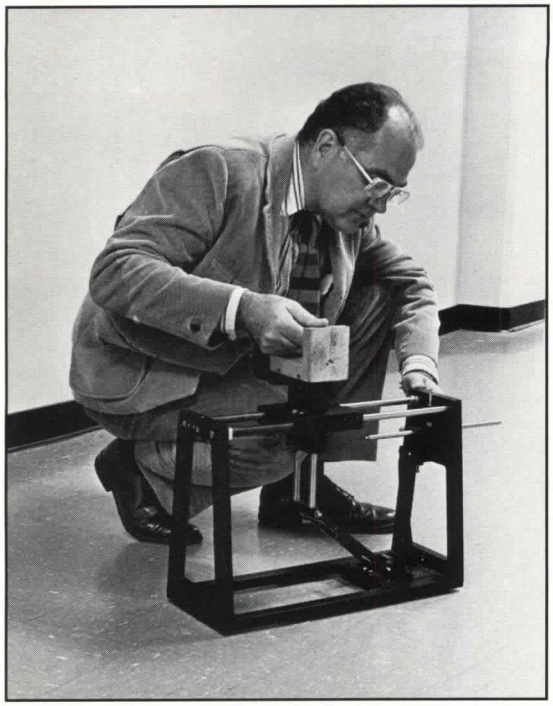
### Recommended Friction Coefficient Values for Building Design

Three ways have been used to establish the value of the friction coefficient needed for safety. The first involves anthropometry, the geometry of the walking body. By analysis of the human frame (1), we can see that the friction needed for walking on a level surface is a function of the stride length of the walker and can be shown to be equal to the tangent of $^1/_2$ the crotch angle of the walker. For ramps, the angle of inclination of the ramp enters the equation, and it can be shown that the necessary friction coefficient becomes the tangent of the sum of $^1/_2$ the crotch angle plus the angle of inclination of the ramp. For equal safety therefore, ramps should be more slip-resistant than a level floor. The second method involves kinesiology, the measurement of forces exerted by a walker's foot on the walkway surface. By the use of a force plate (2), the time variation of normal or contact force and tangential force – that tending to cause slip – can be recorded. At each instant of time, the ratio of these two forces can be calculated, giving the needed coefficient of friction as a function of time. Selection of the largest value over a period of time will again result in the minimum value of the coefficient of friction needed to prevent slipping. The remaining method involves testing floors that have yielded satisfactory service and studying the resulting values. This last method will no doubt include a safety factor, and thus will result in a higher value than the other two. It is believed that Sidney James of Underwriter's Laboratories (UL) used the third method when setting the coefficient of 0.5 for floor polishes that was first adopted by the Federal Trade Commission (FTC) in 1953, and finally by ASTM D 2047 about 1960. So far, except for ASTM F 462 for bathtubs and showers and some military standards for surfaces like gun decks, ASTM D 2047 is the only standard that sets a criterion for performance of a slip-resistant product. ASTM standards for other slip-resistant products, such as shoe sole and heel materials and various flooring materials, have gotten no further than the specification of the methods to be used to measure slip resistance.

Studies by Archea and Templer[5,6] have shown that the anthropometry of stair users is such as to be less demanding of friction than for users of level surfaces. The only critical area of stairs, from a standpoint of slip resistance, has been found to be the nosing, and this only for inadequately designed or carelessly used stairs.

### Setting Standards

Before discussing the status of standards for other slip-resistant products, such as shoe sole and heel materials and various flooring materials, let us consider some of the problems of testing for slip resistance. There are three factors that control slip resistance: the walkway surface, the shoe sole and heel surface, and any contaminant, such as water or oil that may be present between the two. Flooring material and polish suppliers are interested in the walkway, shoe suppliers are interested in soles and



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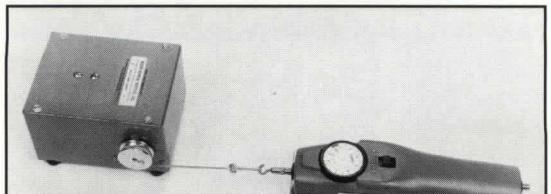

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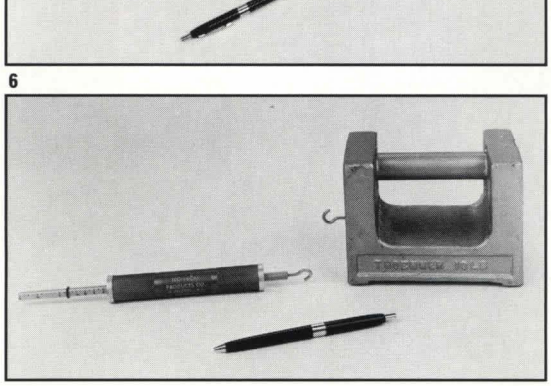

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**3** *One of the various British skid testers used for field measurement.*

**4** *The James Machine is a laboratory device dating from the 1950s by which flooring materials are evaluated for slip resistance. It cannot be used for testing floors in situ.*

**5** *The NBS/NIST–Brungraber tester (Sliptester Mark I) was developed by author Brungraber at the National Bureau of Standards (now National Institute of Standards and Technology) for field evaluation.*

**6** *The Horizontal Pull Slipmeter (HPS) is used in ASTM test F 609 for the evaluation of slipperiness of floor treated with waxes and polishes. It comes with three shoe sole leather plugs that mount in the gauge.*

**7** *Another type of pull meter.*

heels, and floor maintenance personnel should have an interest in the contaminant. However, when developing a test method for any one of the three factors, the other two must also be considered. For example, test methods for walkway surfaces must assume parameters for the shoe sole or heel material and any contaminant. ASTM D 2047 uses a specified standard leather and requires that all tests be performed on a clean dry floor. For the evaluation of shoe sole and heel materials, ASTM F 489 and F 609 make an effort at specifying a standard floor surface and permit tests to be made either wet or dry, even though there is ample evidence that both tests can give erroneous results on wet surfaces, because of adhesion. For the evaluation of ceramic tile floors, ASTM C 1028 specifies a surface of neolite having a hardness in the range 93-96 on the Shore A scale. This method also permits wet or dry tests, even though, here too, tests of wet surfaces have been shown to yield erroneous results, also because of adhesion between surfaces.

When setting the standard of 0.5 that appears in ASTM D 2047, James doubtless used test results made with his device on floors that had given satisfactory service. Later anthropometric and kinesiologic studies[7] have shown that for most people, wearing heels of modest height, and taking normal strides, a minimum value of 0.3 to 0.4 is needed just to prevent slip. Thus the 0.5 value includes a factor of safety of 1.3 to 1.7.

Other groups (in ASTM and elsewhere) attempting to set standards have encountered many problems in addition to that of agreeing on what , if any, measurement devices to use. For example, the shoe industry must consider materials that may be less slip-resistant than the standard leather specified in ASTM D 2047. If they were to use the 0.5 criterion, most of the materials that have been successfully used to provide reasonably wear-resistant surfaces for women's high heels would not pass, unless evaluated against a very slip-resistant walkway such as broom-finished concrete. Yet women have a pretty good record of safely negotiating a large variety of surfaces on high heels, which would lead one to conclude that they take somewhat shorter strides and therefore require somewhat lower values of slip-resistance. The shoe industry, as represented in ASTM Committee F-13, may have to set a series of criteria that depends on the proposed use of the material under consideration.

On the other hand, the ceramic tile industry, as represented on ASTM Committee C-21, must consider that their product is often used in the presence of grease and water – in restaurant kitchens, for example – and that ease and effectiveness of cleaning is essential in such an application. They also have the experience of centuries in the successful use of the product, so that it would seem that drastic changes should not be necessary. They may wish to set one coefficient for when the tile is obviously wet. They may also wish to consider the many highly effective slip-resistant shoes that are currently available and set a standard on the assumption that such shoes will be used by the restaurant personnel.

Another case where the use of 0.5 would be unduly restrictive is for tub and shower surfaces. ASTM Committee F-15.03, in Standard F 462, has specified the use of a very soapy solution when testing such surfaces. The provision of 0.5 would require that for a tub or shower to be classed as slip-resistant, it would need a very gritty surface indeed. The actual criterion specified, 0.04, is sufficiently high that no smooth surface can meet it, while being sufficiently low that it can be met with any currently used bathtub material if adequate production methods are used. This standard does not eliminate all possibility

9 *Views of the Staircase,* in two volumes (vol. I., *Histories and Theories*; vol. II, *Studies of Hazards, Falls and Safer Designs),* J. Templer, scheduled for publication in 1991 by the MIT Press, Cambridge, MA.

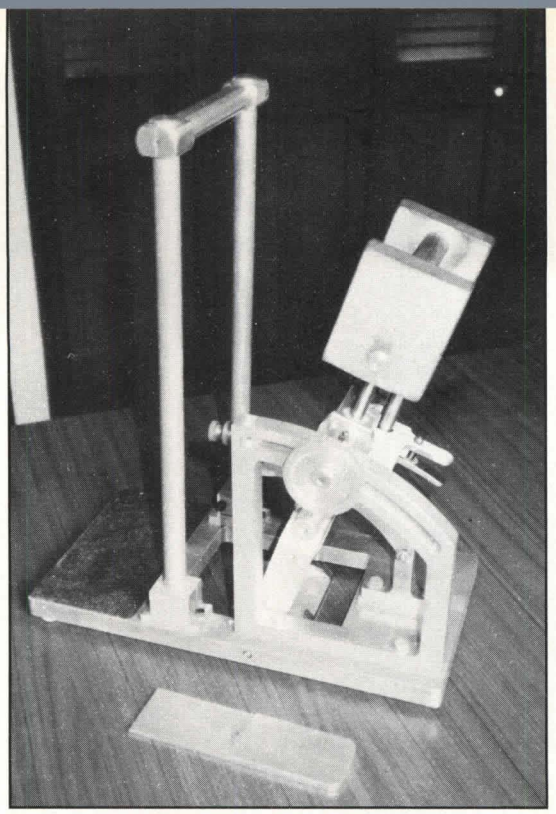
10 ASTM standards, ASTM, Philadelphia (215) 299–5585:

D 2047 *Standard Test Method for Static Coefficient of Polish-Coated Floor Surfaces as Measured by the James Machine.*

F 489 *Standard Test Method for Static Coefficient of Friction of Shoe Sole and Heel Materials as Measured by the James Machine.*

F 609 *Standard Test Method for Static Slip-Resistance of Footwear, Sole, Heel, or Related Materials by Horizontal Pull Slipmeter* (HPS)

F 695 *Standard Practice for Evaluation of Test Data Obtained by using the Horizontal Pull Slipmeter (HPS) or the James Machine for Measurement of Static Slip Resistance of Footwear Sole, Heel, or Related Materials.*



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**8** *The Sliptester Mark II is a refined version of the NBS/NIST–Brungraber tester (5).*

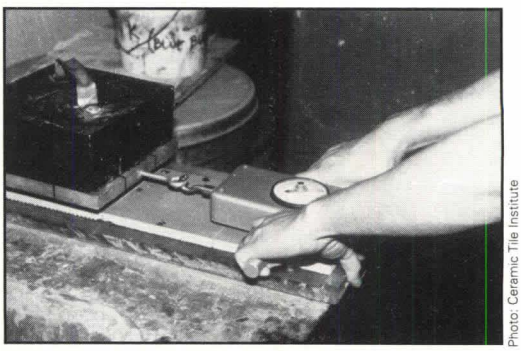

Photo: Ceramic Tile Institute

9

**9** *The Horizontal Dynameter Pull Meter is specified by ASTM C 1028 for measuring the friction coefficient of ceramic tile floors.*

of slips in bathrooms, but the reduction of accidents since the introduction of this standard, as demonstrated by NEISS data[8], has been significant. From the above we see that, while 0.5 is a good general criterion for shoes and walkway surfaces, its universal application would unduly restrict suppliers and users of other products.

Finally, if architectural standards were set for slip resistance, how could the designer or builder be certain that they would be met? It would be convenient to have a list of all possible walkway surface products, giving their slip-resistance with respect to various shoe sole or heel materials and under various conditions of contamination. Currently no such list is available for the United States; however, industry could quickly provide the material for such a list. For example, wax and polish manufacturers clearly indicate on product labels and in promotional literature if their product meets the UL or ASTM D 2047 standard of 0.5.

### Conclusions

For the building designer and the industry generally, meaningful model code provisions do not yet exist. They should indicate not only the minimum coefficient of friction required for dry floor surfaces, but also a minimum for surfaces that are likely to get wet or contaminated by some other lubricant. The code provisions should also treat the minimum required for sloping floors or ramps. At this time, necessary data are not available from independent sources, even for the most common flooring materials in use, so the inadequacies of the model building codes and fire codes are understandable. But why, despite the urging of various federal agencies over the past three decades, has the research to establish this data has not been undertaken? And why has the footwear industry not yet set reasonable standards of slip resistance? If liability concerns have hampered the standard-setting efforts of the flooring material and shoe industries, then they should take a lead role in informing the public that no standards can eliminate all slips, just as all of the model code efforts have not eliminated all deaths and injuries from fires.

**Robert Brungraber and John Templer.** ■

*Dr. Robert Brungraber is a professor of civil engineering at Bucknell University. He spent 1974–1976 at the National Bureau of Standards, where he developed the NBS/NIST-Brungraber tester while researching the slip-resistance of walkway surfaces.*

*Dr. John Templer is Regents Professor of Architecture at the Georgia Tech College of Architecture, where he has been researching building safety and accessibility issues. He was a juror for the 1987 P/A Awards Program.*

F 802 *Standard Guide for Selection of Certain Walkway Surfaces when Considering Footwear Traction.*

F 462 *Standard Consumer Safety Specifications for Slip-Resistant Bathing Facilities.*

C 1028 *Standard Test Method for Evaluating the Static Coefficient of Friction of Ceramic Tile and Other Like Substances by the Horizontal Dynamometer Pull Meter Method.*

D 4103 *Standard Practice for Preparation of Substrate Surfaces for Coefficient of Friction Testing.*

D 2394 *Standard Methods for Simulated Service Testing of Wood and Wood Base Finish Flooring.*

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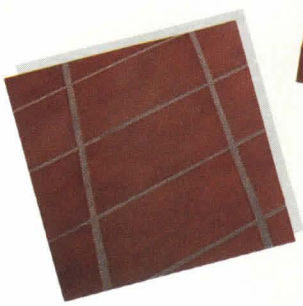

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# Sound Isolation in Floors

Acoustical consultants **Timothy J. Foulkes** and **Gregory C. Tocci**

describe ways to design floors

for maximum acoustical privacy.

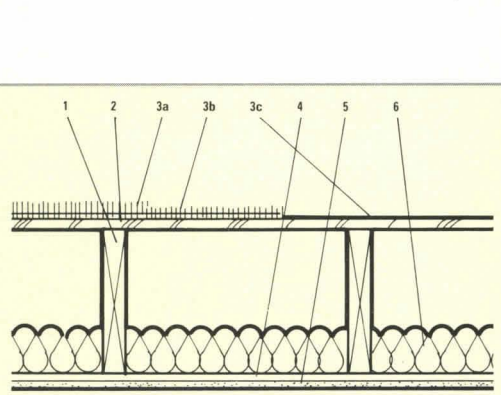
**A**coustic isolation provided by floor systems is one of the most difficult areas of architectural acoustics. Two types of sound are transmitted through floor/ceiling constructions, *airborne sound*, such as that produced by voices and televisions, and *impact sound*, produced by footsteps and other impacts that transmit to the ceiling below and radiate as sound. The ability of a floor assembly to resist the transmission of sound is called the sound transmission loss and is quantified in using the *sound transmission class* rating (STC). The STC rating should be familiar to most architects; it applies to both walls and floor/ceiling constructions.

The STC rating is measured in a laboratory equipped with a pair of rooms separated by a massive wall containing an opening in which the test construction is installed. The sound transmission loss of the partition is related to the arithmetic difference between the sound level in the source room (the room with the speaker) and the receiving room. The STC rating is obtained by fitting a standardized contour to the one-third octave band sound transmission loss data. The sound transmission loss method and the use of the standardized contour are described in the ASTM standards E 90 and E 413.

The ability of a floor/ceiling construction to resist the transmission of impact sound to spaces below is quantified in the *impact isolation class* rating, abbreviated IIC (the ASTM designation is impact *insulation* class). The particulars of sound isolation appear to be fraught with anomalies. For example, while thick concrete does wonders for the STC rating, the same concrete with a wood or ceramic tile finish is practically transparent to the transmission of footfall and other direct impacts. Direct floor impacts in residential dwellings include a wide variety of sounds besides footfall, such as chair sliding, dropping of household items, and vacuum cleaner operation.

