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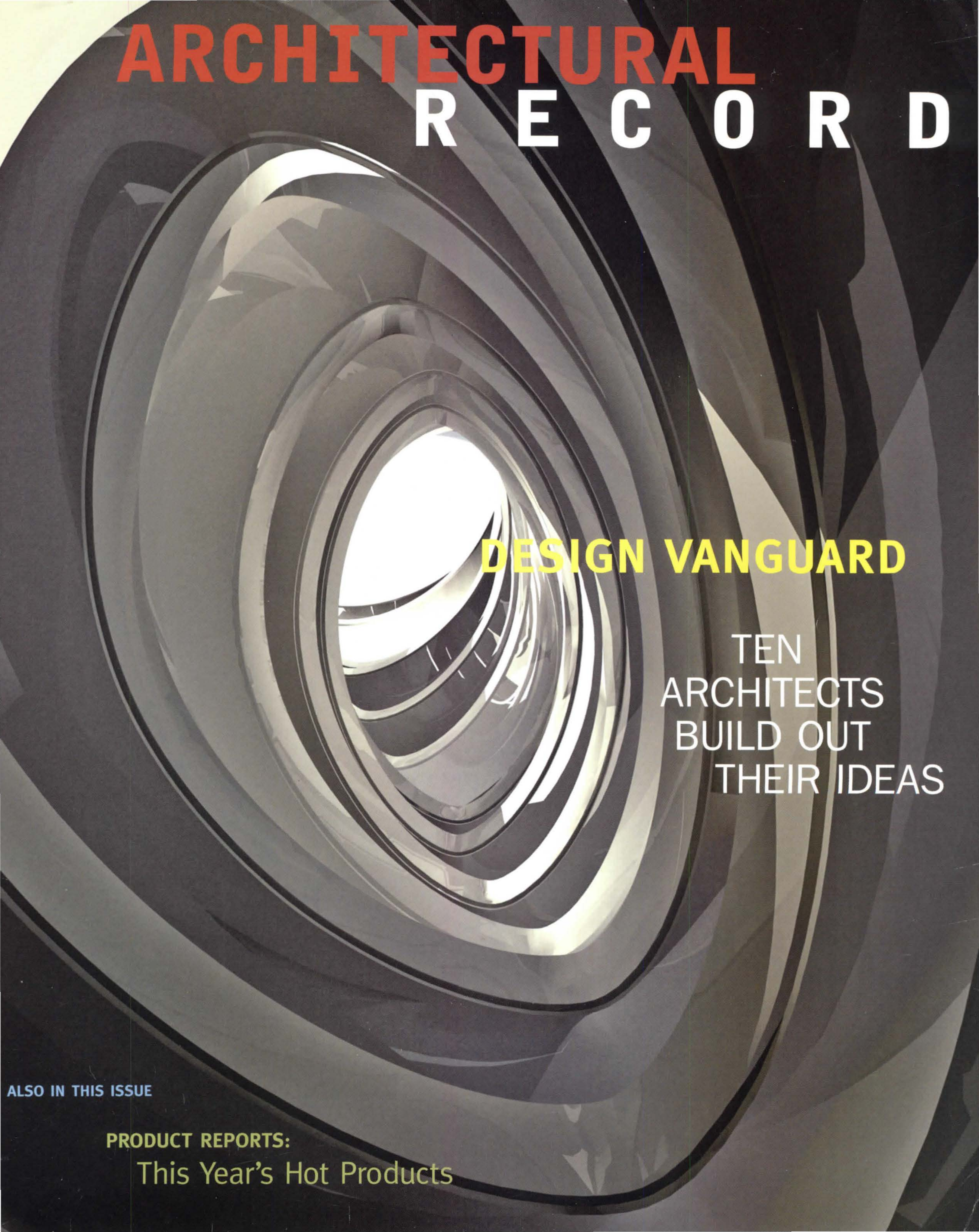

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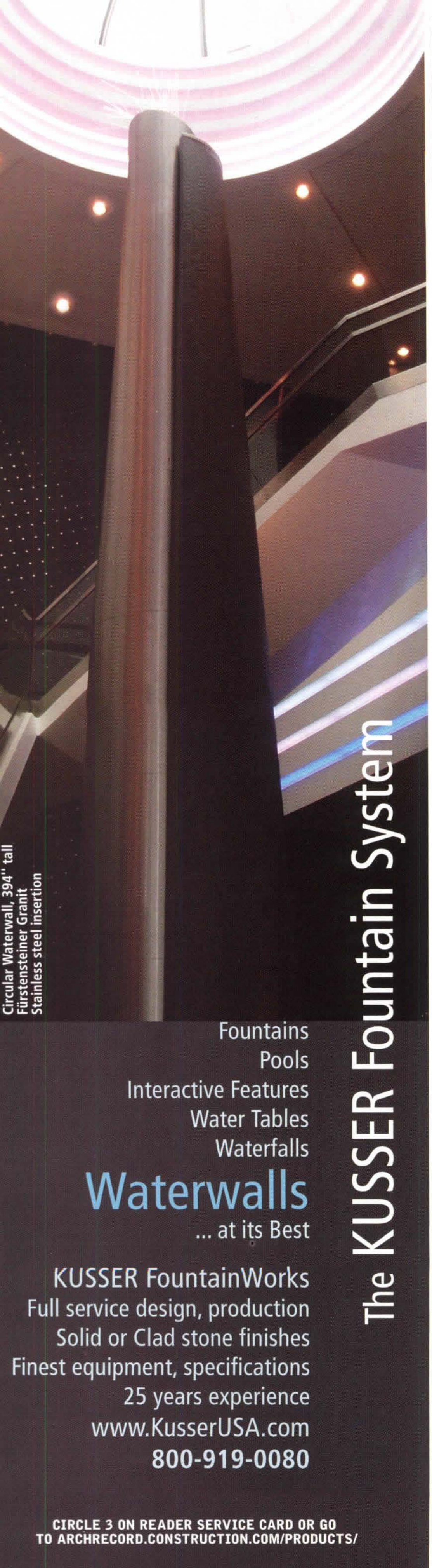

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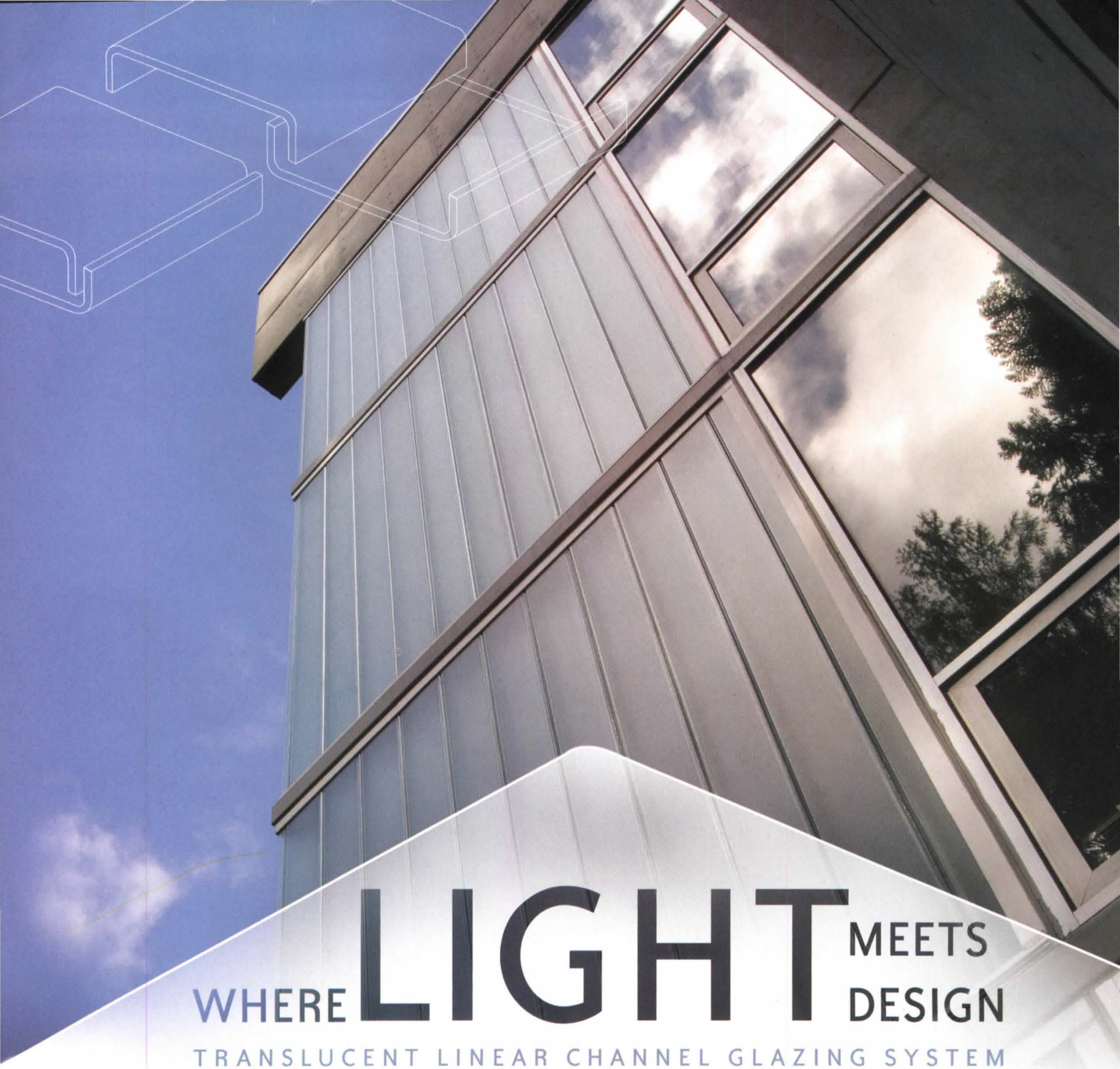

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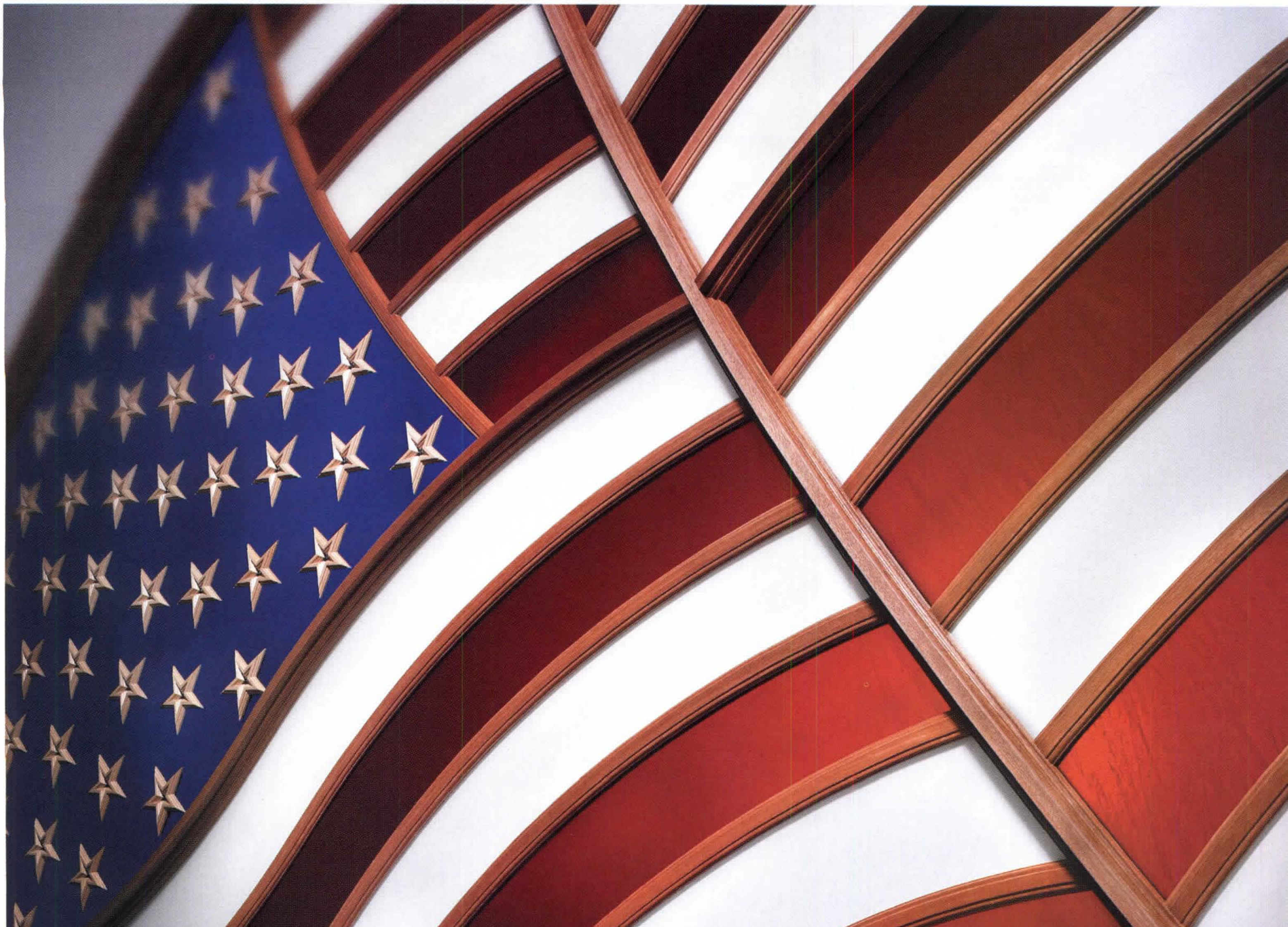

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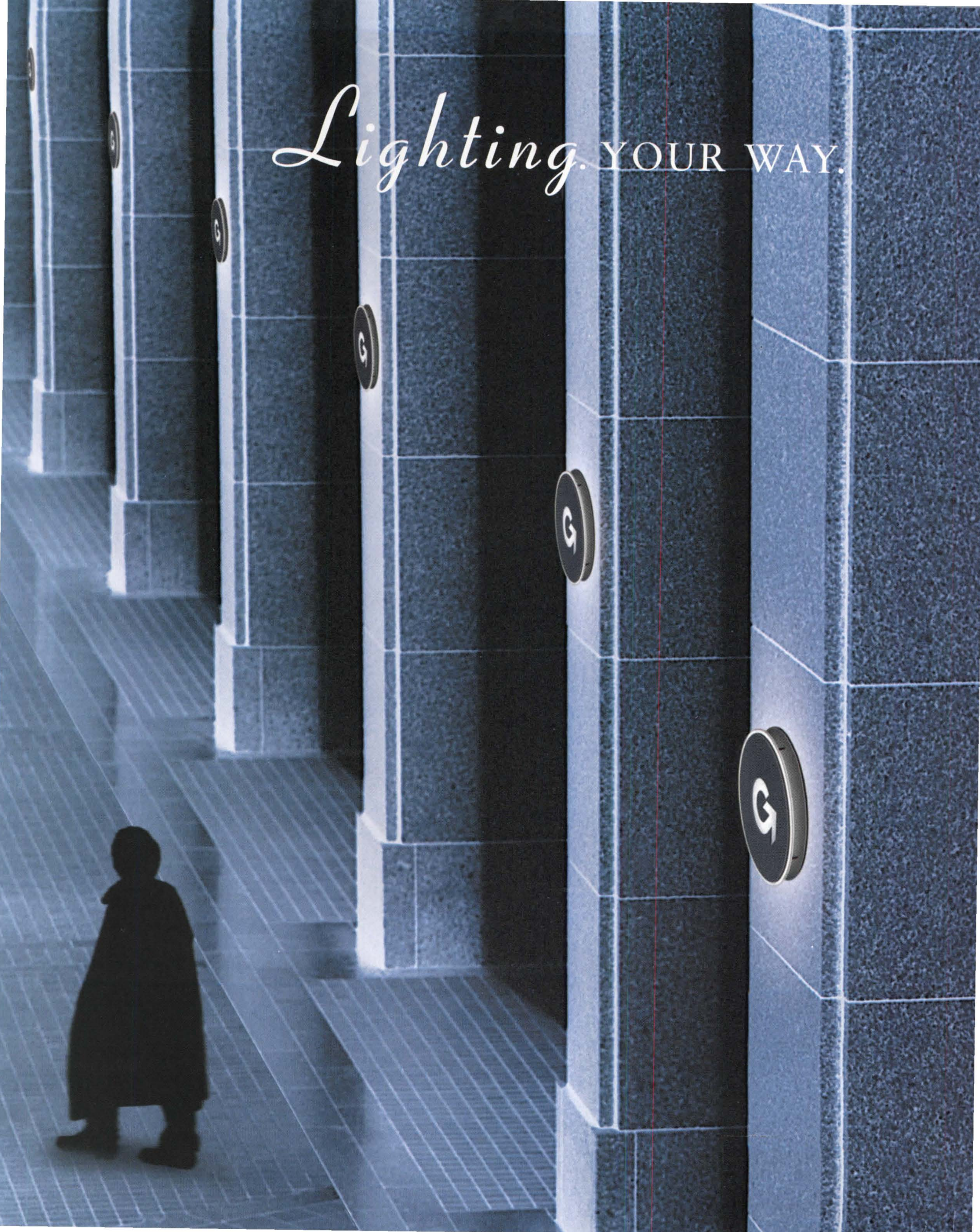
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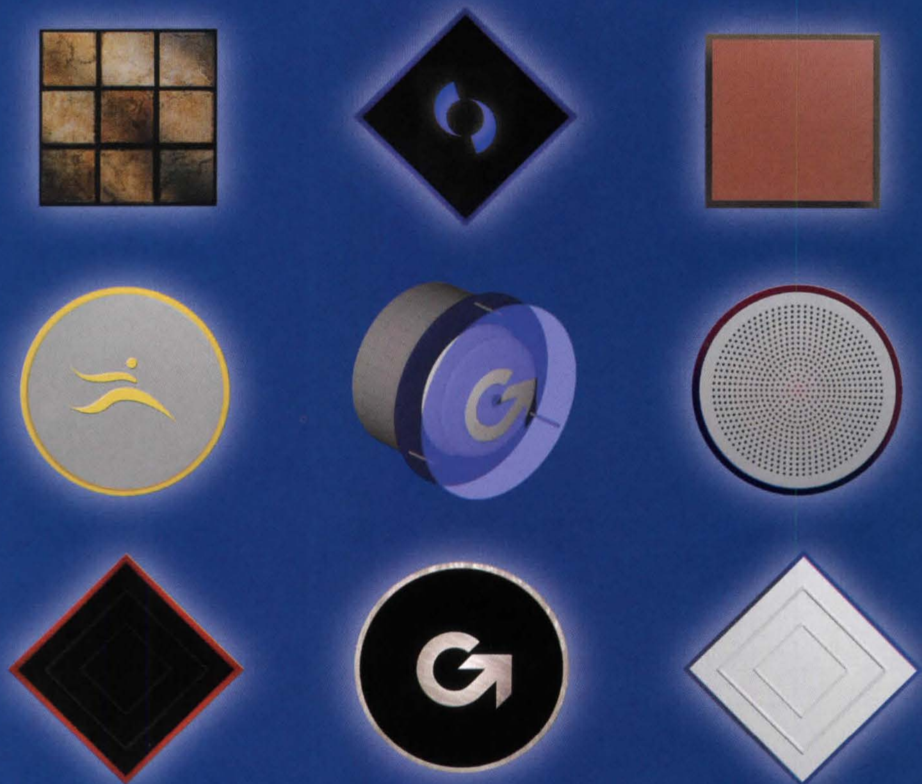

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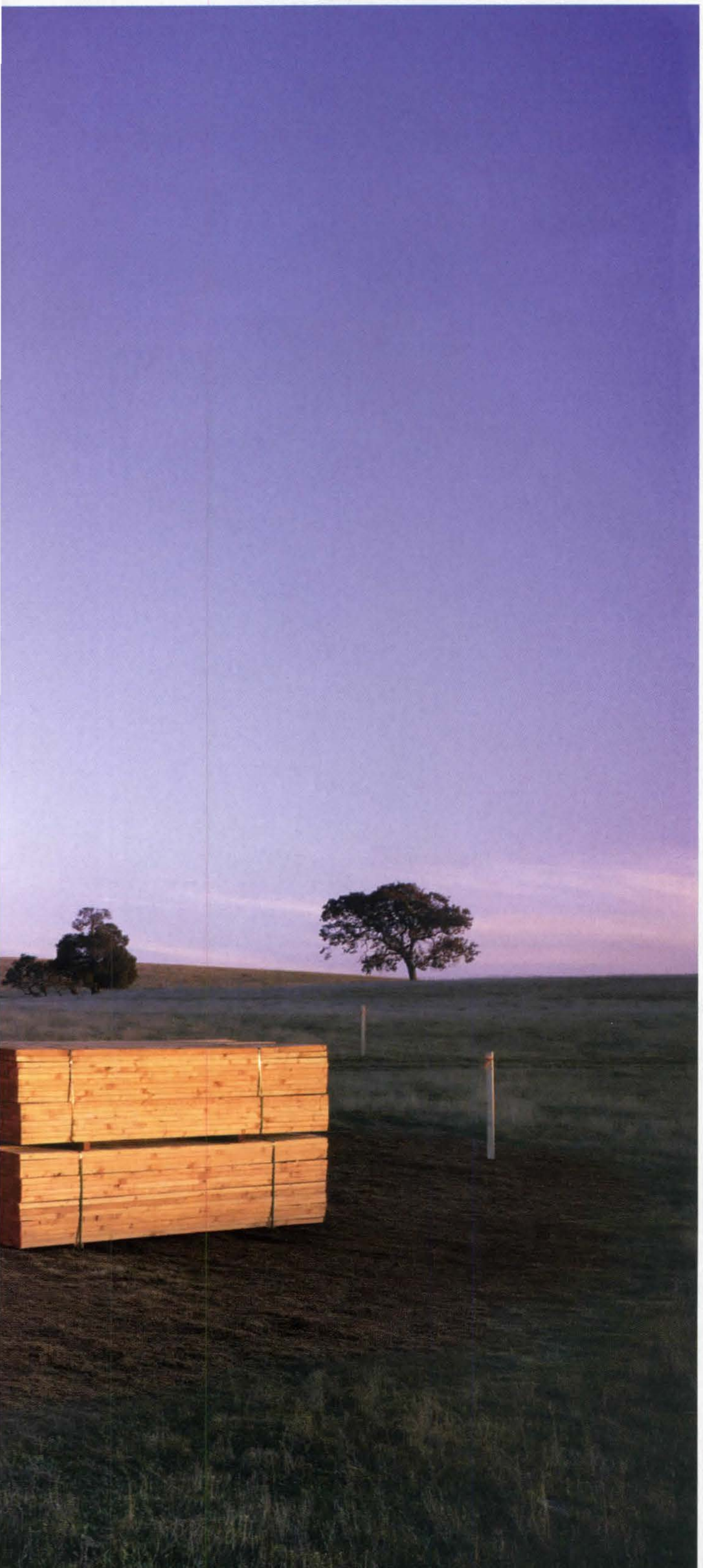

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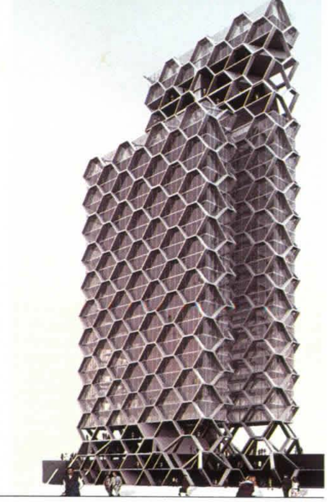

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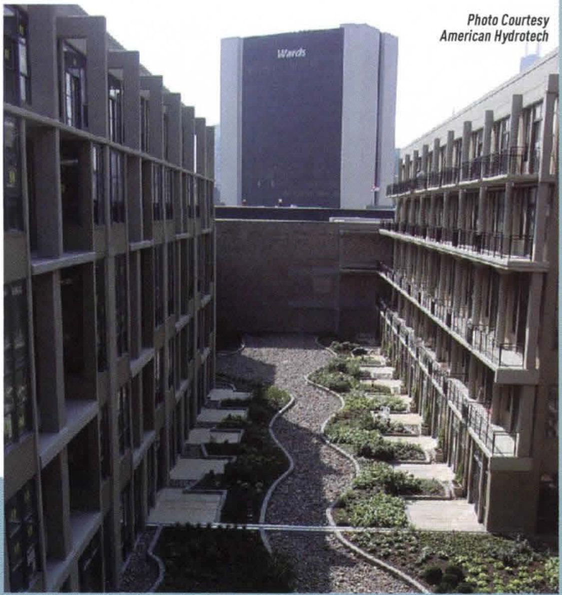
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Building Types Study

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Durham Academy Lower School by KieranTimberlake.
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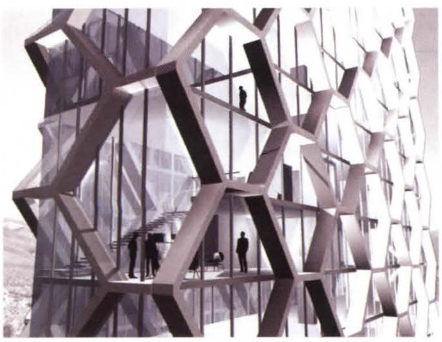

Courtesy Rojkind Arquitectos

Design Vanguard 2005

Ten emerging firms are introduced in this year's Vanguard, all with a huge variety of projects, from furniture to residences to large-scale university and cultural projects. Keep your eye on these 10 firms, and the architects who lead them. They're definitely ones to watch.

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LESSON: Thermal + Moisture Control

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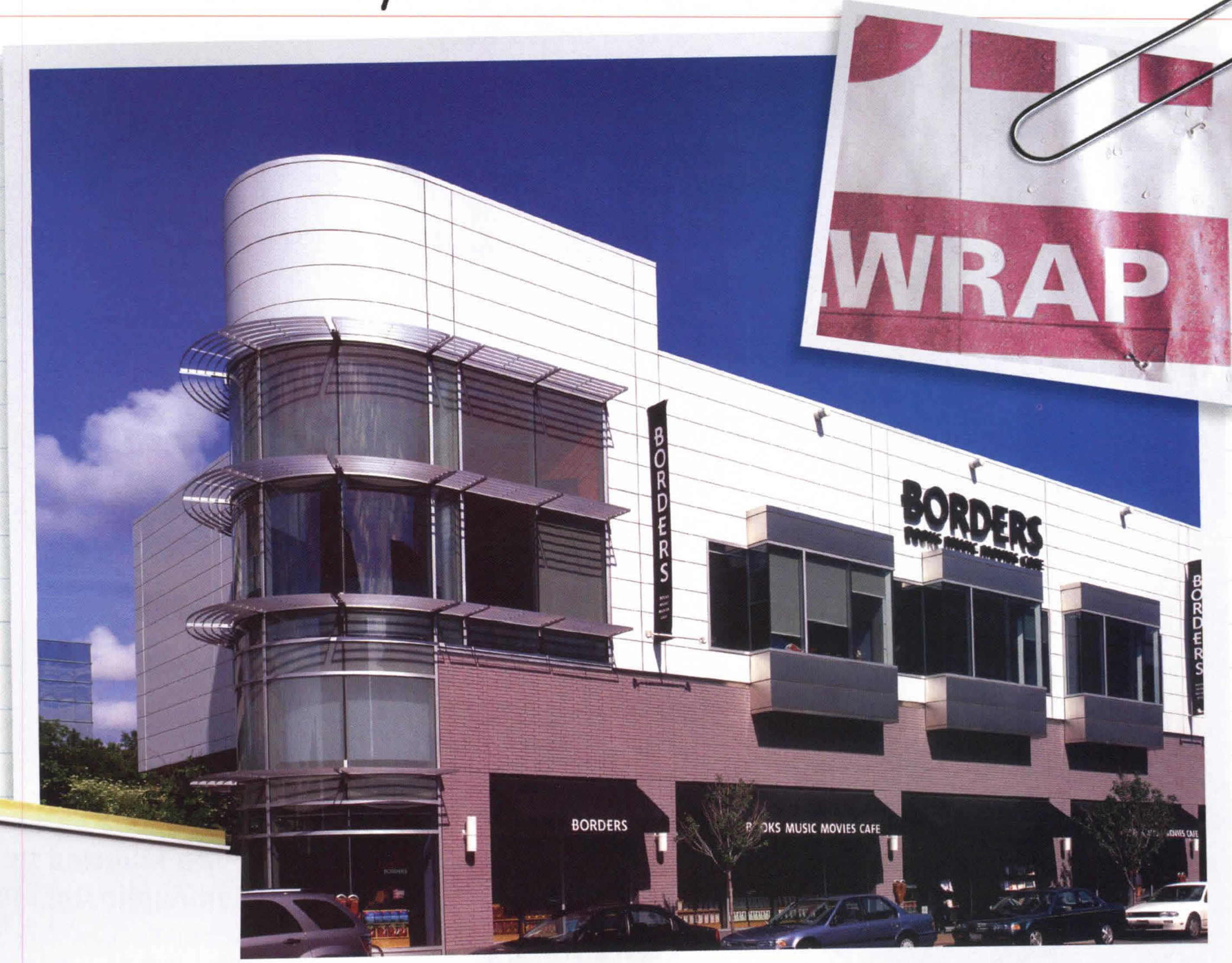

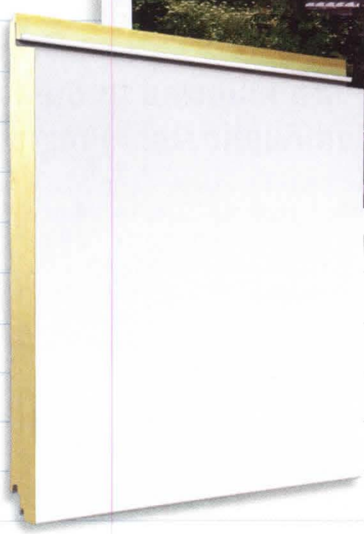

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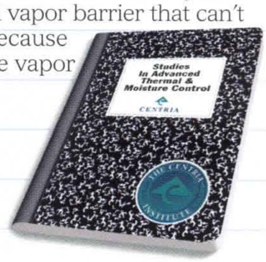

Learn more about avoiding moisture problems in exterior walls with the CENTRIA Institute's *Studies In Advanced Thermal & Moisture Control*. The handbook is free for architects, contractors and building owners with a phone call to CENTRIA today.

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Editorial

Green and Proud of It

By Robert Ivy, FAIA

Several events that occurred in November point out that green is growing up. After its birth in the 1960s as a barefoot earthchild, spending a scrappy adolescence in the 1970s as a Serious Cause—replete with passive heating, organic diets, and "coolth tubes" (remember those?)—and recent decades as a trend manqué, the design and construction culture seems to be getting the green message.

Sustainability, freed from cult status, has matured into a standard that underlies the expectation of all design. Bolstered by scientists from organizations such as the Natural Resources Defense Council, architects now know that their work has immense impact on the environment, consuming 70 percent of electricity in this country, twice the energy consumption of cars and trucks. Our structures contribute one third of total carbon dioxide emissions to the atmosphere, a sobering fact when confronting global warming's effects, which include the melting of polar ice caps or glaciers and an increase in storm activity. While some stubborn few still dismiss carbon emissions as the culprit, no one can dispute the skyrocketing costs of energy. We all live in a world where oil prices routinely hit (and have exceeded) $60 per barrel.

Architects like Norman Foster, who recently received ARCHITECTURAL RECORD*'s and McGraw-Hill Construction's first Innovation Award, have practiced green architecture for decades. Foster, whose practice began in 1961, has grown up as an advocate who has followed a savvy green path, teaching clients, then adding an increasingly sophisticated overlayer of systems to buildings that can only be described as "holistic." Today, Foster and Partners, together with its engineering collaborators, integrates complex computer systems with the most basic physical laws, such as convection, to create intelligent, efficient structures like the Swiss Re headquarters in London, whose complex facade lets in air for passive cooling and then vents it as it warms and rises. Foster's work represents a high point in contemporary practice, while proving that green pays.*

In regions where energy prices have traditionally remained higher than the U.S., sustainability means more than accountancy. Workers in continental Europe, for example, have demanded and received proximity to natural light, clean indoor air free of off-gasses from solvents and toxic glues, and social amenities. In Europe, sustainability is not limited to real estate.

What are the new indicators of broadening acceptance of sustainable design in the United States? Sheer numbers, for a start. The fourth Greenbuild Conference sponsored by the U.S. Green Building Council, for example, which took place in Atlanta from November 9 to 11, drew upwards of 10,000 attendees, who swamped the seminars, crowded the exhibitors, and filled up their tote bags with information and resources to inform their businesses and practices, ready to work and build greener. Everyone wanted in on the topic.

By now, you know the USGBC as the originators of the LEED program, which certifies that completed buildings meet a list of stringent criteria, from appropriate building materials to the disposal of construction waste. The program is generating its own energy, and although relatively few buildings [see RECORD*, June 2005, page 135] have achieved LEED certification yet, and some have thrown up their hands and dropped out (the* New York Times *headquarters, for example, which folded its formal LEED program, if not its commitment to building green in the face of Manhattan's unrealistic costs), projects in the pipeline are increasing. Self-certifying programs, such as Green Globes, which was organized by the Green Building Initiative, may erode LEED's dominance, but increasing awareness by clients, including developers and government agencies like the General Services Administration, point to overall growth for certification. Manufacturers, who can smell a good thing, have jumped on the bandwagon, hoping that a green "seal of approval" will differentiate them from the competition as architects and engineers race toward gold. In recognition of green building's ascendancy in all our minds, and the desire of clients and the larger public to achieve more efficient and life-enhancing structures, McGraw-Hill Construction will launch a new magazine in 2006. Dedicated to sustainable design in all buildings, this publication will include a robust Web presence and resource center. Initially to be circulated primarily to members of the USGBC, the magazine will widen its circulation over time, updating and informing its readership of advances, policy changes, and case studies. Our new green magazine (name to come) will allow architects, engineers, owners, and manufacturers to build with the best 21st-century ideas, including consideration of the whole planet. A maturing movement that was birthed on a collective farm now deserves the informed public voice of a grown-up, and we are clearing our throats for the discussions to follow. Listen up.*

Robert Ivy

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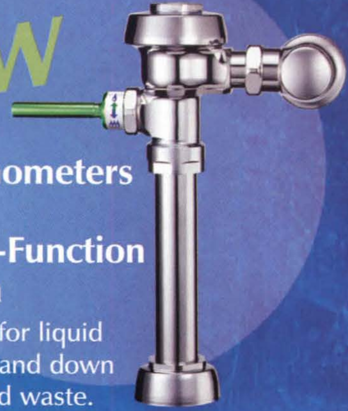

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Letters

Politics of destruction
In sympathetic anticipation of thoughtful insight regarding the reconstruction of New Orleans, I instead found myself struggling through Michael Sorkin's political diatribe in utter disbelief [October 2005, page 73]. It is further astonishing that Sorkin doesn't even attempt to mask his true agenda with clichéd leftist attacks on Halliburton, President Bush, a "self-righteous" Bill O'Reilly, as well as Fox News. I sincerely believe this profession looks to ARCHITECTURAL RECORD for meaningful, unbiased dialogue concerning the state of our built environment, particularly one that has been obliterated. Leave the political editorials for *Time* and *Newsweek*; this disgraceful hit piece written at the expense of a destroyed population provides a severe disservice to both your magazine and the design profession in general.
—Tom Rhodes, AIA
Atlanta

Too California?
In his fine essay "Museums and the Maecenas Touch" [November 2005, page 99], Martin Filler states that Frank Gehry was rejected as architect for the San Francisco Museum of Modern Art because he was "deemed too Californian by the internationally ambitious board." I'm sure Filler has a source for this observation, but it is simply not what happened.

I was an adviser to the SFMOMA selection committee, and they welcomed the idea of a California architect, even if he wasn't from the Bay Area. The reason Gehry was ruled out was that he was virtually certain to get the prized commission for the Disney Concert Hall in Los Angeles. The museum committee—as is often the case—wanted their job to be the most important one in the firm at the time. I was present when the committee made a call to discuss this very issue with Gehry, talking on speaker phone from L.A.

So the San Francisco commission went to Mario Botta, who had no bigger prospective jobs. I fully agree with Filler on the museum built by Botta and his SFMOMA clients—no Maecenas among them.

The irony is that since Gehry's work on the Disney hall suffered a long interruption, it didn't become a reality for several years after SFMOMA—or Bilbao.
—John Morris Dixon, FAIA
Old Greenwich, Conn.

Yes, too California
I cannot dispute John Morris Dixon's eyewitness account of the ostensible reason why the SFMOMA commission went to Mario Botta rather than Frank Gehry. Yet I suggest there are often less openly expressed motivations behind such decisions, especially among a board of trustees known in the art world as much for its willfulness as for its generosity. A few months before Botta was selected over Gehry and Isozaki in October 1988, I was invited to San Francisco speak to the museum's Director's Circle, comprised of its leading donors. Two trustees (who were to be among the biggest contributors to the building fund) confided that, despite my clear preference for Gehry, their choosing a California architect would undermine the desired new identity of SFMOMA as an international institution. Cultural insecurity of that sort is rarely admitted to, and I believe that a more face-saving rationale was devised, which seemed credible even to the selection committee's professional adviser. Close as I was at the time to several central participants in the project, I stand by my understanding of what actually happened, though I am too much a fan of *Rashomon* to insist that mine is the only truthful point of view.
—Martin Filler
Manhattan

Real residences
Thanks, thanks, and thanks again. Imagine, real houses for real folks done by real firms! I was most impressed by the coverage of residences in the October 2005 issue [page 209]. The fact that such careful design considerations resulted in wonderful houses is a lesson to all. McMansions be damned!
—Michael J. Cohen
Manhattan

Writing on the wall
Great contemporary design and interiors aside, at least three of the houses in your Residential section [October 2005, page 209] have one thing in common: They don't relate to the street, to the community. Why is there no criticism of this? When are blank facades and perimeter walls considered friendly? Why would an architect use paranoid Moroccan courtyard housing as a model to site his house in an open society? Are the homes in bad neighborhoods? Why not show the context for these houses?
—J.R. Griswold
Orange County, Calif.

Seeing in the dark
Although generally positive, the article on the new Paul Klee Center [October 2005, page 133] mentions an apparent conflict between what are termed the topographical and the museological experiences. My impression of the museum after a recent visit was distinctly different. Apparently, the fragility of Klee's works called for gallery spaces that permit extremely low levels light. Renzo Piano's team addressed this difficult technical requirement and created exceptional gallery spaces, particularly the exhibition space for the permanent collection. Upon first entering the permanent collection, the visitor experiences low levels of artificial light—the feeling is similar to entering a great circus tent. The paintings, many of which are relatively small in size, appear almost as postcards in the distance. Within a few moments, one's vision adjusts to the darkness and then the paintings magically reappear in all their original subtlety. The lighting solutions, along with many other fine architectural decisions, are extremely effective in carefully illuminating the works and the palette that Klee employed, and help the visitors gain a special insight into his art.
—Frank H. Weiner
Blacksburg, Va.

Corrections
An October News item about the Watergate Hotel being converted into condos [page 58] incorrectly stated that one of the teams, ForrestPerkins, is based in Dallas. They are based in Dallas and in Washington, D.C. November's Roofing & Siding product focus [page 230] included incorrect information for the Safeguard NP fascia system. The company name is W.P. Hickman Company of Asheville, North Carolina, and the Web site is www.wph.com. The November Correspondent's File on Tucson [page 69] misspelled Wil Peterson's name. Additionally, the captions for Ibarra Rosana's Tucson bungalow and custom home on the town's outskirts were switched.