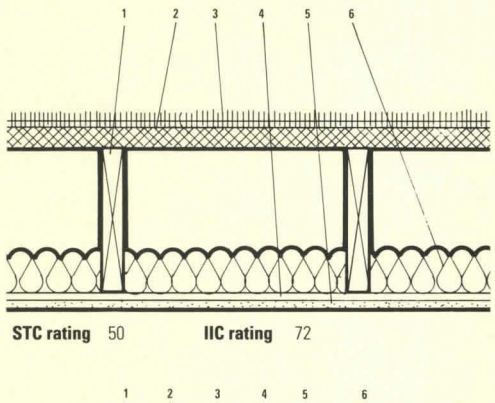
### Testing for Sound

To test the IIC rating of a floor assembly, a standard tapping machine is placed on the floor being tested, either in a laboratory setting or *in situ*. The resulting sound level is measured in spaces below. Obviously, the lower the impact sound levels below, the better the impact sound isolation performance. The IIC rating involves fitting a standardized contour to the measured impact sound level data obtained by using the tapping machine. The higher the IIC rating, the better the impact sound isolation performance of the floor assembly. A 10-point




**STC rating** 47 **IIC ratings 3a** 67; **3b** 55; **3c** 45

**1** 2x10 joists, 16" o.c.
**2** 5/8" plywood glued to joists and nailed with 8d nails 12"o.c.
**3a** 65 oz. carpet on 30 oz. foam rubber pad
**3b** 50 oz. carpet on 24 oz. hair pad
**3c** No floor covering
**4** Resilient channels, 24" o.c.
**5** 1/2" type X gypsum board screwed 12" o.c.
**6** 3" thick sound attenuation blanket



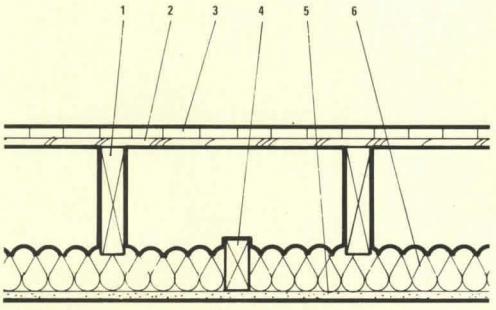

**STC rating** 50 **IIC rating** 72

**1** 2x10 joists, 16" o.c.
**2** 11/32" tongue and groove wood-fiber board
**3** 40 oz. wool carpet on 80 oz. sponge rubber pad
**4** Resilient channels, 24" o.c.
**5** 1/2" gypsum board screwed 12" o.c.
**6** 3" thick sound attenuation blanket




**STC rating** 53 **IIC rating** 80

**1** 2x8 joists, 16" o.c.
**2** 1 1/8" tongue and groove plywood glued to joists and nailed 6"o.c. at edges and 16"o.c. in field
**3** 44 oz. wool carpet on 40 oz. hair pad
**4** 2x4 ceiling joists, 16" o.c. and staggered between floor joists
**5** 5/8" gypsum board nailed to 2x4 joists
**6** 3" thick sound attenuation blanket




**STC rating** 54 **IIC ratings** 45

**1** 2x8 joists, 16" o.c.
**2** 1/2" plywood nailed with 8d nails 6"o.c. at edges and 16"o.c. in field
**3** 25/32" wood strip flooring nailed to subfloor
**4** 2x4 ceiling joists, 16" o.c. and staggered between floor joists
**5** 5/8" gypsum board nailed to 2x4 joists
**6** 3" thick sound attenuation blanket

**"While thick concrete does wonders for the STC rating, the same concrete with a wood or ceramic tile finish is practically transparent to the transmission of footfall and other direct impacts."**

improvement in STC will reduce transmitted sound from airborne sources by 10 decibels. A 10-point improvement in IIC will reduce transmitted sounds from footsteps by 10 decibels. In subjective terms, a sound reduced by 10 dB is usually perceived as being half as loud. The impact sound measurement, the IIC contour fitting, and standardized tapping machine are described in ASTM publications E 492 and E 989.

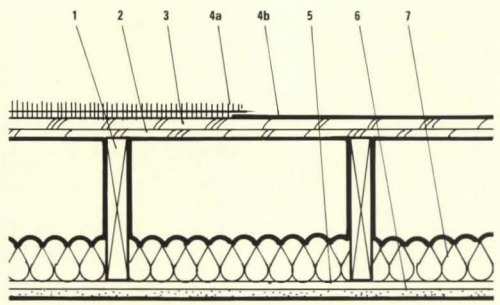
### Achieving Acoustical Privacy

People moving into multi-family dwellings are often surprised to hear footsteps from their neighbors above, especially if they have paid a premium for the rental or condominium. This cost premium is often thought to be, in part, for the purchase of the acoustical privacy they may have enjoyed in their former single-family dwelling. People mistakenly assume that a 4" to 6" concrete floor will provide all the sound isolation they need. Heavy, thick concrete is highly effective in reducing airborne sound. However, unless footstep sounds are "cushioned" by a soft floor covering such as carpet, direct impacts on hard floor finishes like wood or ceramic tile are readily transmitted to spaces below. The thickness of the concrete floor seems to matter little. Once the sound energy is directly imparted to the concrete, it is conducted though with great efficiency. Impacts on hard floors are heard not only in the space directly below, but can be audible several rooms away. The sound often gives the impression of being directly overhead even when the source is offset 30 feet horizontally.

Building codes usually establish limits of 45 to 50 for both the STC and IIC ratings in multifamily dwellings. Depending on the level of occupant expectation, acoustical consultants often recommend STC ratings as high as 55 to 60 and IIC ratings over 65. Such high ratings can pose a significant challenge to the architect.

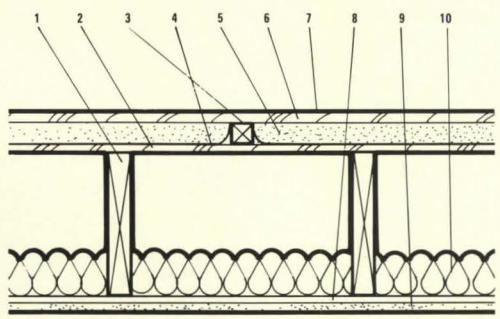
As a guideline, most hollow-core concrete floor constructions provide an STC rating ranging from 45 to 50. STC ratings for concrete floors with suspended gypsum wallboard ceilings below range from 50 to 60. With special sound isolation techniques, STC ratings above 60 can be achieved in conventional multi-family buildings with concrete floors.

IIC ratings for different floor assemblies depend much more on floor finish than on actual construction. With hardwood floors or non-resilient tiles, IIC ratings can range from 35 to 45, largely below mini-



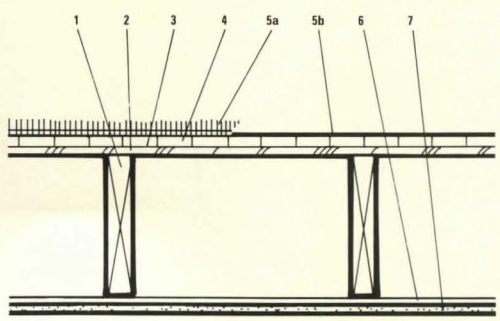

**STC rating** 47 **IIC ratings 3a** 59; **3b** 44

**1** 2x10 joists, 16" o.c.
**2** 1/2" plywood nailed with 6d nails 6"o.c. at edges and 10"o.c. in field
**3** 5/8" plywood stapled 3"o.c. at edges and 6"o.c. in field
**4a** 44 oz. carpet on 40 oz. hair pad
**4b** 1/16" vinyl asbestos tile
**5** Resilient channels, 16"o.c.
**6** 1/2" type X gypsum board screwed 12"o.c.
**7** 3" thick sound attenuation blanket



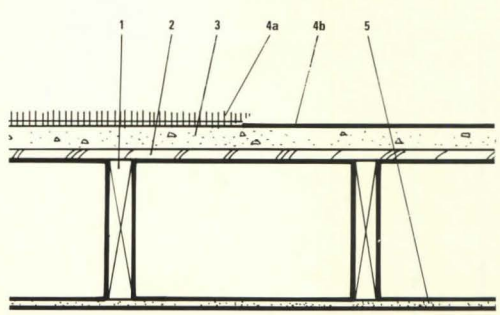

**STC rating** 59 **IIC rating** 56

**1** 2x10 joists, 16" o.c.
**2** 1/2" plywood glued continuously and nailed 12"o.c.
**3** 2x2 sleepers between joists, 16"o.c., glued continuously and lightly nailed
**4** 4 mil. plastic over subfloor and sleepers
**5** 1 1/2" sand
**6** 5/8" tongue and groove plywood stapled 12"o.c.
**7** .07" vinyl asbestos tile
**8** Resilient channels, 24"o.c.
**9** 5/8" gypsum board screwed 12"o.c.
**10** 3" thick sound attenuation blanket




**STC rating** 45 **IIC ratings 5a** 67; **5b** 39

**1** 2x10 joists, 16" o.c.
**2** 1/2" plywood nailed with 6d nails and 6"o.c. at edges and 10"o.c. in field
**3** Building paper
**4** 25/32" hardwood flooring
**5a** 44 oz. carpet on 40 oz. hair pad
**5b** No floor covering
**6** Resilient channels, 24"o.c.
**7** 1/2" type X gypsum board screwed 12"o.c.




**STC rating** 49 **IIC ratings 4a** 62; **4b** 33

**1** 2x10 joists, 16" o.c.
**2** 1/8" plywood subfloor nailed with 8d nails 6"o.c. at edges and 10"o.c. in field
**3** 1 1/2" thick lightweight concrete over 15 lb. asphalt felt
**4a** 20 oz. carpet on 40 oz. hair pad
**4b** 1/16" vinyl asbestos tile
**5** 5/8" type X gypsum board nailed with 6d nails 7"o.c.

*Tapping machines (8"x8"x22") used in testing floor assemblies for impact isolation are generally considered to provide a good simulation of the noise made by walking in high heels, but not necessarily of that made by heavy-footed plodding or jumping about.*

Photo: Brüel & Kjaer

mum code requirements. With carpeting over concrete, IIC ratings increase to 65 or higher, well over minimum building code requirements.

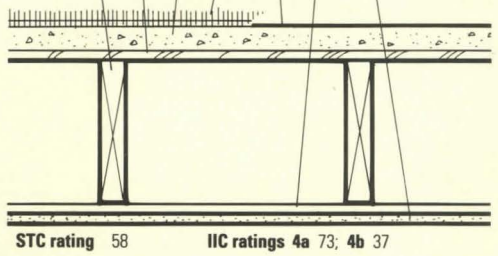
There are a number of tile and floor system products on the market that provide a hard finish while also providing some vibration isolation treatment to reduce footfall sounds. These systems fall into two major categories – floating floors, which provide a 15-point IIC increase, and resilient underlayments, which provide a 5–10 point IIC increase.

A floating floor system provides the best possible control for both airborne sound and impact sound. A true floating floor system consists of a 3"–4" concrete slab supported at least 1" above the structural slab on isolators. Isolators and accessories are provided as a system by a vibration isolation vendor (Mason Industries of Hauppauge, NY and Peabody Kinectics of Dublin, Ohio). In addition to the added cost, a floating floor adds 4"–6" to the floor thickness. These systems are used in the most critical applications, such as in recording or television studios, or noisy mechanical rooms above luxury housing.

Resilient underlayments provide some of the isolation capability of floating floors in a thinner, less expensive installation. The underlayment is continuous below the finish floor, as opposed to point supports in a floating floor. These products were developed to help control footstep sounds in multi-family buildings, especially where ceramic tile or wood is used on hollow core plank with no ceiling below. Resilient underlayments typically add 1"–2" to the floor thickness. If the architect knows where hard floor finishes will be used during design, the slab can be depressed to allow for the extra thickness. Usually the finishes are not determined until the structure is complete, so resilient underlayment is specified for the entire floor including carpet areas.

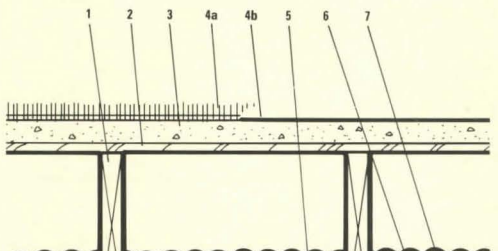
**Minimum Sound Isolation Guidelines:**

- Resiliently suspended (from neoprene isolation hangers) gypsum wallboard ceilings in residential units are frequently needed beneath all types of floor constructions. Install glass fiber batt in all ceiling cavities.
- Stack like areas in a building: Avoid situating a bathroom above a living room, for example.
- Provide a generous (deep) ceiling cavity under kitchens, baths, laundries, foyers, and other areas where hard floors will be installed. Generally, the deeper the cavity, the better the sound isolation.
- Require test data from product manufacturers



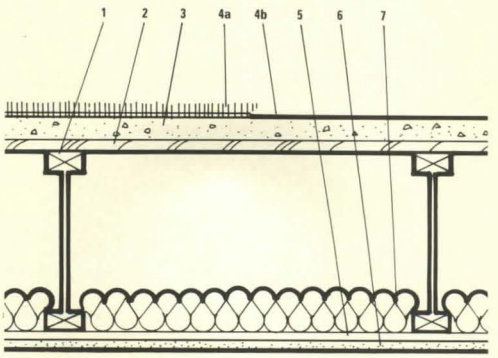

**STC rating** 58 **IIC ratings 4a** 73; **4b** 37

**1** 2x10 joists, 16" o.c.
**2** 5/8" plywood subfloor nailed with 8d nails 6"o.c. at edges and 10"o.c. in field
**3** 1 1/2" thick lightweight concrete over 15 lb. asphalt felt
**4a** 20 oz. carpet on 40 oz. hair pad
**4b** 1/16" vinyl-asbestos tile
**5** Resilient channels, 24"o.c.
**6** 5/8" type X gypsum board screwed 12"o.c.



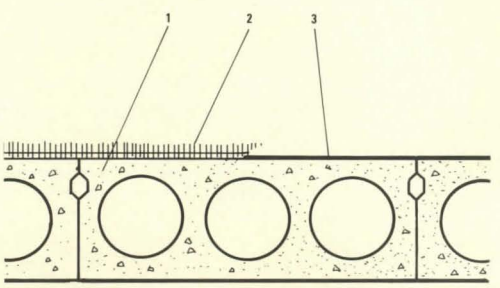

**STC rating** 60 **IIC ratings 4a** 73; **4b** 47

**1** 2x10 joists, 16" o.c.
**2** 5/8" plywood subfloor nailed with 8d nails 6"o.c. at edges and 10"o.c. in field
**3** 1 1/2" thick lightweight concrete over 15 lb. asphalt felt
**4a** 20 oz. carpet on 40 oz. hair pad
**4b** 1/16" vinyl-asbestos tile
**5** Resilient channels, 24"o.c.
**6** 1/2" type X gypsum board screwed 12"o.c.
**7** 3 1/2" thick sound attenuation blanket




**STC rating** 58 **IIC ratings 4a** 77; **4b** 50

**1** Plywood web I-beams 12" deep and 24" o.c.
**2** 3/4" plywood subfloor nailed with 6d nails 6"o.c. at edges and 10"o.c. in field
**3** 1 1/2" lightweight concrete, 15 psf
**4a** 44 oz. carpet on 40 oz. hair pad
**4b** .07" vinyl tile
**5** Resilient channels, 24"o.c.
**6** 5/8" gypsum board screwed 12"o.c.
**7** 3" thick sound attenuation blanket




**STC rating** 50 **IIC ratings 2a** 74; **2b** 28

**1** 8" thick hollow-core concrete panels, 57 psf
**2a** 66 oz. carpet on 50 oz. hair pad
**2b** No floor covering

**"Impacts on hard floors are heard not only in the space directly below, but can be audible several rooms away."**

for the specific floor assembly being considered in your project. Claims of high IIC rating performances for floor products are sometimes bolstered by floor/ceiling construction features that you can not use in your project.

• Be especially careful with wood frame construction, which can sound "boomy" under heavy footsteps. At a minimum, use resilient channels to support the ceiling, and insulate the joist cavity. For best results, use lightweight concrete over the subfloor.

### Using Ambient Noise as a Buffer

Acoustical consultants often find that complaints of insufficient sound isolation are partly the result of low background sound levels in multi-family buildings. Often, fin-tube units are used to heat buildings at a cost premium to provide the quietest possible environment. Unfortunately, ambient sound levels that are too low allow sound produced in adjacent units to be clearly heard. Hence, background sound can play an important role in covering or masking unwanted sound. Such masking can easily be provided by a properly designed air system that cycles coil temperature and allows fans to operate nearly constantly in dwelling units.

**Timothy J. Foulkes** and **Gregory C. Tocci** ■

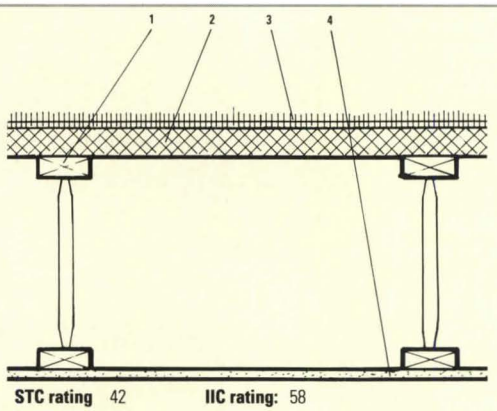
*Timothy Foulkes is a principal consultant and Gregory Tocci is a partner of Cavanaugh Tocci Associates, Inc., Sudbury, Massachusetts, a member firm of the NCAC, of which Tocci is a former president.*

### References and Recommended Reading

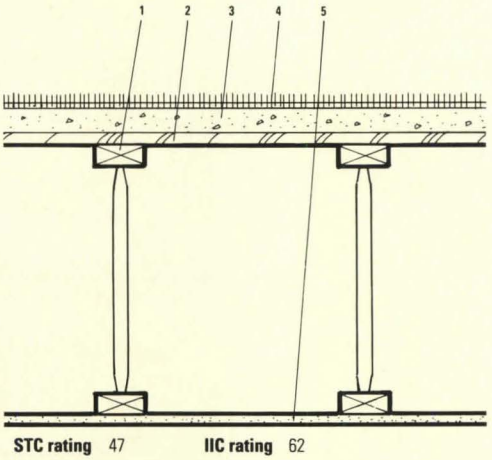
ASTM E 90, *Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions;* ASTM E 413, *Classification for Rating Sound Insulation*; ASTM E 492, *Standard Method for Laboratory Measurement of Sound Transmission Through Floor-Ceiling Assemblies using the Tapping Machine;* ASTM E 989, *Standard Classification for Determination of Impact Insulation Class (IIC);* ASTM, Philadelphia (215) 299–5585.

*Architectural Acoustics,* M.D. Egan, McGraw-Hill, (800)–2–MCGRAW, 1988, 411 pp.

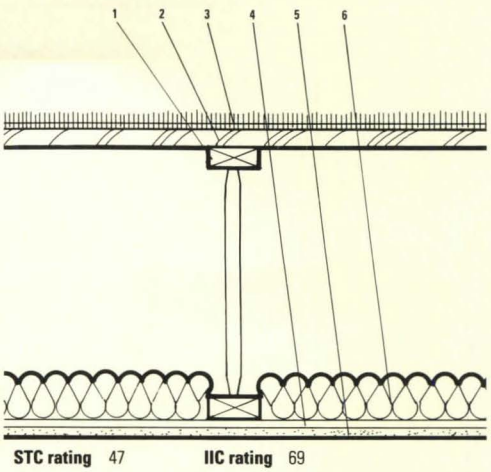
*Research Project on the Noise Isolation Provided by Floor/Ceiling Assemblies in Wood Construction,* MJM Acoustical Consultants; *Sound Performance of Wood/Floor Ceiling Assemblies*, MJM Acoustical Consultants; Canada Mortgage and Housing Corporation, Ottawa, (613) 748–2367.