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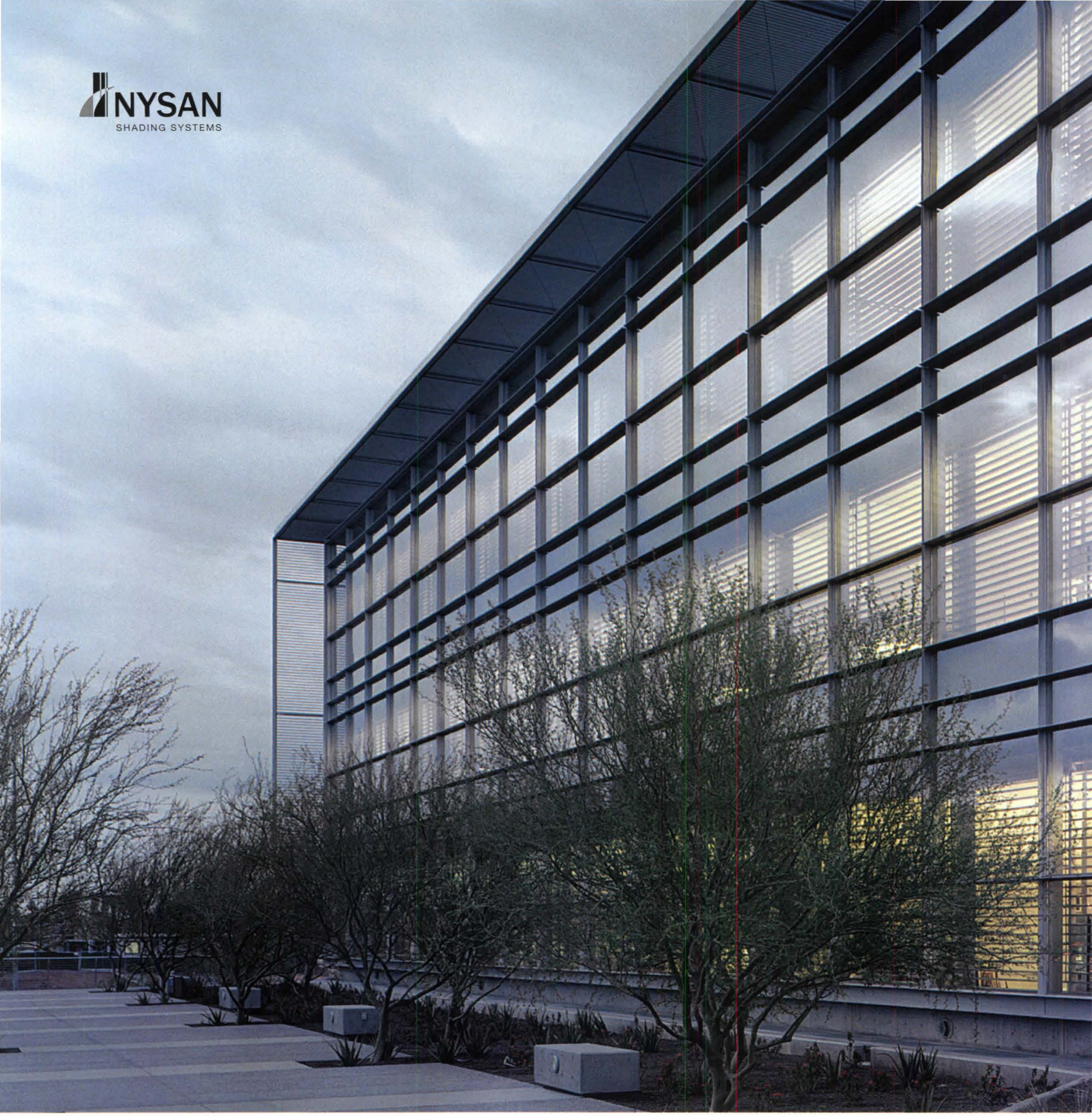

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For and about the emerging architect

archrecord2

A subject frequently explored in the pages of archrecord2, competitions are a good opportunity to sharpen one's craft, create collaborations, and attract attention to a burgeoning career. For direct links to the competitions listed below, visit archrecord.com/archrecord2/.

Student Competitions

Light of Tomorrow The International VELUX Award 2006 invites students to explore daylight in all its dimensions. Winners attend the awards ceremony in Europe, October 2006. More information is available at www.velux.com/a. *Registration Deadline: February 10, 2006. Submission Deadline: March 10, 2006.*

Hospitality Transformed: Resort Hotels in 2055 Imagine the possibilities for the future of hotel design in the age of advanced technology. Your submission must be a digital design. More information is available at www.acsa-arch.org. *Registration Deadline: February 8, 2006. Submission Deadline: May 24, 2006.*

UNESCO/UIA This competition's humanitarian concerns address the issues of urbanization in historic districts and social sustainability. Design a historic-district renewal area comprising an existing historic structure or located in a new complex. More information is available at http://portal.unesco.org/shs/en/ev.php-URL_ID=8203&URL_DO=DO_TOPIC&URL_SECTION=201.html. *Registration Deadline: January 15, 2006. Submission Deadline: March 31, 2006.*

International Association for Humane Habitat Design sustainable and humane work places for an urban node that includes landscaped open spaces. More information is available at www.humanehabitat.org. *Submission Deadline: January 20, 2006.*

DFI Student Papers Competition Open to students in engineering, construction, and geological sciences, this competition asks entrants to write about deep foundations. The winner will travel to the October DFI conference in Washington, D.C., expenses paid, to share the winning paper. More information is available at www.dfi.org. *Abstracts Submission Deadline: January 6, 2006. Submission Deadline: April 7, 2006.*

Open Competitions

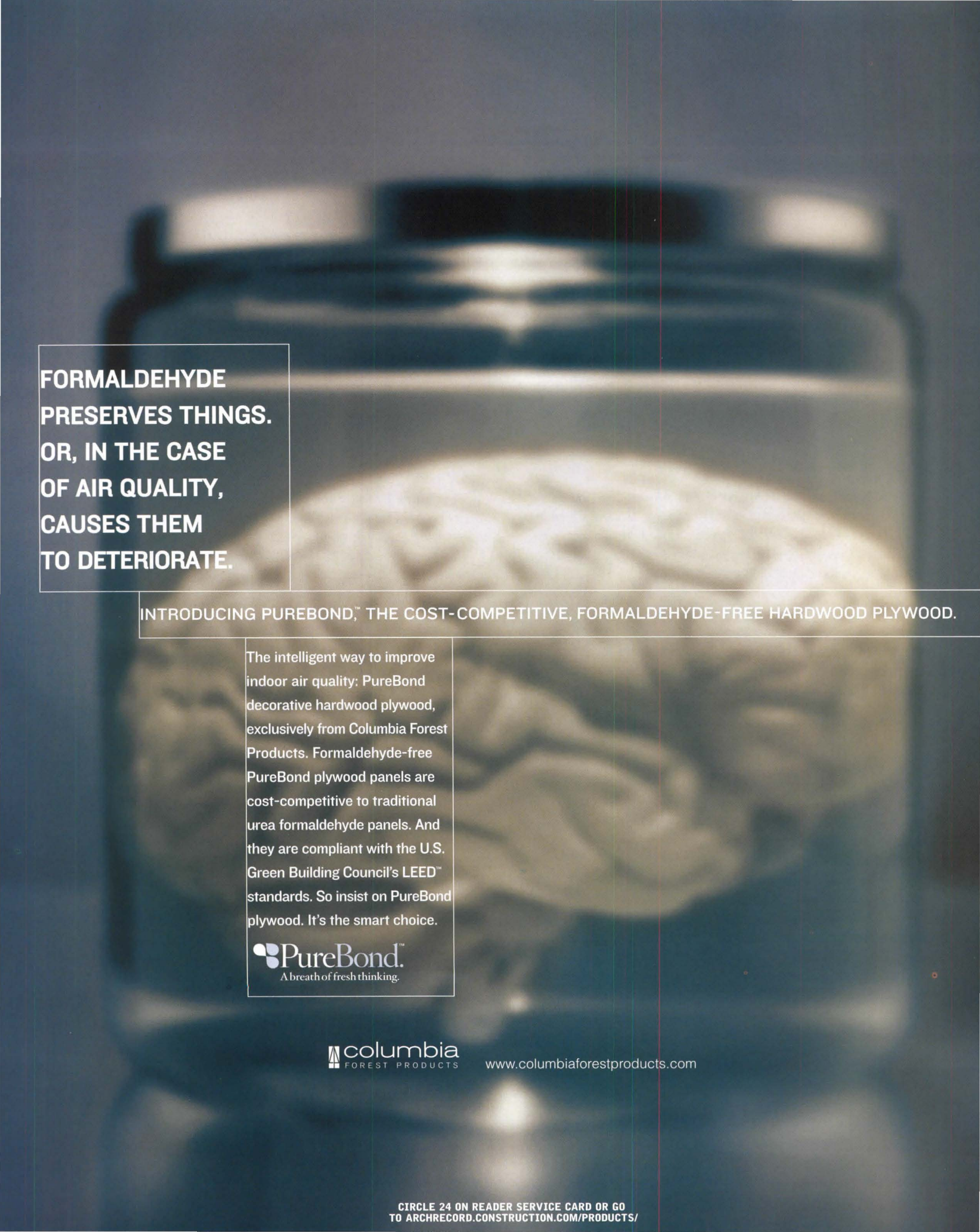
Designare Dramaticus 2005 Intaglio Composites has invented a new process that permanently impresses photographs and images into concrete. Possibilities for applying this technology to design entries are boundless. The winning designer will get to pick between $10,000 cash or $50,000 worth of photoengraved concrete. More information is available at www.intagliocomposites.com. *Submission Deadline: December 30, 2005.*

Chan Chan 2006 Design a beach lodge for the Peruvian Coast. The nearby archaeological monuments, the Citadels of Chan Chan, should inspire and inform your creation. More information is available at www.arquitectum.com. *Registration Deadline: December 31, 2005. Submission Deadline: January 15, 2006.*

06 Skyscraper Architectural Competition Explore new ideas in vertical density by designing a skyscraper in the metropolis of your choice. The competition is run by eVolo, an international architectural organization, which welcomes students and professionals alike to submit. More information is available at www.evolo-arch.com. *Registration Deadline: January 5, 2006. Submission Deadline: January 15, 2006.*

4 Corners Design Competition Submit a design for a pedestrian connectivity in downtown Naples, Florida. In addition to the jury's judging process, community members will vote for the "People's Choice Award." More information is available at www.aiaflasw.org. *Registration Deadline: February 24, 2006. Submission Deadline: March 1, 2006.*

The 8th International Arquine Competition: A Site Museum for Tulum This is a competition to design a 1,650-square-foot museum for the third-most visited archaeological site in Mexico. More information is available at www.arquine.com. *Registration Deadline: January 27, 2006. Submission Deadline: March 17, 2006.*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People who live in urban glass houses ... play it safe

Critique

By Michael Sorkin

What can this image possibly mean? The huge billboard (right)—now obscured by the rise of the building it hypes—appeared on Spring Street some months ago. I recognized the Philip Johnson brand, but who was that on the right? Had Philip posthumously evolved into a woman? The sign had the desired effect: I checked the Web site and it turned out the second face was Annabelle Selldorf, the architect doing the interiors.

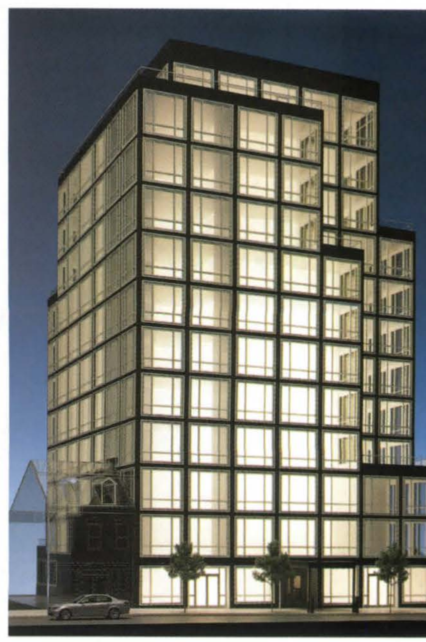
The big glass box in question acquired its bulk via the transfer of air rights from the tiny 1817 Federal house next door (home of the beloved Ear Inn), creating expansive millionaire's views of the Holland Tunnel ventilation tower across the street. While this seems conclusive evidence that the evolution of Modernist luxury hasn't exactly led to intelligent design, there is a certain survival of the fittest aspect. The Urban Glass House replaces an earlier Johnson effort to build a cartoonish, 36-story "habitable work of art" on the site, hooted from the scene despite efforts by the developer to whip up community support for the giant zoning variance required by suggesting that resistance to the project was simply philistine.

The art hype continues. According to Johnson's partner Alan Ritchie—"the discipline and Modernist principles of the New Canaan (glass) house were consciously applied to the final design for the Urban Glass House." Key word: *applied*. The building is being skinned with panels that represent a clear devolution in functionalist tectonics. Instead of frame and infill or its descent into the Miesian curtain wall, these panels use the implicit assembly of mullion, window, and spandrel as decorative devices, part of a cladding sandwich meant to signify joinery and mark structure but with nothing to do with either. Like those fake Louis Vuitton handbags sold a few blocks away on Canal Street, it's just code.

But the code's genetic and much reproduced. The Johnson project is one of a number of glassy buildings that have gone up in the past two years in an area of only a few blocks. While ranging enormously in quality—from a cool, curvaceous building by Winka Dubbeldam to a pair of Soviet-style boxes from Handel Associates—all boast facades that are almost entirely glass. There's something striking about this (most of the surrounding context is masonry), and I think it has to do with styles of both consumption and paranoia. The original Glass House became iconic not simply for its architecture but as a medium for self-exposure. In a masterstroke of celebrity, the house made the career of its creator by putting not simply itself but himself on display. Like David Blaine suspended under London Bridge (or Adolf Eichmann boxed in Jerusalem), the work of architecture was made meaningful by the visible character of its inhabitation. Indeed, the Glass House combined the transparency of Blaine's box—simply a window on his stunt—with the doubly protective quality of Eichmann's, which at once sequestered the monster and protected him against the potential violence of his victims.

The raft of new glass buildings down the street shares this bivalent quality. Like the Johnson tower, all of them (the majority of which face west) have windows that are either sealed or barely operable. In an era of raised environmental consciousness, in which cross ventilation would seem to be the minimum level of architectural common sense, there is something perverse about this attitude. It is, however, perfectly attuned to the post-9/11 culture of anxiety, the contemporary phenomenology of safety. As the media endlessly alert us to the risks around us and identify surveillance with protection, this glass architecture seemingly satisfies the nominally contradictory demands for both isolation and exposure.

Such architecture sees the environment as pathogenic and gaskets itself away from it. The glass house next to the tunnel extract fan is metaphorically precise. Here, windows should not be opened for fear of filling the room with carbon monoxide (or the avian flu, or sarin gas). And yet the activities within remain visible. If safety is identified with panoptic transparency, the willingness to expose oneself becomes a medium for the reduction of risk. More and more of daily life is governed by the management and manipulation of fear. A trip to the airport obliges surrender to close vetting and intrusive examination as the price of protection. (Have you been through one of those air-puff explosives sniffers



A two-faced sign (top) helps brand the 12-story building (above).

Contributing editor Michael Sorkin is the director of the graduate urban design program at City College of N.Y.

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yet?) The police can now check any bag and pat down any rider in the subway. Public service announcements caution us to be on the lookout for people who dress unusually, which covers just about everyone around here. The result is a shrink-wrapped city, designed for the pleasures of danger.

The rise of such actuarial aesthetics has become pervasive and it's making me nervous. While it is the duty of architects to protect the public from danger, and the hard-fought history of health and safety codes marks our progress as a society, a line must be drawn between sensible protection from risk and hyping the morphology of fear. Although we seem to have largely gotten over the mimetic anxiety of Decon and its vapid celebration of trauma, the pervasiveness of "terror" as a driver for architecture and urbanism grows by the day. A show now at the Museum of Modern Art called *Safe* deals with the assimilation of various countermeasures within the discourse of "good" design, scrupulously refraining from passing judgment on their meaning. The architectural press constantly publicizes the high-tech ha-ha's that are being installed everywhere to protect us from truck bombers. We are being swept along in a frenzy of the fear of fear and look for reassurance in the usual wrong places.

A society can be judged by the risks to which it chooses to respond, the dangers it values, the targets it gives high priority. Katrina shocked us not simply for its elemental ferocity but because it peeled back the layers of indifference and concern we so selectively apply. The "news" paused in its usual preoccupations to reveal something it habitually obscured, and we saw not simply the failure of the levees, but the horrible poverty and inequality their collapse suddenly made visible. In the numbers game of lives and dollars, we were forced to wonder why our priority was the weekly expenditure of dozens of lives and billions of dollars in Iraq when our own citizens were so miserable and our own infrastructure so lacking. And we could clearly see that the "better" people and parts of town disproportionately enjoyed the tools and resiliency to recover.

I've been spending some time on the Mississippi Gulf Coast, working with my students on a reconstruction project. Everyone is waiting for FEMA to determine the new legal topography and come up with a cogent strategy for managing hurricane risk, a danger to the homeland that demands at least the same level of attention as terror. There will certainly be restrictive zoning, new building standards, and a shakeout in the insurance industry, including some revisiting of the federal flood insurance that makes building on such dangerous shores feasible. At a minimum, the federal government must stop subsidizing risky behavior, stop being the fiscal enabler of the wanton development of our fragile coasts.

Unfortunately, the solution may make things worse. One dangerous possibility is that new regulations will lead to dramatic upscaling, the building of "safe" high-rise buildings to replace more susceptible houses: Class A construction rode the storm out well. In this scenario, risk becomes a privilege, and higher insurance and mortgage rates, coupled with more restrictive building codes, will exclude the poor from these areas forever. Declared dangerous, life at the shore will only be enjoyed by those who can afford to defend themselves against nature (although the rest of us will keep on picking up the tab for infrastructure). The Gulf Coast might quickly become very much like my corner of Manhattan, defined by a lavish, overscaled architecture of self-protection and marked by unassailable exclusivity, by habitable, hurricane-proof, high-rise works of art. ■

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Exhibitions

DEPARTMENTS

SAFE: Design Takes on Risk. *Curated by Paola Antonelli, with Patricia Juncosa Vecchierini, at The Museum of Modern Art, New York, through January 16, 2006.*

The most unpredictable aspect of *SAFE: Design Takes on Risk* is how it transcends its own title. This exhibition celebrates not only lifesaving ingenuity, but also spirit-supporting creativity, with inventions that ingeniously address such dire threats as land mines, contaminated water, and AIDS. Alongside soberly straightforward devices are items that advance new definitions of safety: projects or products that use satire, metaphor, and aesthetics to provide psychological respite (if not infallible protection) from a wide range of human fears.

The definition of *safety* clearly remains as personal or idiosyncratic as the perception of risk or danger. And the show suggests that few aspects of modern daily life are free from menace. The catalog clusters 300-plus objects into the following categories: shelter, armor, property, everyday, emergency, and awareness.

With concerns for our protection dating back to our infancy, the show presents currently essential baby equipment that barely existed a generation ago: not just car seats, but such objects as pinch-guards for doors. The exhibition juxtaposes a range of these ubiquitous, benign, and clever Western-world items with gruesome childhood accessories from famine- or war-ravaged countries, including an arm bracelet for assessing malnutrition and a tent that shields against chemical warfare.

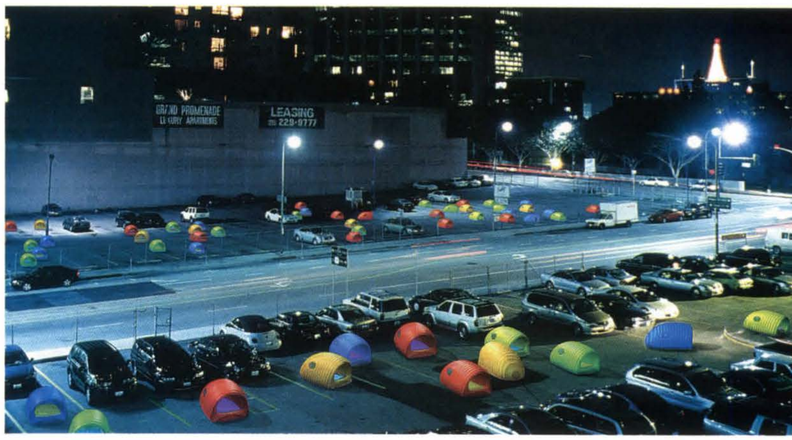
Some of the most intriguing projects relate to shelter. Disaster relief has spawned a category of structures that need to be easy to deliver and assemble, and economical to produce. Paper—a cheap and widely available resource—has counterintuitively proven its potential as a versatile and viable material in such projects as Ferrara Design's *Global Village Shelter* (2001) and Shigeru Ban's *Paper Log House—Turkey* (1999).

In many of the featured structures, the medium, form, and/or material delivers a message. Dré Wapenaar, for example, designed his *Treetent* (1998) [RECORD, July 2002, page 73] for activists to hang from trees they want to protect. The tent's shape suggests rain or teardrops—as if the vegetation were crying at the prospect of being killed.

In some designs, metaphor actually enhances practicality. Marenao Ferrari's *Parka/Air Mattress* (2001) provides homeless people with shelters they can carry, snail-like, on their own backs. And Michael Rakowitz's *paraSITE Homeless Shelters* (1997) visibly attach to the HVAC outtake ducts of existing buildings, inflating the igloo-like forms and providing heating, while calling attention to the plight of homelessness.

Olivier Peyricot's *Vigilhome* (2003) takes a more macabre view of basic 21st-century home needs. Completely collapsible for transport, the structure fits into glossy, hard, red containers that resemble gun cases with the kooky silhouettes of combat-ready essentials: a machete,

Peyricot's *Vigilhome* (2003) prototype collapses the components of a home into hard, gun-caselike carriers (left). Electroland's Cameron McNall and Damon Seeley proposed the inflatable *Urban Nomad Shelter* (below) for the homeless (2004).



PHOTOGRAPHY: © IDSLAND (TOP); CAMERON MCNALL (BOTTOM)

a coffeepot, an oxygen tank, a fire extinguisher, a harpoon, and more. Anthony Dunne and Fiona Raby's *Hide Away Furniture*, from *Fragile Personalities in Anxious Times* (2004), uses hardwood floor tiles to create a huge bulge apparently welling up from a crawl space.

Many of the projects prove that defensive building protection need not appear ugly or antagonistic. Still in prototype, Kolatan/MacDonald Studio's *INVERSAbrane* invertible building membrane (2005), resembling irregular slices of white Swiss cheese, claims a miraculous array of defensive functions. Its purported properties include the filtration of pollutants and allergens, air circulation, rainwater collection, interior and exterior regulation of humidity and temperature (through solar means), and biofiltration that provides a nutritional and physical substrate for microorganisms.

Some critics, after seeing this exhibition, have complained that the industrial design community, particularly in the United States, has become too safe, too conservatively boring. Others have damned the show for a frivolous concern with aesthetics, for inadequate earnestness toward the dangerous threats of our times, and for a lack of focus, cramming a vast mix of items under the "safety" rubric (and producing the equivalent of a mail-order catalog of such goods).

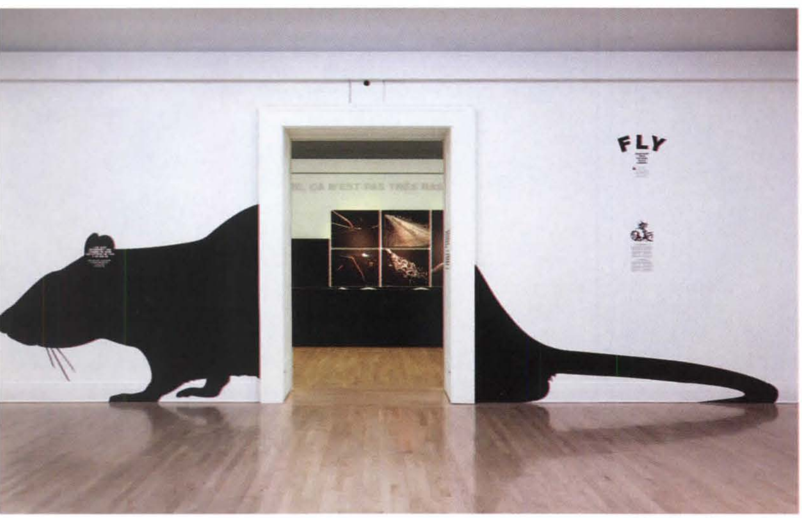
But like other powerful motivators, the quest for safety is impossible to realize in any absolute, permanent, or universally recognized way. If the ultimate ambition of a museum exhibition is to provoke the reexamination of our perceptions—not shying away from the horrors or humor of our times—then this show succeeds and offers an extraordinary experience. *Victoria Rowan*

Sense of the City. *Curated by Mirko Zardini, at the Canadian Centre for Architecture, Montreal, through September 10, 2006.*

As the curator of *Sense of the City*, a major show at the Canadian Centre for Architecture (CCA), the new CCA director, Mirko Zardini, roundly criticizes city planning for its lack of consideration to the ear, nose, and sense of touch. "Sounds and odors have been considered disturbing elements," he writes in the exhibition catalog, "and architecture and city planning have been exclusively concerned with marginalizing, covering up, or eliminating them." To redress the privilege accorded to the eyes, Zardini uses this show to explore what he terms "sensorial urbanism."

With each of five galleries focused, respectively, on the *nocturnal city*, *seasonal city*, *sound of the city*, *surface of the city*, and *air of the city*, the exhibition neither segregates the senses nor excludes the visual.

The *nocturnal city* considers the ways urban centers shun darkness in the name of safety and also to extend the day's active hours. Our reliance on vision demands light, but artificial illumination abstracts the urbanscape, altering our perception of it. Lost is "our ability to hide, the silence, the oblivion" (as the wall text puts it), and the capacity of darkness to amplify noise, intensify odor, and enliven tactile experience. To illustrate that visiting "a night-wrapped urban landscape is to experience a minutely calibrated series of adjustments," Zardini includes John R. Gossage's barely discernable, almost black photographic triptych of Berlin's landscape (1985) and wonderfully surreal black-and-white photos of Paris from Paul Morund's *Paris de Nuit* (1933). Perhaps most striking in this gallery is the audio-tactile map of Bologna, Italy, by Fabio Fornasari and Maurizio Guiuffredi, designed to help the blind experience the city.



The *seasonal city* concentrates on wintertime, with original posters, photographs, and stenographs of 19th- and early-20th-century ice castles. Large color photos document snow structures by artists and architects from *The Snow Show* (2002) in Lapland, Finland. The wall text asserts that modern climate control strips us of the unique pleasures of each season and ignores cultural differences in the tolerance to elemental conditions.

Zardini insists that his goal is to present existing conditions in order to raise questions about our future choices, rather than dictate a normative high ground. If so, value judgments, such as those regarding the intrusiveness of night lighting, often lie close to the surface. Less prescriptive, however, are the galleys dedicated to sound and air.

The *sound of the city* offers primarily headsets dangling from the ceiling, playing such tracks as the interior mechanical drone of New York City office buildings and soundscapes of Vancouver, recorded in different years and areas as part of R. Murray Schafer's *World Soundscape* project. The text wistfully suggests that the reduced noise level of the emerging digital world, versus the declining mechanical city, will allow us "to perceive the repressed and forgotten sounds of nature ... and myriad languages increasingly spoken, shouted, and whispered in our cities."

***Sense of the City*'s installation includes allusions to giant rats (above). The *surface of the city*, in its focus on the positive aspects of asphalt, includes work (right) by West 8, Netherlands-based urban design and landscape architects.**

Meanwhile, *air of the city* critiques the homogenizing effects of enclosed environmental systems while acknowledging that not all smells are pleasant or healthy. In this gallery, visitors can lift stoppers from large perfume flasks containing such realistic city scents as "garbage."

In *surface of the city*, Zardini adds to the mix his long-held, sympathetic interest in asphalt. He presents the topic through historic and contemporary photographs and drawings, illustrating how "asphalt brought about a genuine revolution ... eliminated dust, and cancelled out the noise of carts and carriages." Though the curator centered this gallery around a huge chunk of glassy asphalt, like a poor man's diamond, he at least tempers his enthusiasm with color prints of Richard Register's pavement-busting activist group, Ecocity Builders, ripping up what they disdainfully term "the global material."

Sense of the City, the curator says, is more about atmosphere than design, more about character than objects. Certainly the show is not definitive: Ice castles hardly encapsulate a city's seasonal conditions, nor does asphalt sum up its surface. Surely the shells, skins, and other outer layers of a city comprise a far more complex and tactile universe.

The exhibition's biggest problem is its split approach: Two of the "cities"—*nocturnal* and *seasonal*—suggest broad experiential conditions, bringing all the viewers' senses into play, while the others focus on a single sense, such as sound, within the urban environment over time.

Sense of the City is a modest and somewhat fractured show that should be viewed in conjunction with its more expansive catalog, which whets the appetite for thinking in broader terms. As David Howe writes in the final essay, the exhibition "provides a vibrant means for architects and planners to enhance their sense of ... the city, and imagine how to design or redesign it in sensuously fitting and stimulating new ways." That's clearly the aspiration. *Rhys Phillips*

PHOTOGRAPHY: MICHEL LEGENDRE © CCA (TOP); WEST8/JEROEN MUSCH (BOTTOM)

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Snapshot

By David S. Morton

Liberating a plaza with a wing of steel

The Chicago School lasted a few decades. The Sarasota School, about the same. The Paulista school, São Paulo's Brutalist movement, has fallen in and out of favor for half a century. That it has survived owes much to architect Paulo Mendes da Rocha, the school's unofficial dean.

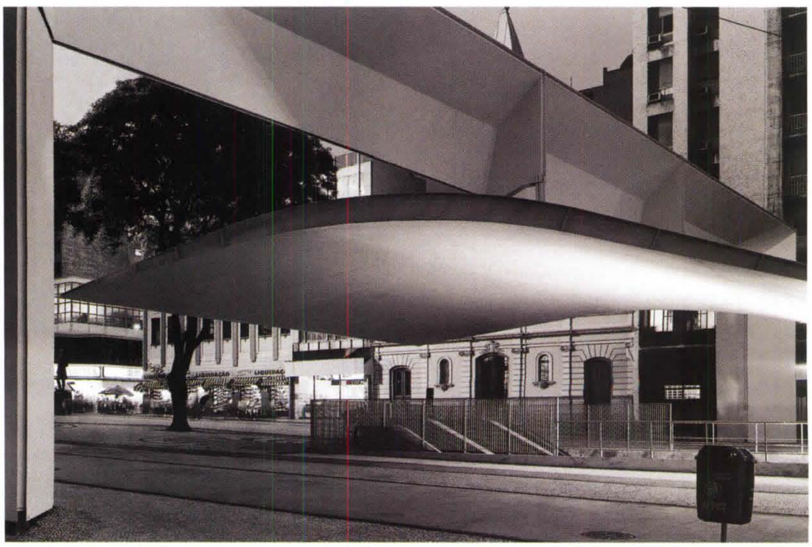
Mendes da Rocha's most recent major public work, the shelter at the Plaza of the Patriarch, completed in 2002, was intended to reinvigorate part of São Paulo's deteriorated downtown. For years, a pavilion in the plaza sheltered a stairwell leading to another plaza below. But the structure blocked the heart of the square. Mendes da Rocha determined that to awaken the space he had to liberate it. So he suspended a steel wing from a steel arch whose only supports would be near the plaza's edges.

In other countries, Brutalism often took shape as overbearing complexes of heaped concrete. But the Brazilians make the rhetoric of accessibility and functionality mean something, maybe because they don't try to do too much. The Plaza of the Patriarch project typifies Paulista simplicity: Build a big roof and let the public do the rest.

It is also another epic demonstration of Mendes da Rocha's restraint. Whether he's working at the intimate scale of an art gallery or the monumental scale of an arena, the architect treats concrete and steel as delicate

PHOTOGRAPHY: © NELSON KON

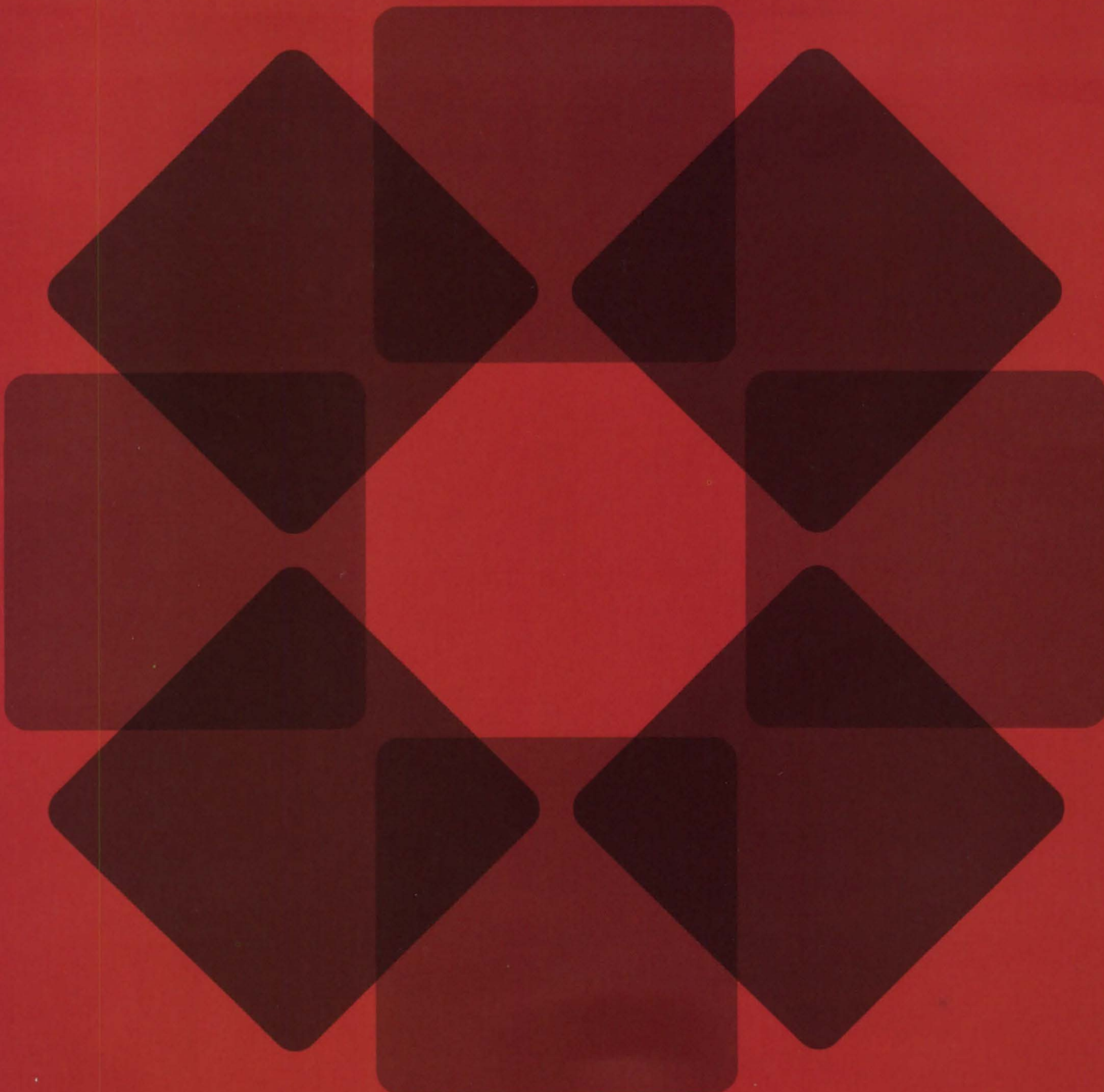
Treating concrete and steel as delicate building materials, architect Paulo Mendes da Rocha lightened the mood of a derelict corner of São Paulo's downtown with a weight-defying shelter at the Plaza of the Patriarch.



materials that might snap upon touch, a counterintuitive approach to building in an indelicate industrial capital. And while monumental architecture can sink under the weight of its own massiveness and grave intentions, Mendes da Rocha often lightens the mood with pure acrobatics.

The shelter's approximately 40-ton canopy, for example, is thin enough to seem as if it could be made of canvas and that the next wind might carry it away, taking the plaza with it. The two moorings between the giant wing and arch are almost skeletal, and to further play up the weight-defying drama, Mendes da Rocha cuts notches at the elbows of the arch. This reveals that the load-bearing elements are slender steel struts, like tiny fingers holding up a heavy platter.

The structure is scaled for mass use as a shelter and a neighborhood gateway. But with its sweep of wing coming within 7 feet of the ground—"It's the height of the door of your house," says the architect—it still manages to take the measure of a man. ■



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For students with limited eyesight, frosted glass lessens glare, and bright colors enliven the space and give it visual depth. A bar of colored glass acts as a rich screen mediating views to the outside.

School design for the blind: learning to see without sight

G. BRUCE STRATTON ARCHITECTS DESIGNS FOR ALL SENSORY EXPERIENCES AT THE W. ROSS MACDONALD SCHOOL FOR THE BLIND IN BRANTFORD, ONTARIO

Large, black handrails help guide students through hallways, while many wooden alcoves provide space for rest.

By Rhys Phillips

Architecture is largely considered a visual medium. How then does one best approach architecture for users who are primarily without sight? This was the essential question Toronto architect Bruce Stratton, of G. Bruce Stratton Architects, tackled recently in designing a primary school addition for the campus of the W. Ross Macdonald School for the Blind in Brantford, Ontario.

His response was to pay close attention to the functional specifics—particularly as they related to touch, sound, and physical orientation—required to ease the complex living and learning challenges faced by the 32 blind, deaf/blind, and visually challenged students attending grades 1 through 6. At the same time, Stratton considered his objective for the $8 million, 30,000-square-foot facility as "not only accommodating pragmatic needs, but also serving intangible spiritual and sensory purposes." Stratton shares with Finnish architect and critic Juhani Pallasmaa the belief that architecture requires broader sensory depth than just the visual. In his essay "The Eyes of the Skin" (1996), Pallasmaa touted the "tacit wisdom of the body," in which vision must share architecture with touch, hearing, and smell. How a door handle greets the hand is more important than how it meets the eye. It is a position that emphatically resonates at the school, where students characteristically have a heightened sense of hearing, touch, and smell.

Furthermore, visual excellence was required of the design, in part because there are 40,

Rhys Phillips is the architecture critic for the Ottawa Citizen.

PHOTOGRAPHY: © STEVEN EVANS

The exterior's layered composition of concrete forms and bright glass and metal coloring (school entrance, top and right) create a uniquely animated facade. A variety of surface textures outside classrooms (bottom) provides visual variety and explicit orienting clues through touch.

mostly sighted staff on campus, and the surrounding community frequently uses the school's facilities. In addition, while all of the students are legally blind, several have some level of sight. Robust colors, along with strongly expressed forms, become critical to their experience of their surroundings.

Resetting the landscape

The facility replaced two nondescript, 1960s boxes, sited somewhat indiscriminately along a largely residential street well away from bluffs rolling down to the Grand River. The new, richly articulated building is low but varied in form, stretching out horizontally over 375 feet. It has been shifted back from the street and now helps define a generous courtyard—boasting aromatic, newly planted pine trees—formed by the senior school (1972) to the south and the senior residence (1999) to the east.

The school is organized along a wider-than-standard, 10-foot corridor that facilitates students' quick and safe navigation. In addition, every attempt has been made to eliminate sharp corners and minimize obstructions that could cause injury. This interior street is broken into two offset wings. The shorter eastern wing houses student residences, a health services center, classrooms, music practice studios, a multipurpose space, and a double-height entrance atrium, spanned by exposed steel beams and almost encircled by clerestory windows. The longer west wing has meeting rooms and offices clustered near the atrium before the hallway traverses four teaching pods. Each pod has two classrooms for six to eight students divided by a washroom and a shared-use activity room that projects outward.

Designing for sense

Stratton uses a range of materials to provide both haptic and aural experiences. By varying tactile qualities, he provides the students with orienting clues. Raw concrete block walls detailed with smooth ceramic tiles work with a continuous, 14-inch-wide, black-phenolic rail along the walls that children use to guide them. Both floor and wall finishes vary in type and texture depending on their location, in order to act as touch-sensitive markers to orient the children as they navigate the building. The corridor and classroom floors are typically dark porcelain tile, but at intersections with classrooms and in the atrium, maple flooring signals the transition. In addition, material variation results in tonal cues through the sound made by footsteps or by canes. For safety, shifts in floor finishes are seamless, achieved by employing a depressed-slab system.

Light—controlled, not denied

While this visual treatment serves to signal different functional components, the building's external massing and detailing also act to mediate how light enters the building; important for children who are highly sensitive to glare. Broad concrete eaves and a series of exaggerated concrete fins are designed to block strong, late-afternoon sun from entering directly into classrooms. Most light fixtures, which are primarily indirect to reduce glare on work surfaces, operate with dimmers. Exterior glazing, particularly in the classrooms, is extensive; windows have lower than normal window heads and employ Solarfective blinds that block out 95 percent of outdoor light. On many interior walls, use of sandblasted and clear glass ensures indirect natural light is teased into central corridors from the classrooms.

Animated form

Not all of Stratton's attention to detailing is strictly functional. Cherry millwork is used for doors, screens, custom storage cabinets, and open student lockers in the corridors (each designed with individual seats). The open ceilings expose structural but warm-toned fir ceiling decks as well as weathered steel in some niches.

In elevation, the firm has created a remarkable animation of sculpted forms. Each discrete form relies on an artful assemblage of finely detailed building blocks. These include raw, poured, and precast concrete; weathered steel; variegated zinc panels; unpainted concrete block; and even a seamless, curved corner window. In turn, these are all drawn together by unifying blocks of deep purple, iron-spot Norman brick. At the school's entrance, a freestanding screenlike structure of weathered steel and laminated orange, yellow, and blue glass panels wraps around a double-height glass block housing a meeting room. At night, the ensemble glows like an ethereal lantern.

In responding to the specific requirements of blind and sight-impaired students, Stratton has created a building that transcends the visual to embrace the "tacit wisdom of the body" while not neglecting the eye. Often, functional responses become a catalyst for the visual, while within a modest public budget and difficult programmatic parameters, the architect has paid attention to detail within strong, legible forms that respond with respect to a worthy landscape. ■

"ARCHITECTURE REQUIRES BROADER SENSORY DEPTH THAN JUST THE VISUAL ... HOW A DOOR HANDLE GREETS THE HAND IS MORE IMPORTANT THAN HOW IT MEETS THE EYE."

Wide, cornerless hallways facilitate safe circulation (top). Natural light fills the ådouble-height activity room (above). Smooth floors ensure that students will not stumble, and indirect light keeps away glare.

Young Turks in Big Tents

by Ingrid Spencer

Large firms don't have a history of heralding their individual talent. Yet some young architects are finding their voices recognized, as big firms see value in letting talent shine.

When a 28-year-old architect named Gordon Bunshaft joined Skidmore, Owings & Merrill (SOM) in 1937, no one could have predicted how his star would rise within the firm and how it would reflect so well on the entire organization. By the time he became a design partner in 1949, SOM had grown to hundreds of employees, and despite its credo of achieving architecture without egotism, it saw the value of promoting Bunshaft's reputation both within the organization and in the profession in general. High-profile designers like Bunshaft; Ralph Johnson, FAIA, from Perkins+Will; and David Childs, FAIA, also from SOM, are the exceptions. Most large firms subscribe to a democratic business strategy, that all projects designed by the company are credited under one brand, with no names in lights on the marquee, except that of the partner whose name is the brand. "It's challenging," says Craig Hartman, FAIA, design partner in charge at SOM's San Francisco office. "The media and the public identify with individuals in creative fields. Still, even though some architects at SOM have made names for themselves, the firm's history is not about the single designer." While that group mentality may not have changed drastically as many firms have grown bigger in recent years, large firms are recognizing that there is a value associated with individual recognition. And not just at architecture firms. Hartman cites car design as an example. "Look at what J. Mays did for Volkswagen," he says about the automobile designer who reinvented the VW Beetle in 1989. An individual design voice from within the firm can build a company's reputation as one that values people and design.

But getting recognized in a big tent has never been easy for young architects. It takes talent and the right attitude. The problem starts in architecture school. According to Mark McVay, design director for SmithGroup's Los Angeles office (see page 75), students learn early on that running their own firm is the ideal. "Architectural education tends to lead students to look down on working at a big firm," he says. "Sole practitioners are highlighted, and it's what we're trained to be. However, lately there has been more talk of architects fitting into other kinds of more nonhierarchical practices."

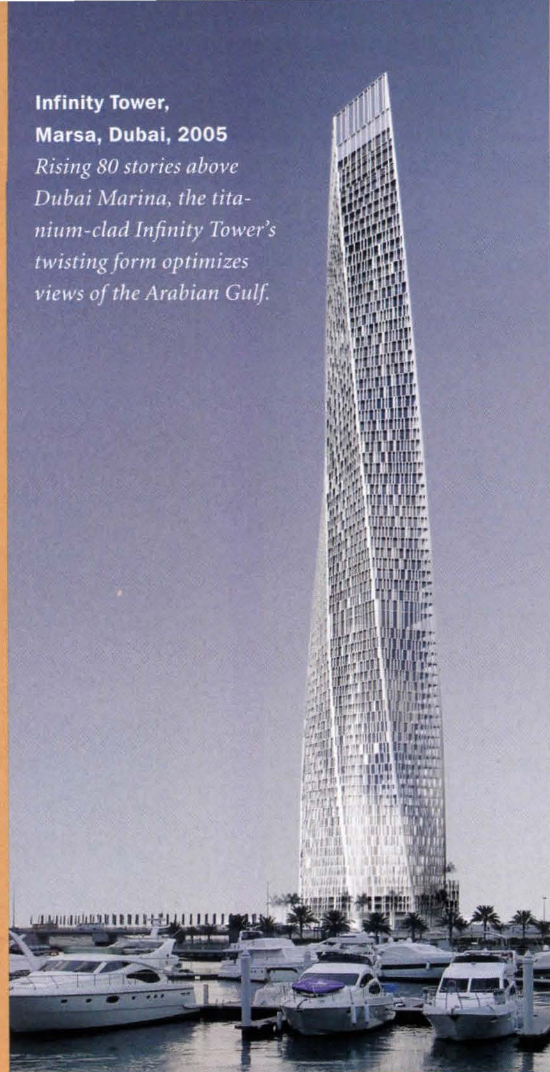
As some firms change, young designers are finding new opportunities to contribute and be heard. Even some very traditional practices are adapting their strategies to not only draw new talent into the company, but also bring in the kind of projects that would entice hot-shot designers, projects that might previously have been denied because of the firm's reputation or size. For example, annex5 (see page 72), a subsidiary of giant, Chicago-based architecture and engineering firm A. Epstein and Sons, was formed to attract clients with smaller, more design-conscious projects. Known for its large-scale industrial buildings, the firm's leaders wanted to have a formalized venue to appeal to a clientele with smaller, edgier work. By hiring young talent and working in a studiolike atmosphere, the firm has managed to forge a new path, giving young architects a chance for input without sacrificing the firm's bread-and-butter clientele.

Other large firms find the studio model working without formalizing the process. McVay says the Los Angeles office of SmithGroup works that way, and his name has become associated with the work produced there. "Our office draws on the collective intelligence of the firm," he says, "and yet, the office is small and has a lot of freedom. For me, it's very manageable." Architects like McVay appreciate the advantages of a firm with built-in resources, such as an accounting department, administrative staff, and a cadre of seasoned professionals. Most large firms also provide other services of value to young architects, like continuing-education opportunities, mentoring programs, and paying for licensing exams. Yet even with those programs in place, large firms know that talent won't always remain. "It's a big ship and people jump on and off," says Hartman. "We expect that."

Young architects may see a large firm as a place where they'll get lost in the crowd, where the "don't tell them you know how to type" adage applies. Nobody wants to be put in a corner creating CAD drawings day in and day out. But most large firms don't want great talent wasted on such tasks either. All of the young turks interviewed for this article spoke about the invaluable experience they've gained while at a large firm, and the mentors who helped shaped them along the way. Large firms give young architects the opportunity to work on high-profile projects, often in foreign locations, while sole practitioners must often be satisfied with smaller, local projects, such as additions and renovations. Still, it's not just about the work. If you aren't the kind of person who knows how to be heard in a crowd, you won't be. Dallas Felder, senior associate for HOK, the largest architecture firm in the U.S., says it's all in how you look at it. "In a large firm you're part of a team—it's not just about you. But it is about what demands you place on yourself to be innovative with each project. And when you have conviction behind your ideas, you learn when to push and when not to."

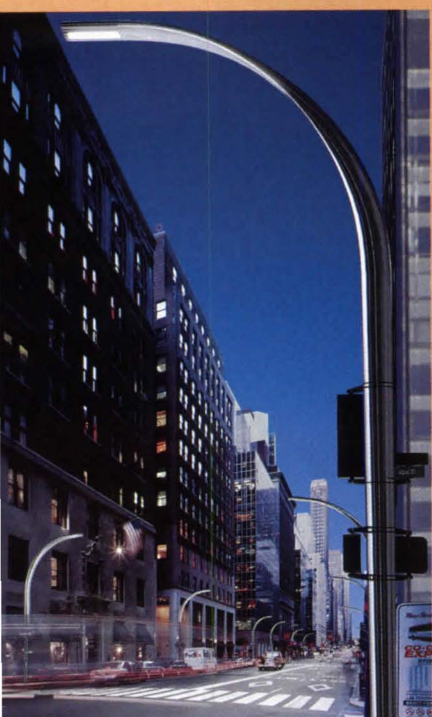
"To work at a large firm you must be a collaborator," says Hartman. "Still, you'll never get anywhere in life by holding back and playing by the rules. To be noticed, you must have opinions and interests, and be passionate about architecture."

And of course, you have to say it out loud. In an interview with Bunshaft published in SOM's *Journal 3* in 1989, one year before his death, he revealed the secret to his successful career at the mammoth firm. "I persevered stubbornly on what I believed," he said, "and I was very lucky." ■



Infinity Tower, Marsa, Dubai, 2005
Rising 80 stories above Dubai Marina, the titanium-clad Infinity Tower's twisting form optimizes views of the Arabian Gulf.

New York Standard Streetlight, 2004
The poles of this innovative streetlight are shaped to catch light, defining the street spatially.



Door Hardware for Valli&Valli, 2005
Intended to imply motion, this new line of door hardware has a series of finishes and textures derived from drag-reduction technology.

Leamouth Peninsula, London 2004
A large, mixed-use complex on the Lea River near Canary Wharf includes residential and retail facilities, and a 50,000-square-foot performing arts center.

IMAGES: COURTESY SOM

Ross Wimer, SOM, Chicago

As a design partner since 2003 at Skidmore, Owings & Merrill, Ross Wimer, AIA, has made a name for himself designing large commercial projects in the U.S., Europe, Asia, and the Middle East. And yet he's just as excited talking about the new line of door hardware he designed for Italian manufacturer Valli&Valli as he is discussing his team's design for the 80-story Infinity Tower in Dubai, to be completed this year.

"What is encouraging is that at SOM I've been able to work at different scales," he says, "from large buildings to something as small and detailed as a door handle or a streetlight." Wimer says he understands the reservations young architects have about getting pigeonholed at a large firm, but for him, that hasn't been the case. "I have the freedom here to concentrate on the areas of design that really interest me," he says. "I'm interested in the flow of information that goes into making great architecture—the culture, the program, the way things work—in channeling or editing that information and getting it to the team."

What Wimer has done with those interests, including his work as an adjunct professor at MIT, has helped him gain the respect of clients locally and oversees. His projects include large buildings in Singapore, Paris, Tel Aviv, and China. While Wimer is gradually gaining recognition outside the firm, he says he understands the part he plays within the firm. "As a partner, mentoring people is a huge part of my job," he says. "I know how important having mentors was for my career, so I try to let new staff know that their energy is important."

Wimer got his B.A. degree at Yale, and his Master of Architecture at Harvard, then went to work for Gwathmey Siegel & Associates and Tsao & McKown Architects before joining SOM in 1996. Before Wimer became a partner, he participated on the team headed by David Childs, FAIA, on the Freedom Tower design in New York. "David Childs's name was always the one associated with that design, and rightfully so," says Wimer. "The partner's hand isn't always as immersed in the design as the team's, but he gets credit because his name has to be on it, as it's ultimately his responsibility to be the critic and sell the architecture. It makes sense." It also makes sense that Wimer's talent as a designer and skills as a team leader give him an edge within such a big firm. "Design is what we're focused on," says Wimer about his success, "and having so many resources available allows me to avoid being conservative." ■

annex5, A. Epstein & Sons, Chicago

The 12th-largest architecture/engineering firm in the U.S., Chicago-based A. Epstein & Sons is known for its large-scale industrial buildings. And while there's certainly a brisk business in projects such as distribution centers and giant governmental or municipal buildings, the firm's architects found they were being ignored for smaller, more design-conscious projects.

In 2002, Epstein's leaders, including its director of architecture and planning Michael Damore, AIA, decided to create annex5—a small design studio within the firm. "We found that we weren't getting on the lists for the more urban, high-design projects," says Andrew Metter, FAIA, annex5's director of design for the Chicago office. "We just wanted the chance to prove our skills."

Three years later, annex5 has won a number of awards for its work and has opened offices in Beijing and Shenzhen, headed by Janis J. Saltans, AIA. "Epstein's resources and support have given us an obvious advantage," says Metter. "We knew we could do this kind of architecturally astute design. In fact, we were already doing it. We just needed to find a way to raise our design profile." Metter says the Chicago office runs like a school studio, involving younger members of the team—Segene Park, Daesun Park, H.K. Li, and Anthony Panico—in all parts of the process. When the studio doesn't have enough for everyone to do, they're pulled into other Epstein projects. "It's my first job out of architecture school," says Daesun Park, "and I get to really participate. I'm involved in the design, and I get to talk to clients. I'm not sure if I'll ever have my own firm. Right now, I'm just lucky to gain experience and learn." "We try to mentor and include our young talent in every element of the design," says Metter.

The annex5 team is currently working on a Holocaust museum in Terre Haute, Indiana; a new facade for a tired industrial park in suburban Schaumburg, Illinois; a planned community on 57 acres outside of Phoenix; and a complex of buildings in China that will showcase Chinese fashion designers and their work. "Our intent was for annex5 to design one-offs," says Metter, "owner-occupied buildings that could make a positive contribution beyond themselves as an object." With Epstein's full support, the studio has taken on a life of its own, giving annex5 and the larger firm the clout it craved. "The great thing about annex5 is that we can do anything, from residential to an entire community," says Metter. "The potential is limitless." ■

LakeBluff Tower, Milwaukee, Wis., 2005
This mixed-use office and town-house building is oriented to have an open-view corridor framing Lake Michigan and Veterans Park. Four town-house units on the ground level have unobstructed views of the lake and city skyline.

Renishaw, Hoffman Estates, Ill., 2003
The U.S. headquarters of a British manufacturer of laser measuring devices, this building's design weaves together the office and warehouse functions of the facility.

Fashion Square, Beijing, China, 2008
This 1-million-plus-square foot "town" will include commercial outlets, a hotel and exhibition center, design studios, offices, a training center, and a recreational holiday district.

IMAGES: COURTESY A. EPSTEIN & SONS,

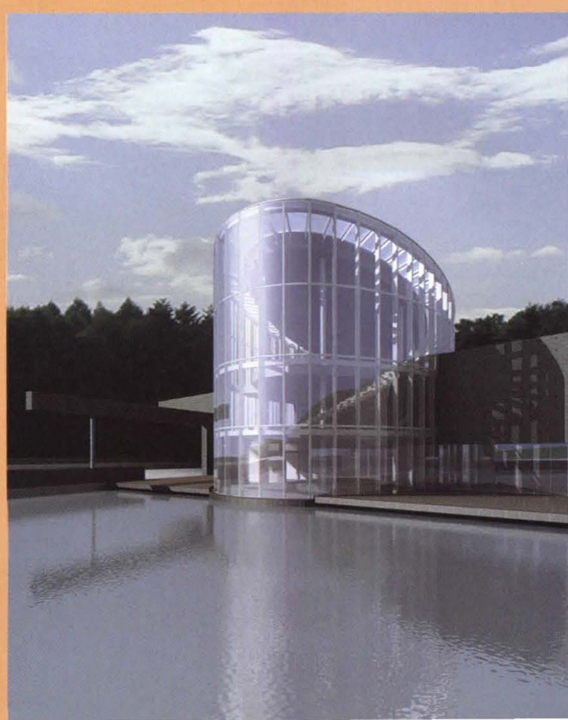
Holocaust Museum, Terre Haute, Ind., 2005
A neutral architectural skin for this simple, boxlike form defines the present in this museum, while a repository for artifacts refers to the past, and interior spaces to display art represent the future.

Shanghai World Financial Center, Shanghai, 2008
This 101-story skyscraper will include office floors, a hotel, shops, an observation deck, conference facilities, and a private club.

Nihonbashi 1-Chome Building, Tokyo, 2004
This 20-story, mixed-use development connects to the surrounding low-scale buildings as it rises substantially above them. The predominant component is commercial office space.

MGM CityCenter Mandarin Oriental Hotel, Las Vegas, 2009
The gateway into the CityCenter development, this hotel will have louvers placed at varying densities, which create dramatic visual fissures in the exterior wall.

INCS-Chino Factory, Nagano, Japan, 2005
This high-tech factory comprises two L-shaped buildings, an oval shaped VIP lounge and presentation room, and a courtyard.



IMAGES: COURTESY KPF

Ko Makabe, KPF, New York City

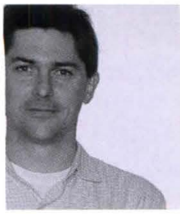
"Call me greedy, but I want to control the details," says Kohn Pedersen Fox (KPF) associate design principal Ko Makabe. "I want to design it all, the reception desk, the lobby furniture, everything." It's Makabe's greediness—let's call it enthusiasm—that has prompted KPF to give him design freedom on a number of national and international projects since he joined the firm in 1997, the same year he graduated from Oklahoma State University.

"I grew up in Tokyo and went to school to study business in West Virginia," he says. "Then I discovered architecture. Now I think it's funny that as an architect you really need to know business. Design is really personal taste, as well as functional, so you need to understand the clients' business and sell your ideas to them. I really love that interaction with the clients."

Makabe spent a summer as an intern at KPF and found himself hooked on the firm. "There are great resources here," he says. "After school, you don't know anything, and I want to learn from experienced people. The senior partners teach me so many things about the industry. Also, I don't want to be a paper designer. I want to build real buildings, and that's what I'm doing here." Makabe's projects with KPF include the Shanghai World Financial Center in China, a 1-million-plus-square-foot office tower with a 220-room luxury hotel (projected to be the tallest building in the world when it is completed in 2007), as well as the Nihonbashi 1-Chome Building, a 321,500-square-foot office and commercial mixed-use building in Tokyo. Does he ever think about starting his own firm? "Who knows what the future holds," he says. "All I know is that I'm fully engaged in the projects I'm working on, and while every project is essentially a KPF project, it's fine, because works of architecture are totally team efforts, and not just a team of architects, but a collaboration with the client, the consultants, the contractor, etc." Makabe credits KPF with keeping him interested because "we are a very design-oriented firm. We have a variety of projects, such as urban design, high-rise office, hospitality, schools, airports, and more. And it's a very international firm, not only projects but employees, as well. So we have more opportunities to influence each other."

Makabe is currently the senior designer on the INCS-Chino Factory, an 80,000-square-foot showroom factory in Nagano, Japan, and the 925,000-square-foot Mandarin Oriental Hotel component of MGM's CityCenter development in Las Vegas. The 34-year-old architect flies to Japan once a month and to Vegas twice a month to oversee the projects. How does he do it? "I'm still young," he says, "I'm used to working a lot." ■

Benjamin Ward, Gensler, San Francisco



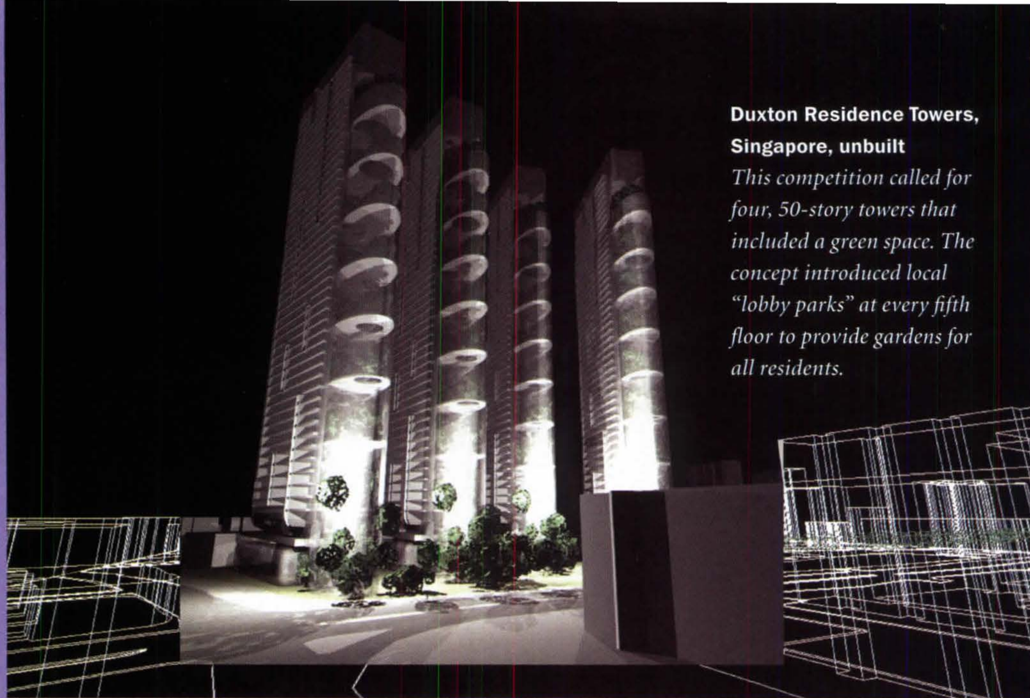
"It's sort of like going to a free university, one you actually get paid to attend," says Benjamin Ward, AIA, about his experience as an associate of design at Gensler's San Francisco office. But even *after* seven years at the firm, Ward seems in no hurry to "graduate" and start his own firm. "It's something in the back of my mind," says Ward, "but there's no reason for me to leave. Gensler respects people's lives outside of the office, and I keep getting cooler and cooler projects to work on."

With a career that includes being an accomplished photographer along with complex projects such as Changi Airport in Singapore, the Gana Gallery Cultural Center in Seoul, Korea, and an expansion of the San Jose Airport in California, Ward certainly stays busy. After getting his Master of Architecture at the University of Pennsylvania, Ward worked in France before moving to San Francisco and joining Gensler.

"I joined Gensler because they have the resources and the knowledge base," he says. "The different offices are organized in studios—little SWAT teams—and we really play off each other within ours." He admits that he started off at Gensler doing redlines. But when he felt he was beginning to get stuck, he complained. "I told them they were wasting my talent, and they heard me. They began to give me things to design—a title block, a door, a miniature canopy, anything. The work just grew from there."

It's in the realm of computer design that Ward's skills really shine, winning him Gensler's internal award for graphics and design in 2004. "The computer really allows me to design on the fly," he says, "I feel like I can really get inside the screen and view the project from every angle. And I really understand how the 3D world translates to reality."

Ward says the virtual world is part of what he calls "storytelling," a process of creating a script to really understand not just the project's client, but the building's end users. He says that for the San Jose Airport, his team created a surrogate, Diane. "Diane represents a woman business traveler, someone who could help us and the client understand who would be constantly using the space." The team went so far as to create a short movie about Diane, using Flash. "It's an academic exercise that gets us thinking about architecture in a conceptual way." While Ward loves the virtual, he isn't one to ignore the real world. He meets regularly with a group of design directors in San Francisco whose goal is to promote good design in the community. He also teaches from time to time, usually FormZ or other technology-related classes. "I like the process of making decisions and working them out in 3D," he says. "I'm a problem solver." ■



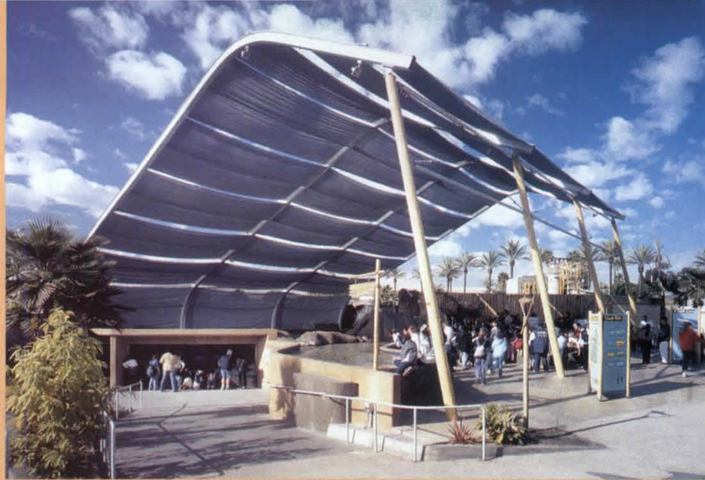
Duxton Residence Towers, Singapore, unbuilt
This competition called for four, 50-story towers that included a green space. The concept introduced local "lobby parks" at every fifth floor to provide gardens for all residents.

Lu-jia-zui Office Tower, Pudong, China, unbuilt
This 800,000-square-foot office building has a transparent, double-skin exterior. The office space is organized in two wings around a central atrium.

Gana Gallery Cultural Center, Seoul, Korea, with Jean-Michelle Wilmotte, 1998
European aesthetics and Asian materiality and spirit inform this cultural center, which includes a wooden sculpture garden framed in glass.

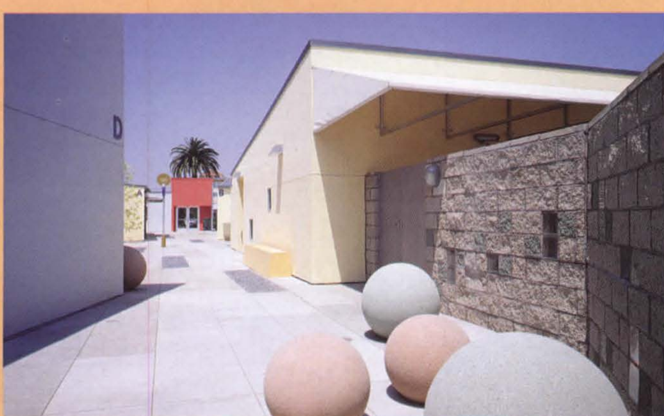
Changi Airport Terminal 2, Singapore, 2006
This major revitalization of the existing terminal uses canopy forms at the upper departure level, recalling Singapore's lush gardens and the soaring aspect of flight.

IMAGES: COURTESY GENSLER



Aquarium of the Pacific, Shark Lagoon, Long Beach, Calif., 2002
Merging science and stage set, the Shark Lagoon includes three distinct outdoor educational Pacific Island habitats.

Shanghai Municipal Electric Power Company Headquarters, Shanghai, China, unbuilt
This winning scheme for a design competition involved the completion of an existing, 29-story, 370,000-square-foot concrete framed tower.



Westside Children's Center, Los Angeles, 2001
Supported by city funding, the center includes a day-care entry/reception building, classrooms, and a meeting hall for community gatherings. Each classroom has its own corresponding playground.

UCSD Pepper Canyon Hall, La Jolla, Calif., 2004
Transparent and open, the building is a multipurpose teaching facility with outdoor courtyard, stairs, and skybridge. Simultaneously monumental and civic in form, the project reinforces the urban character of UC San Diego's planned University Center.

IMAGES: COURTESY SMITHGROUP

Mark McVay, SmithGroup, Los Angeles

"The bias against working at big firms is a kind of self-fulfilling prophecy," says Mark McVay, principal and design director of SmithGroup's 24-person Los Angeles office. "If you look at it differently, you'll see that you're really only limited by your conversation. Ask yourself, 'Where can I do good work?' "

After working for such highly regarded firms as Morphosis, Richard Meier & Partners, and OMA, McVay says he tried his hand at being a sole practitioner. "It's a tough road," he says, "and for me it never quite got off the ground. I found it to be all consuming, and rather lonely. I needed to be at a place like SmithGroup, where I could communicate. Yes, sometimes I collide gracefully with the larger organization. It's inevitable. But all in all, we're doing the best work we can, and that's what we focus on."

Since joining SmithGroup in 1999, McVay's projects have ranged from residential and small-scale exhibition spaces to large, mixed-use complexes in the U.S. and abroad. "The master-builder architect is the term we use and the model for the office," he says. "At the other firms where I worked, I learned so much from observing that model, and that's what I've brought to this office." McVay credits his mentors for giving him a rounded range of experience. "Thom Mayne especially helped me grow as a manager," says McVay. "He really dropped me in the deep end, and let me swim. And when I went back to school, at Harvard's Graduate School of Design, I got to work with people like Mack Scogin and Merrill Elam. They really challenged me and helped me to think about design in a new way." Knowing the value of mentors in the world of architecture, McVay has taught design studios at SCI-Arc, Harvard, and Cal-Poly Pomona, and has lectured in the Los Angeles Forum for Architecture and Urban Design summer lecture series "Out There Doing It."

At SmithGroup, McVay takes the mentoring part of his job seriously, saying that he appreciates young architects "with insatiable curiosity." His own confidence and curiosity has brought him surprising design successes. He described working on a recent project, the University of San Diego's Pepper Canyon Hall, a 70,000-square-foot classroom building: "The project was low-budget, and the client expected it to be more of a background building—quick and temporary. I saw it had more potential." McVay convinced the client to let him create a higher design profile for the building, which went from a temporary structure to a landmark building on the campus and an aesthetic model for the university's future design vision. Recognizing the value of each architectural venture, McVay says he's currently engaged in documenting each design process, to keep them alive within the company's knowledge base. ■

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Design Vanguard 2005

THE FIRMS FEATURED IN THIS YEAR'S VANGUARD OF EMERGING ARCHITECTS APPROACH A RANGE OF SHARED THEMES IN REMARKABLY DIVERSE WAYS

By Clifford A. Pearson

PROJECTS INTRODUCTION

This year's Design Vanguard architects practice in nine different countries (if you count multiple locations for firms with more than one office), but certain themes appear over and over again in much of their work. From Ann Arbor to Mumbai, architects are engaging issues of landscape and built form, nature and city fabric, replication and customization. While the projects designed by this year's Design Vanguard firms reflect a common interest in these varied themes, close inspection of their efforts reveals a marvelous range of architectural expression.

For example, Architecture studio himma in Seoul and the team of Chris Lee and Kapil Gupta in London and Mumbai both talk about absorbing landscape into their buildings, but no one can confuse himma's Hyundai High School, an angular slice of urban geometries and green roofs, with Lee and Gupta's C Quarters in Doha, a rolling terrain of shops and stores that brings fingers of the desert into the heart of the design. Luce et Studio in San Diego and the firm Urbanus in Beijing and Shenzhen also explore integrating nature into the built environment in many of their projects. Yet Luce's interplay of indoor and outdoor spaces in the firm's Nissan La Jolla and Farmington Hills projects, and Urbanus's parks in Shenzhen demonstrate vastly different approaches to that investigation.

The firms featured are:

1. Luce et Studio Architects
2. King Roselli Architetti
3. Architecture studio himma
4. Evan Douglis Studio
5. Urbanus Architecture & Design
6. Michel Rojkind/Rojkind Arquitectos
7. Chris Lee and Kapil Gupta
8. ITERAE Architecture
9. Taira Nishizawa Architects
10. Mitnick Roddier Hicks

For enhanced coverage of our 2005 Design Vanguard architects, visit **www.archrecord.com**

Michel Rojkind in Mexico, Mitnick Roddier Hicks in Michigan, and Taira Nishizawa in Tokyo have all designed projects that challenge traditional notions of interiority, but have given them each a unique manifestation. In his Boska Bar in Mexico City, Rojkind transformed a windowless space into a bucolic retreat using folded wood surfaces and floor-to-ceiling photographic murals of forests. In *Split/View*, an installation on the grounds of the Philbrook Museum of Art in Tulsa, Oklahoma, Mitnick Roddier Hicks created an architectural folly that toys with views and perceptions of the garden surrounding it. And at the Tomochi Forestry Hall in Kumamoto, Nishizawa turned the building's wood frame into an exposed forest of structural supports.

Thanks to digital technologies, the design and fabrication of buildings offer new possibilities for variable repetition and mass customization. As its name implies, the firm ITERAE explores the iterative nature of digital architecture in projects such as the adjustable acoustical domes the partners installed in the Villa Medici in Rome. Evan Douglis also leveraged the latest technologies in a Japanese restaurant project he calls *RE*ptile, in which he used a repetitive system of molded tiles to create astonishing, three-dimensional surfaces. King Roselli in Rome took the notion of iteration in a completely different direction in its various projects for the Ripa Hotel—generating jazzy riffs on a shared architectural melody.

These architects speak or write about the same themes. Yet owing to a rich diversity of architectural vocabulary and meaning, there is no need to fear that globalization will bring homogenization. ■

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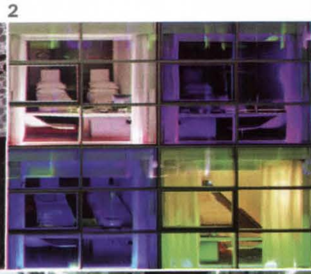
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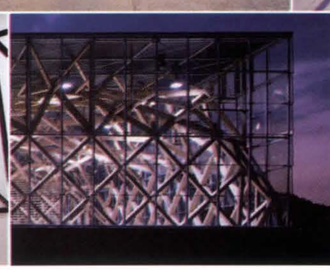
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COURTESY URBANUS (5); © JAIME NAVARRO (6); COURTESY CHRIS LEE ARCHITECTURE (7); © BILYANA DIMITROVA (8); HIROSHI UEDA (9); COURTESY MITNICK RODDIER HICKS (10)

Luce et Studio makes the jump from big to small projects and back again

By Suzanne Stephens

Architect: Luce et Studio Architects
Location: San Diego
Founded: 1990
Design staff: 7
Principal: Jennifer Luce, AIA
Education: Harvard Graduate School of Design, Master of Design Studies, 1994; Carleton University, B.Arch., 1984
Work history: Visions Architects, 1987–90; Arquitectonica, 1985–87; Blood Hughes Architects, 1984–85
Key completed projects: Nissan Design America, corporate offices and design studios, La Jolla, 2005; Nissan Design America, corporate offices and design studios, Farmington Hills, Michigan, 2005; Burton House, Cardiff, California, 2004; Extraordinary Desserts restaurant, San Diego, 2004; Nissan Design America site-specific art installations, La Jolla, 2002–03; *Transfusion*, landscape installation, Grand Métis, Quebec, 2002; Burton Associates/SoLo, landscape studio, gallery and shops, Solana Beach, California, 2001; Messner & Smith corporate offices, San Diego, 2000; Felkner/Lehman loft, San Diego, 1998; Foodmaker, executive office for C.E.O., San Diego, 1997
Key current projects: Nugent House, Napa Valley, California, 2006; Lemke House, La Jolla, 2006; Georges at the Cove restaurant, La Jolla, 2007; Bianchi House, Pacific Palisades, California, 2007
Web site: www.lucestudio.com

It is all too rare for a young design and research firm to build a significant body of work in a relatively short time (15 years), turning the corner from houses and shops or restaurants to large commercial projects. Needless to say, a female single proprietor accomplishing all of this is rarer still. Yet it can happen, as Jennifer Luce, AIA, the principal of Luce et Studio of San Diego, refreshingly demonstrates.

This year alone the Luce office completed a 45,000-square-foot automotive design studio building for Nissan Design America in Farmington Hills, Michigan, outside of Detroit, along with a 65,000-square-foot renovation of Nissan Design America in La Jolla, California. Both projects attest to the range of design abilities of the 7-person firm, beginning with rethinking the program. "We analyzed Nissan's process for designing cars," Luce says, "and reinterpreted it in terms of architectural space—rearranging the studios to improve communication."

Ironically, Luce's career began with a large-scale commission. Right out of architecture school at Canada's Carleton University, the Montrealer won a competition in 1985 for a 2-million-square-foot building for the Center for Innovative Technology in Herendon, Virginia. To get it built, Luce joined Arquitectonica in Miami, bringing the project with her. When the building was completed, Martha Schwartz, the landscape architect, had some advice. "She said that if I wanted to work on my own, I had to go to California," recalls Luce. "Sight unseen, I moved to San Diego."

In the Felkner-Lehman loft in San Diego, a concrete stair cantilevers vertically off the floor (top), and parchment-and-glass laminated panels enclose the shower.

Luce et Studio opened in 1990, emphasizing the collaboration between architecture, art, and design. A growing fascination with landscape led her to Harvard in 1993, where she undertook a theoretical analysis of the American landscape as her thesis project, receiving a Master of Design Studies degree in 1994. After returning to California, she embarked on a range of projects.

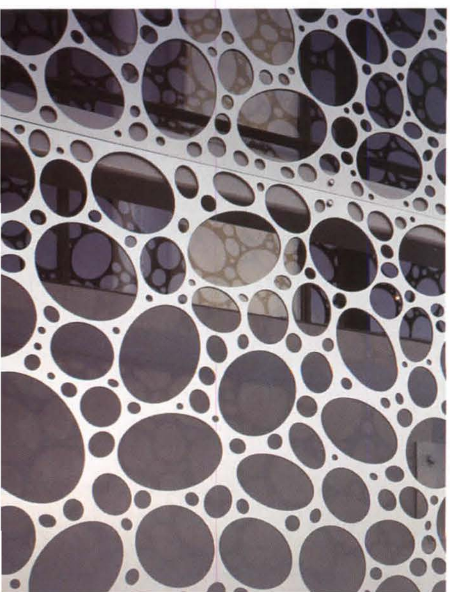
By chance, Luce's renovation of a 10,000-square-foot warehouse in Solana Beach into offices for landscape architects Burton Associates, and a 4,000-square-foot open retail space on the ground floor, got the attention of the head of Nissan Design America. Nissan was reorganizing its La Jolla facility, and the open studio atmosphere Luce created for both offices and shops struck a chord. Nissan hired Luce et Studio to redesign its La Jolla space, and then soon after, Luce reconceived the design facilities there. A double-layer, stainless-steel-mesh "egg," which acts as a viewing courtyard for cars, shows off one of the firm's strengths: attention to materials and detail. Even in small-scale work such as Extraordinary Desserts, a pastry and savories shop in San Diego, this obsession with crafted, artful work is evident in an aluminum screen that masks the original concrete structure.

Attention to detail, though, does not occur at the expense of the program. "Our process is similar to that of a sociologist," Luce explains. "We try to investigate behavior and ways of promoting collaboration, while coming up with a physical representation of that analysis." At the same time, she continues, "We like to work with fabricators, as if we were in a guild." ■

PHOTOGRAPHY: © PAUL RIVERA/ARCHPHOTO, EXCEPT AS NOTED; CLAUDIA BESTOR (MIDDLE TOP); GLENN CORMIER (MIDDLE BOTTOM)

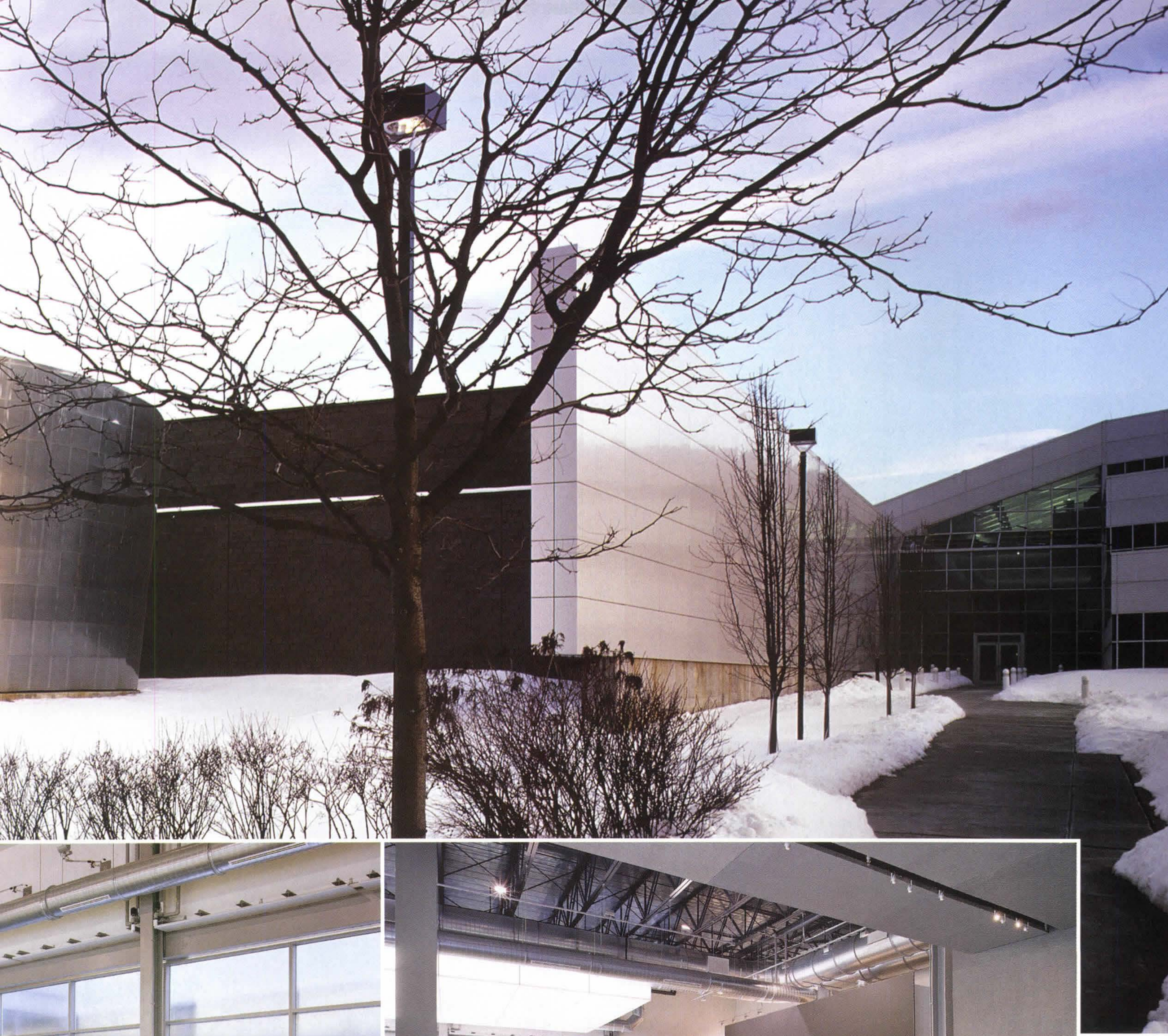
Extraordinary Desserts, San Diego

In San Diego, Luce et Studio renovated an old concrete structure for Extraordinary Desserts, a pastry and gourmet food shop and café. Here a ¼-inch-thick aluminum screen, based on the microscopic image of flour in the baking process, is pulled out 18 inches from the exterior concrete wall to act as the facade. Inside, a loftlike space is delineated by steel framing, steel shelving, and surfaced cedar panels.