1 14" deep type A open web joists 24 o.c.
2 1 3/4" wood-fiber board nailed to joists
3 44 oz. carpet on 40 oz. hair pad
4 1/2" gypsum board nailed to joists




1 18"deep open-web joists, 16"o.c.
2 5/8" plywood nailed to joists
3 1 5/8" lightweight concrete
4 44 oz. carpet on 40 oz. hair pad
5 5/8" gypsum board




1 18"deep open-web joists, 32"o.c.
2 1 1/8" tongue and groove plywood nailed to joists
3 44 oz. carpet on 40 oz. hair pad
4 Resilient channels, 24"o.c.
5 5/8" gypsum board screwed 12"o.c.
6 3" thick sound attenuation blanket

*The STC and IIC rated floor assemblies depicted here were redrawn from a larger selection compiled in the* **Catalog of STC and IIC Ratings for Wall and Floor/Ceiling Assemblies**, *R.B. Dupree, Office of Noise Control, California Department of Health Services, Berkeley, (415) 540–2604, 1981, 162 pp.*

Drawings: Gerald Fitzpatrick

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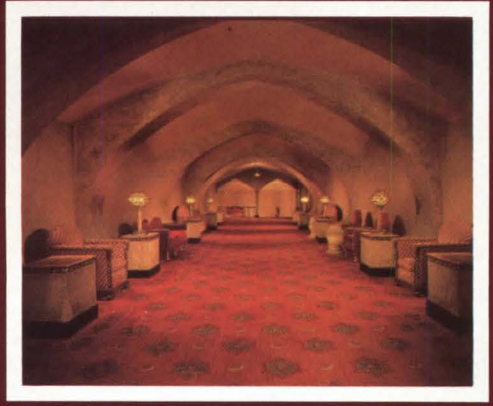

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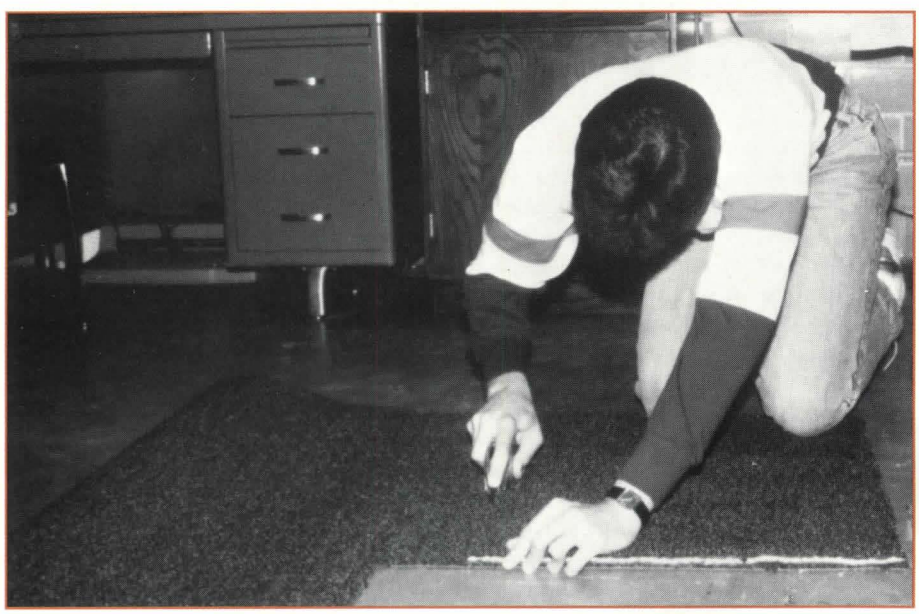
# Carpet Policy Dialogue

Environmental researcher **Dr. Charlene Bayer** reports on the EPA Carpet Policy Group's investigation into carpet industry standards for volatile organic compound emissions.



On January 11, 1990, the National Federation of Federal Employees (NFFE), Local 2050, petitioned the U.S. Environmental Protection Agency under Section 21 of the Toxic Substances Control Act (TSCA) to initiate rulemaking proceedings to reduce emissions from new carpet. The petition focused on chemicals being emitted by new carpeting, particularly on the volatile organic compound 4-phenylcyclohexene (4PC).



*A student cuts carpet samples for testing in an environmental chamber. The samples are sized to represent the proportion of carpeting in a standard room.*

This compound is an inadvertent by-product produced from the manufacture of styrenebutadiene latex used in carpet manufacturing. NFFE claimed that multiple chemical sensitivity and acute irritancy response resulted from exposure to 4PC emitted from the styrenebutadiene latex in "bad" carpets. NFFE supported this contention by citing the complaints and illnesses of federal office workers following the carpet installation in 1987–1988 at the U.S. EPA headquarters building in Washington, D.C. The EPA denied the petition, stating that there was insufficient data supporting the NFFE's conclusions and remedies, but recognized its concerns, and has undertaken three major initiatives:

1. The carpeting industry was formally requested to "undertake a voluntary program to conduct periodic total volatile organic compound (VOC) analyses on a company-by-company and product-by-product basis to provide the interested public with comparative information on total VOC emissions."

2. An invitation was issued to "all interested parties to participate in a one-year dialogue process designed to work out the details of the voluntary testing program and to explore and, where possible, reach agreement on a variety of issues including: the sampling and analytical methods for voluntary testing, any additional information needed, and cost-effective process changes to reduce emissions."

3. The EPA would continue "its risk management activities and research to identify possible health effects associated with complex air mixtures emitted by carpets and low-level volatile organic compound (VOC) exposures."

### Carpet Study Group Formed

The Carpet Policy Dialogue Group was formed to accomplish these three initiatives and met for the first time in August, 1990. Interested members of the public were invited to participate in the dialogue process. Participants include NFFE representatives, the carpeting products industry, consumer/public interest groups, Federal agencies representatives, indoor air and product emissions researchers, and a representative of the chemically sensitive population. The dialogue process is being facilitated by CDR Associates. The dialogue process goal, which was outlined in the Federal Register, is "to characterize emissions and identify low-impact, feasible VOC controls that could be implemented in the near term, not to further characterize the health effects of chemicals emitted from carpeting."

Photos: Georgia Tech

*Adjustments are made on one of the EPA's small scale environmental testing chambers. The EPA chambers are the models for ASTM standards that are currently being written.*

The dialogue participants are currently laboring to meet the charges outlined to them in the Federal Register notice. The charges are:

1. To "develop standard methodologies for testing carpet emissions and obtain commitments to test carpeting." The EPA requested that the carpet industry voluntarily "commence appropriate periodic testing . . . to quantify the total emissions of VOCs from their products to provide the interested public with comparative information on total VOC emissions from new carpets."

2. To "identify information needs for assessment of emission control feasibility, including data on carpet manufacture and installation technology and commercial activities associated with carpet installation!"

3. To "evaluate potential controls for reducing emissions, including product and/or emission standards, and labeling of carpet for VOC emissions."

4. To "identify VOC exposures which are associated with carpet installation but not necessarily from a carpet source (adhesives, floor preparation, etc.) and recommend any appropriate actions to reduce them."

### Testing Methods Considered

The Carpet Policy Dialogue participants must reach an acceptable voluntary agreement within a reasonable time (to be determined by the EPA Office of Toxic Substances) or a test rule under section 4 of TSCA will be proposed by the EPA which will compel emissions testing by the carpet and associated products industry. The Carpet Policy Dialogue participants are considering an environmental chamber methodology for a standard procedure for testing carpet emissions. Environmental chamber methodologies have been extensively used by researchers from the EPA and other academic, industrial, and governmental centers in the United States, Europe, and Scandinavia.

The American Society for Testing and Materials (ASTM) has adopted a guideline for small chamber testing. EPA researchers have been encouraging emissions testing by various industries, not only the carpet industry, using consensus, verified methods. The Carpet Policy Dialogue participants have been collecting research and manufacturing data on carpets and associated products in order to understand potential VOC emissions and the production processes. Data were presented at the Toronto Indoor Air 90 Meeting showing that the initial total VOC emissions from carpet, as is true of several other types of furnishing products, are significantly reduced within the first week following installation.

By understanding the available data, needs can be identified and goals can be established for reduction of emissions from the furnishing products. An objective of the EPA's indoor air pollution research program is to gain information that will reduce human exposure to indoor air pollutants that are known to cause health risks. Before pollution can be prevented, it is necessary to understand it, be able to identify it, and then adopt processes to reduce it. Through the Carpet Policy Dialogue Process the EPA is attempting to take a step in the direction of pollution prevention. **Charlene W. Bayer, PhD.** ■

*The author is a principal research scientist and head of the Environmental Monitoring and Research branch at the Georgia Tech Research Institute. She is a plenary committee member of the Carpet Policy Dialogue Group and researches product emissions.*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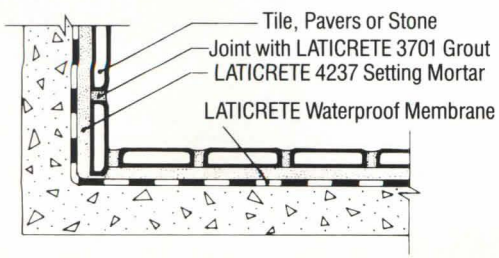


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# Architects, Carpet, and the Carpet Industry

Consultant **Karen Randal** discusses how architects influence the choices offered by the carpet industry through product specification.



**"New carpeting and the adhesives used to glue carpet to the floor are at the root of complaints about indoor air quality and odor."**

**Questions to Ask Your Carpet Manufacturer's Representative**

*Are any components of the of the product or installation method responsible for long term off-gassing?*

*What chemicals are used to install your product?*

*Can you provide an antimicrobial agent as an integral part of your product?*

*What materials do you recommend to maintain the product?*

*What chemicals are required to remove or repair your project in case of repair or renovation?*

*Do you provide written life safety test results?*

*Do you provide written toxicity test results?*

*Do you have any recommended program for recycling your product?*

Look down. Odds are that if you are at work or at home you are standing on carpet. And the odds are too that depending on the specific carpet, it could be a contributing pollutant to indoor air quality, thus having an ultimate effect on your health.

Specified properly, carpet for commercial or residential applications has virtues that range from comfort underfoot to sound absorption to energy savings to psychological well-being. Most important, it has given designers a myriad of alternatives for making the floor plane an integral part of the overall design statement.

Over the past 20 years, the choices in carpet have broadened enormously. In the early 1970s, wool was the fiber of choice and woven the preferred construction. Selecting carpet simply meant making decisions involving color, texture, schedule, and the reliability of the manufacturer. When the price of wool skyrocketed, fiber and carpet manufacturers rushed to develop alternatives using acrylic and nylon in both woven and tufted constructions. Synthetic backing was offered as an alternative to the increasingly costly jute backing materials and to help cut back on mold and mildew problems associated with jute. Carpet tiles appeared on the market, assuring us flexibility in design, enhancing maintenance through rotation and ease of replacement, and addressing the growing problem of wire management. By the end of the decade, options exploded, and an acrylic carpet of tufted construction with a synthetic primary and secondary backing met our aesthetic needs and saved our budgets. As acrylic proved not to have the wearability for commercial use, and as nylon improved in appearance, the latter claimed the greatest market share and remains the most widely specified fiber today.

As a result of the influx of new products and manufacturers into the architectural and interior design marketplace, designers found they needed more technical knowledge of carpeting. Seminars, mill trips, fiber consultants, programs sponsored by the AIA, the Institute of Business Designers, and the American Society of Interior Designers all offered information on carpet selection and specification. Sorting through the information meant using valuable design development time, but it had to be done. A specification mistake could literally stop the project.

Just when we thought things had settled down and we had a grasp on carpet selection, an issue with far greater ramifications than aesthetic and budgetary concerns arose: indoor air quality with "the sick building syndrome." The issue is a direct result of architects' response to the need to design airtight, energy efficient buildings that rely on HVAC systems to circulate and distribute air. All interior building products are in the "blame game" lineup, and carpet is no exception. New carpeting and the adhesives used to glue carpet to the floor are at the root of complaints about indoor air quality and odor. Diverse organic emissions from carpeting have been linked with short-term health effects. Carpeting stands out as a major contributor to the problem because of the various synthetic chemicals, chemical topical treatments, backing glues, dye solvents, antistatic, soil and fire retardants, and fungicide and pesticide applications. Economics have often forced designers to glue carpet directly to the floor to keep their budgets in line. Glued down means glue on the floor and the glue is also a contributor to poor air quality. Two solutions to this problem are to obtain test results on the particular glues recommended by the installer or to use carpet tiles. Free-lay carpet tile systems do not require glue, thus avoiding one of the elements of indoor air pollution. But carpet alone does not make a building sick. It is the responsibility of the design industry to look at the indoor air quality (IAQ) issue as a whole. It is time for opportunity, not blame.

### Much is Already Under Way

The American Institute of Architects has formed The AIA Committee on the Environment. Among their tasks is to produce the *Environmental Resource Guide* to provide information about non-toxic, non-polluting building materials, and to keep designers informed as to the safety of materials they are specifying [see Perspectives, page 171-172].

Individuals are making a difference. Architect William McDonough, AIA, is an architect who has taken a stand on designing buildings that are both aesthetically pleasing and environmentally sound. McDonough designed the Environmental Defense Fund headquarters in New York with the intent of eliminating indoor air pollution by looking at the big picture first and then addressing every element involved, from the ventilation system to the specification of all products to maintaining the space without introducing toxic cleaning agents. It is possible with environmentally safe products and systems to institute a maintenance program that results in appearance retention without degradation.

**Indoor Air Pollutants in Office Buildings**

| Pollutants | Sources | Health Effects |
|---|---|---|
| **Benzene** | Synthetic fiber, plastics, cleaning solutions, tobacco smoke | Central nervous system damage, skin, respiratory system irritant. Possible genetic damage |
| **Formaldehyde** | Urea-Formaldehyde foam insulation, spackling compounds, insulation products, fire retardants, ceiling and floor tiles | Respiratory system, eye, and skin irritation, nausea, headache, fatigue, cancer (in exposed laboratory animals). |
| ***Micro-organisms* (such as viruses, bacteria, and fungi)** | Humidifying and air-conditioning systems, evaporative condensors, cooling towers, mildewed papers, old books, damp newsprint | Respiratory infection, allergic responses |
| **Nitrogen oxides** | Gas stoves, combustion, motor vehicle exhaust, tobacco smoke | Respiratory system and eye irritation |
| **Paint fumes (organics, lead, mercury)** | Freshly painted surfaces | Respiratory system and eye irritation; neurological, kidney, and bone marrow damage at high levels of exposure |
| **Pesticides** | Spraying of plants, premises | Depending on chemical components: liver damage, cancer, neurological damage, skin, respiratory system, and eye irritation |
| **Sterilant gases (such as ethylene oxide)** | Systems to sterilize humidifying and air-conditioning systems | Depending on chemical components: respiratory system and eye irritation, genetic damage, cancer |
| **Tobacco smoke (passive exposure to particulates, carbon monoxide, formaldehyde, coal tars, and nicotine)** | Cigarettes, pipes, cigars | Respiratory system and eye irritation; may lead to diseases associated with smokers |
| **Toluene** | Rubber cement, cleaning fluids | Narcotic, skin irritant |
| **Trinitrofluorenone (TNF)** | Photocopiers | Liver cancer, lung dysfunction; central system damage |
| **Vinyl Chloride** | Plastic products; pipes, light fixtures, upholsterers, carpets | Carcinogen, suspected mutagen, dermatitis, bronchitis |

*The chemicals in carpeting and carpet glues are only one source of many indoor environmental pollutants. Listed above are some of the other sources that are often introduced in buildings after construction is complete.*

Interface Flooring System assembled a forum called "The Colloquium at Seacrest," inviting manufacturers, architects, interior designers, real estate executives, facility managers from Fortune 500 companies, and building owners. This group has spent the last year addressing the subject of health in the work environment. Their goal was to find ways that they, as manufacturers, can be part of the solution and not part of the problem. A two-volume report will be available to designers, professional organizations and educational facilities.

Legislation is under way. An IAQ bill has passed the Senate, and Congressman Joseph P. Kennedy of Massachusetts has introduced a bill before Congress to the Committees on Energy and Commerce and Science, Space, and Technology. The intent of the bill is to authorize a national program to recognize ways to reduce the threat to human health posed by exposure to contaminants in the indoor air.

New products have been developed to respond to "sick building syndrome." A new product on the market is Intersept, an antimicrobial agent that retards the growth of fungi and bacteria in carpet and carpet backing. The product is also being introduced in paint and other plastic products used in building construction. At a recent American Society of Heating, Refrigeration, and Air Conditioning Engineers convention, microbial growth within buildings was the number one topic of conversation. Products such as Intersept respond to this directly and are already available and proven to be effective.

It is time to work together as an industry to challenge the various disciplines within the building community to develop products that are environmentally appropriate. It is time for designers to ask representatives of all the manufacturers for information about the environmental characteristics of their products. Professional requests can make a difference in the research and development and the ultimate goods manufacturers produce for us. It is important that designers respond to the issue of IAQ and specify products based on reality not hysteria. In the past, the carpet industry has always been responsive in the past to designers' needs. Given new specification requirements for environmental characteristics, they will undoubtedly respond again.

Carpet is only one element in an array of IAQ subjects to be dealt with. As architects and interior designers we can make a difference, firm by firm, designer by designer, by letting manufacturers and our clients know the importance of working together to ensure environmentally healthy buildings.

**Karen Randal** ■

*The author, a member of the Institute of Business Designers and associate member of the AIA, is a consultant to design firms and product manufacturers. She is currently the corporate director of client development for Spillis, Candela & Partners, Inc., a full service architectural, engineering, and interior design firm headquartered in Coral Gables, Florida.*

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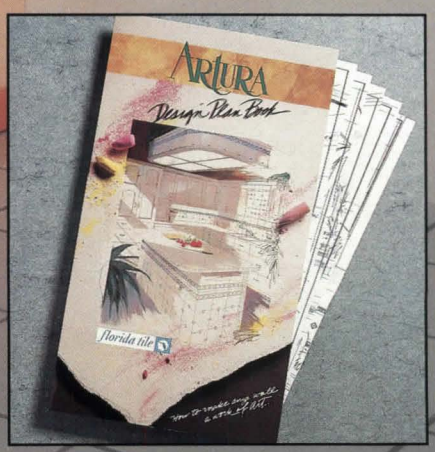
The Artura Collection from Florida Tile opens your mind to a whole new world of redecorating and remodeling possibilities. Artura can provide a home, new or old, with a look that will increase its resale value and help it to stand apart from others on the market. From the exclusive trim features to the wide variety of beautifully designed tiles, Artura lets you express your individuality. So whether remodeling, redecorating, building or selling, look into the many benefits of the Artura Collection from Florida Tile. Pick up your Artura Design Plan Book at any participating Florida Tile distributor. For the one nearest you call 1-800-FLA-TILE.