Nissan Design America, corporate offices and design studios, Farmington Hills, Michigan

At its Technical Center in Michigan, Nissan recently added a new design studio for 30 designers to work along with 400 car engineers. Luce created a ovoid-shaped, 15,000-square-foot courtyard (above) enclosed by a stainless-steel-mesh wall, dubbed "the egg," for viewing the car models in daylight. With Albert Kahn Associates as the executive architects, Luce designed a rectilinear, 51,000-square-foot building, with open-planned interiors (photos, right) for interrelated design laboratories.

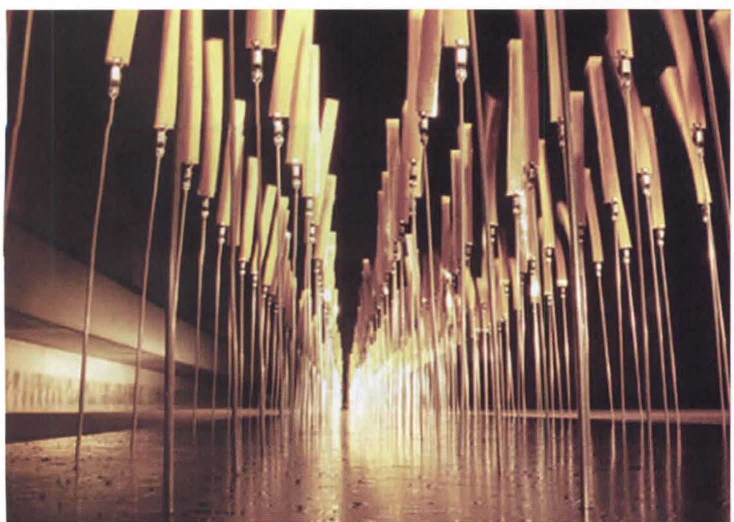


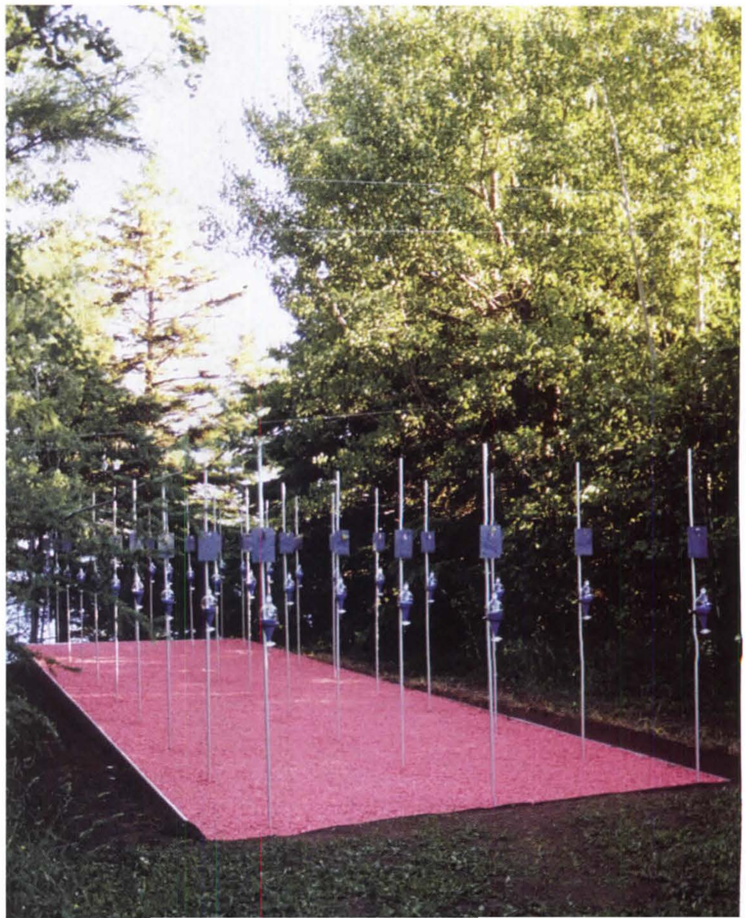
Burton Associates/SoLo, Solana Beach, California

Offices for a landscape architecture firm, Burton Associates, and a retail space with a book store and home furnishings outlet, called SoLo, occupy a one-story, 10,000-square-foot renovated warehouse at Solana Beach. Luce et Studio gutted the warehouse, leaving only its concrete shell and exposing the wood trusses of the 25-foot-high vaulted ceiling (left). An art gallery (below) is combined with the office lobby.

Art Installations, Grand Métis, Quebec, and La Jolla, California

Luce et Studio has long maintained an interest in fine art, as exemplified by its art installations. For the annual Landscape Architecture Festival in Grand Métis, Quebec, in 2002, the firm reinterpreted a contemporary garden in hard-edge materials (right). The following year, at Nissan, in La Jolla, California, Luce created reeds of yellow glass as a temporary installation and named it *Garden of Knowledge* (below).





Nissan Design America, offices and design studio, La Jolla, California

In Nissan's La Jolla offices, Luce et Studio renovated a 60,000-square-foot, concrete-frame building, designed in 1980 by local architect Ken Ronchetti, plus 5,000 square feet of courtyards. The entry corridor to the modeling studio (top left) opens onto a court via pivoting glass walls. An exploratory design studio (above and below) at the center of an H-plan overlooks a courtyard; a design concept lab (left) features 55 feet of wood shelving. By raising ceilings from the original 8 feet to 20 feet, Luce could install glass-and-steel window walls and hangar doors.

King Roselli Architetti moves beyond chic hotels to show off the range of its talents

By Paul Bennett

Architect: King Roselli Architetti
Location: Rome
Founded: 1995
Design staff: 7
Principals: Jeremy King, Andrea Ricci, and Riccardo Roselli
Education: King: Architectural Association, London, AAD, 1993; Ricci: Università di Napoli Federico II, M.Arch, 1994; Roselli: Università "La Sapienza," Rome, M.Arch., 1990
Work history: King: Feddersen & von Herder, 1994–96; Massimiliano Fuksas, 1991; Fitch & Co., 1987; Alessandro Mendini, 1981–85; Ricci: Massimiliano Fuksas, 1997–99; Manfredo Nicoletti, 1996; Squillante & Mango, 1995; Roselli: Massimiliano Fuksas, 1991; Manfredo Nicoletti, 1990
Key completed projects: ES Hotel, Rome, 2003; Hotel Ripa, Rome, 1993–2003; Pontificia Università Lateranense, Rome, 2002; Warner Village Cinemas, multiple locations in Italy, 1997–99
Key current projects: Lateran Università Library Extension, Rome, 2006; Hotel Pisa, Pisa, 2006; Club Med, Cefalu, Sicily, 2006; Dental Clinic, Sala Consilina, Salerno, 2006
Web site: www.kingroselli.com

Jeremy King seems slightly embarrassed as he shows off his firm's ideas for a new Club Med resort in Cefalu, Sicily. The models—nearly a dozen—are crude cardboard constructions with odd pieces of plastic straws and paper sticking out in every direction. "We're drawing our ideas from the landscape," he offers, trying to move attention to a more professional-looking drawing on the wall. But his partner, Ricardo Roselli, cuts in. "The models, though, are strong. They convey this idea of weaving in and out of the ground." This subtle debate about models signals a middle point in the design process of King Roselli Architetti, a small firm based in Rome. Roselli wants to look at the big picture; King wants to focus attention on the details. It's not an argument, and according to the architects, it doesn't even constitute a dialogue. "We're always looking for a third way," says King. "It's a dialectic."

After a few short years, the King Roselli dialectic is bearing fruit. In the late 1990s, the architects worked on a series of projects—a room concept, a restaurant, a foyer—for the Ripa Hotel in Rome. A piecemeal, or as Roselli puts it, "medieval," project, their work at the Ripa paid serious dividends when the Roscioli family, owners of the Ripa, commissioned the firm to build them a new hotel from the ground up.

The ES Hotel, which opened in 2003, put King Roselli on the map both in the relatively insular world of Roman architecture and internationally. Occupying a full city block near Rome's main train station, the boatlike ES sticks out among the 19th-century Beaux-Arts buildings and the fragments of ancient Rome. "Hotels are fun," says Roselli, "because they are elastic and you can really put your imprint on things." At the ES, the firm designed everything, from the structure down to the lamp fixtures.

King Roselli has since won contracts to design and redesign several other hotels for international resort companies, including the Club Med in Cefalu and a boutique hotel built into a medieval structure in Pisa, which should be completed by spring. But the firm is also branching out. It has designed a library extension for the Pontificia Università Lateranense in Rome, a zigzag layer box that should be done by next fall.

Originally from Britain, King first came to Italy when he was 21 years old and realized, as he puts it, "that my birthplace was an accident. It was a romantic notion, but I discovered that Italy was where I felt most at home." Roselli, conversely, grew up in Italy and studied in Rome. The two met in the crash-and-burn studio of Massimiliano Fuksas, a disorganized but energetic environment where they worked side-by-side. "There were people from everywhere," says Roselli. "It was very cosmopolitan. And we were in a constant state of inquiry." Andrea Ricci, another veteran of Fuksas's office, became an associate partner with King and Roselli this year.

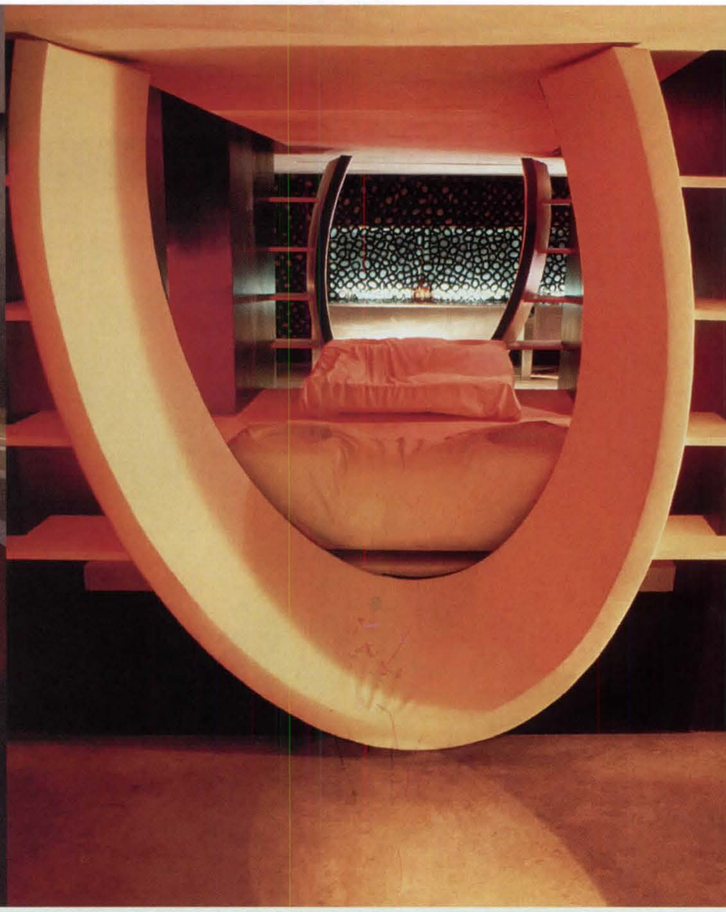
Since then, King Roselli has sought to foster this idea of inquiry by collaborating with other young firms. It is a member of the so-called Rome 8, an informal group of small firms that includes Labics [RECORD, December 2003, page 76], n! Studio, and Nemesi. "Our objective isn't to develop an aesthetic," says King. "We're always striving to find a form and then let it run. We want to be organic." ■

Paul Bennett writes about architecture and design from his base in Rome.

PHOTOGRAPHY: © SANTI CALECA, EXCEPT AS NOTED; JOSE KING (OPPOSITE, BOTTOM LEFT);

ES Hotel, Rome

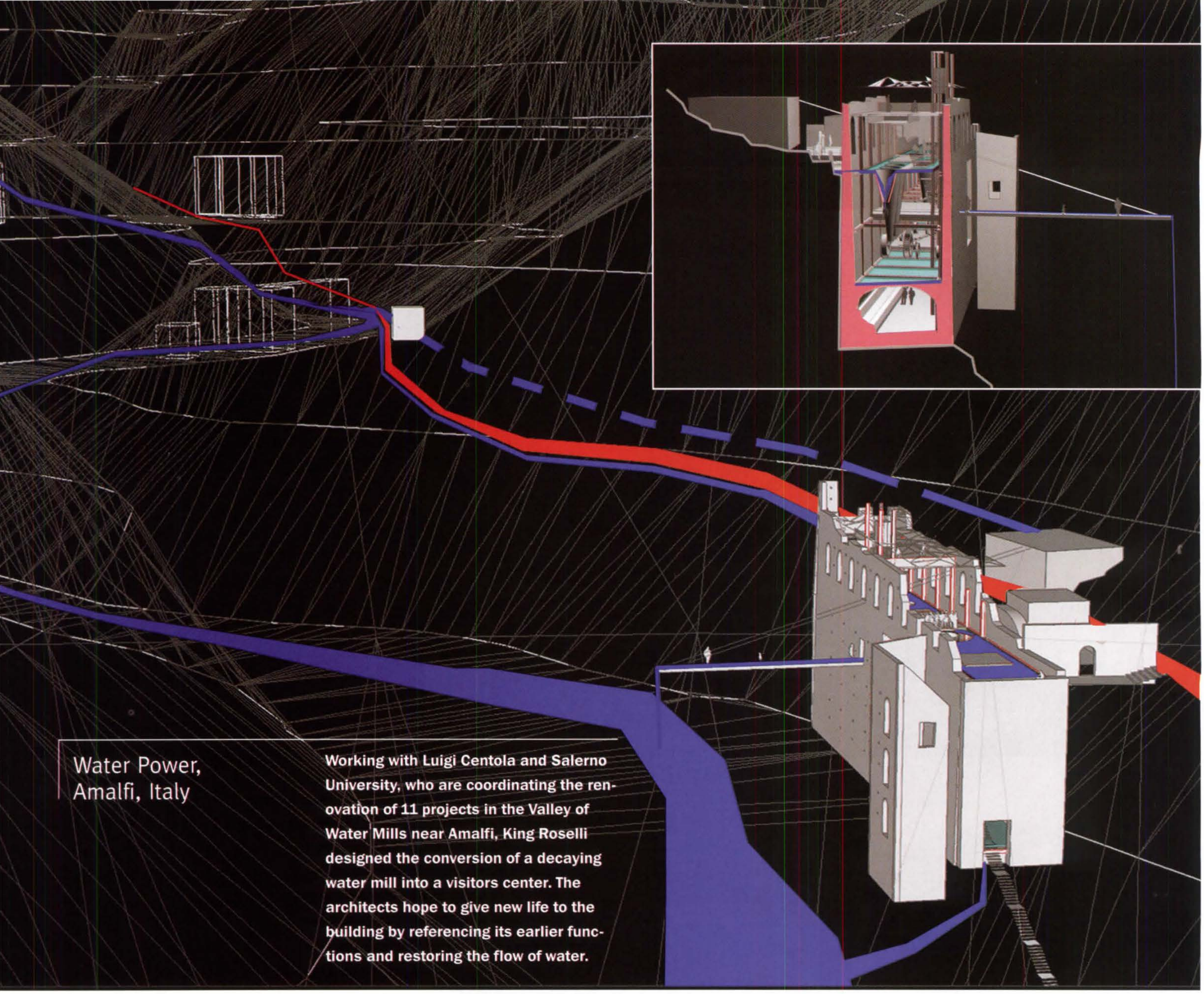
This 162,000-square-foot hotel overlooking the train tracks near Rome's main terminal includes 235 guest rooms, a 500-seat conference hall, three restaurants, a health spa, a pool, and a series of outdoor terraces. King Roselli designed everything from the building itself (below right) and its courtyard facade (above) to the lobby (left), bars and restaurants (bottom left and right), and furnishings (bottom center).



Hotel Ripa, Rome

Over a five-year period, the architects designed a series of interiors in an existing residential hotel from the 1970s and turned it into a 4-star, all-suites hotel. Highlights include (clockwise from top left, this page and opposite): the lobby, the discotheque, an earlier version of the disco, the restaurant's cocktail bar, the penthouse suite, and the exterior of the building.

PHOTOGRAPHY: © JOSE KING (THIS PAGE, TOP TWO AND BOTTOM);

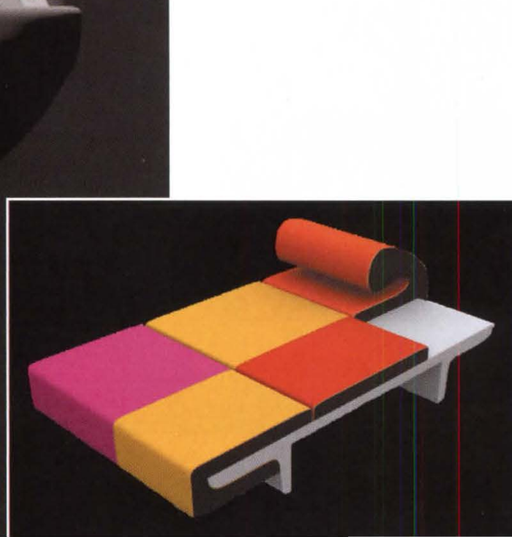


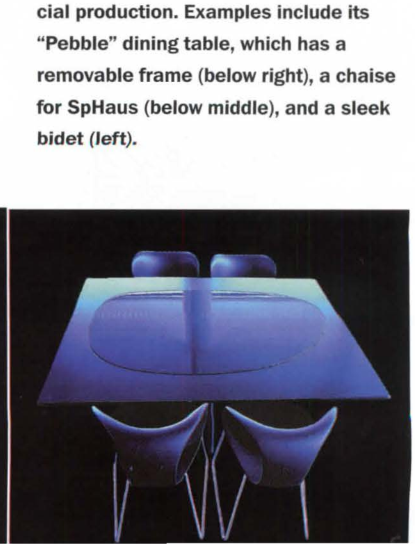
Water Power, Amalfi, Italy

Working with Luigi Centola and Salerno University, who are coordinating the renovation of 11 projects in the Valley of Water Mills near Amalfi, King Roselli designed the conversion of a decaying water mill into a visitors center. The architects hope to give new life to the building by referencing its earlier functions and restoring the flow of water.

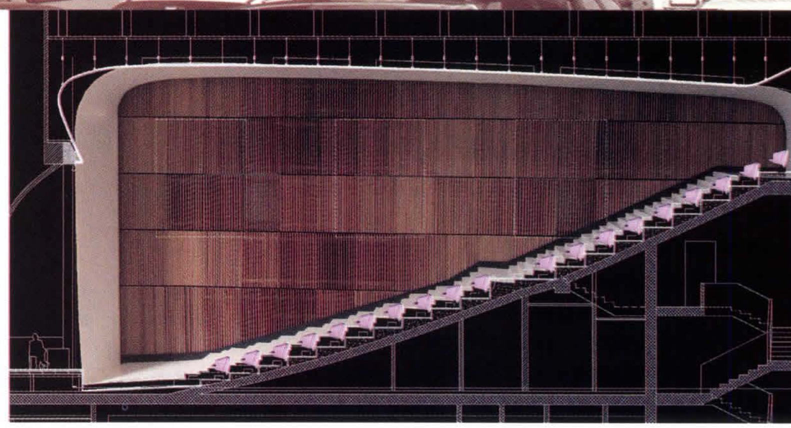
Furniture and Fixtures

King Roselli has designed many of the furnishings and fixtures for its hotels, some of which have gone into commercial production. Examples include its "Pebble" dining table, which has a removable frame (below right), a chaise for SpHaus (below middle), and a sleek bidet (*left*).



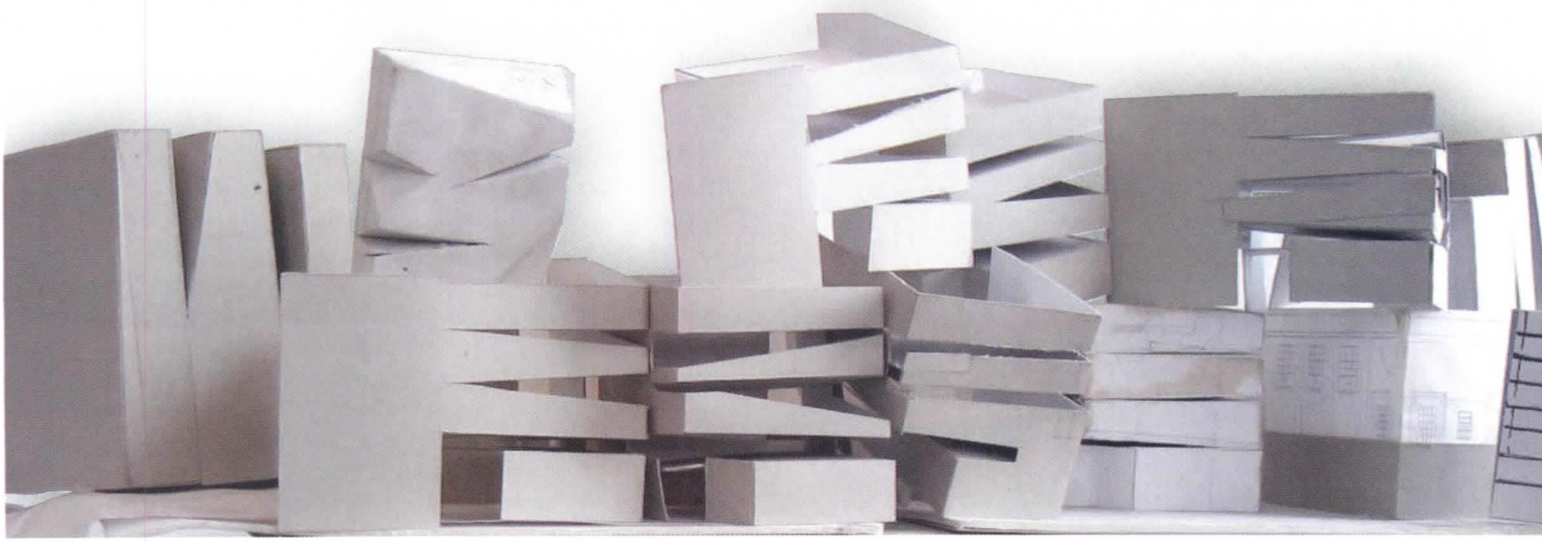


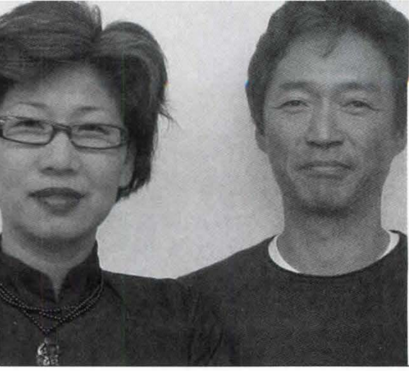
PHOTOGRAPHY: COURTESY KING ROSELLI (BOTTOM LEFT)



Pontificia Università Lateranense, Rome

Now under construction, this project involves renovating an existing lecture hall (right) and adding a new library with reading rooms to a block with buildings dating from the late 1930s (above). As expressed on its exterior, the new building features reading rooms arranged on sloping ramps in three sections. Each section has two floors of book stacks linked by ramps. Completion is scheduled for October 2006.





Architecture studio himma weaves buildings into the fabric of Korea's landscape

By Clifford A. Pearson

Architect: Architecture studio himma
Location: Seoul, Korea
Founded: 1997
Design staff: 10
Principals: Hailim Suh and Junsung Kim
Education: Suh: Harvard University, M.Arch., 1991; Cooper Union, 1990; Columbia University, B.A., 1984; Kim: Columbia University, M.Arch., 1990; Pratt, B.A., 1984; Mackenzie University, Brazil, B.A., 1982
Work history: Suh: Architecture studio Hailim Suh, 1994–97; Rosenblum/Harb Architects, 1992; Skidmore, Owings & Merrill/N.Y., 1985-86; Robert A.M. Stern Architects, 1984–85; Kim: Baum Architects, 1998–2002; Studio Kim Junsung, 1991–97; Steven Holl Architects, 1990; Alvaro Siza Arquitecto, 1988–89; Mayers & Schiff Associates, 1984; Sydney de Oliveria Arquitecto, 1981
Key completed projects: Borim Publishing House and Marionette Theater, Paju, Korea, 2003; House of Books, Paju, 2003; H Residence, Yong-In, 2003; Korean National Research Institute of Cultural Properties, and Dormitory, Daejeon, Korea, 2003; Hyundai High School, Seoul, 2003; Heyri Art Valley Community Center, Paju, 2002
Key current projects: House of Open Books, Paju, 2005; H-3 Residence, Seoul, 2005; Pavilion, Anyang City, Korea, 2006 (with Alvaro Siza); Yangji Waldhaus, Yong-In, 2006
Web site: www.himma.co.kr

In the work of Architecture studio himma, buildings and landscape embrace, creating intricately connected relationships between the natural and the artificial. Set into the earth or floating above it, the firm's projects blur the separation between indoors and out while initiating a dialogue with their surroundings that is both romantic and intellectual. The firm's two partners, Hailim Suh and Junsung Kim, both studied abroad (Suh in the U.S. and Kim in Brazil and the U.S.), and this experience helped shape their approach to design and site. "In the U.S., it's all about infinite horizons or urban contexts, while in Korea we have so many mountains closing off views," explains Suh. "When I returned to Korea, at first I felt closed in by the land." But now she and Kim draw strength from the rugged terrain, using it to add meaning and depth to their work.

While they have known each other since 1994, they started working together only three years ago, after having run their own separate firms. Even today, they sometimes work on small projects separately, while collaborating on larger ones. As a result, they bring different perspectives and skills to the table, two mature designers combining their talents, rather than a pair who have grown up working together. "Hailim is more conceptual than I am," says Kim, "while I'm more interested in detailing and construction." (Suh and Kim are partners only professionally; they are married to other people.)

Even before they joined forces in 2003, both designed projects where architecture integrates landscape and establishes a continuum—instead of a clear separation—between inside and out. For example, with the Korean National Research Institute of Cultural Properties, Suh scored the land with buildings and paths in reference to the way archaeologists demarcate the ground before they dig for the pottery and vessels that are restored and displayed in the project's main building. At the Heyri Art Valley Community Center, Kim pushed the building into the side of a hill and turned the ramped roof into a viewing terrace entered from the street. Together they are currently building the House of Open Books for a publishing company in Paju City, using folded walls—of glass and concrete—to contain artificial landscapes that connect the users of the building to the natural landscape.

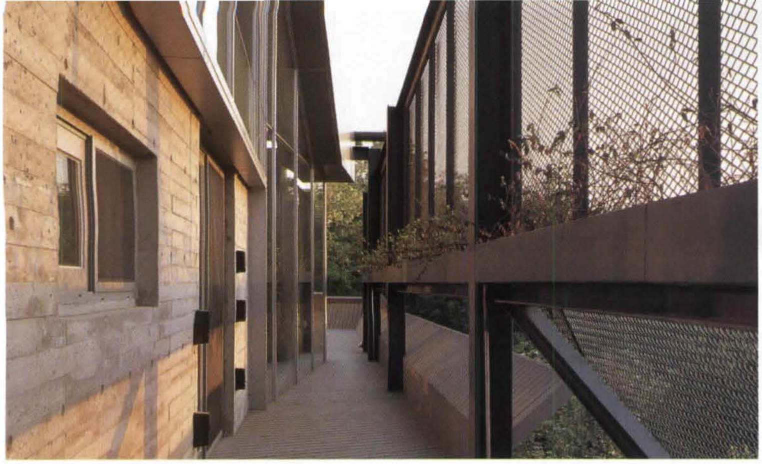
Reflecting Suh and Kim's international view of design, the name *himma* means different things in various languages. In Arabic it means "to challenge or produce something good," says Suh, who notes that a friend told her that Himma is the name of a warrior princess in an ancient Egyptian epic. In Korean, *him* means "power," and *ma*, "magic."

Suh and Kim met when they both returned to Korea and helped establish the graduate school of architecture at Kyounggi University. At about the same time, a number of other young architects also returned to Korea—including Byoungsoo Cho from the U.S. [RECORD, December 2004, page 140] and Jongkyu Kim from England—and together they helped change the direction of the profession. "Before that, the emphasis was always on engineering," says Suh. "But people's perception of architecture here has changed a lot since then," she adds. Now the upstarts of the early '90s are taking charge—helping to educate the next generation and continuing to push for innovation in design. ■

PHOTOGRAPHY: © JONGOH KIM, EXCEPT AS NOTED

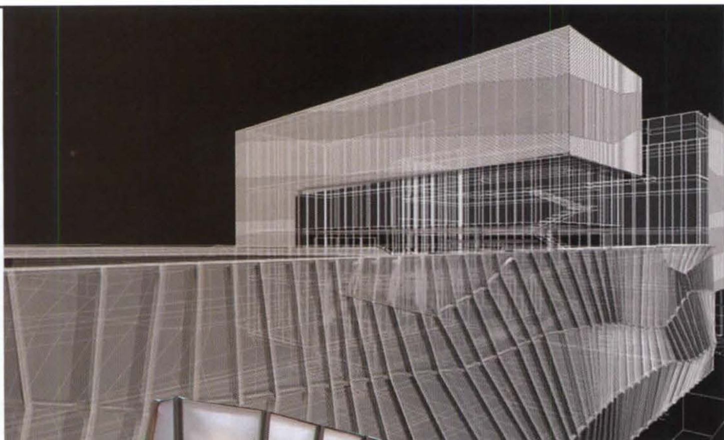
Heyri Art Valley Community Center, Paju

Designed by Junsung Kim before he joined himma, this building serves as a gathering place for a growing development of art galleries, studios, cafés, and houses near the border with North Korea. Outdoor spaces such as a rolling roof terrace and wide, amphitheaterlike stairs help connect the building to the surrounding hills and other projects in the valley. Kim serves as a coordinating architect for the Heyri community.



H Residence, Yong-In

Set into the side of a steep hill, this house superimposes an artificial landscape (in the form of an outdoor patio and deck) onto the existing, natural one. The street facade (right) presents a different, more urban character, though the architects introduced a disciplined type of nature by way of wire-mesh partitions on which vines and plants can grow. The planted mesh planes act as a seasonally changing second skin for the house.

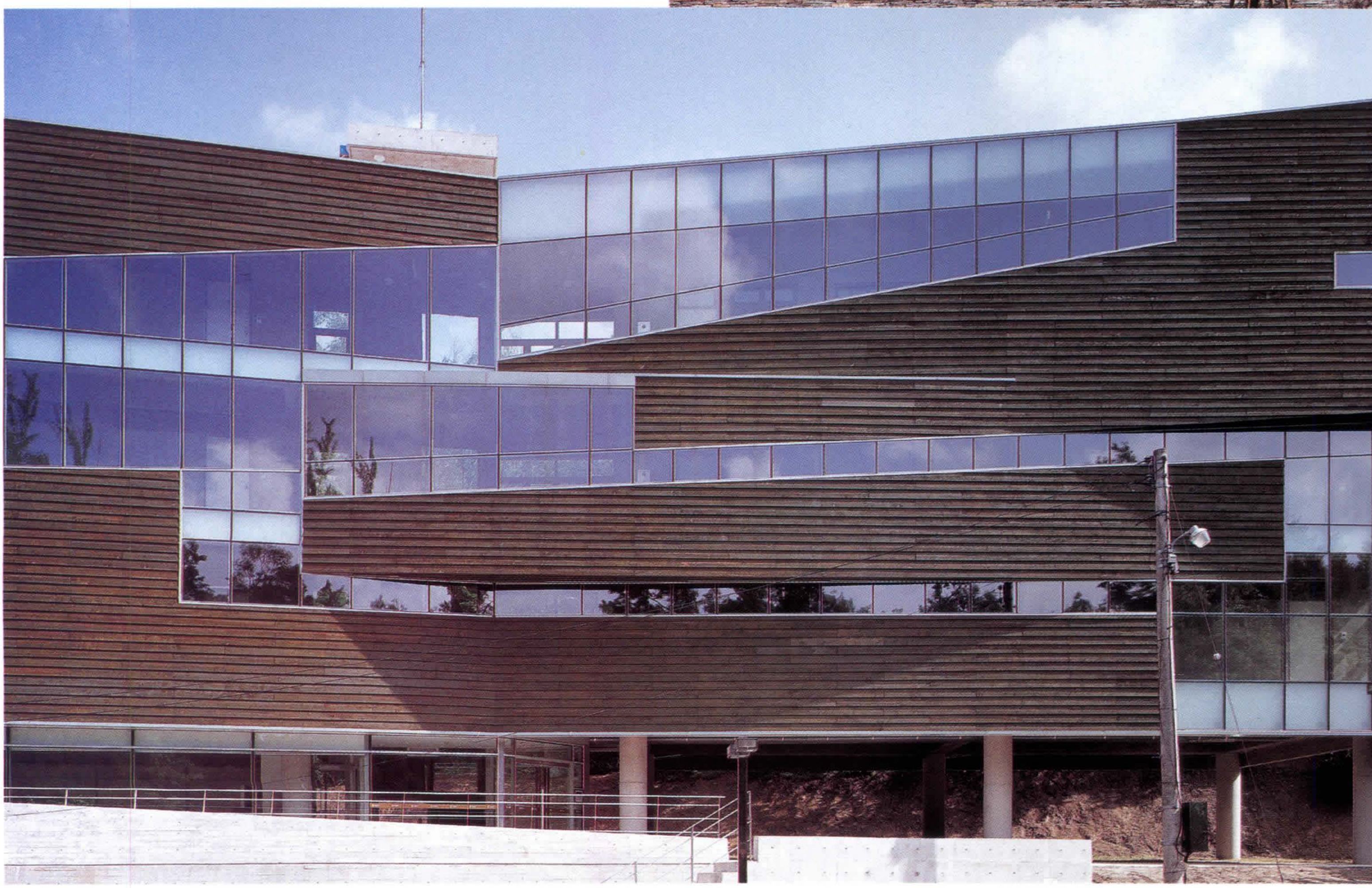


Borim Publishing House and Marionette Theater, Paju

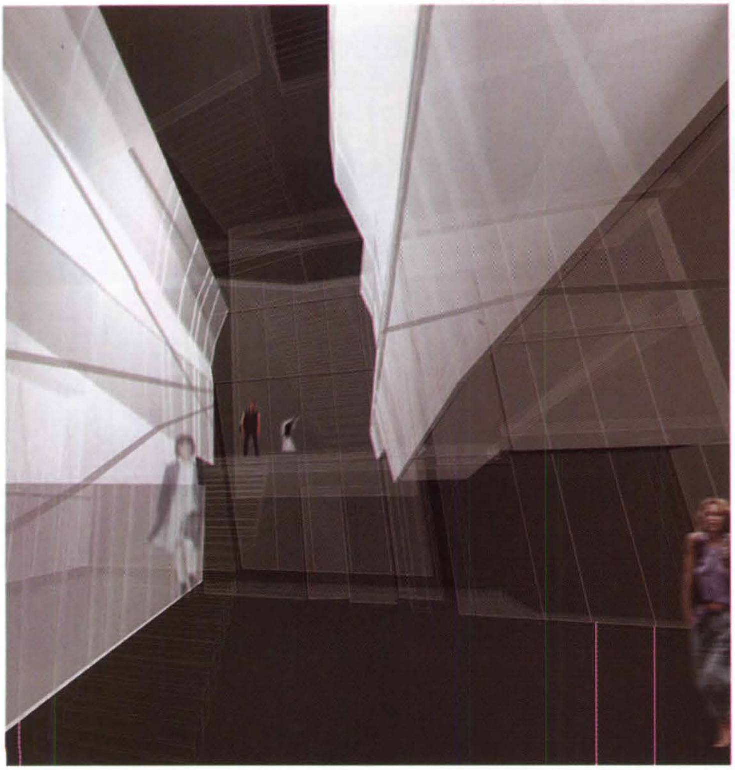
Part of a growing district where many publishing companies have set up operations, this project combines twin, four-story office buildings (right in photo below) with an undulating horizontal box containing a marionette theater. The roof of the theater serves as a "floating deck" for outdoor gatherings and allowed the architects to create an artificial landscape without further disturbing the site.

Korean National Research Institute of Cultural Properties, and Dormitory, Daejeon

For a complex that houses facilities for studying and conserving archaeological artifacts, Hailim Suh excavated channels in the earth and used them as foundations for a set of linear buildings. She placed the library close to the street to give it a public presence and pushed its lower floors under the ground to acknowledge that more needs to be discovered. For privacy, a dormitory sits away from the street on a wooded hill.