ARTURA MAKES EVERY WALL A WORK OF ART™

florida tile®

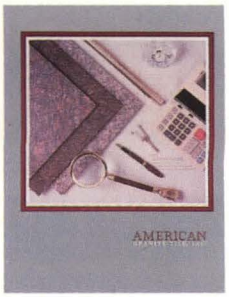
FLORIDA TILE INDUSTRIES, INC. • LAKELAND, FLORIDA 33802



Circle **No. 341** on Reader Service Card

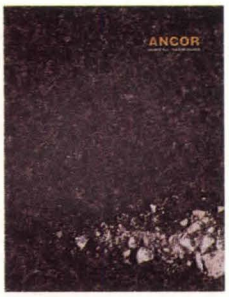
# Flooring and Related Products Literature Digest





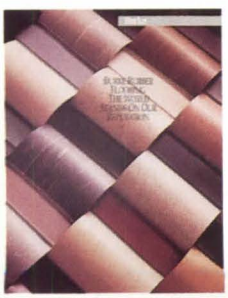

A palette of 18 vibrant colors of granite wall and floor tile from around the world is showcased in a new product brochure published by this nationally known U.S. quarrier and manufacturer of granite. Available in polished, honed, and thermal finishes, the tiles are accurately gauged to suit the most demanding architectural installations.
**American Granite Tile, Inc.** Circle No. 383

American Marazzi Tile offers domestic and imported ceramic floor and wall tiles. This catalog includes information on product features and benefits, durability, finishes, trims, maintenance, technical data, and architectural specifications. The Marazzi Enduro® series and other glazed and unglazed tile lines are described.
**American Marazzi Tile.** Circle No. 384




Ancor Granite Tile, North America's premier manufacturer of modular granite tile for interior and exterior floor and wall applications, produces over a dozen Canadian granites in a variety of finishes for residential, commercial, and institutional use. Standard production is 12″ × 12″ × ⅜″ tile with other sizes up to 18″ × 18″ × ½″ available on special order.
**Ancor Granite Tile Inc.** Circle No. 385


This four-page brochure from Armstrong describes Possibilities, a new commercial sheet flooring that offers the aesthetics of carpet and the performance of vinyl. Available in three versatile patterns in ten colors, the new fabric-inspired flooring is recommended for use in health care and other commercial environments.
**Armstrong World Industries.** Circle No. 386

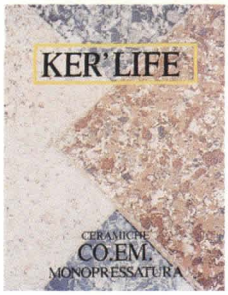


Largest selection of rubber flooring products. Forty-six colors in cove and carpet base. Introducing ARIA – a new chip design tile and stair tread in 10 color schemes. Announcing Burke's new Rouleau Square profile tile – available in a *wide range of exciting* colors along with the Round profile tile and fully matching stair treads.
**Burke Flooring Products.** Circle No. 387

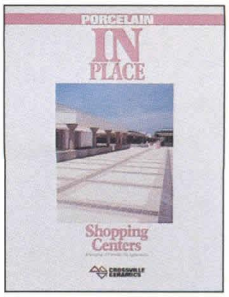

SOFTPAVE and PLAYGUARD low-impact, resilient pavers provide a durable, high-traction surface indoors and outdoors. Manufactured from reclaimed rubber, the maintenance-free, water-permeable tiles are available in a variety of colors. SOFTPAVE surfaces absorb shock and sound; PLAYGUARD surfaces meet CPSC guidelines for playgrounds and schools.
**Carlisle Tire & Rubber.** Circle No. 388


COMPSEAL is a flexible PVC waterproofing membrane used under ceramic tile or marble in showers, etc., generally under a thick set mortar bed. Listed by the three major plumbing codes in 30 and 40 millimeter thicknesses, over 4 million square feet of COMPSEAL is installed annually. This catalog gives specifications and details.
**Compotite Corp.** Circle No. 390

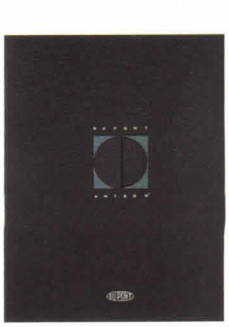

Congoleum commercial sheet flooring products are designed to meet the needs of today's architects and specifiers. Congoleum commercial vinyl floors are ideally suited for both new construction and retrofit projects. The new 12-page, four-color Congoleum 1991 Specifier's Guide provides product specifications and technical data. **Congoleum Corporation.** Circle No. 391



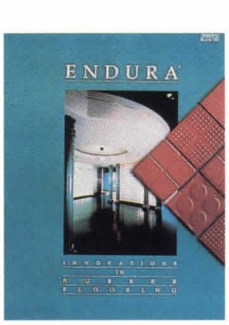

"Ker'Life" is the first and only product in Monopressatura double layer made in Smaltoporcellana with a surface which can be polished. "Ker'Life" is suitable for indoor and outdoor, residential and commercial use. "Ker'Life" has exceptional characteristics of resistance to wear and tear, absolute nonporosity, and nonabsorption. **Ceramiche Cotto Emiliano.** Circle No. 389



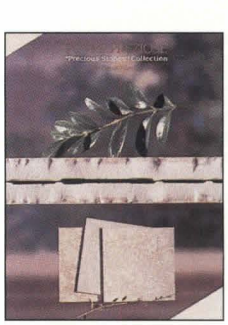

Crossville Ceramics, the only U.S. manufacturer of large unit porcelain tile, offers a series of brochures highlighting both commercial and residential tile installations. The "Porcelain in Place" series provides information on the use of Crossville's porcelain tiles in shopping centers, restaurants, mass transit facilities, offices, and homes. **Crossville Ceramics.** Circle No. 392



This brochure helps make it easy to specify the right DuPont ANTRON® carpet fiber for any commercial application. Two fibers: New ANTRON LEGACY nylon for superior resistance to soiling and ANTRON LUMENA® solution dyed nylon for the ultimate in cleanability. Each has distinct advantages. Both have the performance characteristics of ANTRON®. **DuPont.** Circle No. 393

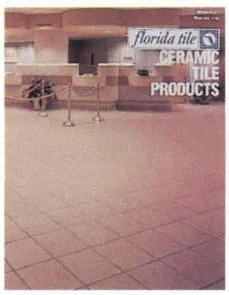



Endura Rubber Flooring's 1991 Product Catalog contains color photos, specifications, technical illustrations, and color charts for Low Vibration "quiet flooring" and the company's 15 standard color line of smooth, textured, and studded rubber tiles, stair treads, riser, cove base, and stringer stock accessories and its nonsolvent-based adhesives. **Endura Rubber Flooring.** Circle No. 394



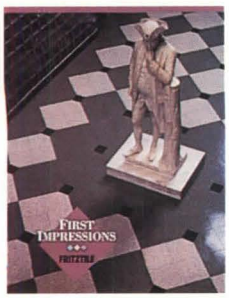
The Pietre Preziose or "Precious Stones" collection is the latest technological advance from GranitiFiandre, the leading manufacturer of ceramic granite tile. Available in seven colors, this collection emulates the look of marble and is destined for sophisticated residential and commercial environments. GranitiFiandre is acid-, fire-, and frost-resistant. **Fiandre/Trans Ceramica Ltd.** Circle No. 399


Flexco produces outstanding rubber and solid vinyl flooring products for a wide variety of commercial uses. Sold through an international network of over 125 distributors, Flexco products combine beauty and functionality. Their unique color palettes and styling offer high design potential for environments with even the heaviest traffic. **Flexco Company.** Circle No. 395

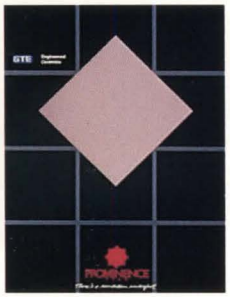



The latest and most comprehensive edition of Florida Tile's annual ceramic tile products catalog is now available. The new catalog is the largest published by Florida Tile to date. Consisting of 52 colorful pages of each of the company's 22 distinctive lines, the catalog is designed to aid decorators and designers with both planning and installation. **Florida Tile.** Circle No. 396

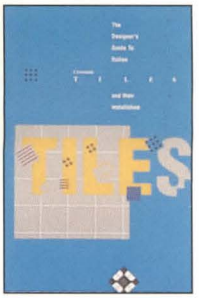

When safety underfoot is desired, Tractionfloor delivers. Sixteen UV-safe colors, smooth and studded. Chemical/heat-resistant. Dimensionally stable. Easy to maintain. Heat welds and flash coves for watertight installation. **Forbo Floor Coverings, Inc.** Circle No. 397




FRITZTILE, a superior resilient, genuine marble aggregate, thermo-set resinous flooring tile. Manufactured since 1962, FRITZTILE is in service all over the world in airports, sports arenas, shopping malls, stores, and other areas demanding high wear qualities, slip resistance, high load-carrying ability, and low-cycle cost. **Fritz Chemical Company.** Circle No. 398

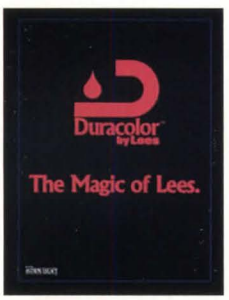



Prominence® unglazed ceramic floor tile represents a significant breakthrough in the manufacture of ceramic tile. Prominence® tile has stain-resistant properties that exceed those of most high service floor tile available today. It is impervious to moisture, is frost-proof, slip-resistant, and exceeds other industry tile standards. **GTE Corp.** Circle No. 400




The "Designer's Guide to Italian Tile," a 64-page guide to the selection, installation, and maintenance of Italian ceramic tiles, is available through the Italian Trade Commission. ITC provides other free publications including a quarterly newsletter, online tile searches, a video on tile selection and installation, and an in-house library of manufacturer's catalogs. **Italian Tile Center.** Circle No. 401


LATICRETE International's new 1991 Ceramic Tile, Marble, and Stone Installation catalog contains information on LATICRETE® ceramic tile mortars, grouts, and waterproof membranes. New products include: Porcelain Bond for Porcelain tiles, LATICRETE® Roof Deck System, and LATAPOXY® 300 for marble tile. **Laticrete International.** Circle No. 402

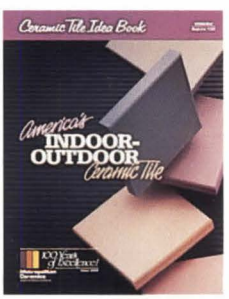



Lees Commercial Carpets introduces Duracolor™, a revolutionary, patent-pending yarn dyeing technology developed for commercial use to produce carpet with superior stain resistance. Duracolor™ by Lees offers ease of cleanability, superior fade resistance to sunlight and gas, long-lasting durability, total color and styling flexibility, and terrific cost-saving opportunities. **Lees Commercial Carpets.** Circle No. 403

Terrazzo made with genuine Lehigh White Portland Cement combines the lasting beauty of marble with the strength and durability of concrete. Terrazzo flooring is ideal for schools, hospitals, airports, shopping centers, office buildings, and other public areas subject to heavy use. **Lehigh Portland Cement Co.** Circle No. 404


A unique line of resilient sheet flooring is described in a 12-page brochure. Flooring for special applications includes embossed designs and iridescent colors for high tech and commercial installations, simulated maple for gymnasiums, resilient foam-backed sheeting with sound absorption and fire retardant properties, and durable, high-gloss finishes. **Lonseal Inc.** Circle No. 405

Traffic Tile™, a complete line of ceramic tiles made with recycled glass, and The Craftsman Line of hand-crafted glazed ceramic tiles, are introduced in an 8-page brochure from the Stoneware Tile Company. Color selections, technical and dimensional information for both commercial and residential tile lines are given. **Stoneware Tile Company.** Circle No. 416




Indoor/outdoor ceramic tile featured in new idea book. Metropolitan Ceramics' colorful new literature details the latest designer colors, product features, installations, specifications, trim shapes, maintenance and more for IRONROCK®, Metro® Tile, and Signet®. It's part of our extensive literature and sampling program. For more information please contact: **Metropolitan Ceramics,** Circle No. 408


## Clear, Fresh Color From Crossville Ceramics

**As clear and cool as a fresh water stream, The Mineral Collection from Crossville Ceramics captures the lucid hues of nature and brings them to porcelain.**

**Extend your design possibilities with Crossville Ceramics porcelain tile—the only large-unit porcelain tile made in the United States. To view the entire Crossville line, phone 615/484-2110.**

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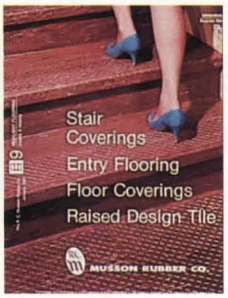
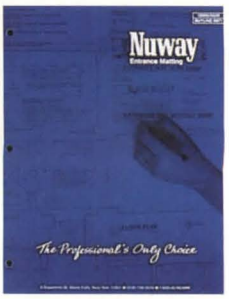
**CROSSVILLE CERAMICS**

**America's Porcelain Tile Made In The U.S.A.**

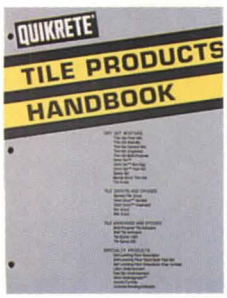

Our recycled antique longleaf heart pine is gracing distinctive homes everywhere. Retrieved from pre-1900 structures slated for demolition, this majestic lumber is perfect for both restoration and new projects. A tradition of quality and attention to fine detail are our trademarks. Our varied grades are suitable for a wide variety of applications.
**Mountain Lumber Co.** Circle No. 406



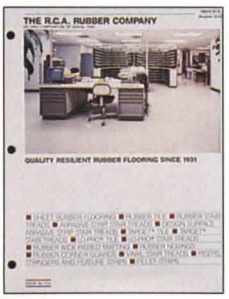

Floor and stair coverings brochure contains helpful illustrations and specifications on fire safety and other rubber floor- and stair-tread systems featuring many different marbleized or plain raised and surface designs in all decorator colors. Included are rubber landing and riser materials, vinyl treads and risers, fluff cord and traffic tiles, and recommended adhesives.
**Musson Rubber Co.** Circle No. 407



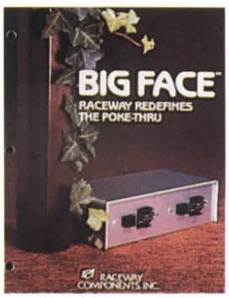

Nuway's exclusive reversible matting systems assure the building professional a high cleaning performance and walking safety with the lowest lifecycle cost. A wide variety of fiber and profile colors – including solid brass – will satisfy the most demanding considerations. Nuway Matting Systems, the professional's only choice.
**Nuway Matting Systems.** Circle No. 409



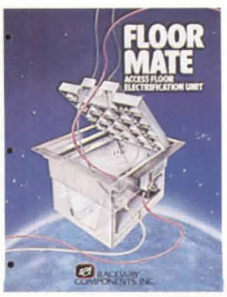

Free Tile Products Handbook from QUIKRETE®. Get your 36 page handbook packed with a wide range of quality QUIKRETE products. Includes descriptions and ordering information for a variety of Dry Set Mortars, Tile Grouts and Epoxies, Tile Adhesives, and Self-leveling Floor Resurfacer. Plus a number of tile-related specialty products.
**Quikrete.** Circle No. 410



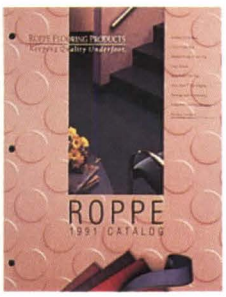

New Adjust-A-Nose® Stair Treads and Abrasive Strip Patterned Surface Stair Treads are detailed in the R.C.A. Rubber Company's 1991 Catalog. Full specifications for the complete line of Rubber Flooring, Stair Treads, and accessories are included. Added to specifications are instructions for seam sealing Sheet Rubber Flooring installations. **The R.C.A. Rubber Co.** Circle No. 411




In the first major Poke-Thru redesign in several decades, Raceway Components, Inc. has introduced a unit that realistically meets the requirements of the modern workstation. BIG FACE® is currently the only Poke-Thru that is UL Listed for seven #12 plus one 25 pair com/data cables. A two gang design of the service head permits high and low tension combinations.
**Raceway Components, Inc.** Circle No. 413

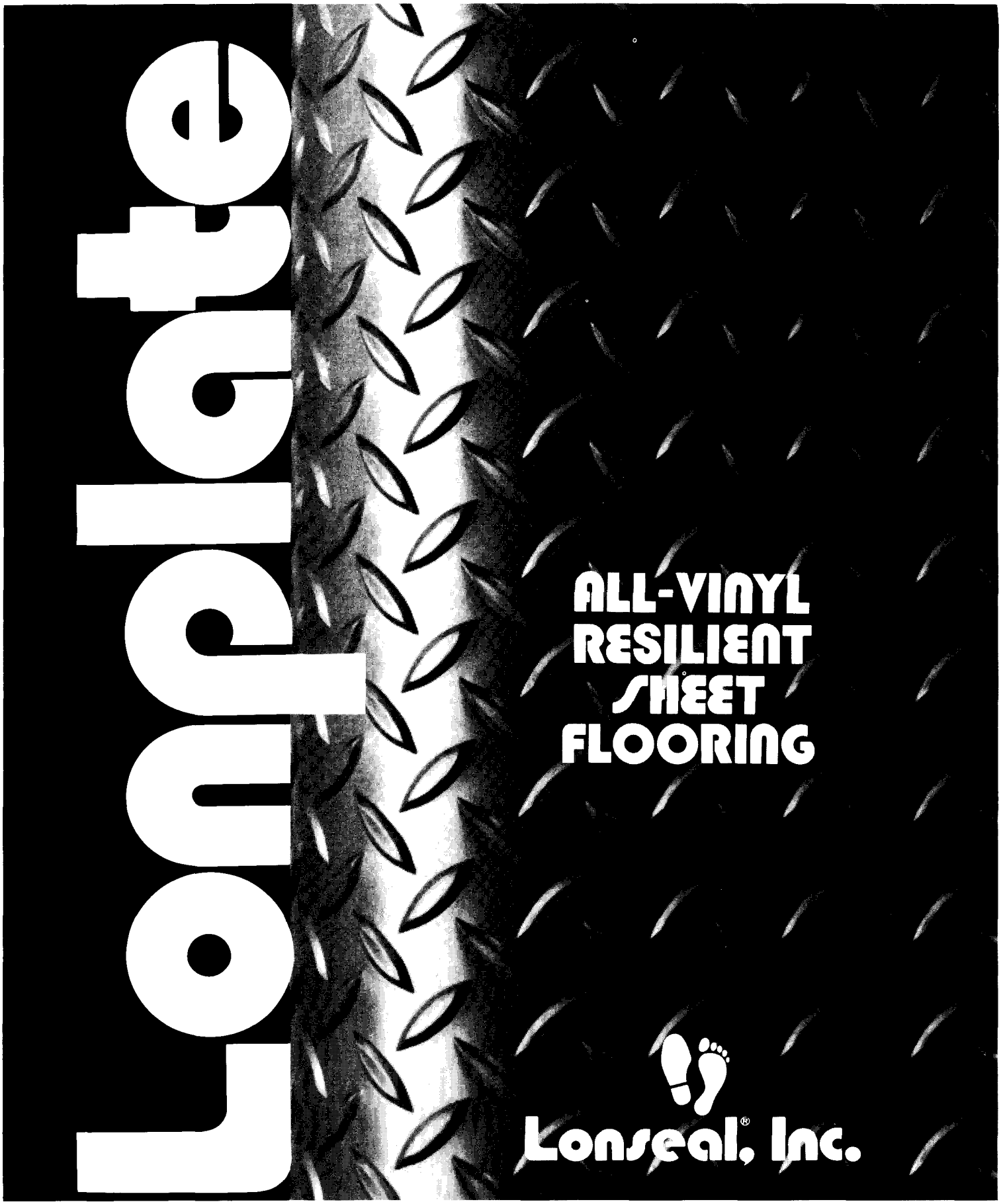



Raceway, Inc., innovator in thru-floor electrification technology, has introduced an all-metal Access Floor electrification unit designed to provide a new standard of protection. "Floor-Mate" completely eliminates plastic by using an all Zamak III/steel construction. A patented cable exit or "Cable Guard" rises to a vertical position, encasing wires in a protective well.
**Raceway Components, Inc.** Circle No. 412