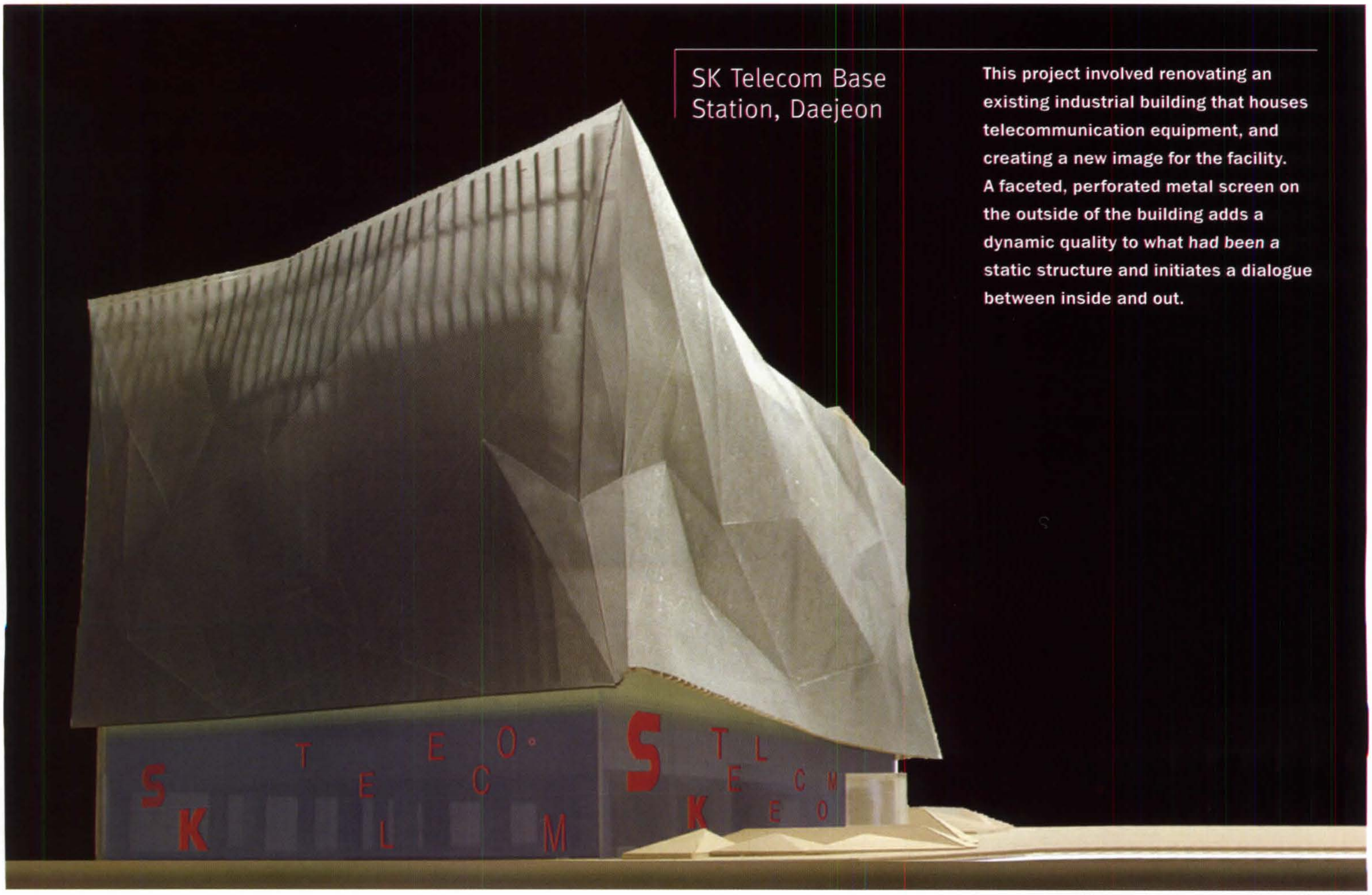
PHOTOGRAPHY: © JAEKYUNG KIM (OPPOSITE, BOTTOM)



House of Open Books, Paju

Like the Borim Publishing House, this project is located in what is called Paju Book City, a hub for publishing companies. The architects designed a building with two blocklike bar structures, one featuring folded walls of poured concrete and the other with a folded glass wall. The contrast between transparency and solidity helps create an intriguing architectural tension.

PHOTOGRAPHY: © COURTESY HIMMA (TOP RIGHT)

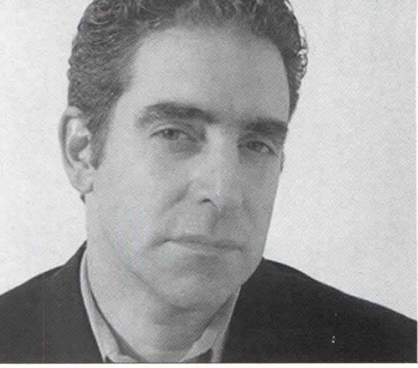


SK Telecom Base Station, Daejeon

This project involved renovating an existing industrial building that houses telecommunication equipment, and creating a new image for the facility. A faceted, perforated metal screen on the outside of the building adds a dynamic quality to what had been a static structure and initiates a dialogue between inside and out.

Hyundai High School, Seoul

The architects inserted this linear building within the dense urban fabric of Seoul. Engaging a busy street on one side and an existing school playground on the other, the school mediates between the two realms. A planted, sloping roof serves as a welcome slice of green space for students and teachers.



Evan Douglis experiments with emerging technologies as he explores cultural issues

By Sarah Amelar

Architect: Evan Douglis Studio
Location: Brooklyn, New York
Founded: 1992
Design staff: 3 to 7
Principal: Evan Douglis
Education: Harvard Graduate School of Design, M.Arch. 1991; Cooper Union, B.A., 1983: Architectural Association, London, Exchange Program, 1980
Work history: Practice—Agrest and Gandelsonas, 1991–92; Emilio Ambasz, 1985–87; WPG Design Group, 1983–85; Tod Williams Billie Tsien Architects, 1982–83; Academic—chair, Undergraduate Architecture, School of Architecture, Pratt Institute, 1993–present; director, architecture galleries, Columbia University, 1995–2003; Columbia University, 1992–2003; Cooper Union, 1992–97; New York Institute of Technology, 1991–92; University of the Arts, Philadelphia, 1991–92
Key completed projects: *RE*ptile–Haku Japanese Restaurant, New York City, 2005; *Accordion Fractals, Lantern Restaurant*, design for building proposal, New York City, 2004–05; *Helioscopes*, traveling media-scape, Orleans, France, 2004–05; *ECO Bars*, Cape Verde Islands, Africa, 2003–04; *Auto-Braids/Auto Breeding*, installation for traveling Jean Prouvé exhibition (ongoing), originated 2003; *Anamorphic Balloons*, Columbia University, 2000; *Liquid Assets*, Columbia University, and FAARM Gallery, Philadelphia, 1999
Key current projects: *Helioscopes*, Los Angeles, Chicago, New York, 2006–07; *RE*ptile: tile product line, 2006–07; *Auto-Braids/Auto Breeding*, Taiwan, Japan, Denmark, 2006–08; LUNIT: Living Unit, prototype for new modular house, U.S.A., 2006–08

"Great architecture should, on some level, be a provocation—one that comments on our prosaic rituals, while also elevating our awareness of a larger, changing world," says architect Evan Douglis. Though most of his built projects have commanded sites within the confines of art galleries (either as exhibition design or conceptual pieces), the work cuts a wide swath intellectually, taking on issues of consumerism, fashion, cultural mythology, voyeurism, and more. And Douglis, chair of Pratt Institute's undergraduate architecture program, is committed to moving his practice, and provocations, into a more permanent and exterior realm.

His only foray there, so far, has been with *RE*ptile–Haku Japanese Restaurant, in New York City. With this 1,400-square-foot project, the architect pursued inquiries he had begun in gallery installations. As the playful name *RE*ptile implies, the scheme explores repetition or replication, biological mimesis, and, literally, tiles. Like all of his work, the project generates dynamic spatial effects through high-relief 3D, or topological, surfaces. With a limited number of parameters (what Douglis dubs "controlled chance"), he deploys digital technologies of design and mass production to create great variation. He also abstracts biological conditions to elicit visceral and associative responses in the viewer. Here, the mimesis evokes characteristics of the reptile, a creature of mythological status in Japanese culture, through a complex system of wall tiles. Mass-produced in lightweight plastic, with CNC-milled masters, the spiky, undulant surfaces emerged from a computer animation program, in which the architect superimposed two independent meshes, fluctuating at different frequencies, to produce interference patterns.

Though Douglis's gallery installations may, at first, appear purely abstract and sculptural, he sees his work as "always anticipating the arrival of the human body to complete the architecture, making program essential." In his *Helioscopes* installation, a dreamscape of iridescent fiberglass-resin spirals descends from the ceiling, forming individual viewing booths, where visitors, each wrapped by a helical tail, watch video displays. The footage in this quasi peep show documents the multithemed decor of Japanese "Love Hotels," commenting on architecture as an ephemeral fashion commodity and fodder for fantasy.

During eight years as the director of the architecture galleries at Columbia University, Douglis created exhibition designs that were never neutral or inert. His installations interacted with displayed work, actively engaging viewers and blurring the line between audience and actor. In *Anamorphic Balloons*, for instance, he cast multiple projections of videos (the show's actual subject) onto his own shell structures. The act of passing through these curvy forms transformed visitor perceptions of the videos.

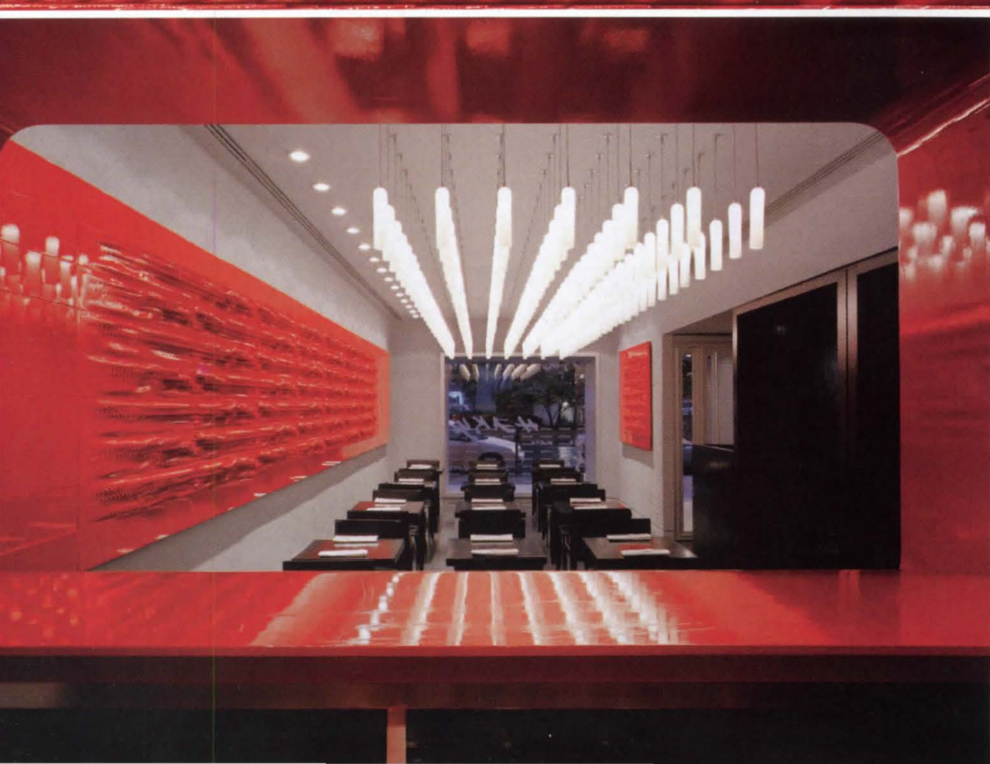
Continually exploring new materials and technologies, he designed *Liquid Assets* using pneumatic forms suggesting a future of animate architecture with intelligent membranes. Like much of his work, these translucent "bladders," restrained by metal "corsets," veer toward the sensual or erotic, inviting multiple readings.

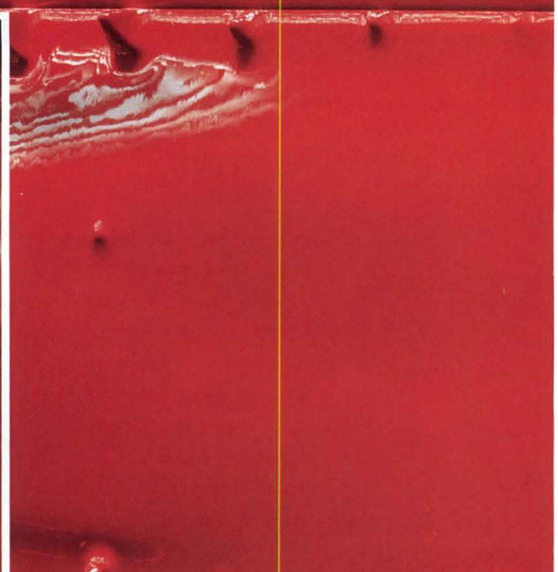
How such experiential qualities will translate into larger-scale, permanently inhabitable work remains to be seen. But if Douglis has his way, *RE*ptile is just the beginning. ■

PHOTOGRAPHY: © MICHAEL MORAN

*RE*ptile–Haku Japanese Restaurant, New York City

For this 1,400-square-foot restaurant, the architect generated dynamic spatial effects through 3D, or topological, surfaces. To create the lightweight wall tiles, he deployed digital technologies of design and mass production, using a limited number of parameters to produce great variety. Through biological mimesis, the spiky, undulant surface evokes characteristics of the reptile, a creature of mythological status in Japanese culture.



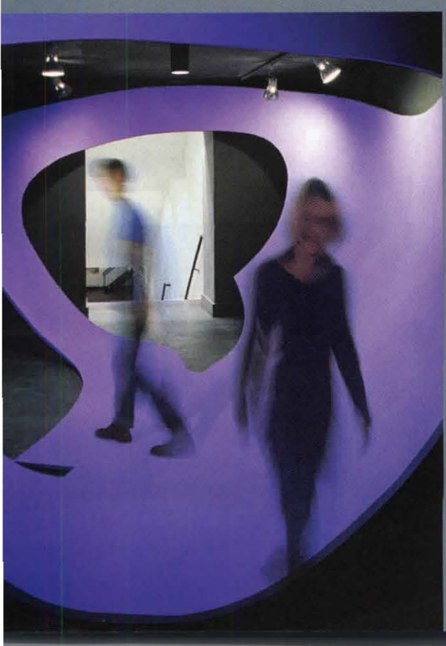


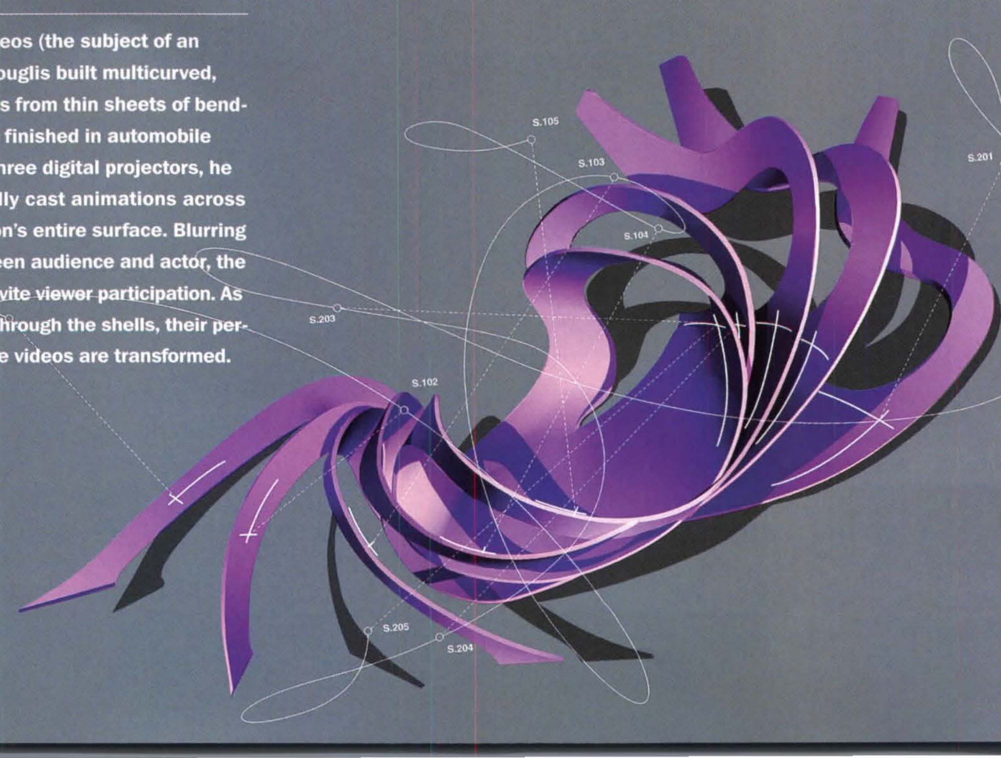
Helioscopes, traveling media-scape

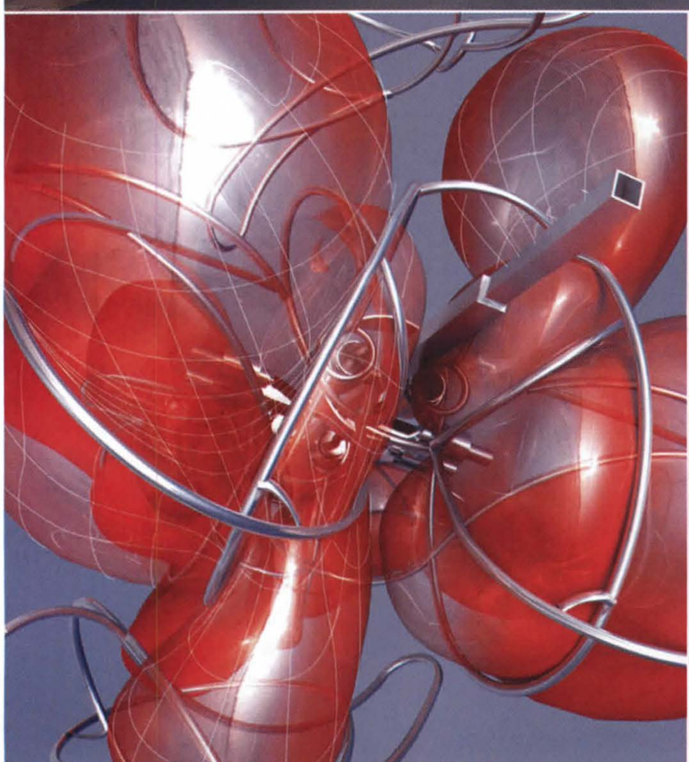
CNC-milled, this dreamscape of fiberglass-resin spirals hangs from the ceiling, forming individual viewing booths, where visitors, each wrapped by a helical tail, can watch video displays. The footage presents multithemed Japanese "Love Hotels," offering an implicit commentary on architecture as fashion commodity and food for fantasy. When seen directly from below, the spirals flatten visually, producing an overall pattern (near left).

Anamorphic Balloons, Columbia University

To present videos (the subject of an exhibition), Douglis built multicurved, concave shells from thin sheets of bendable plywood, finished in automobile paint. Using three digital projectors, he anamorphically cast animations across the installation's entire surface. Blurring the line between audience and actor, the curvy forms invite viewer participation. As visitors pass through the shells, their perceptions of the videos are transformed.







Liquid Assets, traveling exhibition

To create overhead pneumatic forms, Douglis used latex weather balloons, or "bladders," as he calls them, with a "corset" of latex and aluminum tubing, connected to bicycle valves and an air compressor. This quasi-erotic piece (left, as rendered, and above left and right, as executed) invites multiple readings, alluding conceptually to intelligent membranes and animate architecture of the future.

Urbanus's three partners keep their eyes on China's amazing, fast-growing cities

By Robert Ivy, FAIA

Architect: Urbanus Architecture & Design
Location: Shenzhen and Beijing, China
Founded: 1999
Design staff: 22 (Shenzhen); 15 (Beijing)
Principals: Yan Meng, Xiaodu Liu, Hui Wang
Education: Meng: Miami University, M.Arch., 1995; Tsinghua University, M.Arch., 1991; Tsinghua, B.Arch. 1988; Liu: Miami University, M. Arch., 1992; Tsinghua, B.Arch., 1985; Wang: Miami University, M.Arch., 1997; Tsinghua, M.Arch., 1993; Tsinghua, B.Arch., 1990
Work history: Meng: Meltzer/Mandl, 1996–99; KPF, 1995–96; Brown & Bills, 1991–93; Yongmao, 1991; Liu: Stang & Newdow, 1992–93; Design Group, Inc., 1984–90; Wang: Gary Edward Handel, 1998–2000; Gensler/NY, 1997; Gruzen Samton, 1993–95
Key completed projects: Metro Office Tower, Shenzhen, 2005; Teda Vanton U-Club, Tianjin, 2005; Diwang Park B, Shenzhen, 2005; OCT Contemporary Art Terminal, Shenzhen, 2004; Xinhai Garden Residential Development, Shenzhen, 2004; CRLand Constellation Development Sales Office, Beijing, 2003; Diwang Park A, Shenzhen, 2000
Key current projects: Shenzhen International Yacht Club, Shenzhen, 2006; Public Art Plaza, Shenzhen, 2006; Dafen Art Museum, Shenzhen, 2006; Shanghai Multimedia Valley Office Park, Shanghai, 2007; Digital Beijing, 2007, Nanyou Shopping Park, Shenzhen, 2007

China's booming economy is encouraging native-born Chinese architects to return home. Urbanus, a firm based in both Shenzhen (the massive city in southeast China) and Beijing, was founded by four architects—all trained at Beijing's prestigious Tsinghua University and in American universities—who made that decision. The practice grew out of their collective determination to leave active positions in the United States and return to the opportunities they saw growing on native soil.

Today, three partners form the firm's core: Yan Meng, Xiaodu Liu, and Hui Wang, all of whom received graduate degrees at Ohio's Miami University; a fourth partner, Pei Zhu, went on amicably to the Digital Beijing project. The three that remained had worked with well-known New York firms. Quickly, they found work in China.

Initial forays in 1999 by one partner, who arrived in China before the others, suggested that Beijing should be headquarters. However, their first commission came from Shenzhen. Called Diwang Park A, the job brought immediate attention to the fledging company. It was achieved by sending drawings over the Internet, according to Yan Meng, who subsequently moved back himself in 2001. Combining strong geometric ideas with landscape, their first commission signaled the firm's interest in urban design and urban architecture, but also created some confusion for clients. "Some people thought we were a landscaping firm," Meng says.

The architects cite the ability to see their ideas come to life as the real attraction. Regarding speed of execution, "China is a different story," Meng says. "Where we might have taken 3 to 4 weeks just on building elevations in New York," he offers, "we are producing drawings for a whole project in China." At the same time, he notes real differences in normal architectural work life for the young firm, including challenging conditions in the field and a keen eye required to overcome nonprofessional resources. However, the partners are learning how to work there.

Although the firm now numbers 38 people, including 22 in Shenzhen and 15 in Beijing, their numbers pale in comparison with the scale and volume of work to be achieved. Consequently, they always partner with larger organizations, including China's massive design institutes, which sometimes employ thousands of architects.

In approaching each project, the firm's commitment to the urban situation has remained constant, from the smallest project—public restrooms—to the massive. Even large projects are built in less than a year. Today, Urbanus can boast a roster of accomplishment, both built and in planning, that its peers in Europe or the United States would envy. Included in the mix are a museum park to be constructed on reclaimed grain depots, an art museum, a yacht club, and a mixed-use residential and commercial development slated for Shenzhen. More work is filling the hopper. Yan Meng sums up Urbanus's (and China's) current warp-speed design and construction economy: "Time is the hardest thing we face." ■

The flowing lines of Diwang Park B in Shenzhen reflect a city on the go.

IMAGES: COURTESY URBANUS

OCT Life Art Place, Beijing

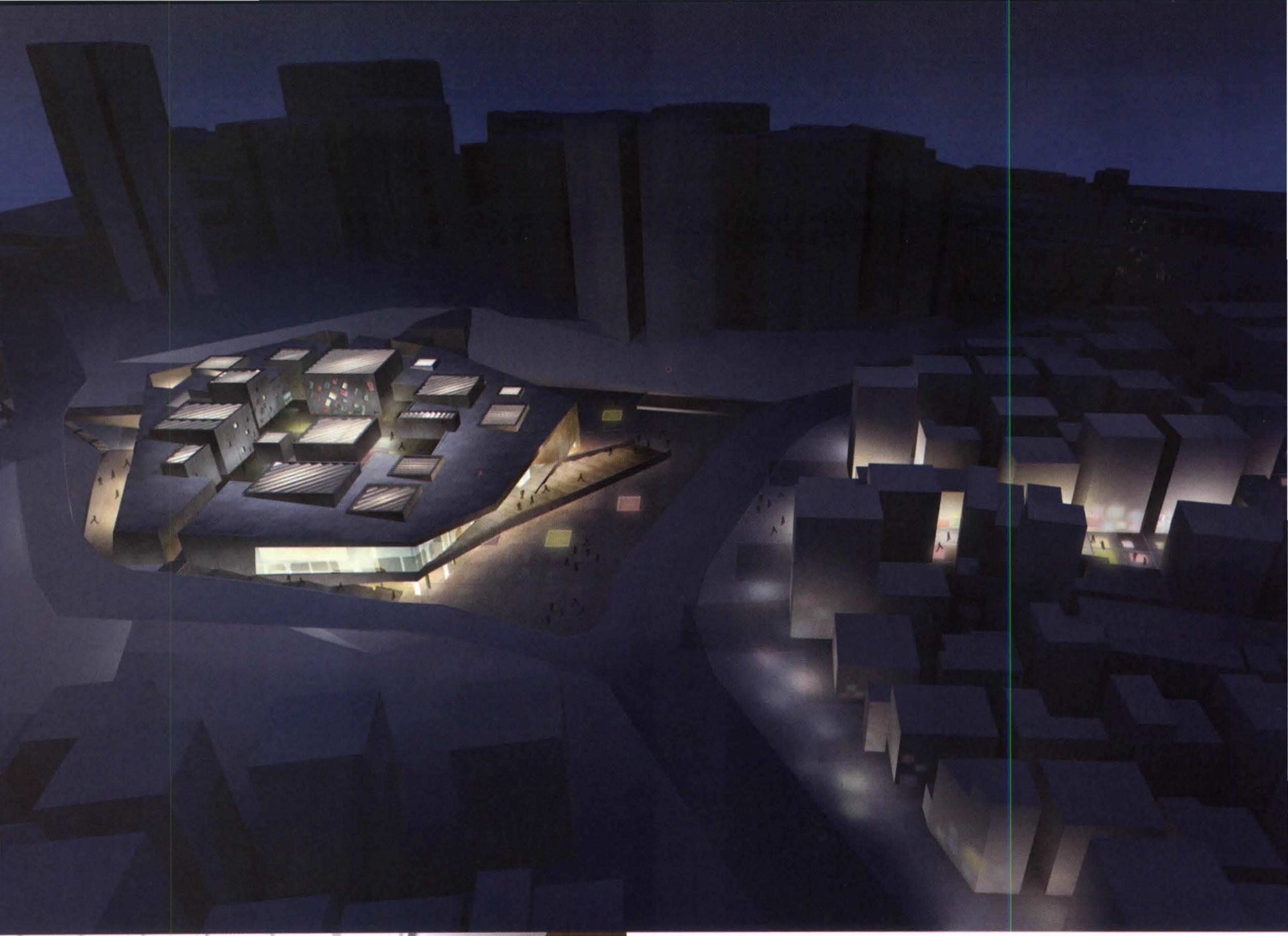
Although the client, OCT, a large real-estate developer, asked the architects to design a sales office for a new residential community, Urbanus convinced the company to make the building a cultural venue, as well. Floating above a pond, the building is light and transparent facing an adjacent park, but presents a more solid and muscular side facing the street.

Dongguan Polytechnic Institute, Guangdong

This 500,000-square-foot education complex sits between an existing campus and public plaza to the west and a narrow lake on the east. Urbanus designed the west facade as a strong urban edge facing the plaza and kept the ground floor open to maintain views from the plaza to the lake. Covered walkways and shaded courtyards adapt the building to the hot climate.

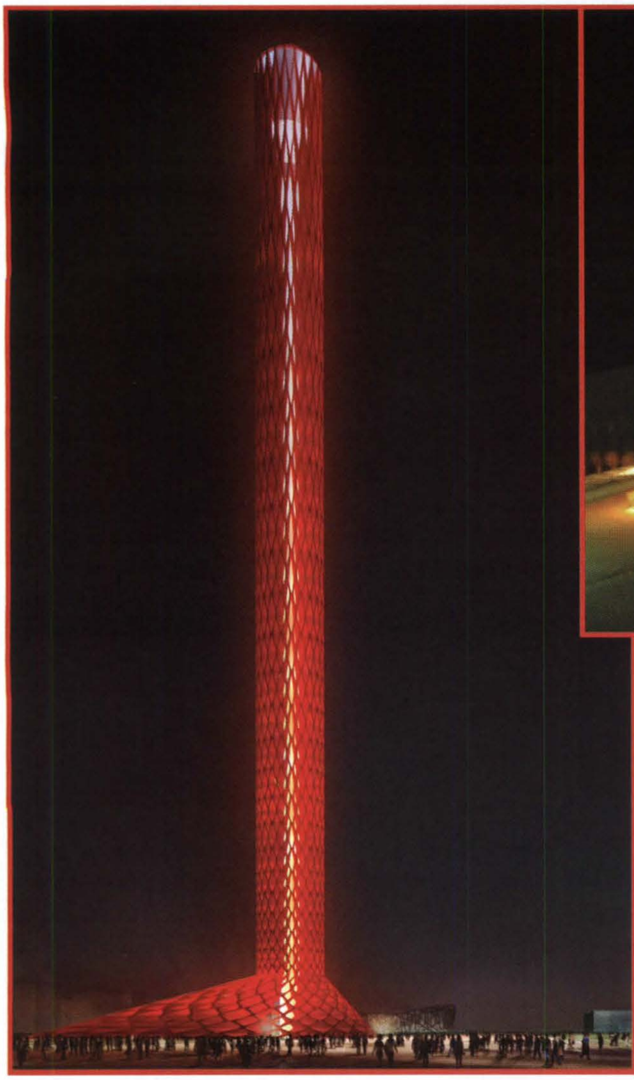
Tangshan Museum Park, Tangshan

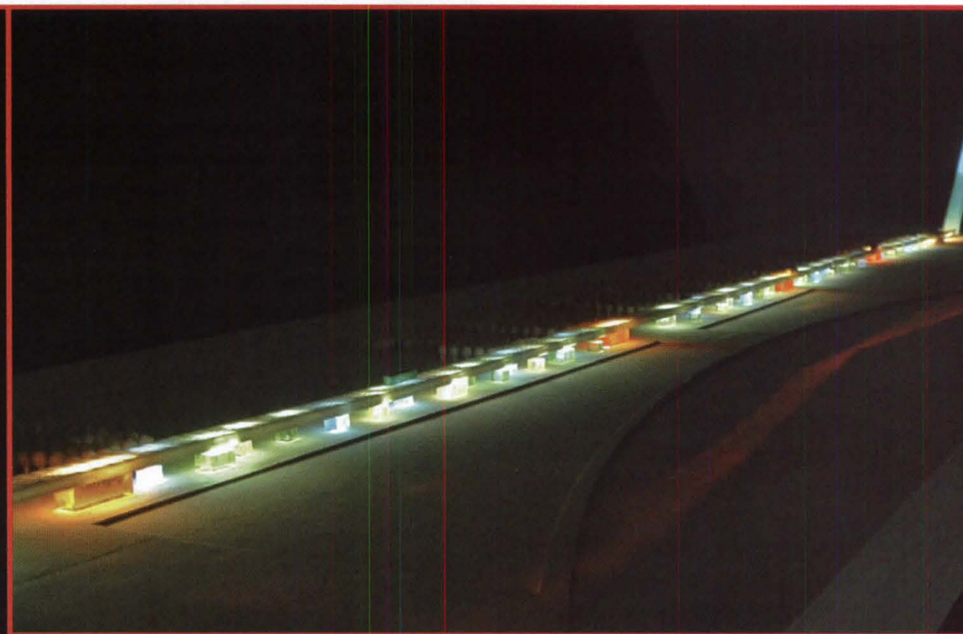
For a town that was almost totally destroyed by an earthquake in 1976, Urbanus designed a museum that preserves four existing grain depot buildings and creates a villagelike cluster of new structures. The project includes facilities for photography, folk art, shadow puppet plays, urban-history exhibits, as well as an antiques trade market.



Dafen Art Museum, Shenzhen

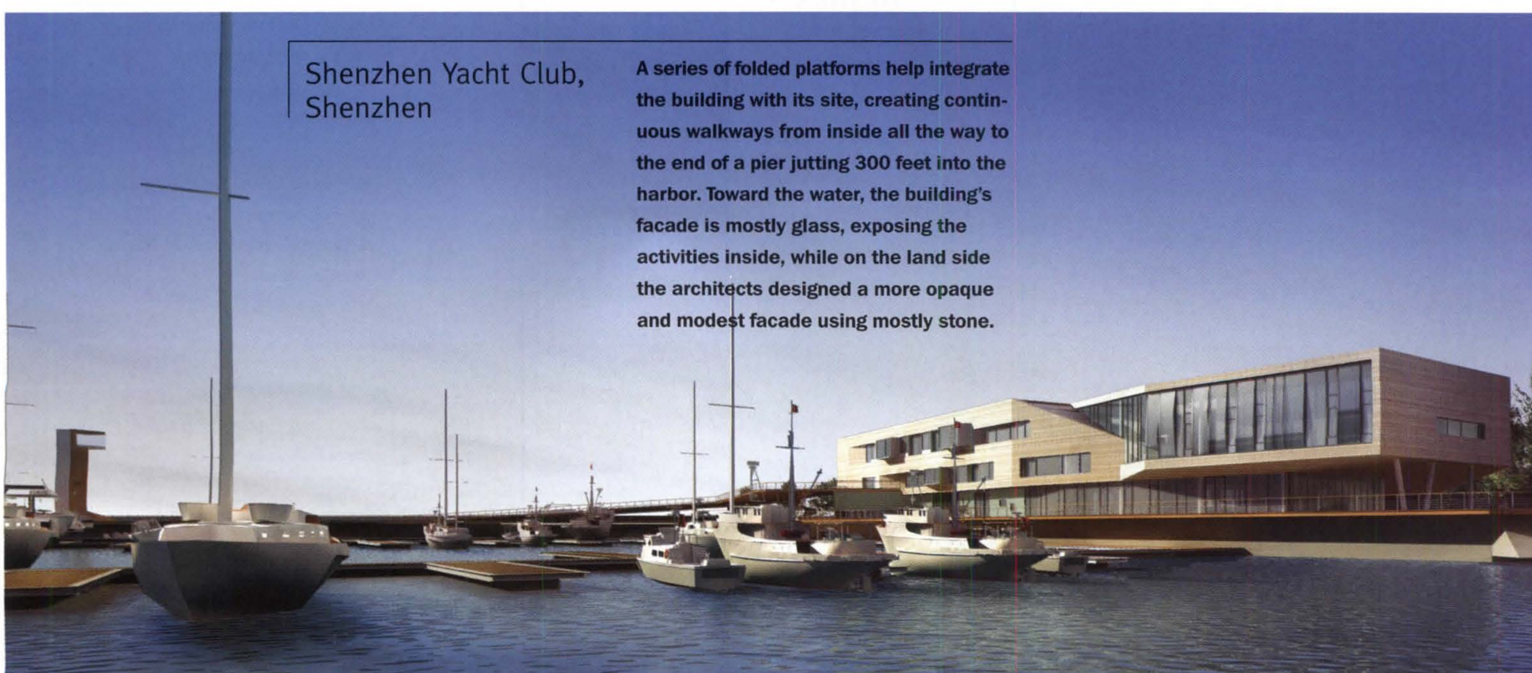
Located in the Buji Township area of Shenzhen, known for its oil-painting-replica workshops, this museum will bring under one roof a mix of galleries, workshops, studios, and commercial spaces. The plan offers a variety of pathways through the building and reinterprets the area's chaotic streets jammed with places for buying and creating fine and popular art.





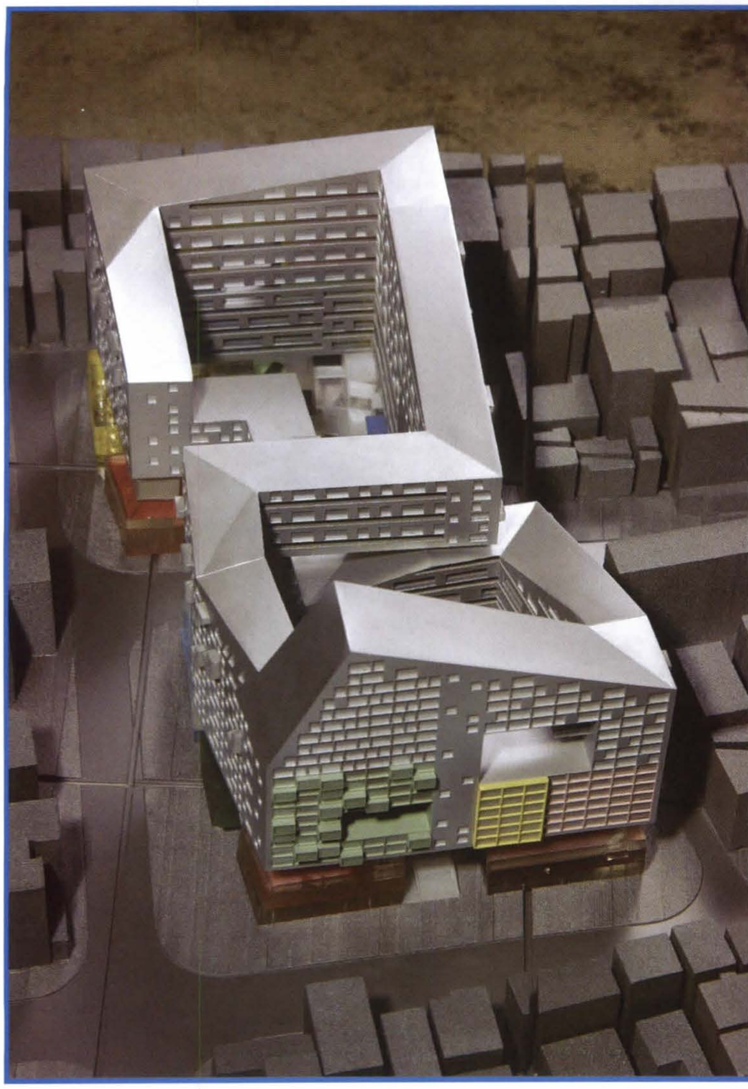
Olympic Landmark, Beijing

Urbanus designed two different schemes for a landmark tower at the end of the north-south axis leading to the 2008 Olympic site. The first one (top) features an angled tower with viewing platforms at many levels and an elevated monorail taking visitors along a 1.5-mile-long walkway. An alternative design (left) proposes a straight tower modeled after Chinese lanterns.



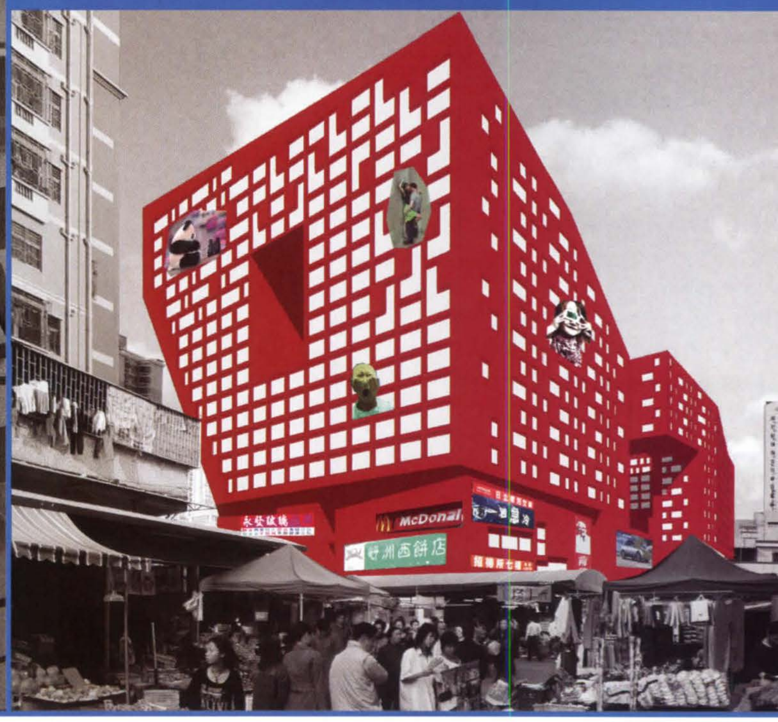
Shenzhen Yacht Club, Shenzhen

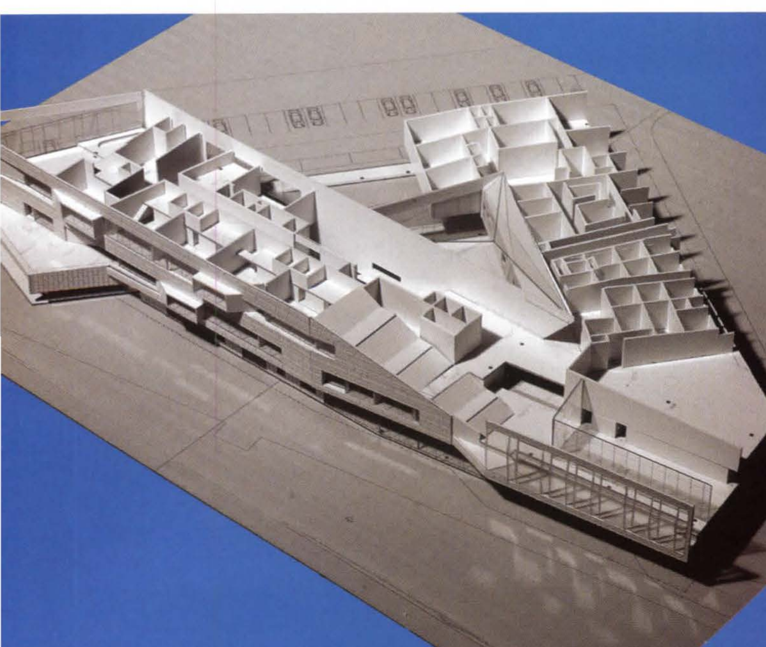
A series of folded platforms help integrate the building with its site, creating continuous walkways from inside all the way to the end of a pier jutting 300 feet into the harbor. Toward the water, the building's facade is mostly glass, exposing the activities inside, while on the land side the architects designed a more opaque and modest facade using mostly stone.