This 1991 catalog offers specification information, sizes, and color charts for a variety of interior commercial flooring products including: Rubber Cove Base, Vinyl Cove Base, Raised Design Floor Tile, Stair Treads, Rop-Cord Tire Tile, Trim-Ease™ Tile Edging, Nosings and Accessories, Adhesives and Maintenance.
**Roppe® Corporation.** Circle No. 414

Never before has a mosaic product so clearly rewritten the rules about tile. A technical breakthrough, SICIS makes mosaic a viable and desirable solution for both residential and commercial applications. SICIS's unique system gives designers and builders a measurable advantage in terms of aesthetics, adaptability, and cost.
**SICIS, INTERNATIONAL.** Circle No. 415

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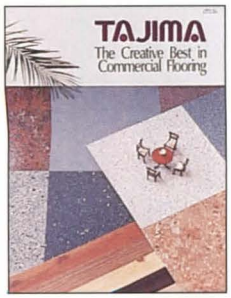
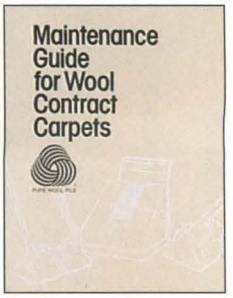



Interior vinyl flooring achieves ultimate commercial durability and beauty for installation in offices, shopping malls, universities, etc. Choose from the Roscoe Awards-winning vinyl tiles, featuring subdued sands, traditional marbles, warm woods, and inlaid granites – all warehoused in the U.S.A. This brochure provides technical data. **Tajima, Inc.** Circle No. 417


"Tile Spain" is a quarterly newsletter on the ceramic tile industry in Spain; it is published by "Home Furnishings from Spain," a division of the Trade Commission of Spain in Miami. Articles on trends, trade shows, in both the United States and Spain, manufacturers, distributors, and statistics are presented.
**Trade Commission of Spain.** Circle No. 418




It is important that carpets and rugs continue to look good. Wool is naturally soil and stain-resistant, still spots need attention and daily vacuuming, intermediate maintenance, and periodic cleaning are musts. In French, Spanish, or English, these 8-page booklets with easy to follow copy and illustrations are a foolproof guide for any maintenance crew.
**The Wool Bureau.** Circle No. 419

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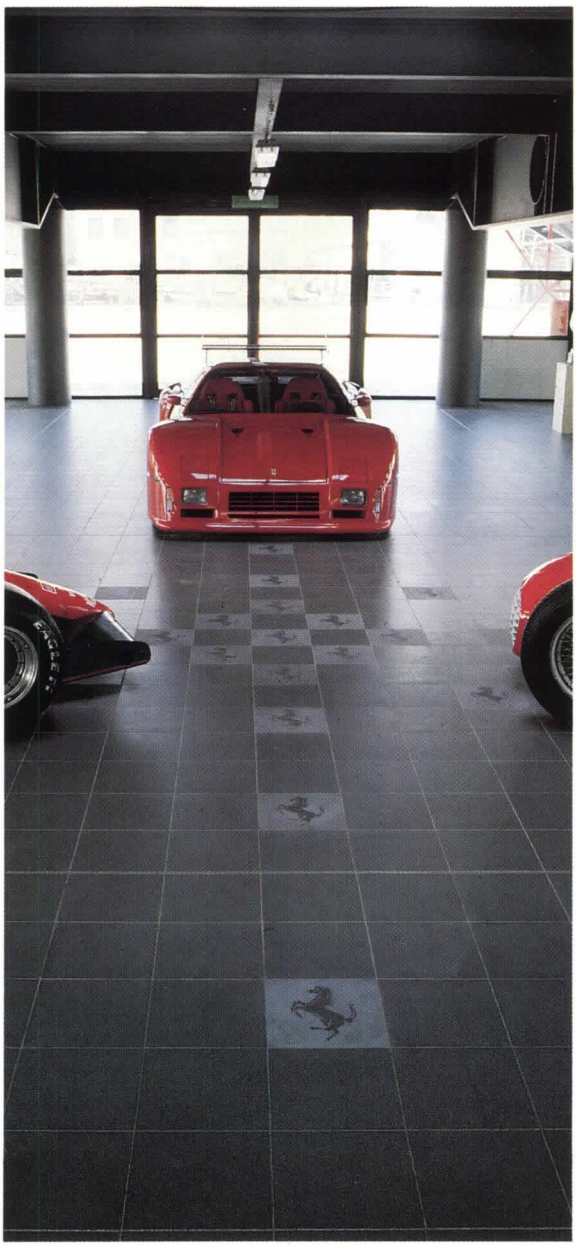
■ **The beauty of GRANITIFIANDRE® makes you forget its most important quality: superior technology. The result of endless research, matchless creativity and sophisticated technology, GRANITIFIANDRE® in polished or matte finish allows for infinite creations of stunning beauty. GRANITIFIANDRE® is porcelain stoneware through and through. Stronger than granite, it is a perfect blend of function and aesthetics. GRANITIFIANDRE®, architectural projects that leave a mark forever!**



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fax 416.789.5745

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■ MARANELLO, ITALY
FERRARI MUSEUM
Architect:
TIZIANO LUGLI, Modena

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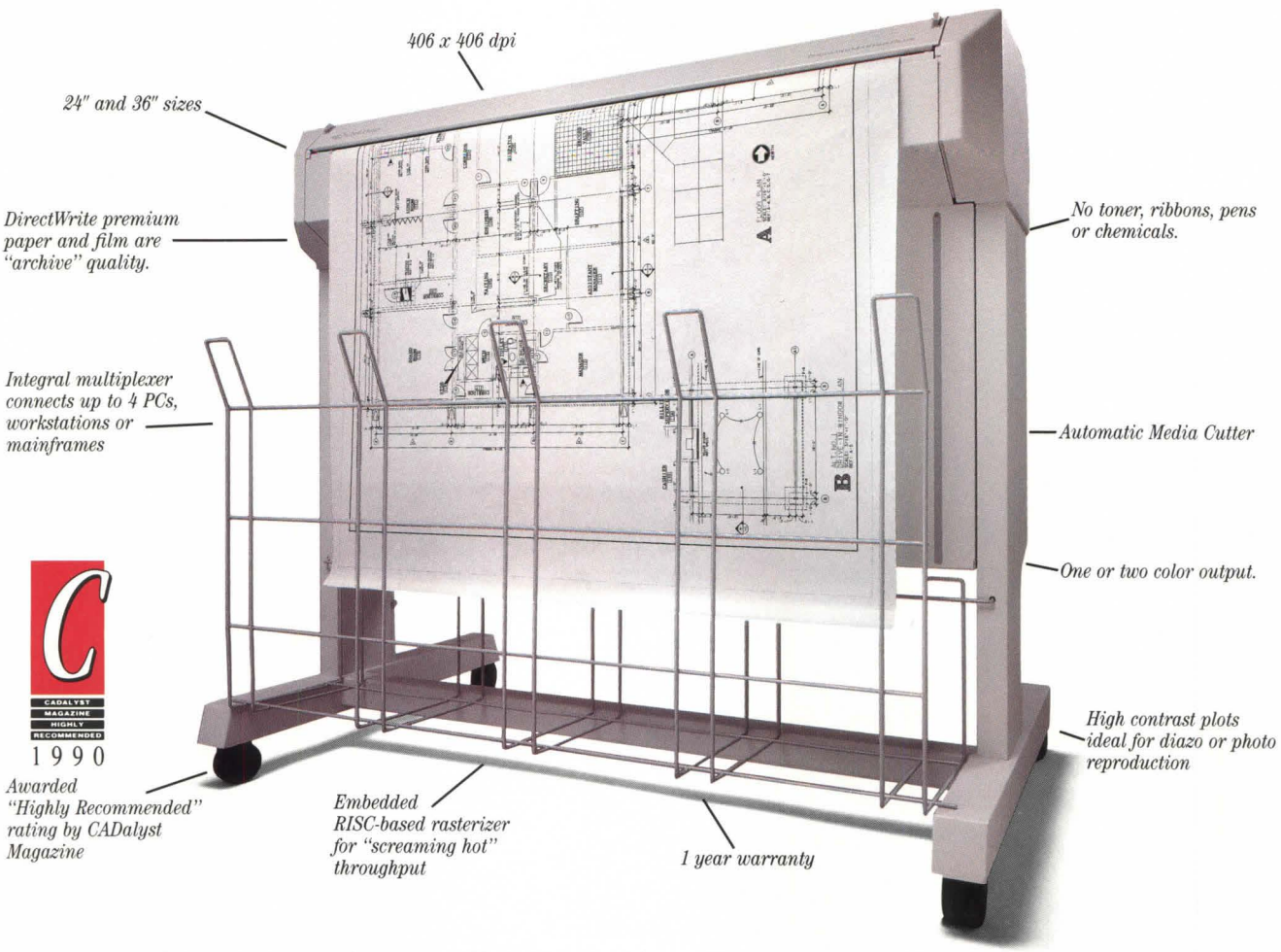
Circle **No. 342**

# Hotter Plotter.

## Introducing DrawingMaster Plus




DrawingMaster® Plus is hot to plot.

In fact, it was specifically designed to run with the fastest CAD systems – taking just minutes to do jobs that take pen plotters hours.

And high throughput doesn't mean low resolution. At 406 X 406 dpi, you get exceptionally clean lines that rival laser and electrostatic plotters.

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While DrawingMaster Plus is hot, complicated it's not.

There are no pens, no toner and no chemicals involved. You simply load a roll of paper or film and plot – more than 50 E-sized plots completely unattended.

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And no other 406 dpi plotter comes close to DrawingMaster Plus in price.

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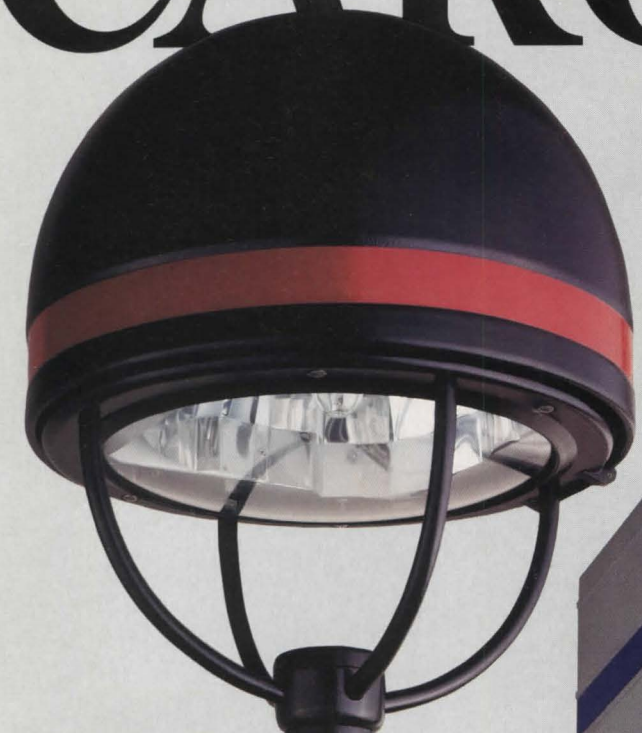

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# R H A P S O D Y  I N  W H I T E .

Architect: Chumney and Associates, San Antonio, TX; Photography: Peter Leach, Philadelphia, PA

Terrazzo designs made with Lehigh White Portland Cement bring classic elegance, inside and out, to any building project. With its unique composition and durability, white portland cement terrazzo allows the architect unlimited freedom to develop original and versatile wall and floor designs that are beautiful, functional and economical. The blending of modern design, ancient artistry and Lehigh White Portland Cement produce a terrazzo that is truly a material of timeless function and beauty.

Leading architects continue to specify Lehigh White Portland Cement to insure the consistent and lasting beauty of their terrazzo designs.

Lehigh White Cement is a true portland cement. The raw materials are carefully selected using only the whitest limestone and clay, and manufactured under precise, rigidly controlled conditions to assure uniformly pure white color, consistent performance and reliable strength.

We invite you to discover more about Lehigh White Cements. For additional information or to request literature, call 1-800-523-5488 and speak to one of our representatives, or write to Lehigh Portland Cement Company, P.O. Box 1882, Allentown, PA 18105.

LEHIGH WHITE CEMENT

T H E  D E S I G N E R S  P A L E T T E

Circle **No. 381** on Reader Service Card

# New Products and Literature: Environmentally Responsible Products



*George Luks,* Roundhouse at High Bridge, *1909–1910, Munson-Williams-Proctor Institute Museum of Art, Utica, N.Y.*

Gathering products for this special issue on the environment has been both enlightening and disheartening: Manufacturers are jumping on the green bandwagon for reasons both benevolent and economic. The task of discerning the substantial from the superficial is difficult at best: Announcements touting products that are environmentally "safe," "sound," "recyclable," "biodegradable," and/or "from sustainable sources," were a provocation to ask questions and investigate answers.

Jargon is the first hurdle to overcome; it is at times misleading and vague. The term "environmentally safe," for example, is a non sequitur, as everything produced affects the natural order on some level; and "biodegradable" sounds good but may mean ten days, months, or more. Still in its nascent years, the current environmental movement must be assimilated into our culture in universally specific terms.

Not only is it important to understand the jargon, but it is necessary to familiarize oneself with ingredients, with raw materials, their origin, and their physical properties. In this same vein, questions about the manufacturing process, packaging and shipping, installation procedures, and compatibility with users once installed should also be asked.

Product standards is another issue raised in the course of our research. What should the criteria or standards be for environmentally responsible products? Who should select and regulate these standards? Should the government be involved?. . . the manufacturing industry regulate itself?. . . an independent watchdog group be established? What is the architect's role? The AIA is attempting to define its own role with its yet-to-be-completed "Environmental Resources Guide," a listing of construction product alternatives researched by a special committee (see Perspectives, p. 101).

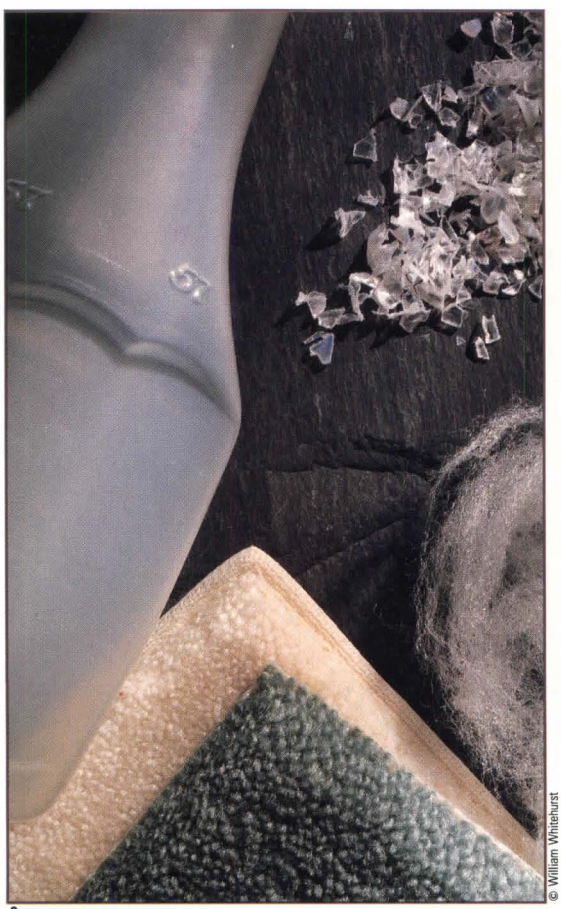
We have used the headline "Environmentally Responsible Products" this month to acknowledge that the products listed were conscientiously designed to reduce their impact on the environment; many reuse what is essentially waste material, some use only natural ingredients. And we have added a (catchall) section, "Environmental Sources and Publications," in an effort to show a sampling of books, journals, magazines, and organizations (nonprofits, usually, to educate, lobby, and substantiate claims) for a more thorough picture of environmental possibilities. Together, they form a small sampling of what is available.