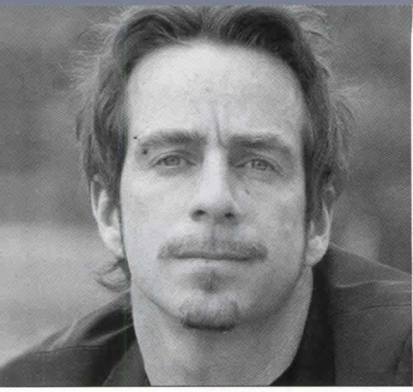


Xinzhou Village, Shenzhen

Located adjacent to the central business district, this project combines shopping and commercial spaces on the ground floor and residences above. By cutting the building into two parts and incorporating streets, paths, and courtyards within the complex, the architects hope to create a sense of community and a "village-amidst-the city."







Michel Rojkind is making a name for himself and Modernism in Mexico City

By Sarah Cox

Architect: Michel Rojkind/Rojkind Arquitectos
Location: Mexico City
Founded: 2002
Design staff: 4 to 10
Principal: Michel Rojkind
Education: Department of Architecture and Urbanism, Universidad Iberoamericana, B.A., 1994
Work history: Adria+Broid+Rojkind, 1998–2002; Mir+Ro+H arquitectos, 1993–98
Key completed projects: Falcon Headquarters, San Angel, Mexico City, 2004; Boska Bar, San Jeronimo, Mexico City, 2004; pR34 House, Tecamachalco, State of Mexico, 2003; F2 House, Sayavedra, Mexico City, 2001; Mexico City National Videotheque, Mexico City, 2000
Key current projects: Polanco Park and Polanquito, urban master plan, with Arthuro Ortiz, Polanco, Mexico, 2006; *Thinking Ahead*, project for Vitra Design Museum exhibition *Open House*, Essen, Germany, 2006; City Santa Fe Residential Building, Santa Fe, Mexico, 2007
Web site: www.rojkindarquitectos.com

Architect Michel Rojkind has the type of high-energy personality that can't be satisfied by just one career path. Formerly a professional musician in Mexico City, Rojkind had earned an undergraduate degree in architecture and spent four years pursuing it on the side in what he describes as a playful and naive way, while drumming for a rock band. Then things began to get serious in 1997 when a client approached him with a commission to design a home. Rojkind laughingly recalls thinking, "I don't even have an office. I work at my home! Are you kidding?" The following year, he established a firm with two partners.

Only three years after founding his own practice in 2002, Rojkind has already produced some very innovative work. The Falcon Headquarters, a corporate office in Mexico City for medical manufacturers, involved turning a residential home into a commercial building, with collaborating architect Derek Dellekamp. Intrigued by the clients' passions, he created diagrams of chemical changes. This led to the concept of linking pixilated panels that create a "second skin." The panels appear translucent or orange-tinged depending on the angle of the viewer and the lighting conditions, and evoke the interreaction of a chain of chemicals. This cladding system encloses an interior garden and is made of panelite—a plastic honeycomb inside an insulating glass unit—which had not previously been used in Latin America; Hector Esrawe, another young Mexican talent, designed the furniture.

The pR34 House, an apartment built for a 19-year-old ballet dancer, rests atop the roof of a 1968 home in Tecamachalco, State of Mexico. Once again, Rojkind attempted to abstract the occupant's personality on the exterior, this time using curving steel forms to evoke the movement of dancers. The architect hired Mexican steel workers, who usually do bodywork on wrecked cars, to work on the project, and was impressed with their "improvisation." "These are the kinds of things you can do here in Mexico," he says, noting, "This would have cost a lot of money in most parts of the world."

Though young, Rojkind has already had an opportunity to revisit his past in collaboration with Hector Esrawe. For the Boska Bar, Rojkind redesigned a space he had originally done seven years earlier, this time with more constraints from the growing development on the adjacent property. Given a windowless, cavelike space with a long entry tunnel, Rojkind chose to bring the outdoors in (Boska derives from the Spanish for "forest").

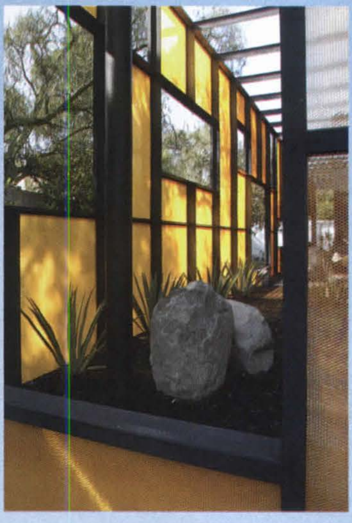
As for upcoming work, the City Sante Fe, in Sante Fe, Mexico, will be his biggest building to date; the project includes a tower with 180 housing units and a hotel. Construction will begin in August 2006. For a 2006 Vitra Design Museum exhibition, Rojkind addresses the concerns of Mexico's aging population with homes for the elderly that take into account how our bodies change over time, becoming bent and diminishing in height.

Rojkind still depends on the simultaneous influence of music and architecture. "I could eventually get away from my architecture for a bit through my music and see my architecture objectively through another vision. That flexibility really helped me." And while he'll never stop singing the praises of Mexican workers, Rojkind feels it may be time to take his unique blend of passions and go for his first big commission north of the border in the U.S. ■

PHOTOGRAPHY: © JAIME NAVARRO

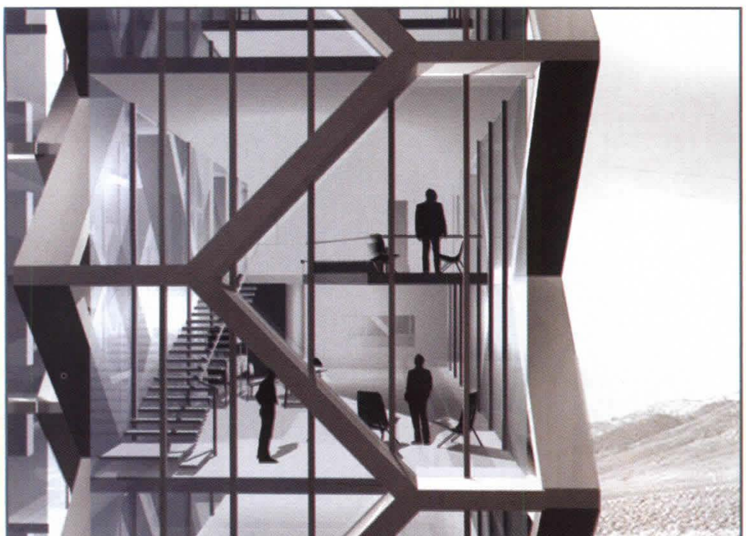
Falcon Headquarters, San Angel, Mexico City

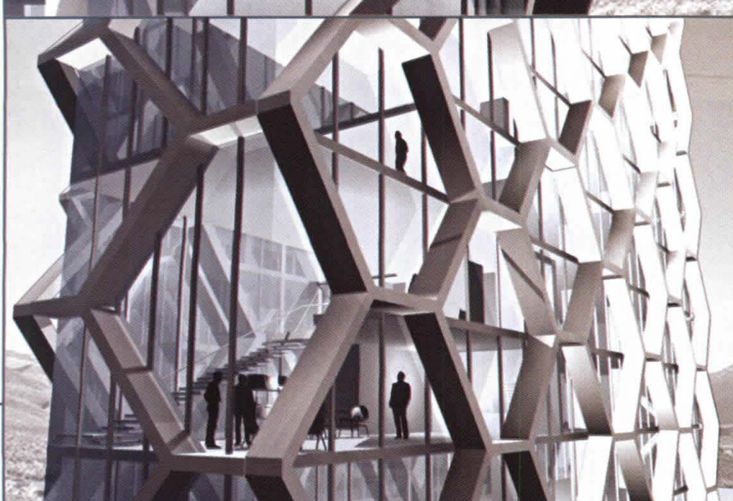
Rojkind created an enclosed garden behind the exterior "skin," which features the agave plant (below right). The panelite used for the cladding can appear both translucent (left) or bright orange (below left). Adding the panelite gave the whole structure, formerly a residence, a more commercial feel, which also expressed the clients' personality (bottom). The cladding allows ample natural light into the office.

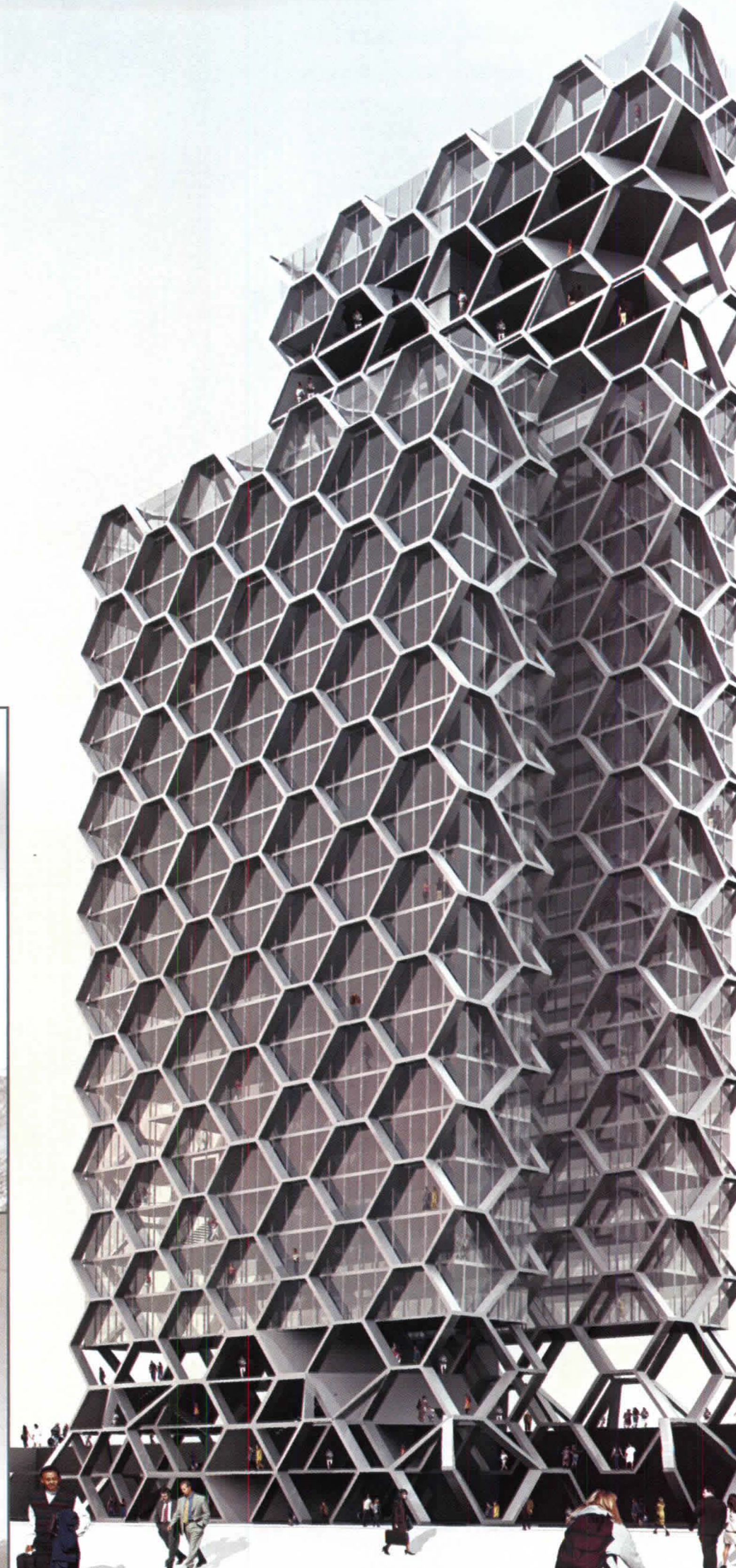


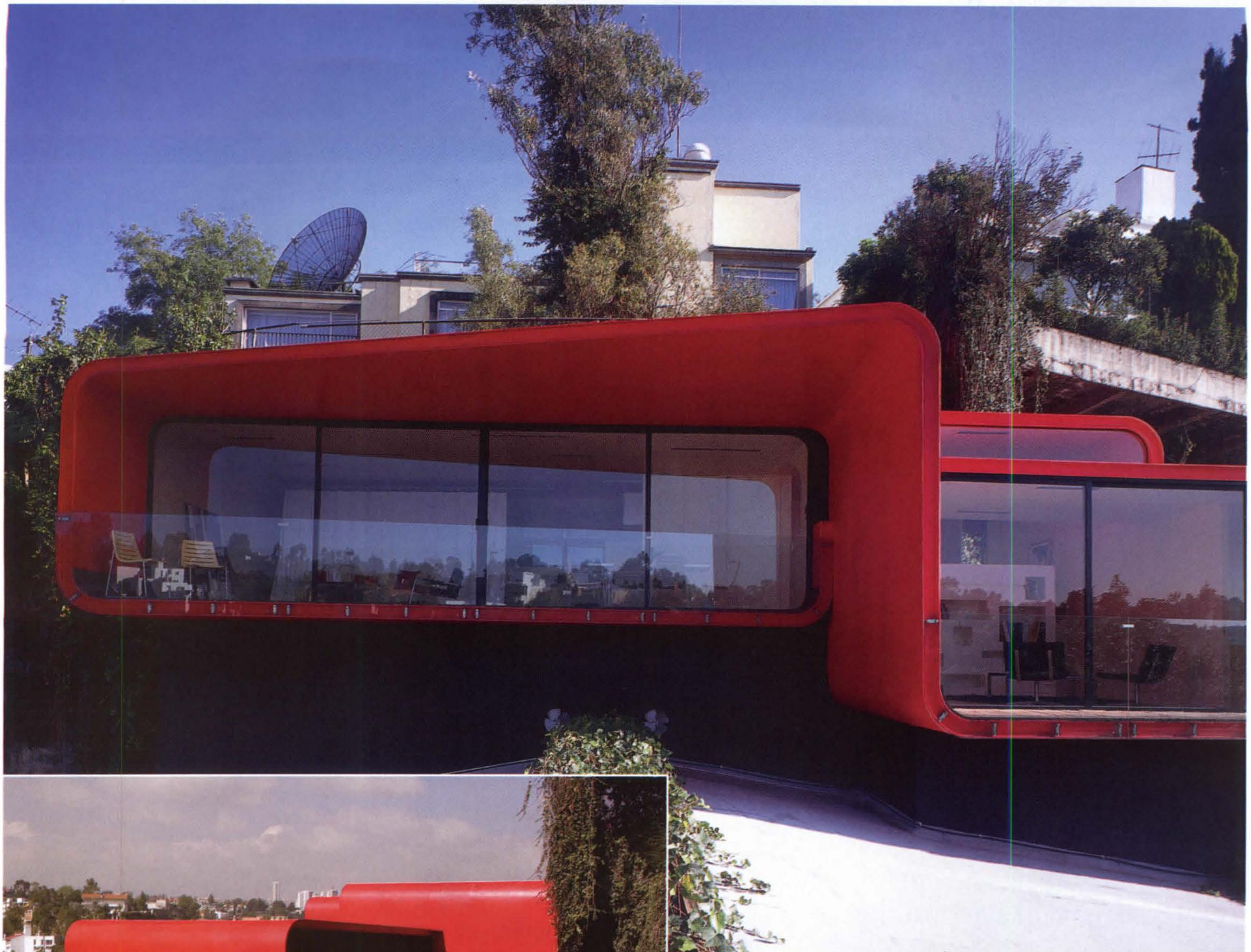
City Santa Fe, Santa *Fe, Mexico*

For a complex of residential and mixed-use towers near the Universidad Iberoamericana, Rojkind designed a tower with a supporting structure that unfolds on the ground level to create public and commercial spaces (right). The project will be of mainly concrete structural elements with a glass-and-steel skin (below). It will include a hotel and 180 residential units, and construction will begin in August 2006.







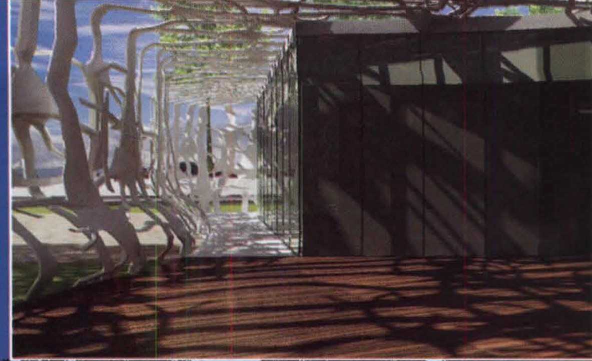


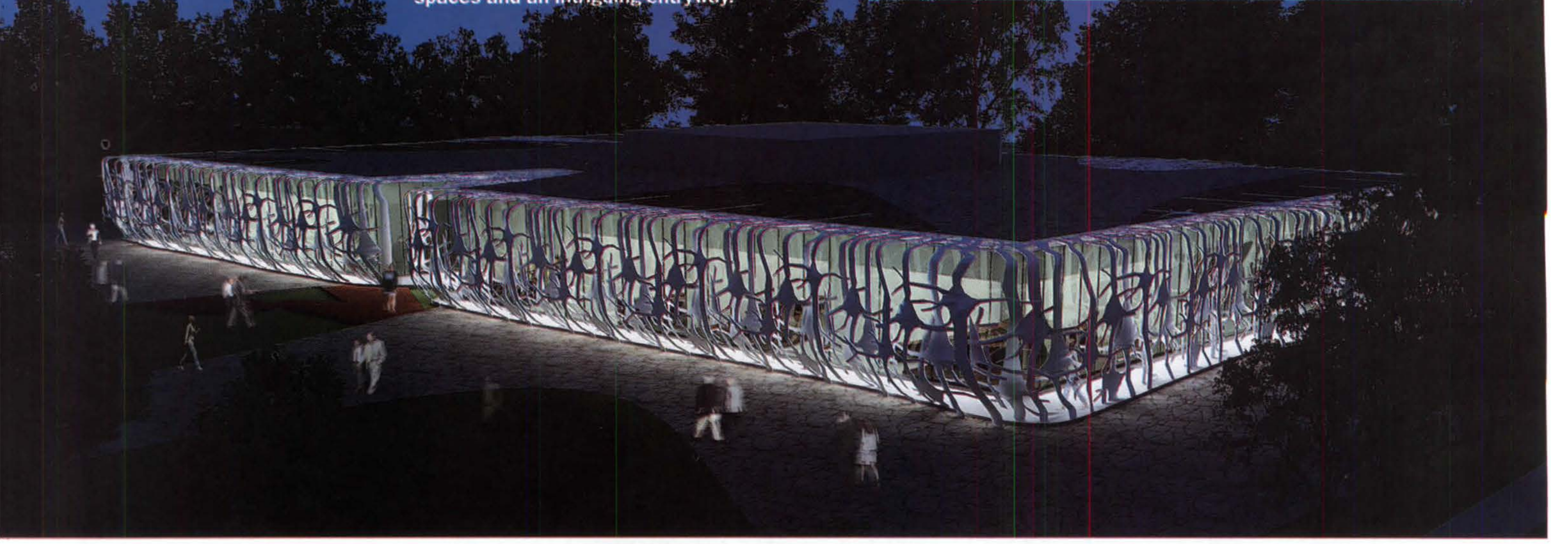
pR34 House, Tecamachalco, State of Mexico

After renovating the 1968 home underneath the pR34 House, Rojkind focused on the personality of the owner's 19-year-old daughter, a ballet dancer, for the rooftop apartment (top). The curving metal forms (above) resulted from studying the motions of dancers, while Rojkind picked the color red because it expressed youth and passion to him. The interior is a compact living space of 1,507 square feet (right).

Business School Building, Puebla, Mexico

This competition entry for a Graduate Business School Building for the Universidad de las Americas was based on the concepts of speed, flexibility, and interconnection. The orthogonal building (right) is clad in an expressive brise-soleil membrane (below). The concept extends to the landscape, as well, creating public spaces and an intriguing entryway.



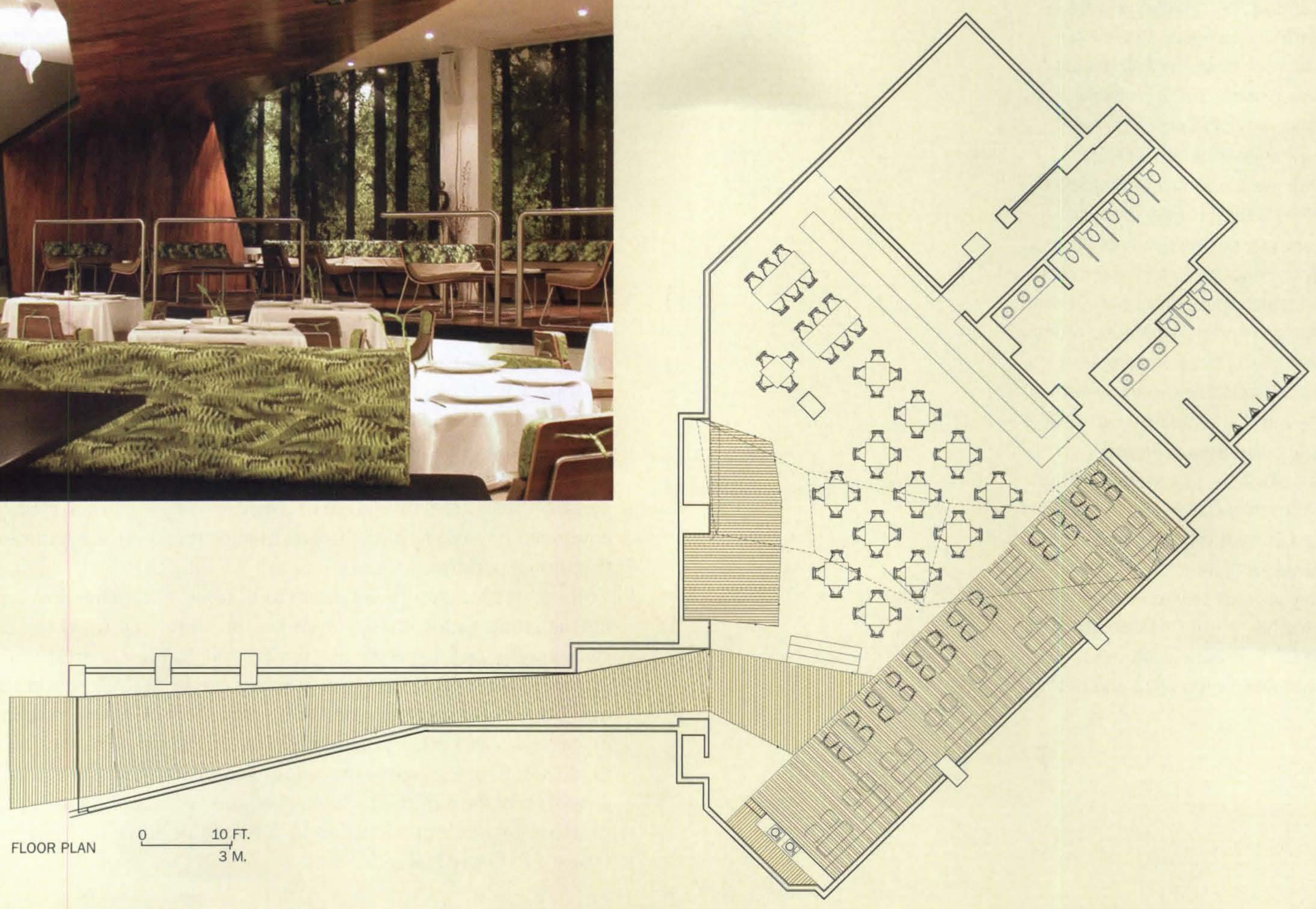


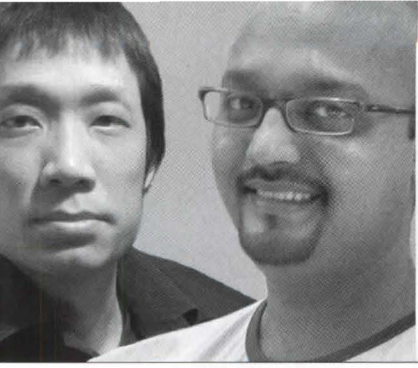
MP3 Apartment, Colonia Condesa, Mexico City

The client for this home, a famous Mexican actor, wanted a space to reflect his playful, extroverted, and sensual lifestyle. Industrial Designers Hector Esrawe and Simon Hamui, as well as artist Stefan Brugerman, were key collaborators on this remodeling job. Translucent walls (above) contributed to the feel of openness and freedom (left).

Boska Bar, San Jeronimo, Mexico City

For the Boska, Rojkind transformed a windowless space into a virtual forest retreat by creating a deck area that takes guests through the tunnel-like entrance (plan, bottom) and then unfolds in the main room (above right), wrapping the ceiling and creating another platform. With a backdrop of lush and leafy interior prints (left and top left), commissioned from photographer Lara Becerra, the room lost its sense of claustrophobia.





Chris Lee and **Kapil Gupta** make a long-distance collaboration seem effortless

By Catherine Slessor

Architect: Christopher C.M. Lee, Chris Lee Architecture & Urbanism, London; Kapil Gupta, Contemporary Urban India Pte, Mumbai
Design staff: Lee: 3; Gupta: 12
Education: Lee: Architecural Association, London, AA Diploma (Honors), 1998; National University of Singapore, B.A., 1995; Gupta: Sir J.J. College of Architecture, B.A., 1998; Architectural Association, postgraduate studies
Work history: Lee: Practice—Rabin Square International Design Competition, first place, 2001; Shinkenjiku-sha Residential Design Competition, second place, 2000; design coordinator, RSP Architects Planners & Engineers, Singapore, 1998–2000; Raglan Squires & Partners, London; Academic—Unit Master at the Architectural Association, 2002–present; University of Pennsylvania/AA Exchange Program, 2001; National University of Singapore, 1999–2001. Gupta: Practice—currently design principal at Contemporary Urban and director of Research and Publications, Urban Design Research Institute, Mumbai; member of prize-winning team at the Sustainable Urban System Design Competition, Japan, 2003
Key completed projects: Thanks Boutique, Mumbai, 2005; Aluhwahlia Gallery, Mumbai, 2004; Leo Burnett office, Mumbai, 2003; Jewel Tech, Mumbai, 2002
Key current projects: deGustibus, Mumbai, 2007; C House, Bangalore, 2007; Fort School, Mumbai, 2007
Web site: www.chris-lee.net

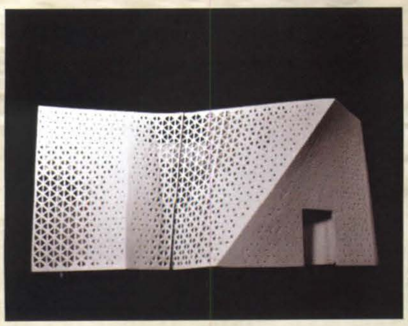
Separated by some 4,500 miles and five time zones, London-based Chris Lee and Mumbai-based Kapil Gupta enjoy a thriving, if slightly unorthodox, long-distance design collaboration. Gupta, from India, and Malaysian Lee met while savoring the cultural and intellectual melting pot of London's Architectural Association in the late 1990s. Lee, who studied under Ben van Berkel, still teaches there and sees his AA experience as a vital source of enrichment for his emerging practice. Made possible by the cheapness and whizziness of modern communications technology, which continues to shrink the world, the transcontinental partnership relishes its sense of informality and the notion of moving fluidly between the global and the local. As Lee notes, "We like to think we operate between these two extremes; neither taking the position of the catch-all brand, nor being the paralyzed, sensitive local architect. After all, architecture operates in messy conditions."

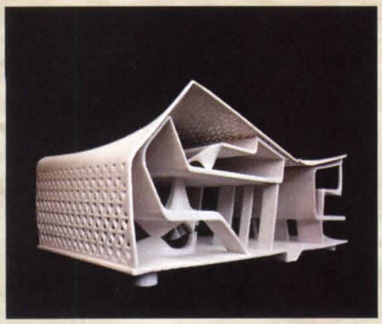
Few places epitomize this messy vitality more than Mumbai, India's Bollywood and business center, where the partnership is now seizing the chance to build a series of projects. Lee and Gupta are fascinated by typology, and especially how new types might emerge out of established historical models through pressure from competing forces, such as abstraction, technology, or simply local conditions. A project for a diamond-cutting factory in Mumbai, for instance, takes as its starting point the tight security required for workers passing through the building and how this is manifest in regular and often demeaning physical searches. Lee and Gupta invert the traditional 19th-century panopticon model of surveillance, so that instead of workers being constantly surveyed and frisked, they are only subject to scrutiny as they move through a nodal core of vertical circulation that links together the various spaces.

A scheme for a multistory school, also in Mumbai, rethinks the alienating Modernist tower block as a forum of social exchange and place-making, with floors removed to create external gardens and ramps like those in New York's Guggenheim Museum contained in structural cores to encourage a constant promenade around the building. A column-free floor plate has the potential to provide greater spatial incident and variety, so that pupils are able to cultivate a more clearly defined sense of place. In Doha, capital of the wealthy Gulf state of Qatar, a project for a shopping mall recasts the monofunctional, monolithic mall surrounded by a sea of parking into a reinterpretation of a dense, complex, Arabian city quarter enveloped in a modern, high-performance version of a *mushrabeyeh*, or traditional perforated Islamic screen.

With currently no desire to become a big-name firm churning out signature architecture, Lee and Gupta aim to cultivate the freedom, spontaneity, and capacity for intellectual inquiry that a more loose improvisation with other creative spirits can bring. "We would rather see unexpected and surprising deviations in collaborative efforts spurred on by ourselves and other potentially interesting collaborators," says Lee. It might sound like a slightly precarious way of working, but at this still relatively early stage in their careers, Lee and Gupta are happy to embrace transcontinental improvisation as a means of allowing their talents to evolve and flourish. ■

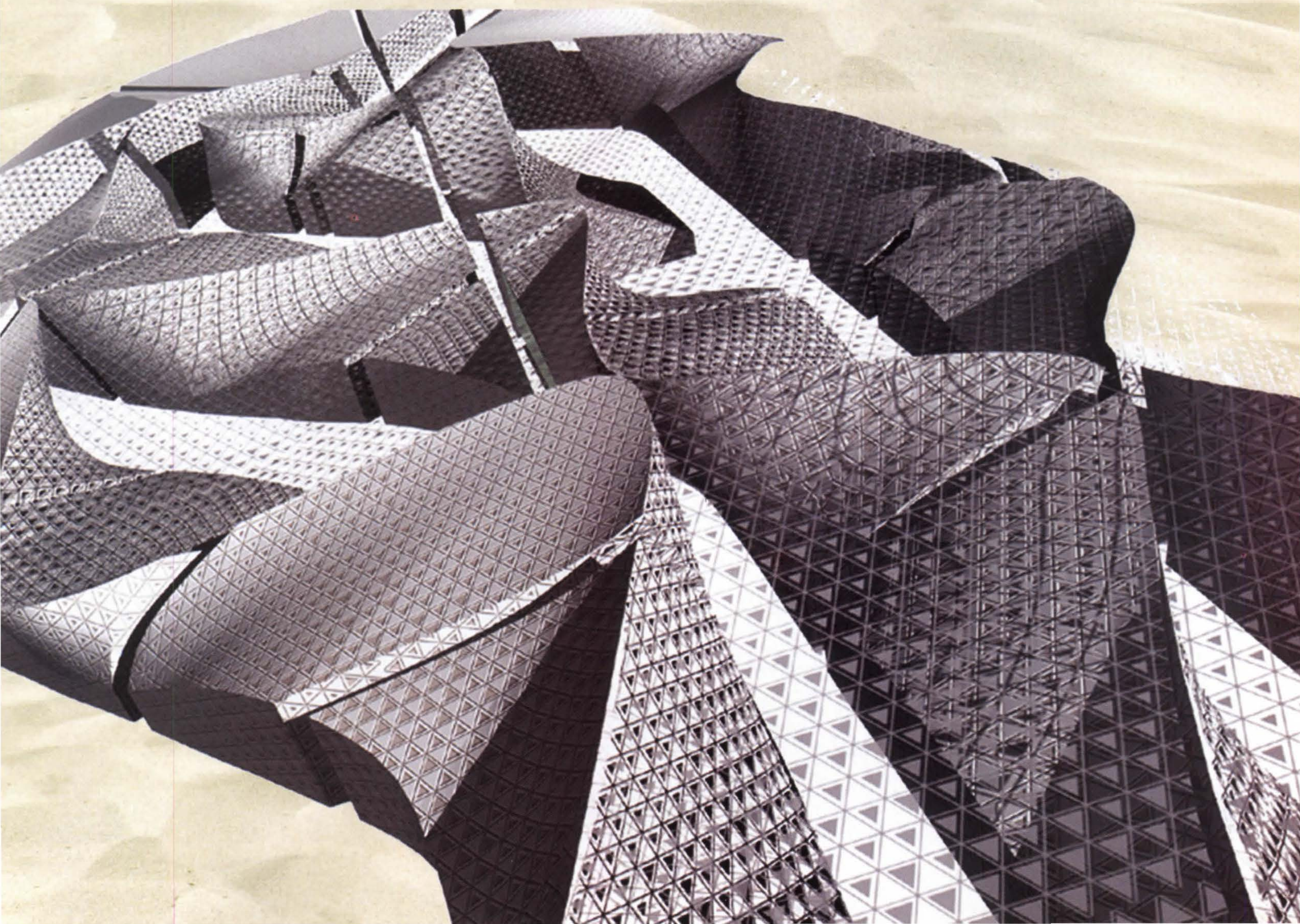
IMAGES: COURTESY CHRIS LEE ARCHITECTURE & URBANISM

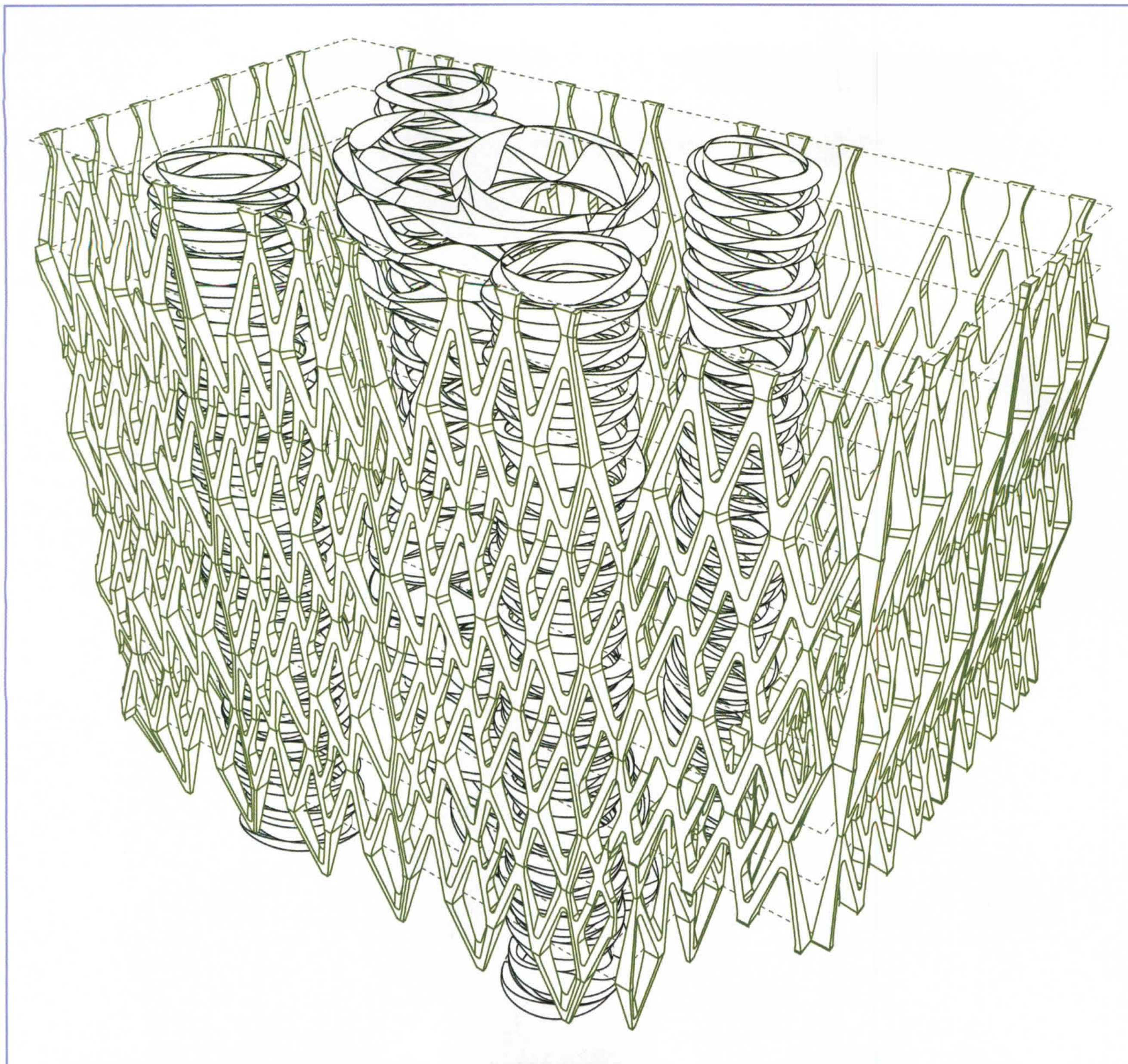


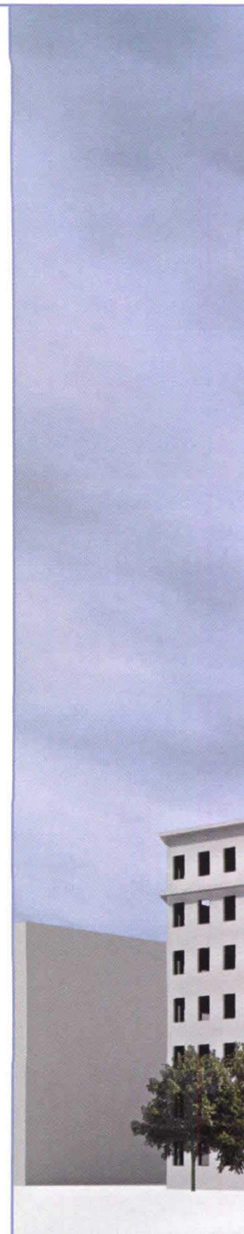


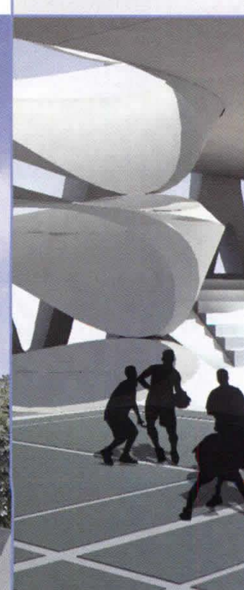
C Quarters, Doha, Qatar

This large mall will be located on the edge of a state-sponsored campus, constructed in Doha, called Education City. The spatial system alludes to the surrounding sand dunes in a series of undulating voids and masses (above). The perforations in the structural system (left) are abstractions of traditional Islamic architectural elements.