We hope these pages will continue to be full of healthy products, and that this special section in this special issue will become the norm. For now, we must all ask questions, architects and manufacturers alike; and in the future, environmental responsibility should become a natural process. **Abby Bussel** ■

# Environmentally Responsible Products

1

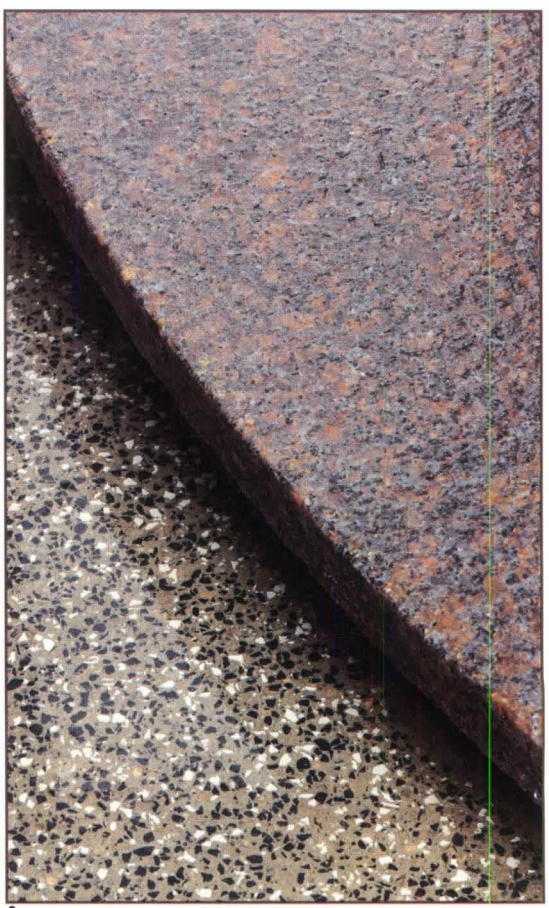
**1 An Icon Updated**
Helping to set a precedent among manufacturers, Herman Miller has eliminated use of tropical woods from unsustained-yield sources; Charles and Ray Eames' lounge chair and ottoman (1956), for example, originally specified in rosewood, will be offered in alternative veneers when the company's current supply of rosewood is depleted. (The chair shown here is in rosewood.) Herman Miller.
*Circle 100 on reader service card*



2

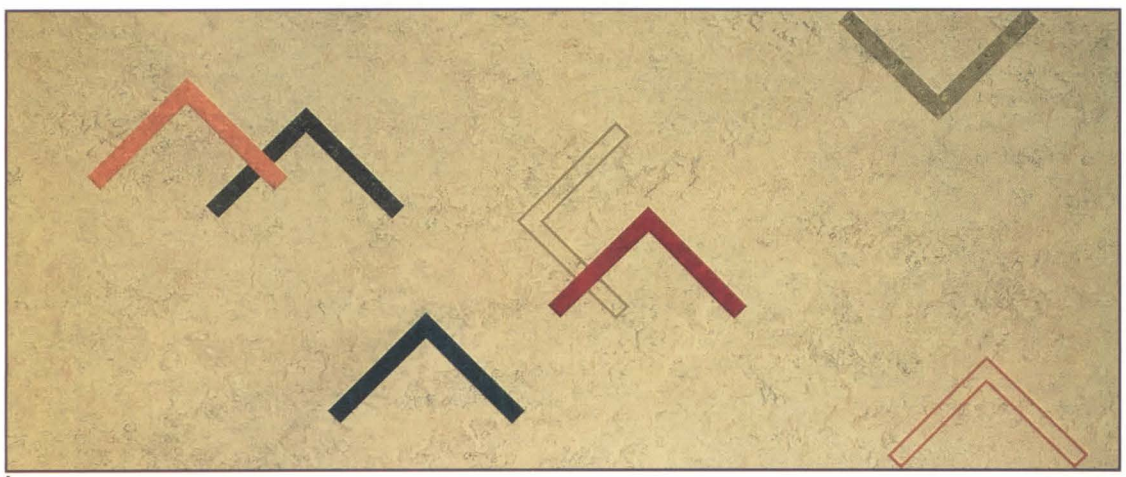
**2 Carpet Via Plastic Bottles**
Recycled polyethylene terephthalate (PET) – recycled plastic bottles, in layman's terms — is used to produce face fibers for Wearlon® and Duratron® carpets. Both are constructed of PET fibers produced in-house from plastic soda and ketchup bottles. The carpets are said to be resistant to soil, stains, and sun-fade. Image Carpets.
*Circle 101 on reader service card*

**3 Recycled Surface Topping**
A terrazzo-like portland cement-based synthetic aggregate surface topping called Syacon® may be specified with virgin or recycled plastic aggregate; the latter is preferable. The ½-inch thick material is "30 percent" lighter than traditional concrete, and is applicable for commercial or institutional floors and precast floor sections, countertops, tables, walls, and litter containers. Several mortar and aggregate colors are available. Master Builders/GE Plastics.
*Circle 102 on reader service card*



© William Whitehurst

3



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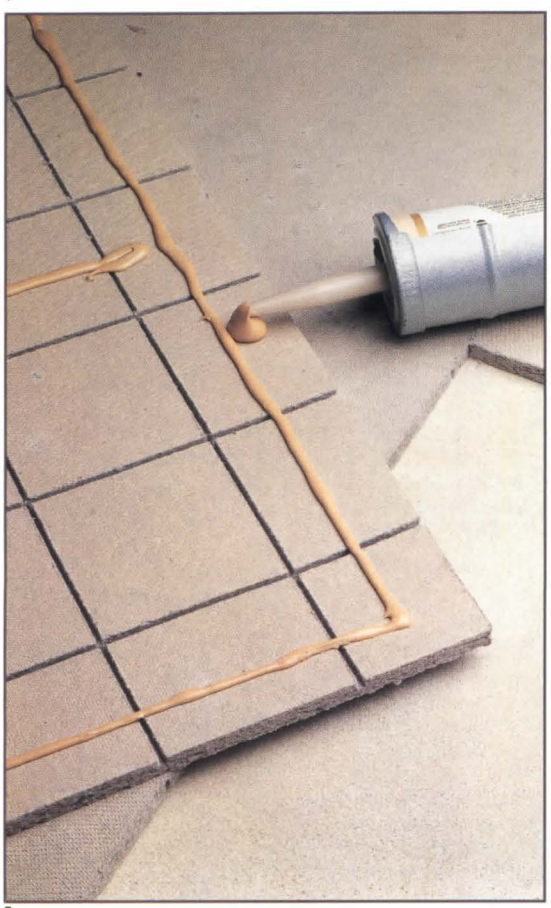

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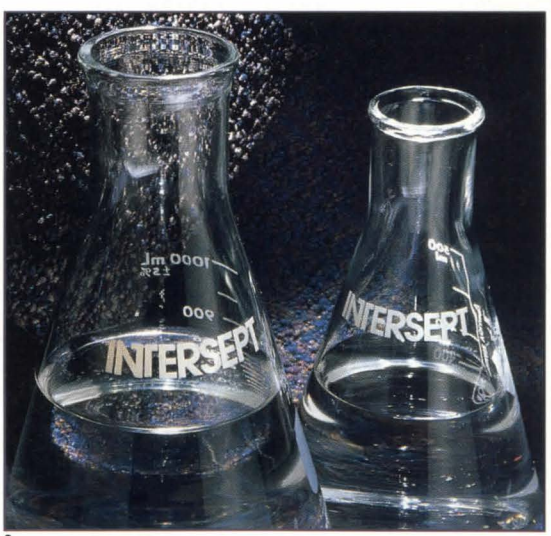



6

**4 Natural Floor Coverings**
Marmoleum® is a decorative linoleum floor covering made from linseed oil, wood flour, cork, resins, and pigment. A variety of patterns on marbleized fields may be specified as may custom designs. Invented in 1860 by Englishman Frederick Walton, linoleum is produced from self-generating materials and is biodegradable. Forbo Floor Coverings.
*Circle 103 on reader service card*

**5 Recycled Paper Building Products**
Comfort Base, a high-density fiberboard underlayment for concrete slabs and floors, is one of the 100 percent recycled paper-based building products produced by Homosote. Using recycled paper as its primary ingredient since its founding in 1909, the company offers roof and floor decking, interior paneling, interior and exterior sidewall sheathing, and other products. Homosote Company.
*Circle 104 on reader service card*

**6 Antimicrobial Products**
Impregnated in interior products from carpeting to panel fabrics and water-based paint, Intersept™ antimicrobial inhibits bacteria and fungi from breeding on interior surfaces; microbial contamination may cause odors, product degradation, and allergic reactions. Literature on Intersept™ and its parent program Envirosense™ ("to design and specify interior products that . . . enhance Indoor Air Quality") is available. Interface®.
*Circle 105 on reader service card*

*(continued on page 149)*

## NEW!...THE MOST POWERFUL...MOST ACCURATE CLUB IN GOLF!

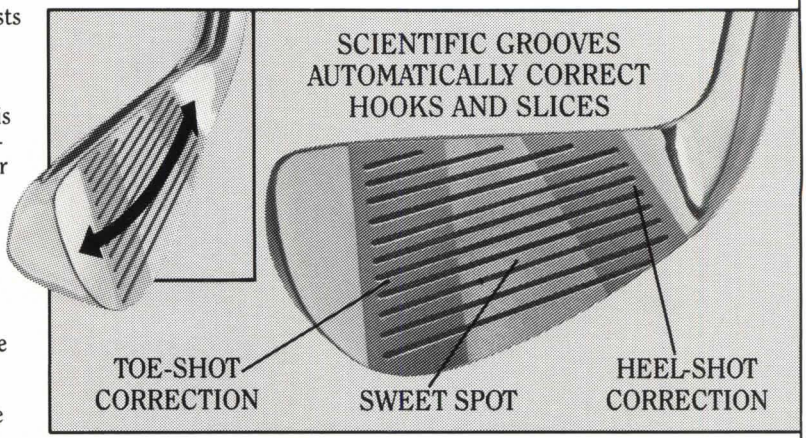
# The CONTROLLER® HITS 30-50 YARDS LONGER, AUTOMATICALLY CORRECTS HOOKS AND SLICES ...MUST CUT STROKES — OR MONEY BACK!

Put your #3, #4 and #5 woods in the cellar. Tests show our new Controller driving iron can outhit all three by 30 to 50 yards.

And that's only half the story. The Controller automatically corrects hooks and slices! The club is so powerful, so accurate, we unconditionally guarantee it will cut 5 to 10 strokes off your score — or you owe us nothing! In fact, to prove it we'll send you one risk-free.

Test it against your #3 wood. If it doesn't give you 30 more yards (if you are a fairly good golfer), send the club back for a refund.

But it will give you 30 more yards! In fact, the Controller is so powerful many golfers use it off the tee, especially on narrow fairways.




Here is the Controller's exact distance advantage as compiled by some low-80's golfers.

| | |
|---|---|
| **CONTROLLER®** | **220 yards** |
| #3 Wood | 190 yards |
| #4 Wood | 180 yards |
| #5 Wood | 170 yards |

Now test the Controller's accuracy against your 3-iron. Purposely hit a shot off the *toe* of each club and watch what happens. Your 3-iron will *hook* the ball violently—the Controller will keep it down the middle! The same is true with *heel* shots. Your 3-iron will *slice* the ball violently—the Controller will automatically keep it on course!

### THE GREATEST STROKE-CUTTER IN GOLF

These scientific breakthroughs make the Controller driving iron the most powerful strokecutter in golf. We believe the club will transform the game. First of all, **it obsoletes fairway woods!** The Controller not only hits 30 to 50 yards farther than fairway woods, **it automatically corrects hooks and slices!** Here's how it works.

### AUTOMATIC ACCURACY

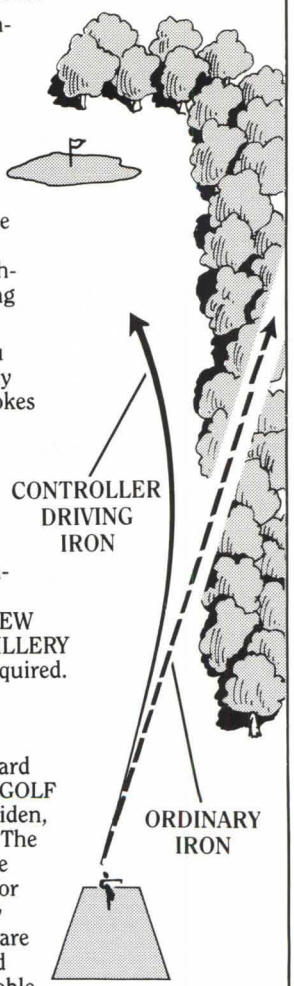
The Controller has an *invisible curve* across its hitting surface—a curve that's going to revolutionize your game. *No other iron has it!* Hit a shot off the Controller's sweet spot and it will go straight, as it would with an ordinary iron. But even pros hit off the heel and toe.

Now, here is the Controller's genius...here is why you could cut as many as 10 strokes off your score. Hit the ball off the Controller's heel or toe and its invisible curve will automatically impart a corrective spin to what would otherwise be a disastrous hook or slice. The ball will actually fade or draw back on course! It's an incredible sight and you can prove it to yourself with only a few test shots. **THIS IS THE MOST IMPORTANT GOLFING BREAKTHROUGH IN GENERATIONS.** ALONG WITH THE CONTROLLER'S EXTRA 30-50 YARDS, YOU SHOULD EASILY CUT 5-10 STROKES OFF YOUR GAME!

Here are more reasons why the Controller driving iron is going to give you the best golf of your life...

- it gives you the power of a driver with the control of an iron...
- its sleek, smooth head swoops through grass more cleanly than a wood...
- its 17° loft gets your shot up faster than a #3 wood...
- its smaller head size (versus a wood) boosts clubhead speed...
- its boron-graphite shaft model adds even more clubhead speed...
- it lets you carry more wedges and putters without exceeding the 14-club limit (by eliminating your #3, #4 and #5 wood)...

The Controller is new and supply is limited. You must act now and remember, you are completely protected. If the Controller doesn't cut 5-10 strokes off your score, you may return it (undamaged, of course) for a prompt refund of its price.




### FREE!

...just for trying the Controller! Keep your new power pin-high with a $15.00 Rangefinder! It's yours to keep FREE! even if you return the Controller for a refund. NOW YOU CAN RANGE YOUR NEW DISTANCE LIKE AN ARTILLERY OFFICER. No batteries required. Clips to belt.

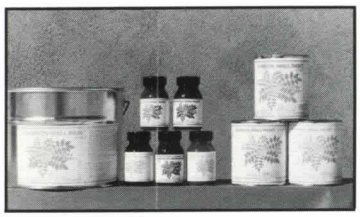
### HOW TO ORDER

Send your name, address and check (or credit card number and expiration date) to the NATIONAL GOLF CENTER (Dept. DR-50), 500 So. Broad St., Meriden, CT 06450. Or call 203-238-2712 (8-8 PM, M-F). The steel-shaft CONTROLLER costs only $59.00; the boron-graphite model costs $89.00. Add $4.00 for shipping. CT and NY must add sales tax. Specify regular or stiff flex, no P.O. boxes, all deliveries are UPS. A refund is guaranteed if a club is returned undamaged within 30 days. Clubs are also available in ladies size, steel or graphite, same prices.

**THE CONTROLLER HITS LONGER AND STRAIGHTER THAN ANY OTHER CLUB IN GOLF. IF IT DOESN'T CUT 5-10 STROKES, YOU OWE US NOTHING! ACT NOW!**

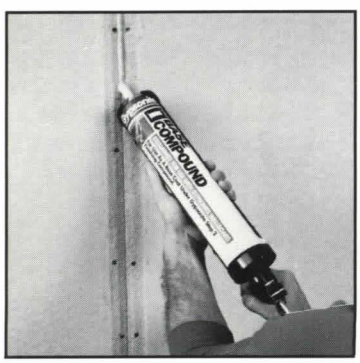
(continued from page 147)

## Environmentally Responsible Products



### Non-Toxic Paints, Finishes
*Livos Paints* and *The Natural Choice* catalogs offer non-toxic, plant-based paints and wood finishes among other building-related and household products. Eco Design Company.
*Circle 200 on reader service card*

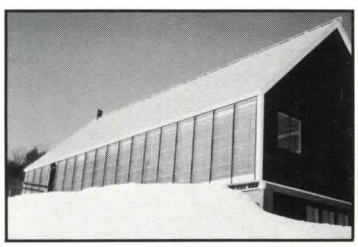
### Non-toxic Insulation
"Air Krete" is an ultra-light inorganic cementitious thermal and acoustical foam insulation product. It is non-toxic, formaldehyde-free, and fireproof. Air Krete™, Inc.
*Circle 106 on reader service card*




### Recycled Newsprint in Fiberboard
Paperless "Gypsonite™" fiberboard is a homogeneous mixture of gypsum and cellulose fibers produced from newsprint waste. Installation is with a tapeless two-step joint system. Highland American/Furman Lumber.
*Circle 107 on reader service card*

### Formaldehyde-free Fiberboard
"Medex" is a formaldehyde-free, non-structural exterior medium density fiberboard. It is manufactured from a blend of Western softwoods and may be sandblasted, laminated, glued, painted, or machined. Applications include signage, cabinetry, furniture, interior moldings, and display cases. Medite.
*Circle 108 on reader service card*

### Healthy Products Catalog
Water purifiers, compact fluorescent bulbs, air purification systems, non-toxic building products, and a variety of other products are accompanied by informative text and statistics. Eco Source.
*Circle 201 on reader service card*



### Energy Saver's Catalog
*The Energy Saver's Catalog* includes specifications and information on solar glazing material, storage tubes, energy efficient skylights, hot water systems and accessories, temperature controls and monitors, and other solar products. Solar Components Corp.
*Circle 202 on reader service card*

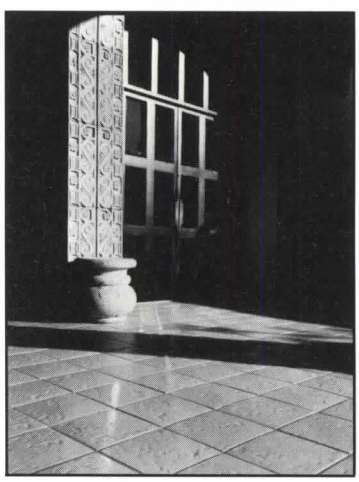
### Low Biocide/No Fungicide Paints
The low-biocide/no fungicide paint products are designed "to meet the needs of most, but not all, hypersensitive individuals." Miller Paint Co.
*Circle 109 on reader service card*

### Water-saving Toilet
The "Veneto" one-piece vitreous china toilet uses 1.5 gallons of water per flush, meeting new state and local water conservation guidelines for flush-efficient systems. Porcher.
*Circle 110 on reader service card*
(continued on page 150)

*(continued from page 149)*

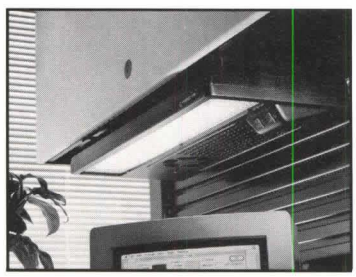

**Newsprint-based Wallboard**
Comprising three blended layers of gypsum, recycled cellulose fiber (newsprint), and perlite, "Fiberbond™" fiber wallboard is installed with a tapeless joint system. Louisiana-Pacific.
*Circle 111 on reader service card*