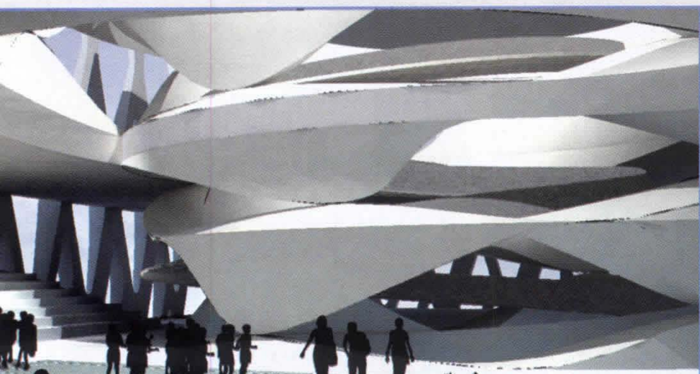


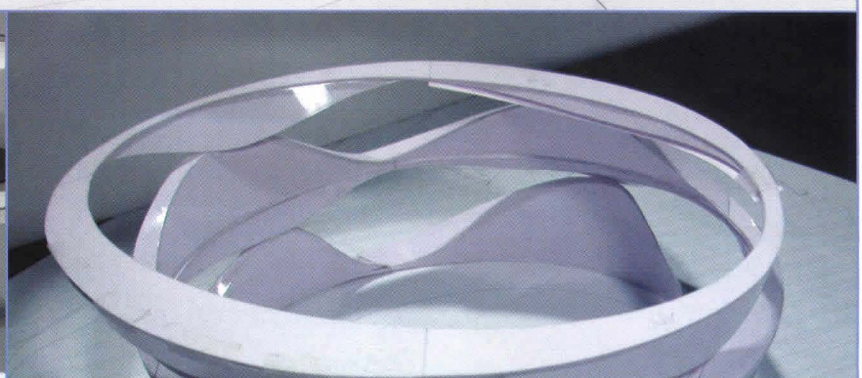




Fort School, Mumbai, India

Instead of the typical low-rise-block typology, the planning parameters for the school district required a high-density, high-rise block. Five perforated cores (left and bottom right) act as structural elements as well as circulation. The main core is a continuous ramp that forms the main circulation. The structural-concrete diamond-grid facade resists the stresses of the cores.



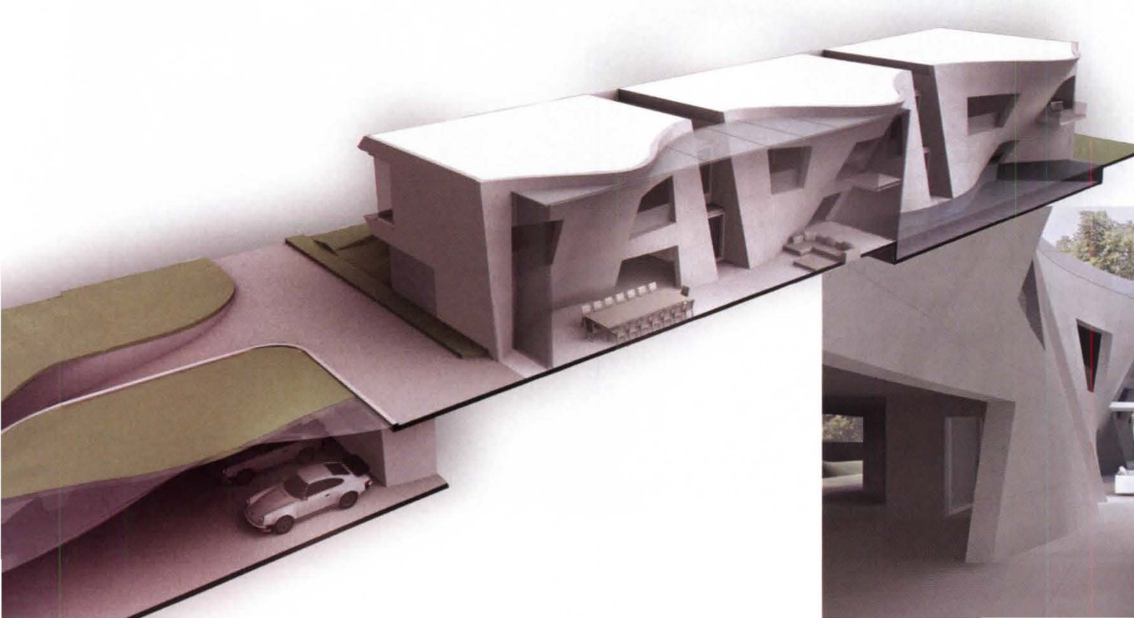


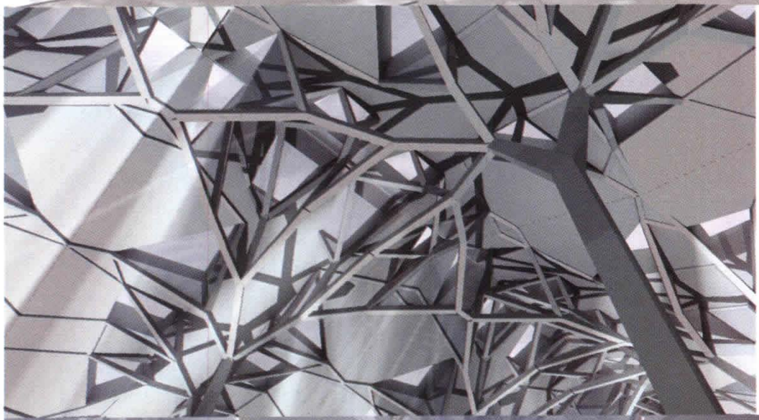
Jewel Tech,
Mumbai, India

For a high-security diamond factory, the architects proposed a "reverse panopticon," whereby a void (right) in a glass canyon acts as a surveillance chamber. The void connects all the different departments, services, and administration. All circulation and routing within the building is forced through this opening, reducing the need for constant body searches.

C House,
Bangalore, India

The design of this house was inspired by the architects' desire to transform the traditional, fragmented courtyard house into a linear organization that will be experienced as a whole. The house is bisected by a courtyard defined by serpentine walls.





deGustibus, Mumbai, India

A series of existing buildings within the Mumbai Race Course are to be converted to food and beverage complexes. Mimicking the ubiquitous mature shade trees, the architects proposed a new structural system in the form of tree branches, which will allow various modulations of volume and light penetration. The Cor-Ten roof will be perforated to correspond to the branches.

ITERAE Architecture fuses research and technology to create a global practice

By Deborah Snoonian, P.E.

Architect: ITERAE Architecture
Location: Brooklyn, New York, and Paris
Founded: 2000
Design staff: 6
Principals: Elena Fernandez and David Serero
Education: Fernandez: Columbia University, M.A.A.D., 1998; Escuela Tecnica Superior de Arquitectura de Madrid, 1996; Serero: Ecole Architecture Paris-Villemin, DPLG, 2000; Columbia University, M.A.A.D., 1998
Work history: Fernandez: Eisenman Architects, 1998–2000; Serero: Asymptote Architecture, 1998–2000
Key completed projects: New York Center for the Arts and Media Studies, New York City, 2005; Glass Loft/Cohen Residence, New York City, 2005; Belle Hong Kong, retail spaces in 15 North American cities, 2004; De Costa Clinique and Spa, Brooklyn, N.Y., 2003; Steve Madden Showroom, New York City, 2003; Echart/Baldwin Loft, New York City, 2001
Key current projects: Arcade Headquarters, Paris, 2006; Variable Geometry Acoustical Dome, Rome, 2006; Art Arena, Roland Art Film Museum, Northwich, U.K., 2008; Hellenikon Metropolitan Park and Urban Development, Athens, 2014
Web site: www.iterae.com

According to David Serero, he and his wife, Elena Fernandez, don't run a design firm, exactly. Instead, he characterizes their partnership, ITERAE Architecture, as a "mobile network agent." The name ITERAE is a sly reference to "iterate," or repeat, referring to the way calculations are done by computers. And Serero's description aptly captures the ethos of a bicontinental practice that employs engineers as well as architects, and generates designs by writing scripts for CAD programs and obscure analytical software. "Essentially, we're hackers," Serero says cheerfully.

Serero, who is French, and Fernandez, who is from Spain, met as master's students at Columbia in the mid-1990s, during the heyday of the school's paperless studio years. But like the better architects of their generation, they realized not all architectural issues can be resolved on-screen. "We go back and forth between making computer and physical models," says Serero, echoing the methods of Frank Gehry and other technophiles.

It was precisely this iterative approach that led the designers to begin writing software scripts, which lets them explore design alternatives cheaply and examine the limits of scale, structure, and form. For ITERAE's overhaul of a 2,000-square-foot loft in Manhattan (pictured on opposite page), programming savvy helped them determine the best geometry for a complicated glass-and-steel wall separating the bedrooms and bathroom from the main living areas. Then came the hard part—finding a fabricator who could make it for $25,000, about the cost of a conventional glass wall. "The guy we ended up hiring was once a ship builder in Holland," Serero says. The wall's glass panels were cut with a water-jet machine, while its steel structure was laser cut and later welded and sandblasted on-site.

Research is never far from ITERAE's agenda. Serero's analyses of the form of historic theaters, and computer modeling of the acoustic properties of domes, led him to propose installing an adjustable acoustical shell in the Renaissance Salon of the Villa Medici in Rome, whose high ceilings create echo problems. He won the Rome Prize last year to design and build it. The project underscores the firm's enthusiasm for working with cultural institutions. "We're interested in the ambience of these places, the sort of mood a space creates," says Serero.

***Ghosttrack*, a braided-wood sculpture, was ITERAE's contribution to the 2002 Venice Biennale.**

Recently ITERAE snared its biggest project yet, winning a competition to turn the former airport in Athens—most recently the site of the 2004 Olympic Village—into what may be the largest metropolitan park in Europe. Their parti for the 1,300-acre site evolved from a rigorous study of the site's drainage patterns (the airport was closed in part because of problems with flooding). In ITERAE's hands, drainage swales define recreation corridors for biking and walking, and the park's edges bleed into the surrounding urban fabric, the way water seeps into soil, which creates more opportunities for development at the periphery. Many details about the program have yet to be resolved, but Serero's not cowed. "Concepts don't have scales," he says. "If you start with a strong idea, you can design anything, from a chair to a city." ■

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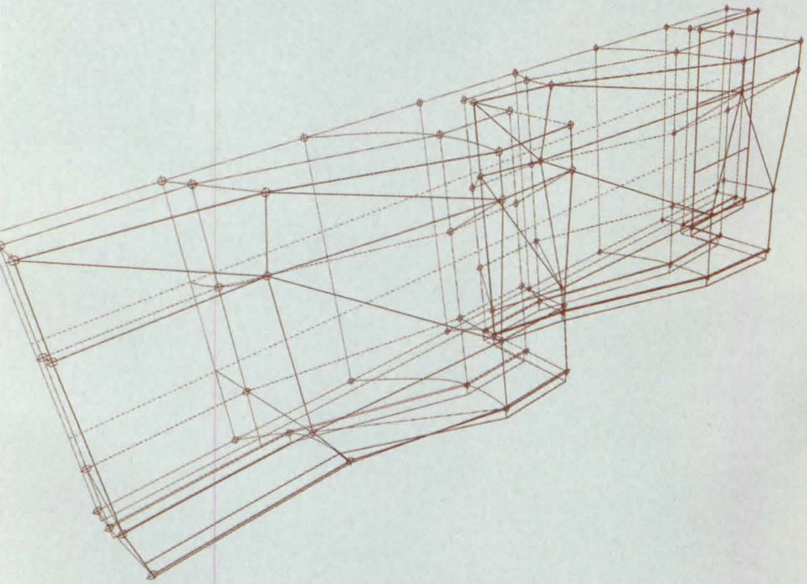
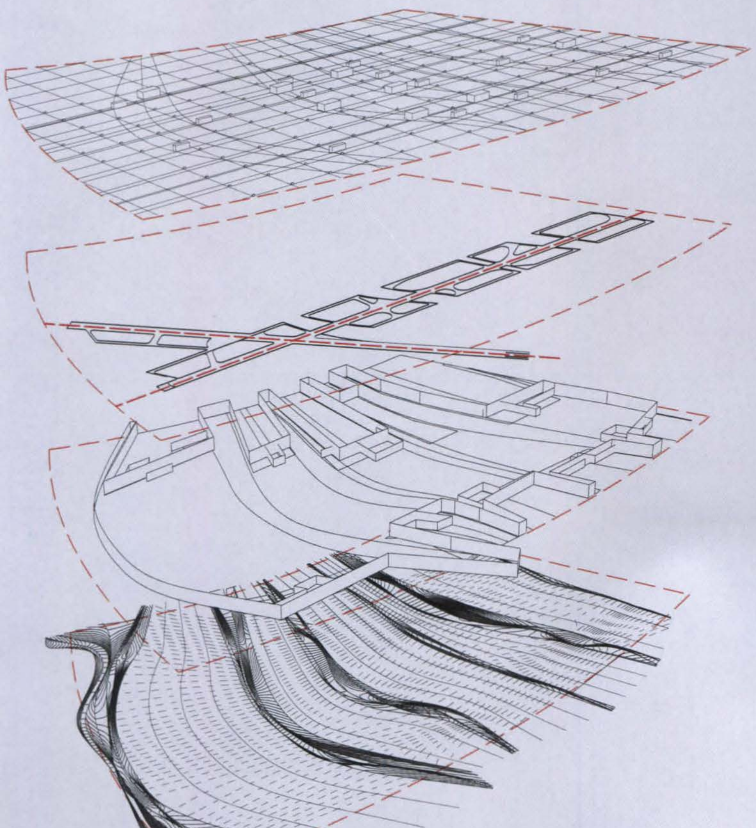


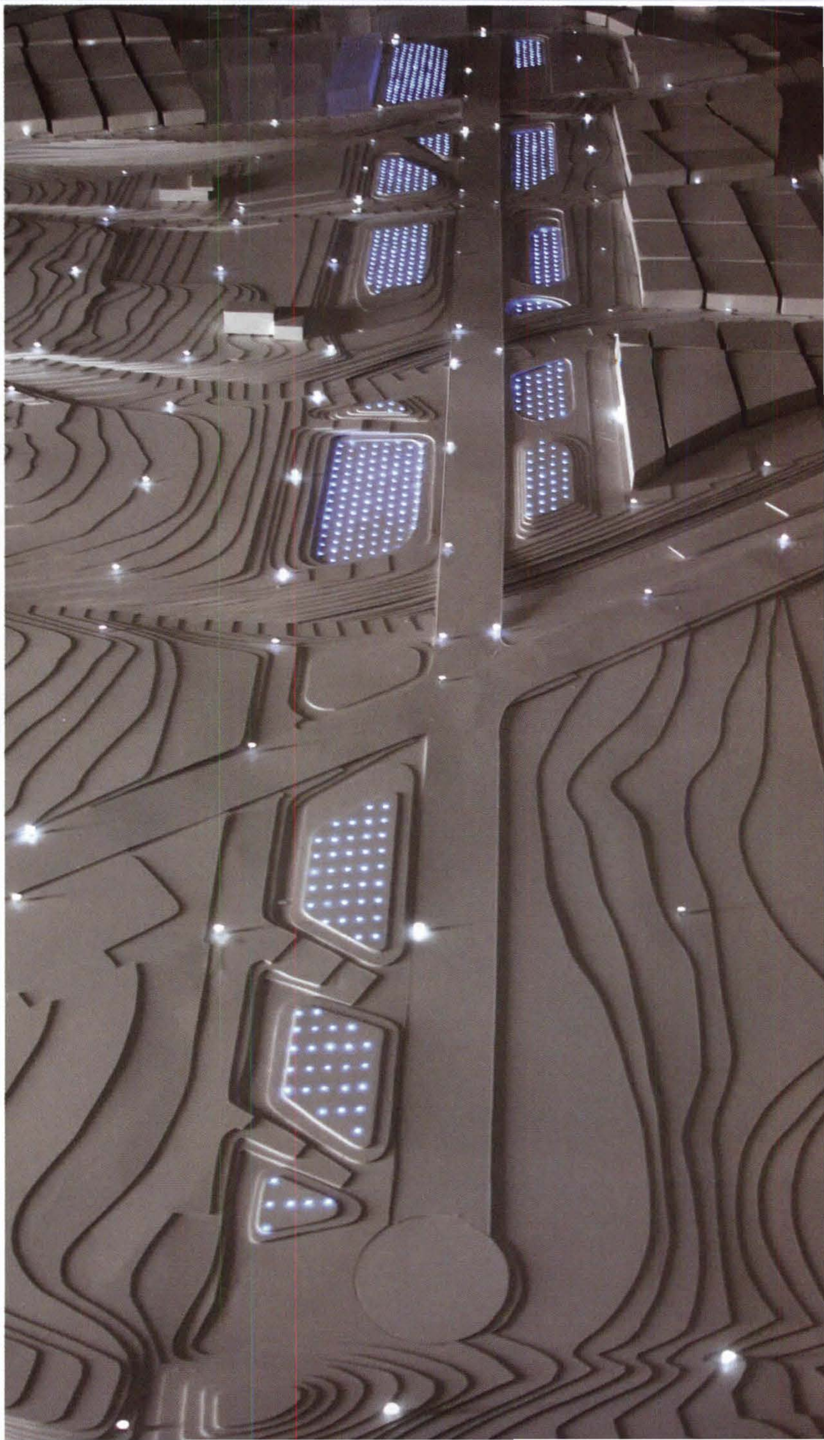
Glass Loft,
New York City

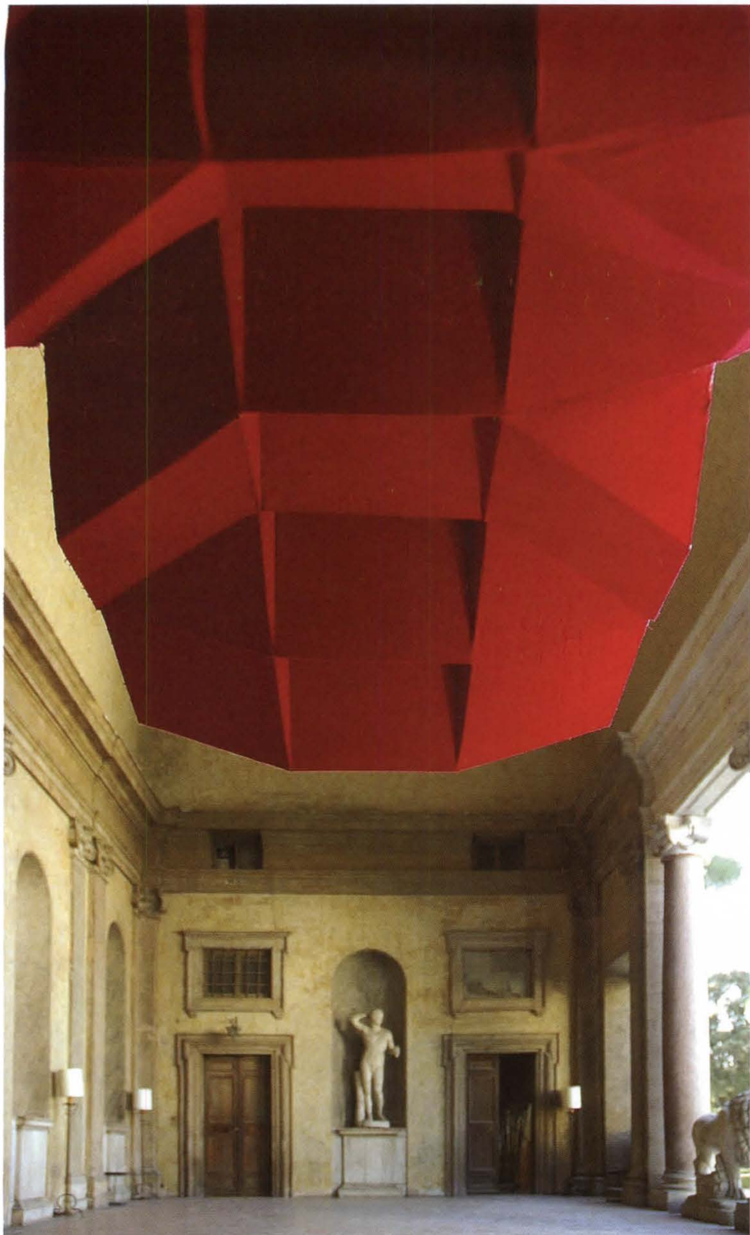
A couple wanted to create two bedrooms and a bathroom in their open loft space just north of SoHo, in New York City. ITERAE used engineering software to create a complex 3D wall of frosted, laminated glass and a steel skeleton to separate private areas from public and allow light to filter through. Doors to the bedrooms penetrate the wall at an angle rather than straight-on, to create more privacy.

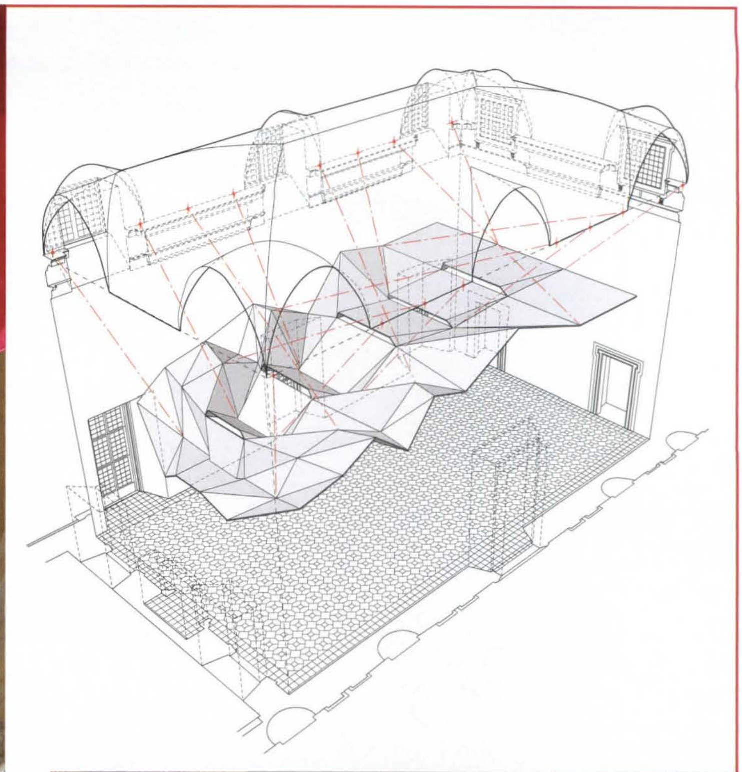
Hellenikon Metropolitan Park and Urban Development, Athens

ITERAE will transform the former airport in Athens, which closed in 2001, into a 1,300-acre urban park. The runways (center in photo below), which must be retained because they're too expensive to tear up, will define a visual and circulation axis, while drainage patterns and swales (bottom images in drawing below) help define both the park's perimeter and recreation corridors for biking and walking.



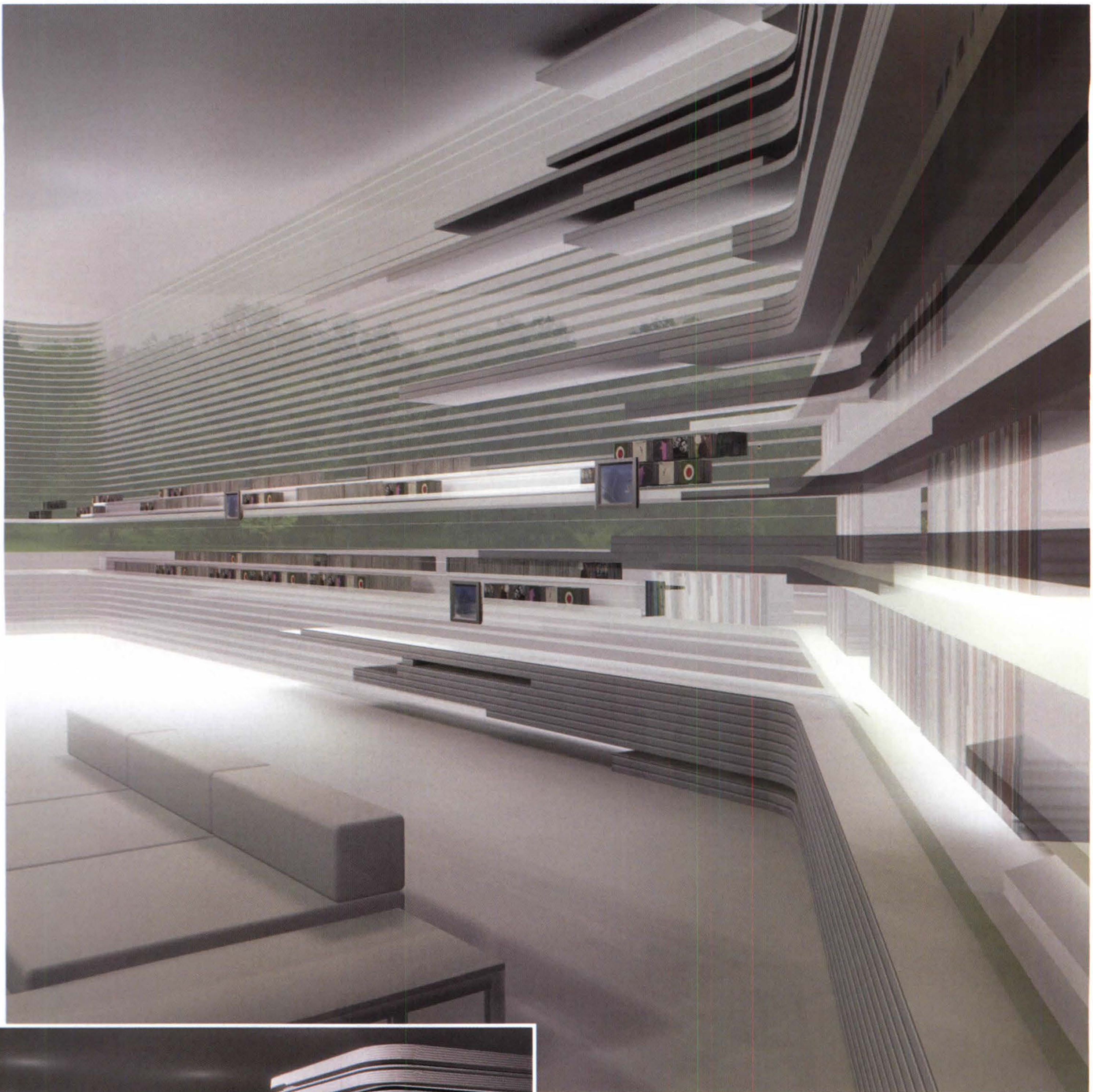






Acoustical Domes, Rome

Serero won the Rome Prize in 2004 to design and build this adjustable acoustic shell for the Villa Medici, home of the French Academy in Rome, whose rooms are used for everything from lectures to receptions to classical music performances. The canopy can be moved and shaped to improve the sound qualities of the echo-prone spaces. Serero modeled his design extensively with 3D CAD software, and assessed the acoustic performance of different design alternatives before deriving its final form.

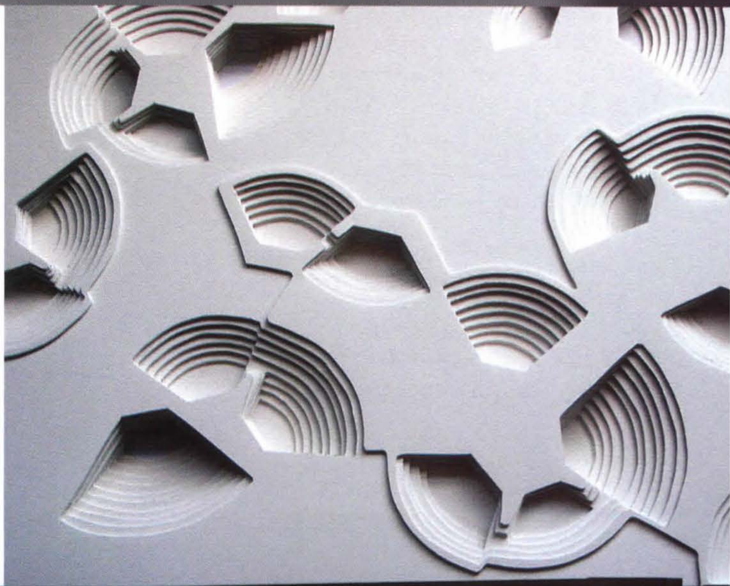


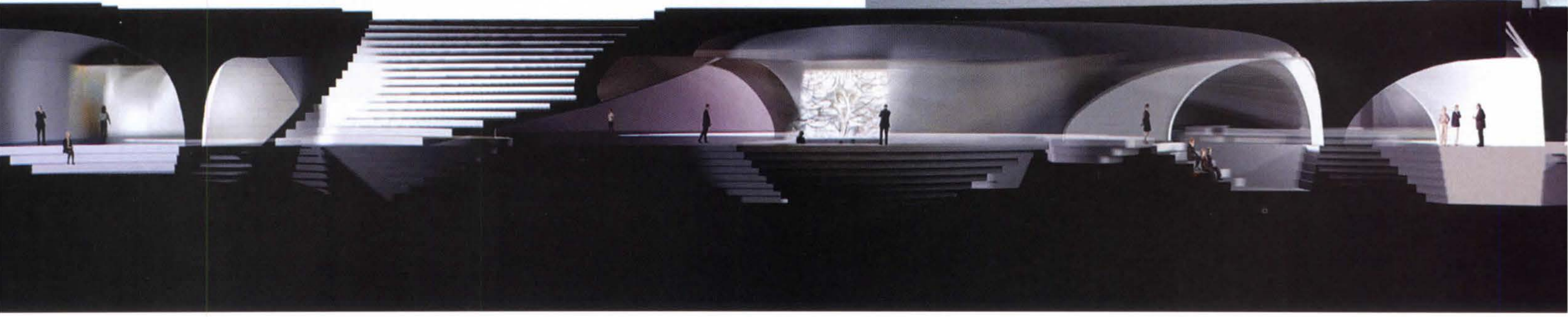
Mediatheque of Proximity, Carnoux-en-Provence, France

ITERAE designed this reception area and media center for a French library as part of an invited competition in 2003. The perimeter walls were conceived as both structure and shelving system, made of stacked layers of stone and glass blocks, with books placed on stone shelves, and modern storage and retrieval media, such as CDs and DVDs, placed on glass shelves.

Art Arena, Roland Museum, London

This museum will host a private collection of films about art and the art world; up to 42 films will be playing simultaneously. The building's structure is conceived as a flexible system of concrete shells and beams housing theaters of various capacities. Advanced audiovisual systems obviate the need to enclose each theater, creating a seamless, flowing interior where visitors can move freely among the screening areas.





Taira Nishizawa turns the jumble of everyday life into fodder for design

By Naomi R. Pollock, AIA

Architect: Taira Nishizawa Architects
Location: Tokyo
Founded: 1993
Design staff: 5
Principals: Taira Nishizawa, Hiroyuki Unemori, Taichi Mitsuya, Ayae Takeda, Takeshi Ogihara
Education: Nishizawa: Tokyo Institute of Technology, B.A., 1987; Unemori: Yokohama National University, B.A., 2001; Mitsuya: Osaka University of the Arts, B.A., 2003; Takeda: Kyoto Institute of Technology, B.A., 2004; Ogihara: Chiba University, B.A., 2003
Work history: Nishizawa: Keiichi Irie Architects, 1987–93
Key completed projects: Tomochi Forestry Hall, Kumamoto, Japan, 2004; Akishima House, Tokyo, 2004; Chofu Housing B, Tokyo, 2003; Chofu Housing A, Tokyo, 2003; Tsurumi House, Kanagawa, Japan, 2000; Endeneu Shop, Tokyo, 1999; Suwa House, Nagano, Japan, 1999; Ota House, Tokyo, 1998; Tachikawa House, Tachikawa, Japan, 1997
Key current projects: Kawasaki House, Kanagawa, Japan, 2005; Itabashi House, Tokyo, 2006; Sunpu Church, Suzuoka, Japan, 2006
Web site: Under construction

Taira Nishizawa knows that glossy magazine photos of beautifully ordered, pristine buildings hardly reflect the chaotic urbanism of his home city, Tokyo. "People in Japan have such a variety of stuff, it makes Japanese living space look messy," he says. "But I want to show how it is beautiful." Instead of being fazed by mounds of magazines, mismatched chairs, and drying laundry, Nishizawa sees the detritus of daily life as fodder for design.

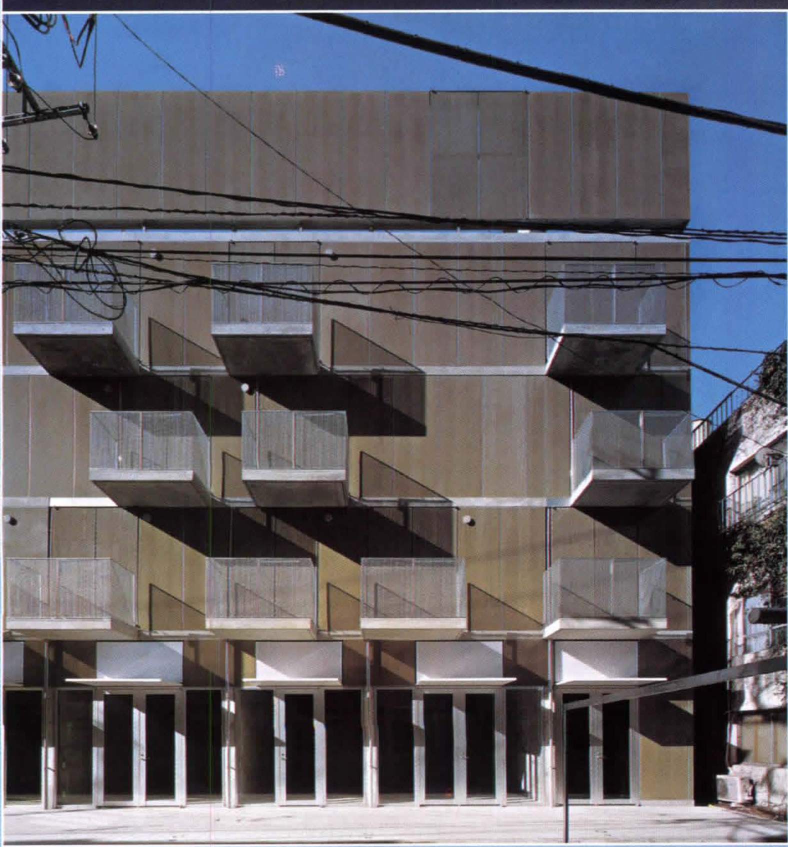
He first revealed this view in a single-family home in Tachikawa, a typical Tokyo "bedtown," or residential suburb. Key to his design was the client's collection of American audio equipment, produced for theaters and cabarets from the 1930s through the '50s. To meet the sound system's spatial requirements (for a minimum of 33 feet between listener and speakers), Nishizawa created a curved, wall-like house that measures only 8 feet wide at its thinnest point and 49 feet end-to-end. Because the main space had to remain unobstructed by walls or braces, Nishizawa supported his building with an exterior flying buttress of steel. Instead of hiding the massive, black audio components, he left them visible, but made the counters, stairs, and other architectural elements black to match.

In designing Chofu A and B, a pair of apartment buildings that straddle a narrow commercial strip in suburban Tokyo, Nishizawa developed a similar strategy for grappling with real-life conditions, but on a larger scale. "In Japan, people use their balconies in so many different ways—to air futons, grow bonsais, store dog houses," he says. "I tried to regulate how this looks from the outside." So he deftly flattened overhangs, keeping balconies to a minimum. For Chofu A, a concrete building that gets little direct sunlight, he imposed order on the exterior with cement-panel shutters that blend with the outer wall. By contrast, for Chofu B, which is bathed in sunlight, he chose standard-issue sliding glass doors within sash framework to give disparate elements a patchwork harmony.

The architect's biggest project to date, Tomochi Forestry Hall, also uses a gridded frame as an ordering device. A combined public gymnasium and meeting hall, the commission was part of Kumamoto Prefecture's Artpolis program. As an emblem of a town known for forestry, the project had to feature local cedar. Nishizawa overcame the material's inherent weakness by devising a unique hybrid structure: an irregular wood truss, shaped to meet internal programmatic needs, and a light-gauge-steel frame to support a glazed enclosure. The architect likens this arched truss to an "artificial bush" in a building, which happens to sit atop a man-made hill.

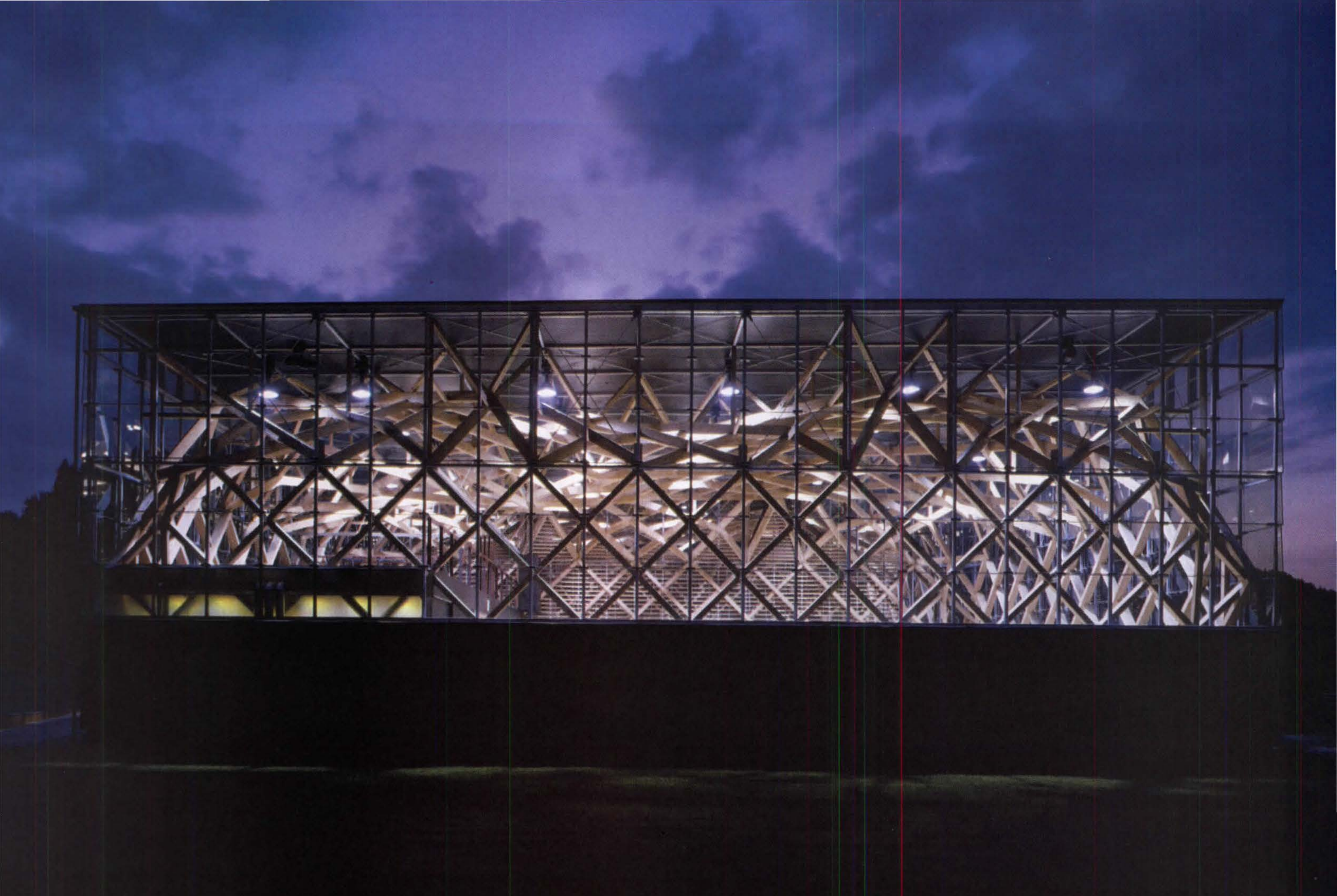
One of Nishizawa's other claims to fame is his younger brother, Ryue, who has partnered with Kazuyo Sejima to establish the Tokyo firm of SANAA. How a single household produced two such talented architects remains a mystery, even to Taira Nishizawa. "My father was a typical Japanese workaholic—not an architect," says the designer. Though the two brothers talk about their shared discipline, they have only collaborated once to date—on a competition they entered together, but did not win. What keeps them apart is not sibling rivalry, but the mega-demands of their independent careers. ■

PHOTOGRAPHY: © SHIGERU HIRAGA, EXCEPT AS NOTED



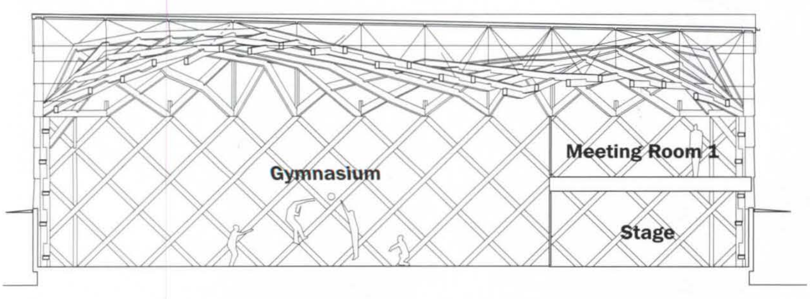
Chofu Housing A and B, Tokyo

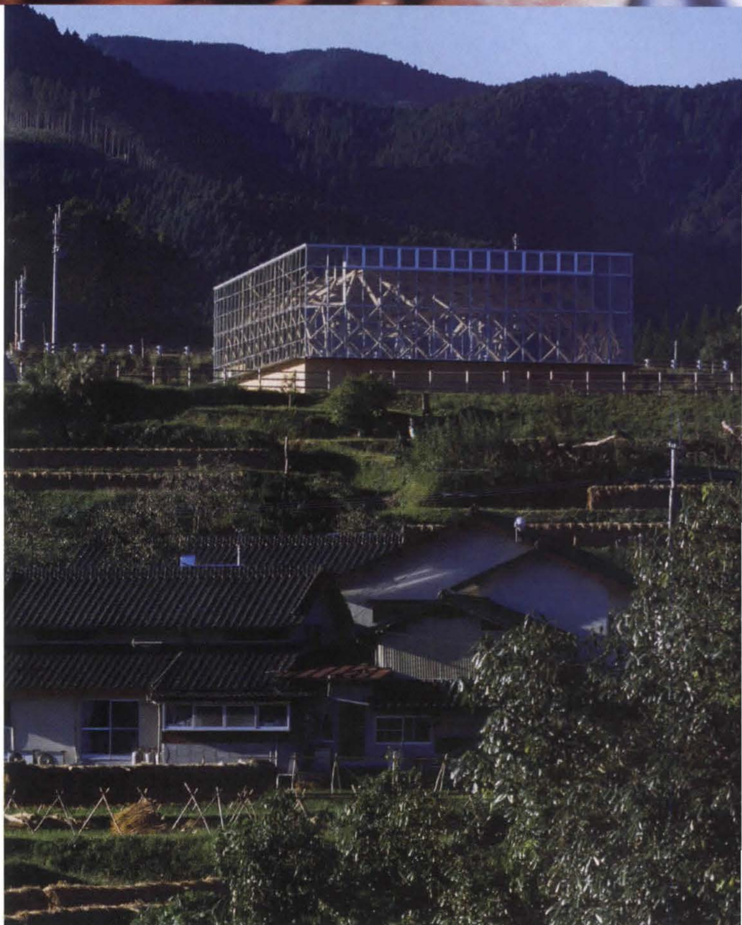
Along a shopping strip in a Tokyo suburb (below), Housing A (left) offers a facade mostly of cement-board shutters, while Housing B (above) provides 10 large windows per unit—standard sliding-glass doors with sash frames that bring order to disparate elements. Despite "variously colored curtains, drying clothes, and bird cages," say the architects, "the buildings will still have a degree of precision."