**Colored Concrete Finish**
"LITHOCHROME® Colorwax, Water Base" is a color-matched curing and finishing material for concrete. It has passed ASTM C 309 for curing compounds and has received approval from the City of Los Angeles. Fifty-one colors are available.
L.M. Scofield Company.
*Circle 112 on reader service card*



**Recycled Glass Floor Tile**
Over "70 percent" of raw materials in "Traffic Tile™" ceramic floor tile is recycled glass. Available in 22 standard colors or to-match custom colors, the tile is available in 4″ × 4″ to 12″ × 12″ squares, 10-inch octagons, and 8-inch Gothic shapes. Stoneware Tile Company.
*Circle 113 on reader service card*

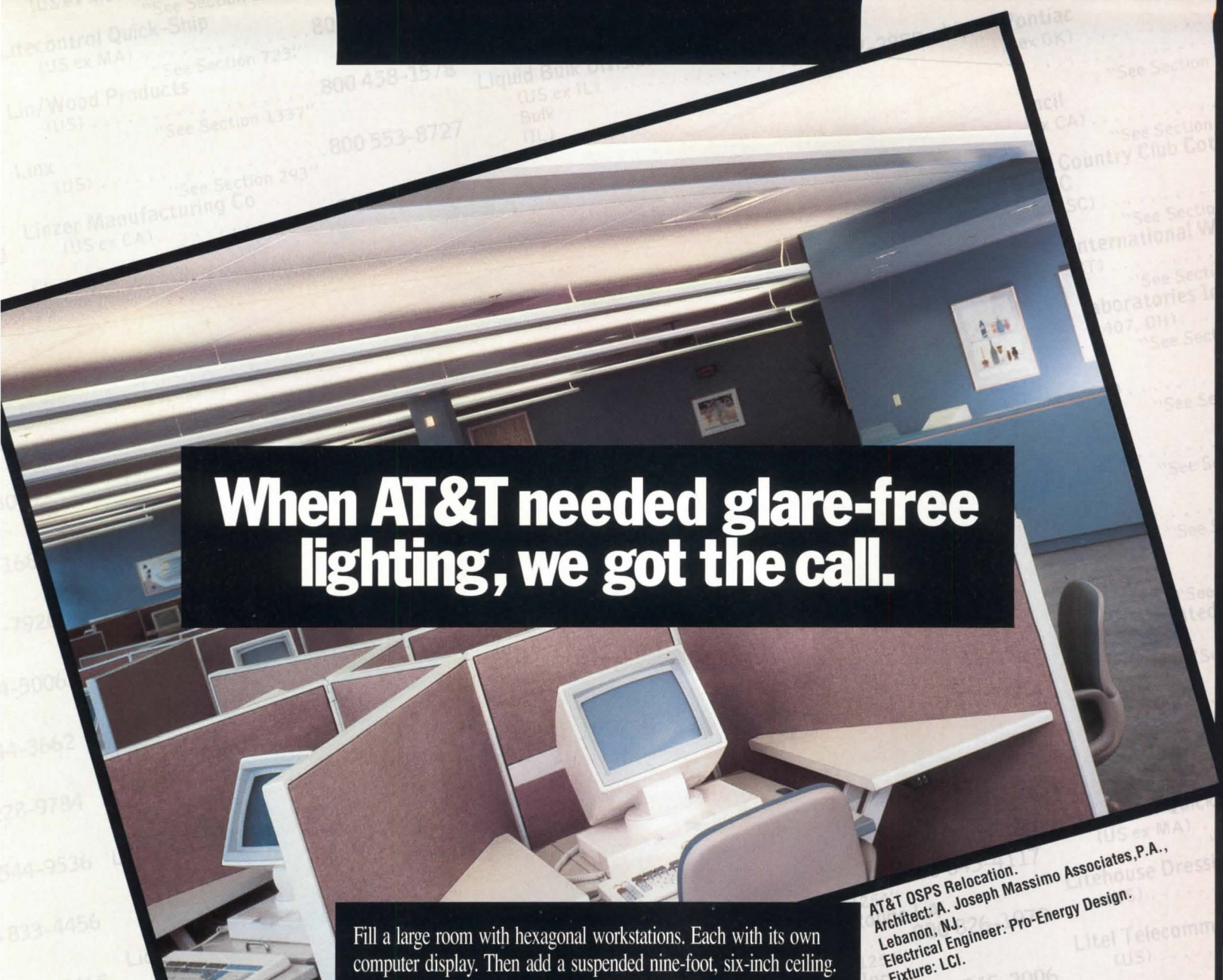
**All-natural Wood Protection**
"Special Formulas" is an architectural coating (with a transparent or colored finish) for interior and exterior wood surfaces, shingles, shakes, and metal building components. The natural vegetable oils and vegetable resin base "creates a monolithic bond" with wood cells and "will not evaporate or wash out." Weather-Master.
*Circle 114 on reader service card*



**Pure Air/Task Light**
"Purelite" is a combination task light and air purification system for individual climate control in office workstations. Designed to help remove dust, allergens, and odors and enhance air circulation, it is available in 27 ½-inch and 39 ½-inch widths for cabinets from 30 to 72 inches wide; universal mounting brackets are included. Systematix.
*Circle 115 on reader service card*

**Energy Efficient Products Catalog**
Information on energy-efficient building products (EPDM roofing systems, air-vapor barrier film, building gaskets, utility seals, window and door seals) and installation procedures can be found in this catalog. Resource Conservation Technology.
*Circle 203 on reader service card*

**Natural Wallcoverings**
Manufactured from gypsum and woven natural jute fibers, "Plaster In A Roll™" (fabric-reinforced wallcoverings in 3 patterns and several colors) and "Faster Plaster™" (white plaster-finish wall liner) fuse with underlying substrates upon curing. Flexi-Wall® Systems.
*Circle 116 on reader service card*
*(continued on page 153)*



# When AT&T needed glare-free lighting, we got the call.

AT&T OSPS Relocation.
Architect: A. Joseph Massimo Associates, P.A., Lebanon, NJ.
Electrical Engineer: Pro-Energy Design.
Fixture: LCI.

Fill a large room with hexagonal workstations. Each with its own computer display. Then add a suspended nine-foot, six-inch ceiling.

What you end up with is a difficult lighting problem.

But with a very simple solution: the LCI system from Litecontrol.

Project architects chose LCI because of its widespread, indirect light - even at a distance of nine inches from the ceiling.

The result was a non-glare environment with ample work-surface illumination.

And high-performance LCI fixtures were matched by a high-performance project team. Litecontrol supplied lighting calculations, fixture layouts, and ordering data that saved both time and money for architect, engineer and contractor.

Litecontrol is one of only a few lighting companies with an advanced photometric lab that allows us to develop and test fixtures for every aspect of a project - from type A to type Z.

Get all the information. Call 1-800-852-3455 (in MA, call 617-294-0100) to request information and technical reports to help you design lighting for schools, offices, libraries and more. Or write to Litecontrol, 100 Hawks Avenue, Hanson, MA 02341.

Just like AT&T, you'll like the way we operate.

LITECONTROL

SEE YOUR WORK IN A BETTER LIGHT.

Circle **No. 315**

# Tack on another reason to choose Homasote:

# New, elegant DesignWall™ Interior Panels.

You've always known Homasote for its great tackability. Now you can choose it for its beauty, too. Because new DesignWall panels combine superior tackability with the elegant appearance of textured fabric.

With DesignWall panels, you can create attractive, tackable walls for even the most prestigious offices and conference rooms. The panels also have sound-deadening properties. They're completely finished, ready to apply with fasteners and adhesive.

DesignWall panels come in four handsome colors: Rose, Grey, Twilight and Burlap.

For a free sample and more information, call 800-257-9491, ext. 120.

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P.O. Box 7240, West Trenton, New Jersey 08628-0240
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Circle **No. 320** on Reader Service Card.

*(continued from page 150)*

**CFC and HCFC-free Doors**
The use of CFCs and HCFCs has been eliminated from Thermacore® insulated door products. The fully encapsulated steel/polyurethane/steel sandwich door panel is now offered with a thermal break to help alleviate the "small loss" in R-Value due to the product's new composition. Overhead Door™.
*Circle 117 on reader service card*

**Recycled Plastic Lumber**
Produced from recycled plastic materials, "TriMax" lumber is paintable and "will not decompose, splinter, or weather"; it may be recycled repeatedly. A variety of colors, sizes, textures, and performance grades may be specified. Outwater Plastics/Industries.
*Circle 118 on reader service card*

**Recycled Aluminum Signs**
Conversion coated aluminum sheets and blanks, covered or painted blanks, and finished signs with screen printing are manufactured from 100 percent recycled aluminum. Signs and Blanks Inc.
*Circle 119 on reader service card*

**Low-Flush Toilet**
The "New Cadet Aquameter Elongated Toilet" has been added to the existing line of 1.5 gpf (gallons per flush) toilets. Many colors and pressure-assisted flush action are offered. American Standard.
*Circle 120 on reader service card*

**Chemically Sensitive Products**
This company catalog includes extensive descriptions of low-toxicity finishes, paints, sealers, and other products. AFM.
*Circle 121 on reader service card*

**VOC-free Office Files**
Paint finishes on Stackable Storage modular storage and office files is electrostatically applied baked enamel and does not emit any VOCs into the air during application. Meridian.
*Circle 122 on reader service card*

*(continued on page 154)*

(continued from page 153)

## Environmental Sources and Publications

### Construction Materials

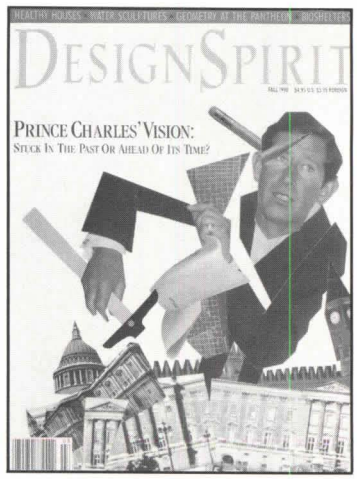
Caleb Hornbostel's *Construction Materials: Types, Uses, and Applications* (1991, 2nd edition, 1023 pp.) is an essential single-source reference for architectural and construction materials. History, specifications, standards, codes, performance evaluation guidelines, and questions to ask product manufacturers are offered for each of the 2000 entries. Contact John Wiley & Sons, Professional, Reference, and Trade Group, 605 Third Avenue, NY 10158–0012. Cost: $95.

### Resource-Efficient Housing

*Resource-Efficient Housing: An Annotated Bibliography and Directory of Helpful Organizations* (1991 edition) provides an abundance of information on periodicals, organizations, catalogs, source books, books on design, construction, and retrofit, renewable energy resources, and many other topics related to efficient housing. Contact Rocky Mountain Institute, 1739 Snowmass Creek Road, Snowmass, CO 81654–9199 (303) 927-3851 or FAX (303) 927-4178. Cost: $15.

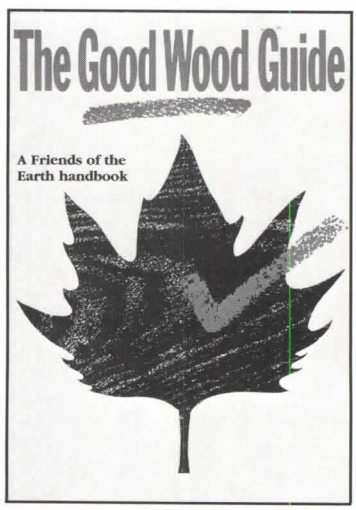
### Energy Design Update

*Energy Design Update* is a monthly newsletter on energy-efficient housing design. Brief technical articles are supplemented with illustrations, charts, and plans. Contact Cutter Information Corp., 37 Broadway, Arlington, MA 02174 (617) 648-8700 or FAX (617) 648-8707. Subscription rate: $145/year.




### Design Spirit Magazine

With articles on architects, designers, artists, and others working in allied fields, *Design Spirit* – published three times per year – explores alternative design methodology in an effort to alleviate environmental deterioration. Contact Design Spirit, Subscription Department, 438 Third Street, Brooklyn, NY 11215. Subscription rate: $15/year.




### The Good Wood Guide

This compact handbook, by Simon Counsell (1990, 75 pp.), chronicles the current status of the world's tropical rainforests; it includes lists of timbers to avoid, alternative timbers, and references for further reading

(continued on page 156)

## For colors in rubber flooring, take your cue from Endura.

The 15 standard colors in the Endura palette are carefully chosen for the way they'll harmonize with contemporary designs. There's an excellent selection of custom colors, too, and no one does them for smaller minimums. When you include rubber flooring in your plans, Endura's colors are a nice break from the ordinary.

# ENDURA®

**ENDURA Rubber Flooring, Two University Office Park, Sawyer Road, Waltham, MA 02254-9045 (617) 647-5375 Fax (617) 647-0919**

Circle **No. 339**

*(continued from page 154)*

and resources. Contact The Good Wood Guide, Friends of the Earth, 26–28 Underwood Street, London N1 7JQ, England. Cost: £5 (prepayment by international money order required.)

**BUZZWORM Magazine**

Reporting on the "condition of worldwide environmental conservation," *BUZZWORM: The Environmental Journal* is a National Geographic-style bimonthly. It has published articles on environmental design and green products and product resources. Contact BUZZWORM, PO Box 6853, Syracuse, NY 13217. Subscription rate: $18/year.

**Human Ecology Action League**

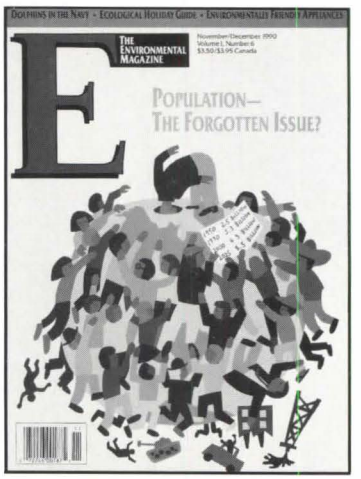
A quarterly magazine, brochure, and service list on chemical risk and how to cope with and/or avoid it in the home are offered in an effort to educate the public about chemicals in personal environments. Contact Human Ecology Action League, PO Box 49126, Atlanta, GA 30359.

**Atmospheric Ecology for Designers and Planners**

William P. Lowry's book (1989, 435 pp.) is the most comprehensive production on the subject since Rudolf Geiger's classic *Climate Near the Ground* – and it is better ilustrated. Contact Peavine Publications, Box 1264-R, McMinnville, OR 97128. Cost: $30.

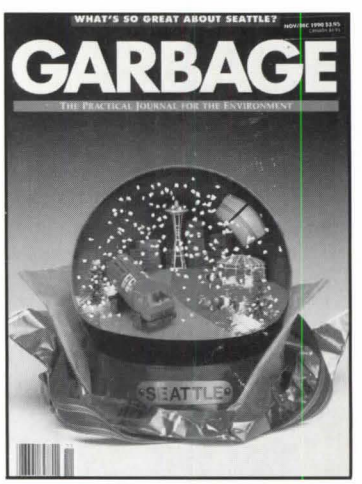
**The Green House Bulletin**

Subtitled "Environmental Awareness for Designers," this monthly bulletin selects a single subject for each issue; safe paint (December 1990) and the AIA's Environmental Resource Guide (January 1991) were recent subjects. Contact The Green House Bulletin, 4711 Springfield Avenue, Philadelphia, PA 19143. Subscription rate: $10/year.




**E Magazine**

Though *E: The Environmental Magazine* is not directly relevant to architects, it is a good source on general environmental news. Contact: E Magazine Subscription Department, PO Box 6667, Syracuse, NY 13217. Subscription rate: $20/year.

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*Garbage: A Practical Journal for the Environment,* published bi-monthly by Old House Journal Corp., is a significant newcomer in the environmental publishing world. Articles on innovative, slightly off-beat, design alternatives are presented for a consumer audience, though architects will find

*(continued on page 158)*

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(continued from page 156)
useful information as well. Contact Garbage, PO Box 56519, Boulder, CO 80322–6519. Subscription rate: $29/year.

### Wasting Away

Kevin Lynch's last book, *Wasting Away* (1990, 256 pp.) is being published posthumously, and is due out in May. It is a "plea," according to its editor, Michael Southworth, for people, and the design profession particlarly, to recognize waste, act on its existence, and plan the built environment with its natural counterpart in mind. Contact Sierra Club Books, 100 Bush Street, 13th Floor, San Francisco, CA 94104. Probable cost: $25.

### Permaculture

*Permaculture: A Practical Guide for a Sustainable Future* (1990, 575 pp.) by Bill Mollison thoroughly documents the interdisciplinary earth science of permaculture (a design system for sustainable land use, urban and rural), its implementation, and environmental advantages. Contact Permaculture Drylands, P.O. Box 27371, Tucson, AZ 85726–7371. Cost: $34.95.

### Recycled Products Guide

An extensive listing of recycled construction materials is included in the *Recycled Products Guide*. Published two times a year, RPG listings are cross referenced alphabetically, geographically, and by product type. Contact RPG, American Recycling Market, P.O. Box 577, Ogdensburg, NY 13669 (800) 267-0707. Cost: $195/year.

### Tropical Forest Foundation

The Tropical Forest Foundation is a nonprofit organization "established to educate the consuming public and promote the positive effect of properly managing the forest." Contact TFF, Keister Evans, 1421 Prince Street, Suite 230, Alexandria, VA 22314.

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(continued on page 160)


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*(continued from page 158)*

tronic filing system stores up to 12,000 documents on a single optical disk using a 40-page-per-minute scanner. Canon.
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**Building Documentation**
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**Landscape for Architects**
LANDCADD Light is software for architects who are not professional landscape architects but need to do site planning. This AutoCAD-compatible software has routines for planting plans and irrigation. It also contains a library of plant materials that can be viewed in plan, section, or 3D. LANDCADD.
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**Computer Fax**
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**Standards on Disk**
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**Terrain Modeler**
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**Books** *(continued from page 106)*

remaining two chapters review the relationships among solar strategies. "Architectural Integration" by Edward Mazria presents a number of historical examples in his argument for a new regional aesthetic. In the final chapter, "Nonresidental Buildings," Harry Gordon et al. take on a difficult subject in a clear and straightforward manner: The challenges of overlaying solar strategies on an already complex building problem are there to see. Unfortunately this chapter is marred by several mislabeled figures, which detract from a well produced book.

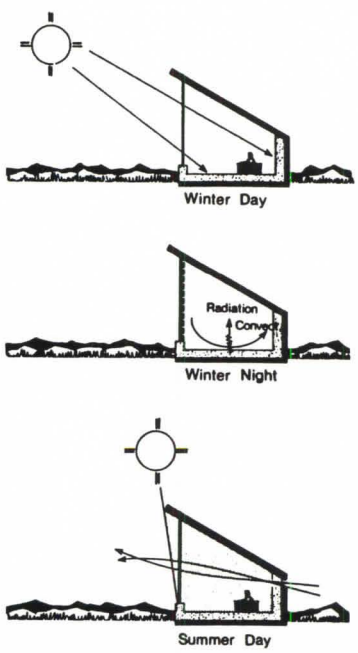
In contrast to Anderson's selective presentation of the evolution of solar integration, Jeffrey Cook made *Passive Cooling* an ambitious review of nearly every existing non-mechanical means to provide cooling. The majority of these do not rely on the direct use of solar energy, but rather allow a building to modify its temperature by rejecting heat to any of three sinks – the atmosphere, the sky, or the earth.

Cook opens *Passive Cooling* with a thorough overview that gives the reader an excellent understanding of the subject. The next two chapters present cooling strategies that use the atmospheric sink. "Ventilative Cooling" by Subrato Chandra describes the enormous potential of natural ventilation. "Evaporative Cooling" by the late John I. Yellott traces the advantages of this remarkably effective concept in hot arid climates. In "Radiative Cooling," Marlo Martin explains how the sky (particularly on a clear night) absorbs the earth's heat. The third heat sink is addressed in "Earth Coupling," by P/A's Technics Editor Kenneth Labs, who describes how the stable temperature of the ground can thermally control a building. "Passive Cooling Systems" by Gene Clark completes the technical discussion by explaining how each cooling strategy or combination of strategies can yield an effective passive cooling design. The volume concludes with "The State of Passive Cooling Research," where Jeffrey Cook reviews the present state of research and speculates on promising future directions.

Overall, both volumes are needed contributions to the literature; they assemble previously scattered information into usable references. While those who have been following the field will be familiar with some of the material (moreso in the Anderson volume), most designers will find these two books to be useful resources and important additions to their library.

**Harvey Bryan** ■

*The author is an associate professor at Harvard's Graduate School of Design and a frequent contributor to P/A in the area of building technology.*

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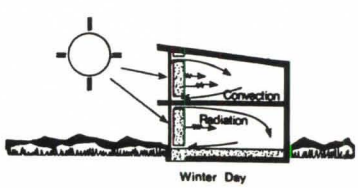


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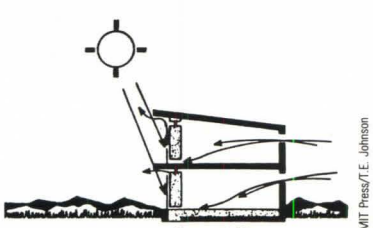


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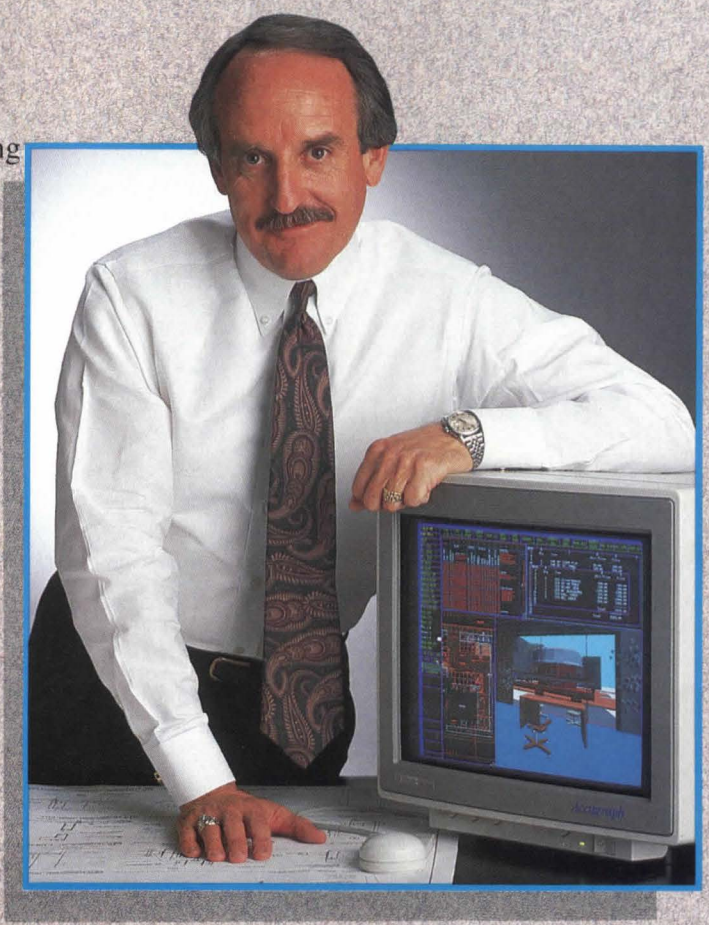

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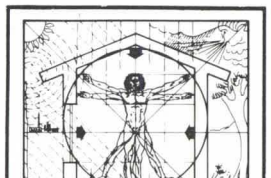


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Photo: Tadahisa Yoshikawa

*Arata Isozaki at work: "no rush or fuss."*

**Arata Isozaki, whose latest works in Spain and Florida will be reviewed in next month's P/A, seems like the archetypal jet age architect.**

*Since P/A published his early works in some of Japan's provincial centers back in 1976, he has expanded to a global field of operations and seems to feel at home on any continent. His office in Tokyo, however, seems less like the center for international operations that it is than a monastic retreat.*

*To reach it, one turns off one of the main arteries of the Roppongi district, with its high-energy boutiques and restaurants, into a tree-shaded cul-de-sac lined with domestic-scale buildings, where "Iso" has both his office and – a couple of doors away – the house he shares with his wife, the artist Aiko Miyawaki. There is nothing particularly Japanese about the place; it is reminiscent of the architecture offices that used to occupy old houses on shady alleys off Harvard Square in Cambridge. And the office interior has that same kind of genteel feeling – no rush or fuss, a few handsome models dominating the view, drawings artfully dispersed – the feeling of a sedate atelier. But one with worldwide impact.*

*If one is fortunate, a visit to Iso's retreat/office may be followed by lunch in the restful dining/kitchen space of the nearby house, where the architect and his wife will share their favorite macrobiotic dishes, some updating Japanese traditions, some translating from the larger culinary world. After a final sip of tea here, the crass commercial world a few hundred feet away is hard to accept.*

. . .

It surprised us all to learn from Dr. Robert Brungraber (Technics Focus, page 112) that more accidents – and just as many fatalities – are related to simple falls than to burning buildings. Yet one contributing Technics writer this month went out of her way to prove the danger of a slippery slope.

The author told us that the article was nearly complete when a violent winter storm caused an ice-laden tree to fall on her home's power lines, in turn causing a surge and then a complete loss of electricity. When the power came back, our article had vanished in an electronic vapor. Already pushing the deadline, she called her sources to help recreate what she had written. Working late one Saturday night, the weary author went out into the frozen night to revive herself with some fresh air. She fell and broke her leg only a few steps beyond her front door.

The deadline came and went, and as anxious editors are wont to do, we called to inquire about the story. Each day of that week there was a new tale of woe – emergency rooms, crutches, reactions to medication – yet our steadfast contributor pushed forward and faxed the piece at the last possible moment to make this issue. It was fortunate that we were newly enlightened on the frequency of falls.

. . .

In AIA Gold Medalist Charles Moore's seminal and much-cited 1965 essay on Southern California urbanism ("You Have to Pay for the Public Life," *Perspecta* 9/10), the architect offered what he called the "revolution test" to find the civic and spiritual center of a community. The gist of the test was this: Where in a given community would one go to stage a popular uprising? Reminding us of the revolts that have taken place in civic plazas in Latin America and Europe, he searched for such a place in Los Angeles. His somewhat flippant answer for would-be L.A. revolutionaries was:

**1) take over the freeways; or**
**2) fly to New York, organize sedition on Madison Avenue, and let the word filter back.**

As often seems to be the case these days, though, yesterday's Post-Modern irony has evolved into today's reality. While recent anti-war demonstrations involving attempts to take over federal buildings have not received much attention, a San Francisco march against the war made the news when participants did take over the freeways, stopping traffic on the Bay Bridge.

Meanwhile, just blocks from Madison Avenue, AIDS activists have targeted the nation's town square – television news – by slipping past security guards at the network studios in an attempt to air their message on the nightly news. One such activist was briefly seen on the *CBS Evening News* before Dan Rather cut to a commercial and had him removed. Another missed camera time but wrought havoc on the PBS *MacNeil/Lehrer Newshour* by attempting to handcuff himself to host Robert MacNeil.

**So, for all you urban designers who are eager to create a place for public life, put down your Leon Krier and send your résumés to**

**1) the Department of Transportation; or**
**2) the set design department of your favorite network.** ■

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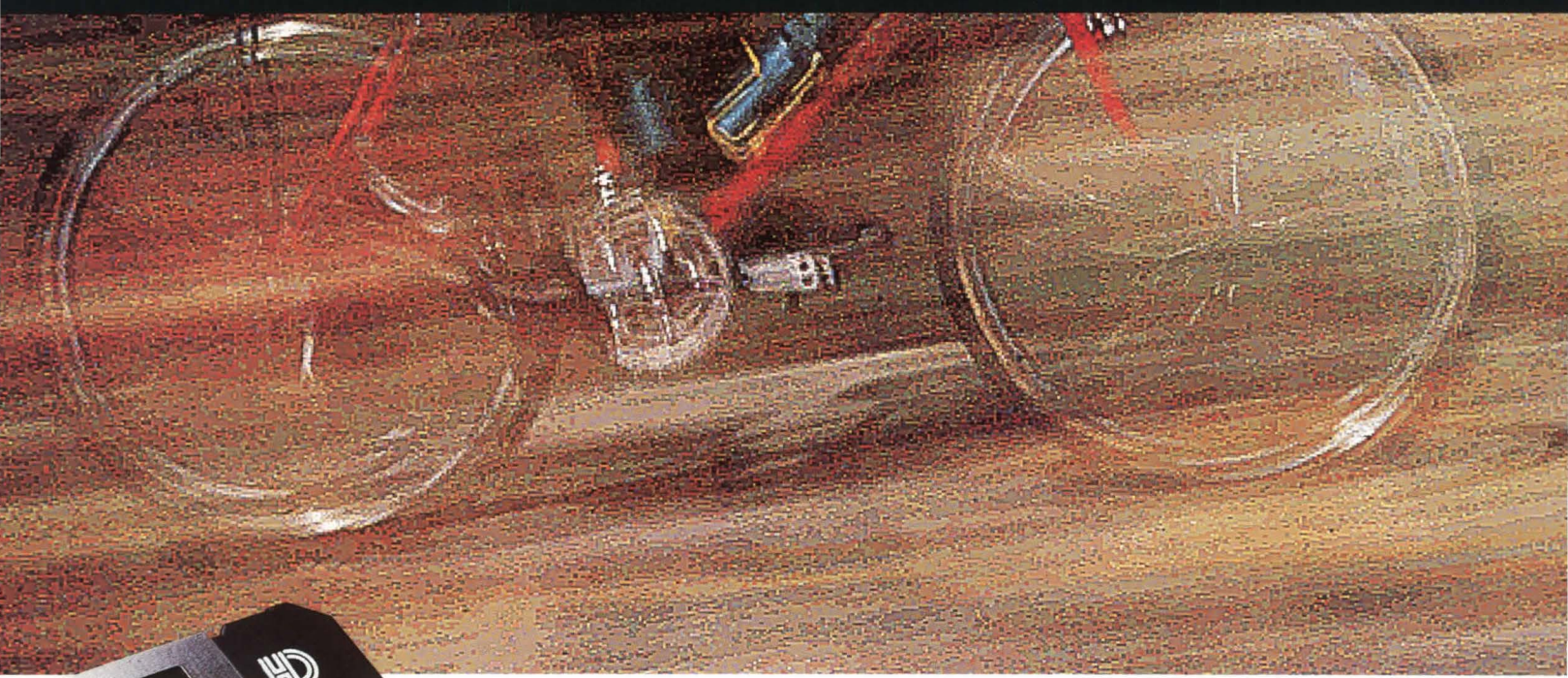

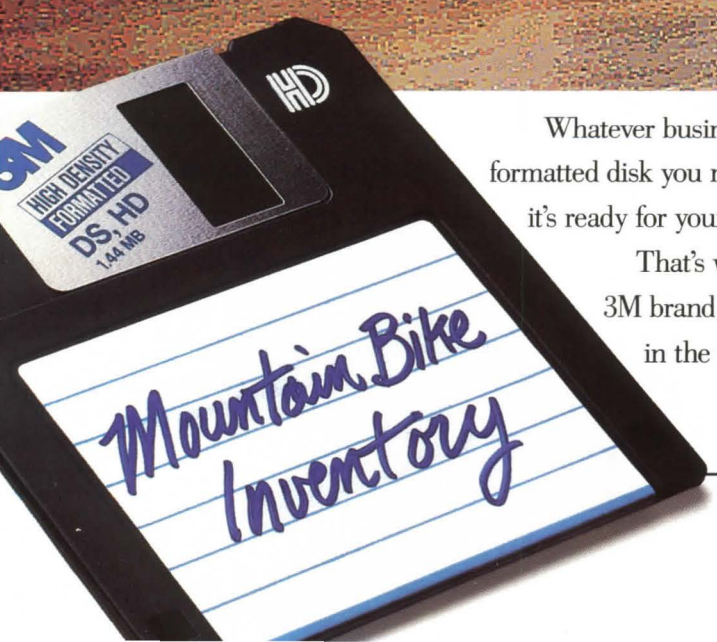


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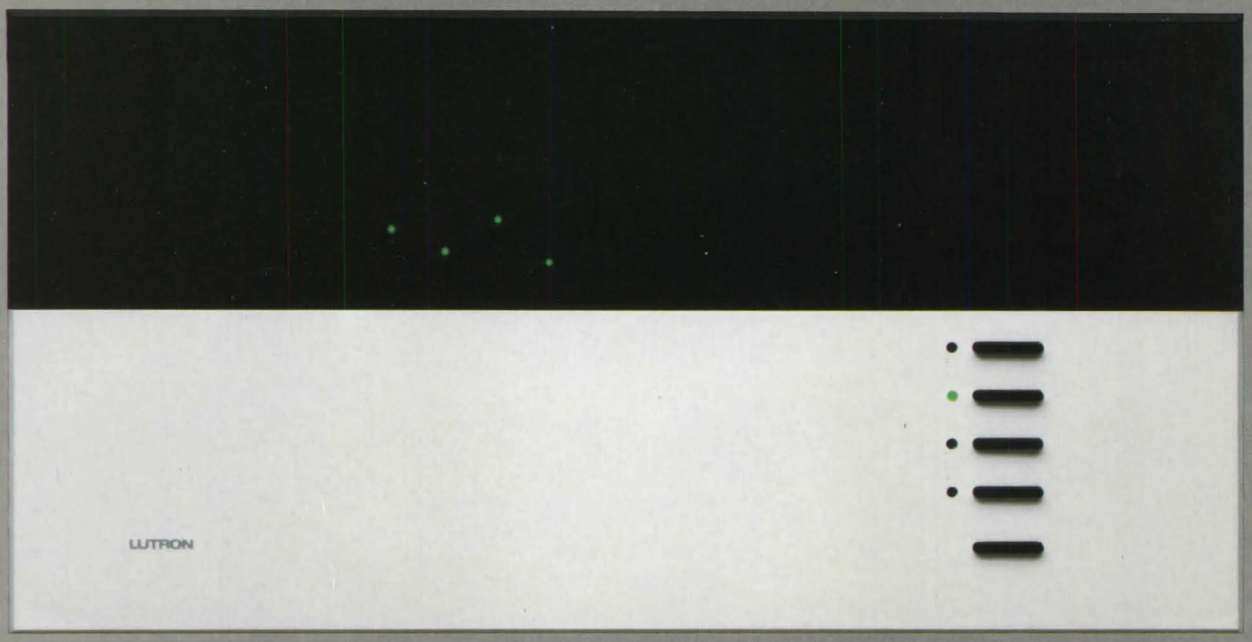
GRAFIK Eye®

# 4-Scene, 4-Zone Preset Dimming Control




*GRAFIK Eye Control—Preset dimming with a sleek, thin profile design*

## Create 4 Distinct Lighting Scenes. . . Recall Each by Touching a Button

The GRAFIK Eye Preset Dimming Control offers:

- coordinated lighting control in one sleek, thin profile unit.
- control of 4 independent lighting zones* (circuits) which create 4 distinct lighting scenes.
- the ability to transform the lighting of any space with the simple touch of a button.

The GRAFIK Eye Control can:

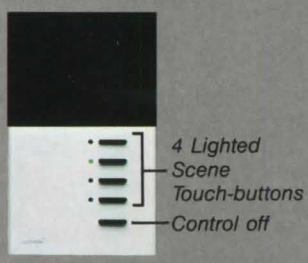
- provide proper lighting levels for multiple functions.
- emphasize unique features that have been designed for the space.
- create different moods or ambiance.

The GRAFIK Eye unit controls up to **2000 watts*** of incandescent, incandescent low voltage, and fluorescent lighting.

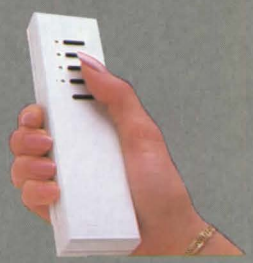
* GRAFIK Eye Controls can be used in up to 12-zone applications; systems are available to control up to 18,000W/VA maximum capacity. Call Lutron for more information.

*GRAFIK Eye Control with white opaque cover*
*Dimensions: .295" thin x 8⅞" x 4½"*

*Thin profile*




*Auxiliary Scene Activator provides remote touch-button control from 1 or 2 additional locations. Dimensions: .295" thin x 2¾" x 4½"*



*Wireless Remote Control Accessory for GRAFIK Eye Control. Dimensions: .93" thin x 1.5" x 5.7"*

For more information on the GRAFIK Eye Preset Dimming Control, call Lutron's Hotline toll-free:
**(800) 523-9466 (U.S.A.)**
**(800) 222-4509 (Pennsylvania)**

LUTRON®

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Coopersburg, PA 18036-1299