Tomochi Forestry Hall, Kumamoto, Japan

A combined public gymnasium and meeting hall, the building was commissioned as part of Kumamoto Prefecture's Artpolis program. For this forestry town, Nishizawa was required to build with cedar. He overcame the material's inherent weakness by devising a hybrid structure, incorporating an irregular wood truss with a light-gauge-steel frame that supports a glazed enclosure.





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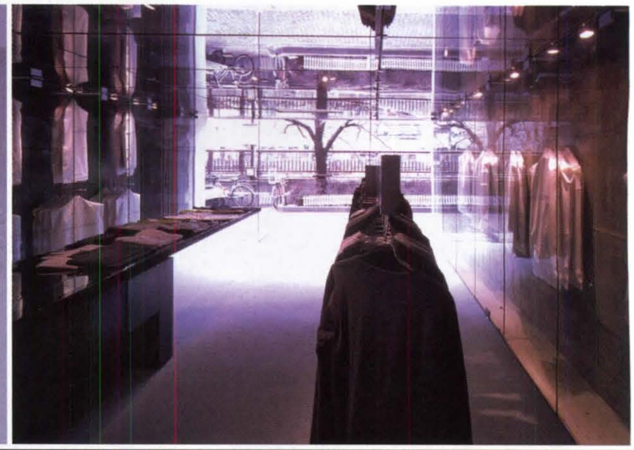
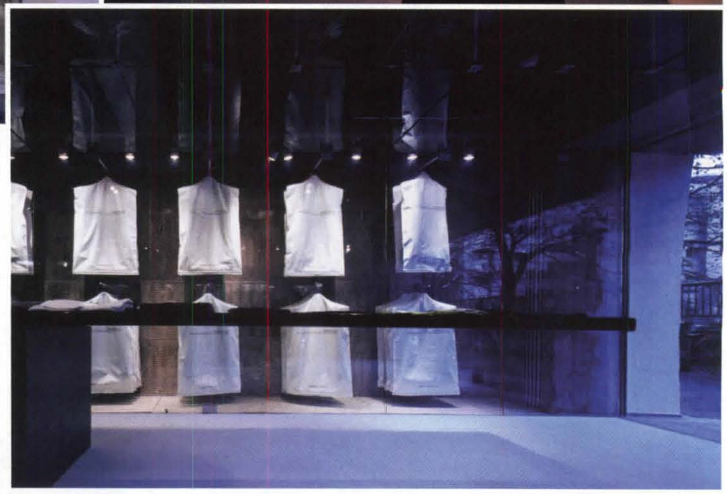


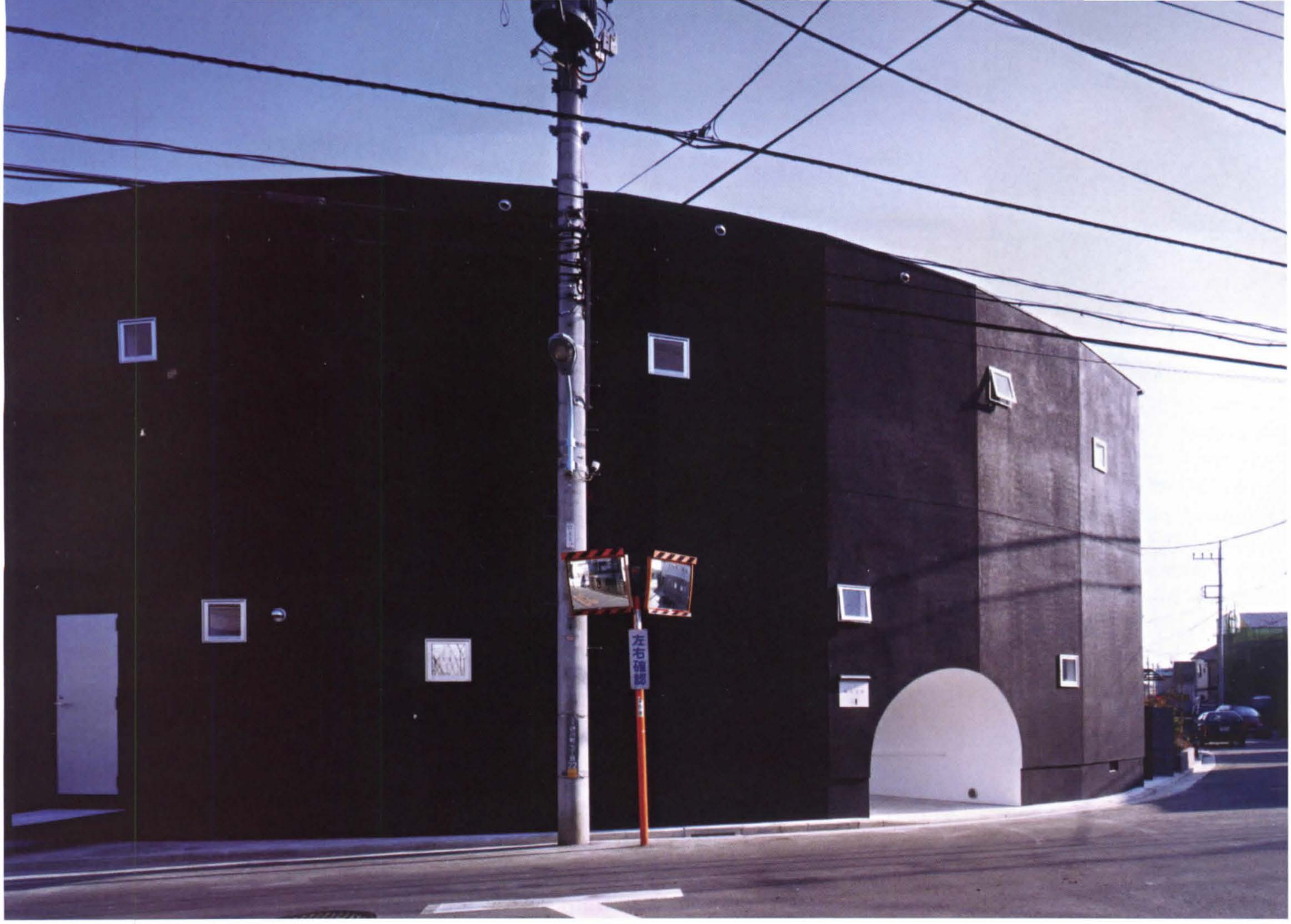


Endeneu Shop, Tokyo

This interior scheme created a small boutique on the ground floor of a structure in the middle of the city. The architect inserted a large glass box within a preexisting concrete building. In the space between the glazing and the concrete shell, he provided for displays, stock areas, and dressing booths. On top of the box, he tucked away air-conditioning and lighting fixtures.

Ota House, Tokyo

This small house, in a densely built area of central Tokyo, has high upper-floor windows, positioned to yield outward views of sky only. With steel-frame construction on the first floor and wood framing above it, the building is clad entirely in aluminum. Nishizawa finished the skin in a pair of different colors to distinguish between the two floors.



Tachikawa House, Tachikawa, Japan

For this home in a Tokyo suburb, the client's vintage audio equipment collection was key to the design. To meet the sound system's spatial requirements, the curved, wall-like building is only 8 feet wide at its thinnest point and 49 feet end-to-end. To provide an unobstructed main space, Nishizawa supported the building with an exterior flying buttress of steel.

Mitnick Roddier Hicks deftly explores the experience of space and framed views

By Suzanne Stephens

Architect: Mitnick Roddier Hicks
Location: Ann Arbor, Michigan
Founded: 1995
Design staff: 3
Principals: Keith Mitnick, Mireille Roddier, Stewart Hicks
Education: Mitnick: University of California, Berkeley, M.Arch., 1996; Antioch College, B.A. 1987; Roddier: University of California, Berkeley, M.Arch. 1997; Ecole Normale Supérieure, Paris, France, DEA (Diplôme d'Etudes Approfondies), 1996; University of Arizona, B.Arch., 1994; Hicks: Princeton University, M.Arch., 2006, candidate; University of Michigan, B.Arch., 2002
Work history: Academic—Mitnick and Roddier: Taubman College of Architecture and Urban Planning, University of Michigan, 2001–present
Key completed projects: *Split/View*, pavilion, Tulsa, Oklahoma, 2005; *Expositions*, installation, Cité Internationale des Arts, Paris, France, 2005; *Young Architects Exhibition*, installation, The Architectural League of New York, New York City, 2004
Key current projects: LL House, Yellow Springs, Ohio, 2006; Datum-Frame Boathouse, Hubbard Lake, Michigan, 2006
Web site: Under construction (www.mitnickroddierhicks.com)

As a young firm practicing in Ann Arbor, Michigan, Mitnick Roddier Hicks relies on teaching to keep the three-person office alive, and on entering competitions to build up its architectural prowess. "Competitions," says Mitnick, "give us a chance to work on more rarified projects. When you are running a business, you don't have a chance to think about some of these problems." In its design work, Mitnick Roddier Hicks attempts to enhance the experience of the viewer moving through space, and underscore how architecture frames individual perception. For example, at the Philbrook Museum of Art in Tulsa, Oklahoma, the firm was selected in a competition to design one of five permanent installations in the museum's garden. Its *Split/View* pavilion, a 400-square-foot steel structure, employs attenuated geometries, held together by stairs and layered with screens, to create an instrument that dramatically frames shifting views for the visitor moving in and around the building.

Through an "ideas" competition for the new Spertus Institute of Jewish Studies in Chicago, sponsored by the Chicago Architectural Club and the Graham Foundation, Mitnick Roddier Hicks won the 2002 Burnham Prize. Even if the scheme was not intended to be built (the Spertus Institute selected its own architect, the Chicago firm of Krueck and Sexton, in 2003), the young architects took the opportunity to experiment with the arrangement of programmatic elements. They organized a library, college, museum, and research institute around three atriums in a mid-rise building: The library stacks, wrapped with balconies, open onto a staggering view of Michigan Avenue and Grant Park. "We like to vitalize spaces through unconventional relationships in the plans," explains Mitnick.

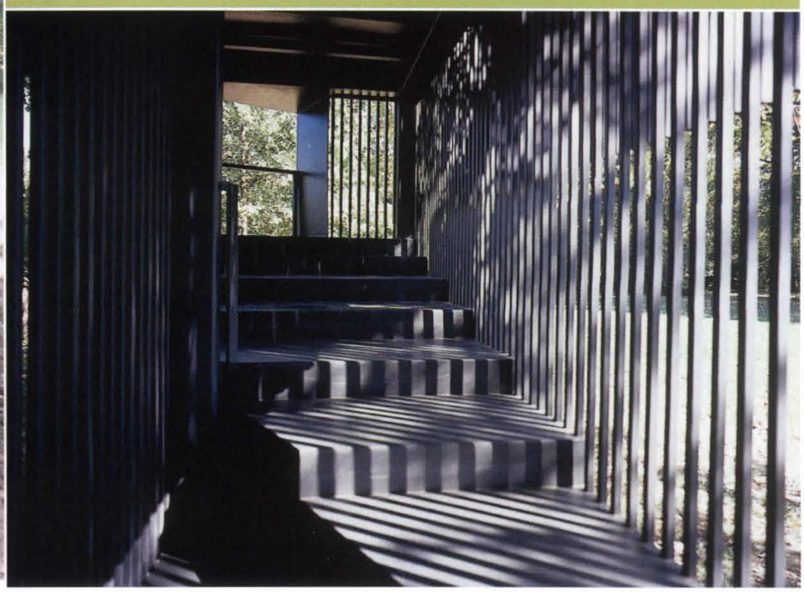
Mitnick had planned to be an artist after getting his bachelor's degree at Antioch College in Ohio in 1987 [RECORD, October, 2002, page 67]. To make a living, he took on odd jobs, including installing art in galleries—which stirred an interest in architecture and led him to enter the school of architecture at the University of California, Berkeley, where he got his M.Arch in 1996. There Mitnick encountered Mireille Roddier, who had received her B.Arch. from the University of Arizona in 1994 before going to Berkeley for her master's. After the two executed a number of small projects in and around San Francisco and Berkeley, they relocated to the University of Michigan, where they have been teaching at the College of Architecture and Urban Design since 2001. There, they met their third partner, Stewart Hicks, who was just finishing up his architecture studies and joined the firm to work on the Spertus Institute competition. (Hicks is currently at Princeton getting his M.Arch.)

Not all projects worked out the way the firm planned, but the architects are finding that this isn't a disaster. A commission to remodel an art gallery near Mitnick's alma mater, Antioch College, ended up being built in a much simpler version than conceived. Nevertheless, the original design caught the attention of a client, who wanted them to design a house, also near the campus. Again, the architects are working with framing the views and the relationships between inside and out for this exposed-poured-in-place-concrete house. As Mitnick says, "As much as we are interested in experiential qualities of the space, we also play around with the unexpected relationships between materials and their applications." ■

PHOTOGRAPHY: © COURTESY MITNICK RODDIER HICKS

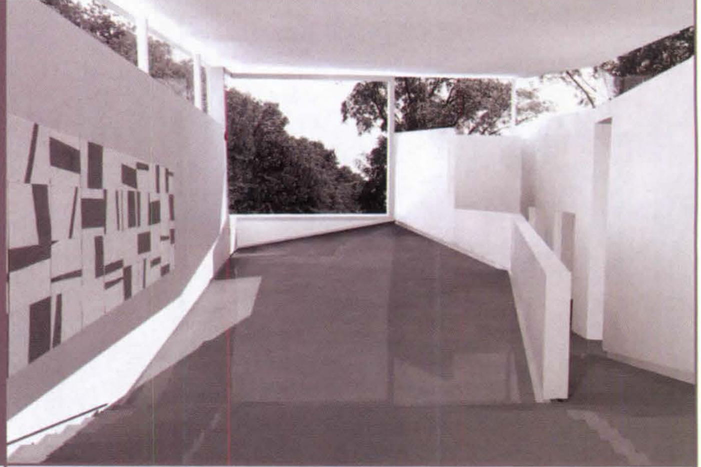
Split/View, pavilion, Tulsa, Oklahoma

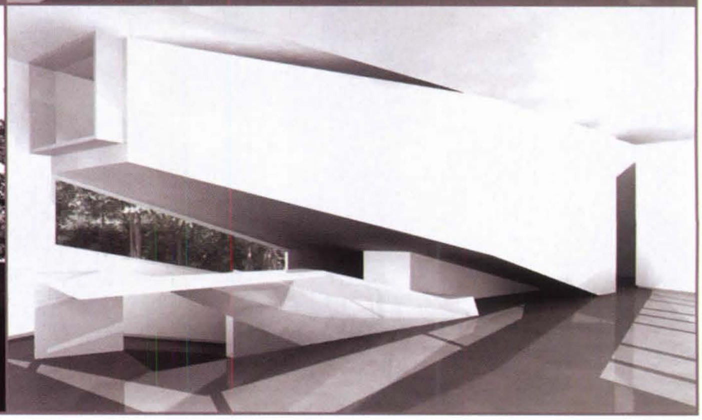
A permanent installation at the Philbrook Museum of Art in Tulsa, Oklahoma, *Split/View*, a 400-square-foot pavilion, is one of five garden follies selected in a competition organized by the museum. Made of steel slabs, beams, and posts, the stepped and bifurcated structure, with 10-foot-by-10-foot bays, is "a dynamic viewing instrument to contemplate the surrounding garden," states Mitnick.



Gallery 45387, Yellow Springs, Ohio

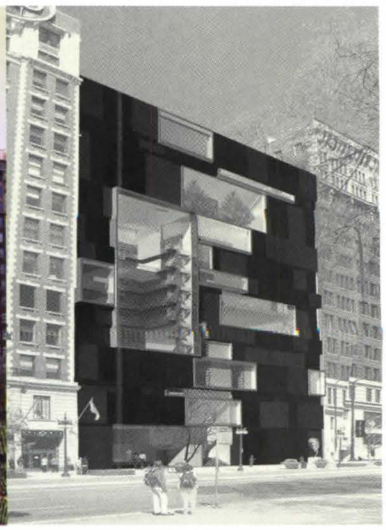
In an initial proposal to remodel a flat-roofed, one-story, concrete-block structure for an art gallery in Yellow Springs, Ohio, Mitnick Roddier Hicks camouflaged the exterior with paint and opened up the interior to framed views. The scheme expanded the 1,200-square-foot structure to 2,000 square feet by inserting a bilevel wedge with offices on the lower level and gallery spaces above.

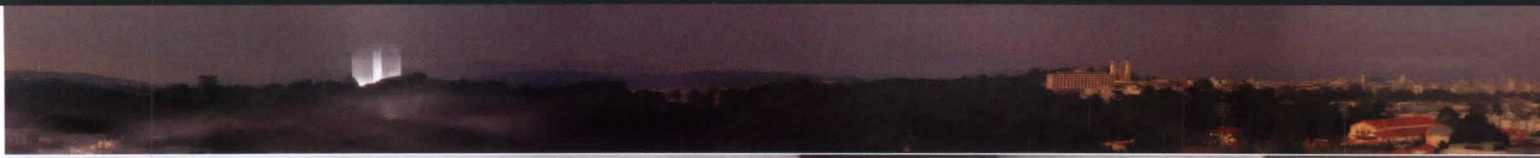




Spertus Institute of Jewish Studies, Chicago, Illinois

A competition entry for a theoretical design for the Spertus Institute of Jewish Studies, sponsored by the Chicago Architecture Club, won Mitnick Roddier Hicks the 2002 Burnham Prize. The architects put a park on the roof and arranged the different programmatic features (including a library, museum, and college) around three, two-to-five-story-high atriums throughout the mid-rise building. One, for the library stacks, looks out to Michigan Avenue and Grant Park.





Ephemeral Vigil,
National AIDS Memorial Grove, San Francisco

This year, Mitnick Roddier Hicks won an honorable mention in the competition sponsored by National AIDS Memorial Grove for the eastern end of Golden Gate Park in San Francisco. The firm designed two walls of light that can be seen from all points of the city on clear nights but becomes denser with the humidity and fog. By day, the memorial would only appear as a simple groove carved into the ground plane.

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H. Michael Hill, AIA, LEED™, AP, CSI, CCS, CCCA, Perkins + Will, Paul Danna, AIA, DMJM Design, John McRae, FAIA, Dean, College of Architecture and Design, The University of Tennessee

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Back to the Future

WHILE SOME SCHOOLS REMAIN OUTDATED, MANY NEW FACILITIES ARE ADAPTING TO THE CHANGING NEEDS OF TODAY'S STUDENTS.

By Sam Lubell

Thanks to ballooning student numbers, changing demographics, and the inevitable decline of buildings constructed at least 50 years ago, more K-12 schools are being designed now than any time in our country's history. For instance, McGraw-Hill's *Dodge* estimates that in 2004 about 150 million square feet of K-12 space was built in the U.S., versus about 99 million square feet in 1990.

Unfortunately, many new facilities are being designed in a manner that is unimaginative or outdated. The reasons are plentiful. Many school officials, and even some school architects, perhaps influenced by their own childhood, have a bygone vision of what a school should look like. This often results in functional, double-loaded corridors, Collegiate Gothic, Postwar, or Colonial styles, or sprawling suburban models on tight urban sites. Many schools are shaped by practically minded school officials with little knowledge of design, creating huge, functional spaces that look more like malls than places of learning. Often, cheap tokens to "playful" design, such as bright colors or interesting shapes, try to hide what are really institutional schemes. Architects suffer from bureaucratic restraints on their designs, budgets, and delivery times. Projects are often affected by lack of funds due to vast levels of economic inequality between school districts.

The lineup of schools in this Building Types Study—all public facilities—is representative of the economic inequalities that characterize today's school districts. Fernau & Hartman's Eastside Performing Arts Center in East Palo Alto, California, and Perkins+Will's Perspectives Charter School in Chicago have budgets around $150 per square foot. The Roger Ludlowe Middle School and the Burr Elementary, in upscale Fairfield, Connecticut, have budgets hovering around $200 per square foot. Yet with limited means, Fernau & Hartman used simple materials, including concrete and corrugated metal, to create a tasteful, inspiring performing arts space. Perkins+Will carefully employed corrugated metal, spacious and flexible interiors, and natural lighting to create a lively learning space that fits extremely well into its urban environment. Similarly, Perkins Eastman developed a simple design that fits neatly into its neighborhood, utilizing wood and brick finishes, while Skidmore, Owings & Merrill (SOM) has created an elegant building that not only makes a bold sculptural statement, but preserves much of the area's bucolic setting.

Other new design ideas are plentiful. Some schools, like the Perspectives Charter School, fit better into urban environments, embracing the rich urban texture and using space more much efficiently. Other

1.

Chicago, Illinois

A small school by Perkins+Will employs industrial materials in a dynamic design that fits well into its urban site.

2.

Fairfield, Connecticut

The natural materials and flowing forms of Skidmore, Owings & Merrill's school in a rural setting help the building merge with its surroundings.

3.

Fairfield, Connecticut

Perkins Eastman's hilltop siting and L-shaped plan maximize the views and natural light and mitigate the size of a new school in a residential area.

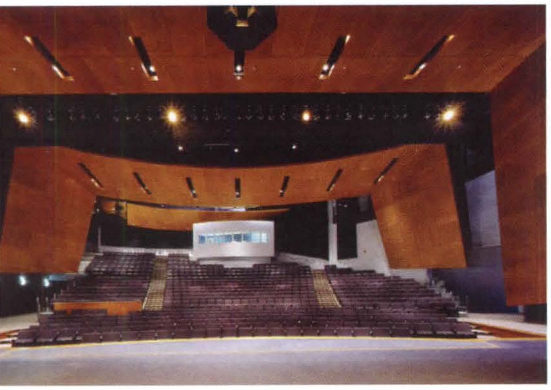
4.

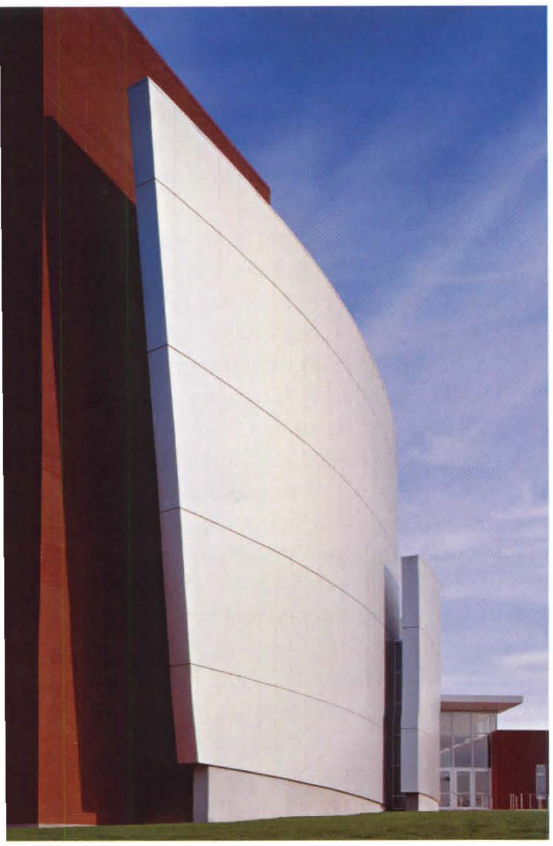
East Palo Alto, California

Rhythmical use of color and material help a low-budget educational facility by Fernau & Hartman have a positive impact on its community.

For more information on these projects, go to Building Types Study at **www.archrecord.com**.

PHOTOGRAPHY: © STEINKAMP-BALLOGG PHOTOGRAPHY (1); FLORIAN HOLZHERR (2); WOODRUFF/BROWN (3); SHARON RISEDORPH (4)





Legat Architects' Lake Zurich High School Performing Arts Center in Lake Zurich, Illinois (left), represents a resurgence in school performing arts architecture. Leaflike metal walls and abstract concrete plates emphasize the building's artistic function (top and bottom). Acoustical wood panels and sculptural wood reflector panels articulate the dynamic interior (middle).

facilities provide greater amounts of natural light (proven in numerous studies to help enhance student performance), better acoustics, and better air quality, and they incorporate new educational features like "breakaway spaces," which foster informal learning outside the classroom. Larger schools are being broken down into smaller components, including, in some cases, several smaller buildings arranged around a central courtyard. Classrooms continue to be designed flexibly, to accommodate a variety of uses, and some have math equations or foreign-language words printed on their walls to reflect the subjects being taught inside. Even small issues, like the shape of a classroom (L-shaped classrooms with alcoves are becoming more popular, for example) are important. "It's a different world. You can't just have the same old classroom," says Pam Loeffelman, AIA, a partner at Perkins Eastman and chair of the AIA's Committee for Architecture in Education (CAE).

Several new schools, like Burr Elementary, embrace green architecture, introducing sustainable elements, such as new plant species in landscaping, natural materials in construction, large windows with solar shades for natural light, operable windows for cool air, and high-efficiency HVAC systems, to name a few. And just as students have become more versed in the world of technology, so have schools. At Los Angeles's High Tech High, designed by Berliner and Associates, the architects included wired and wireless technology accommodations, overhead projectors, and smart boards (which display the screen of any computer in the room). Several hi-tech companies donated equipment and know-how to the school, including Cisco Systems, AOL, Xerox, Oracle, Dell, Lexmark, Apple, IBM, Verizon, Hewlett-Packard, NEC, and Microsoft.

Many architects now create well-defined internal and external campuses, providing valuable public spaces rather than leaving undefined edges with little room for students to congregate in a beneficial manner. Like Roger Ludlowe Middle School, schools are also becoming round-the-clock community centers, with facilities designed with the public in mind, and open at all hours, not just during the school day. "The ties to community are not as close as they used to be, so schools need to become centers of social life," says Loeffelman.

"Design" architects are getting more involved in a field that once seemed the domain of a handful of specialists. Well-known firms like Coop Himmelb(l)au, Antoine Predock, Arquitectonica, and SOM's Roger Duffy—at the Burr Elementary, as well at nearby Greenwich Academy

PHOTOGRAPHY: © JAMES STEINKAMP (LEFT THREE); OWP/P ARCHITECTS (BOTTOM RIGHT)

At North Grand High School, Chicago (right), OWP/P Architects combined glass, steel, and contemporary styling with traditional materials like brick and stone. The glass entrance loudly announces its presence (opposite, bottom left). Light floods a central space designed to encourage student interaction and community (opposite, bottom right).

[RECORD, June, 2004, page 228]—have recently designed schools that are beginning to garner acclaim in all circles of architecture. The prevalence of design competitions, like those used to choose both Burr Elementary and Roger Ludlowe Middle School, has helped advance this trend.

Yet implementing good design remains a challenge. As creative as architects might be, without willing clients, their ideas will never be put to use. "If a client is driven by budget and schedule, not things to help educate children, there's no room for that kind of conversation to occur," notes Ron Bogle, president and C.E.O. of the American Architecture Foundation, which has recently sponsored events like the School Design Institute (July 20 to 22 in Washington, D.C.) and the National Summit on School Design (October 6 to 8 in Washington, D.C.) to help connect educators, politicians, and school architects. Participants at the School Design Institute included mayors and school superintendents from places like St. Louis; Bridgeport, Connecticut; and Oklahoma City, as well as architects and researchers from New York, Oregon, Michigan, Illinois, and California. The Summit drew over 100 school thinkers from around the country. "A lot of school decision-makers don't have the latest information on design. We want to make sure they get it," says Bogle.

In many cases, the client is not a single entity, but a school board, and sometimes an entire city. Major school boards are taking the initiative, as for example, New York City's efforts to partner with the private sector to help fund school construction. The Los Angeles Unified School Board's new construction and repair program, utilizing many top firms and funded by several massive bond measures, is the largest in the country's history. But more such plans need to follow, paying careful attention to design, not just to construction tallies and budget numbers. On the other side, architects have to understand that the scope of their work is much greater than design drawings and construction documents; they have to lobby school boards and communities for better ideas, fight states over unfair regulations, and help districts develop more intelligent, holistic planning.

The school projects that follow show how creative architects and clients can overcome challenges of budget, bureaucratic restraints, and outdated thinking to create vibrant learning spaces. They are a product of today's challenges, and are made possible by today's innovations. The lessons they can teach are invaluable, not only for students, but for communities, and for architects working on all building types. ■

For Durham Academy Lower School, Durham, North Carolina (right), Kieran Timberlake combined exposed concrete, steel, brick, metal panels, stained wood panels, and tackboards to produce an eclectic aesthetic. Significant changes in elevation and contrasting structures help create a cadenced layout.

At Berliner and Associates' High Tech High, Los Angeles (above), wireless access, advanced screening techniques, and open layouts transform educational opportunities.

PHOTOGRAPHY: © OWP/P ARCHITECTS (BOTTOM TWO); BARRY HALKIN (TOP RIGHT); TOM BONNER (BOTTOM RIGHT)

Perspectives Charter School
Chicago, Illinois

1

PERKINS+WILL CREATE A DYNAMIC DESIGN THAT FITS EFFECTIVELY INTO ITS TIGHT SITE WHILE ADDING DRAMA TO A RESIDENTIAL CONTEXT.

By Blair Kamin

Architect: *Perkins+Will—Ralph Johnson, FAIA, design principal; Steve Turckes, AIA, managing principal; Jim Skalla, AIA, senior project architect; Rusty Walker, AIA, senior project designer; Eric Spielman, AIA, project manager; Pat Grzybek, lighting designer*
Client: *Perspectives Charter School*
Engineers: *TGRWA Engineers; WMA Consulting Engineers*
Consultants: *Site Design Group (landscape)*
General contractor: *Levine Construction*

Size: 30,000 square feet
Cost: *$4.5 million*
Completion date: *September 2004*

Sources
Metal/glass curtain wall: *Wausau*
Corrugated-steel panel: *Centria*
Built-up roofing: *Johns Manville*
Aluminum: *Wausau*
Glass: *PPG*
Acoustical ceilings: *Armstrong*
Cabinetwork and custom woodwork: *Olympic Woodwork*

For more information on this project, go to Building Types Study at **www.archrecord.com**.

Best known for its pathbreaking skyscrapers, Chicago has an equally progressive tradition of school design, most notably the Crow Island Elementary School (1940), the human-scaled postwar masterpiece by Eliel Saarinen and Perkins+Will. But while Crow Island sprawls over the grassy landscape of the affluent suburb of Winnetka, the Perspectives Charter School, by Ralph Johnson, FAIA, of Perkins+Will, fills a far more compact urban site, in Chicago's South Loop, about 2 miles south of Downtown. It also serves a far less privileged student body.

Sitting in her office overlooking the school's outdoor play area, Kim Day, the principal of the school, which serves grades 6 through 12 , reels off the daunting statistics about the 325 students, nearly all of whom are African-American and Hispanic; 85 percent come from families below the poverty line, and only about 20 percent are from two-parent households. Typically, such numbers would lead to a predictable outcome: a prisonlike building with institutional, double-loaded corridors—the "cells and bells" approach, as Day calls it. But Johnson has upended that paradigm with a design that gives eloquent expression to the charter school's distinctive mission: creating a disciplined but intimate learning environment.

Blair Kamin is the Pulitzer Prize–winning architecture critic of the Chicago Tribune.

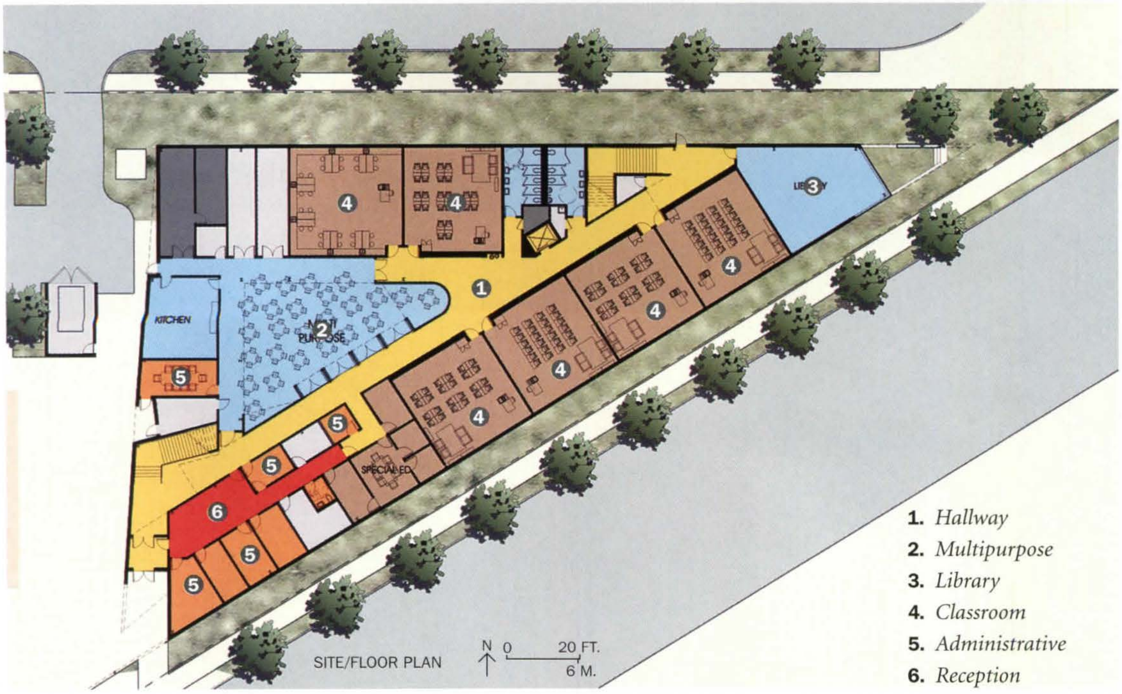
Program
The school is located on a former parking lot not far from the rumble of the elevated tracks, in a gentrifying neighborhood of light-industrial buildings, redbrick town houses, and a public housing complex designed by Bertrand Goldberg. The 30,000-square-foot, $4.5 million school, chartered by the Chicago Public Schools and funded by public and private sources, including the Gates Foundation, cost an economical $150 a square foot, less than a typical Chicago public school.

Solution
Johnson saved money by substituting corrugated steel for the usual brick exterior and by using drywall instead of tile-covered walls inside. With the steel-framed school now in its second year, both are being treated with respect. The design principally succeeds, however, because of Johnson's deft handling of the 1-acre site, a right triangle that is an anomaly among Chicago's relentlessly right-angled street grid. Pushed to the apex of the triangle, the wedge-shaped school, resembling a ship's prow, makes a strong urban gesture. The tilted roof folds down and pops out to create the entrance's sheltering canopy, and a tall trellis of metal subway grating completes the roof's knifelike thrust, trumpeting the school's identity. The leftover space to the west becomes the outdoor play area.

The architecture is deceptively sophisticated. In plan, it suggests a static wedge. But by making one side of the roof tilt gradually upward, Johnson reinforces the design's dynamism and gets daylight into the multipurpose room through clerestory windows. Riding above a base of iron-spot brick, the corrugated-steel cladding enhances the sense of motion, evoking the city's streamlined elevated trains, even as it responds to the industrial context. Dark aluminum mullions ensure that the ribbon win-

PHOTOGRAPHY: © JAMES STEINKAMP/STEINKAMP-BALLOGG PHOTOGRAPHY

The wedge-shaped building, covered in corrugated steel, thrusts out to resemble a ship's prow at the point where the library meets the apex of the tight, triangular site. The highly dynamic design contrasts with the redbrick town houses nearby.



1. *Hallway*
2. *Multipurpose*
3. *Library*
4. *Classroom*
5. *Administrative*
6. *Reception*

The school's entrance (below) is marked by a triangular porte cochere and a play of receding steel and glass planes not shown on plan (above).

dows read as part of the taut skin, not openings punched into it.

Inside, classrooms splay out to the perimeter of the school's triangle shape, framing an innovative, three-story, multipurpose room that serves as a cafeteria, assembly hall, and study hall. Impressively scaled rooms make what could have been a claustrophobic interior seem as open and light-filled as it is compact. Students and teachers repeatedly pass through the multipurpose room, which has become a mini town square. With its balconylike overlooks, the architecture facilitates interaction among students on the first and second floors, helping to build community. Even though this space has limits (the school borrows facilities for a theater and indoor gym), it projects a warm aura.

The single-loaded corridors that lead from the multipurpose room to the classrooms are tough but loving, their easy-to-clean concrete floors balanced by welcoming touches such as benches set within niches. The classrooms are lit by both vision and clerestory windows, and are outfitted with ergonomic furniture that allows students freedom of movement instead of being forced to sit rigidly.

Commentary

In every aspect, this is a very intelligent design. While Johnson clearly owes a debt to Frank Gehry and Thom Mayne's earlier essays in corrugated steel, his language is very much his own. Despite its aggressive, sculptural form-making, the design is deeply urban, at once shaping the public realm of the street and enlivening it with peeks of the soaring, light-filled spaces inside. The building's small scale helps ensure that kids don't get lost in the shuffle. And in contrast to the facile traditionalism of the redbrick town houses that surround it, the Perspectives Charter School is at once of its place and brings something new to that place. Economical yet stirring, hard-edged but humanistic, this is the latest chapter in Chicago's ongoing story of innovative school design. ■

The multipurpose room (top and near right) serves as a mini town square, offering open space, cafeteria, and study hall. Its balcony-like overhangs facilitate interaction between floors. In the main stairwell (far right), the firm takes the required steel fire stair and transforms it into a piece of sculpture, complete with its own balcony. Brightly colored supergraphics written in English and Spanish further enliven the entrance and the multipurpose room.

Burr Elementary School
Fairfield, Connecticut

2

SKIDMORE, OWINGS & MERRILL DESIGNS A PUBLIC ELEMENTARY SCHOOL THAT OPENS ONTO THE LANDSCAPE, AND EVEN SURROUNDS SOME TREES.

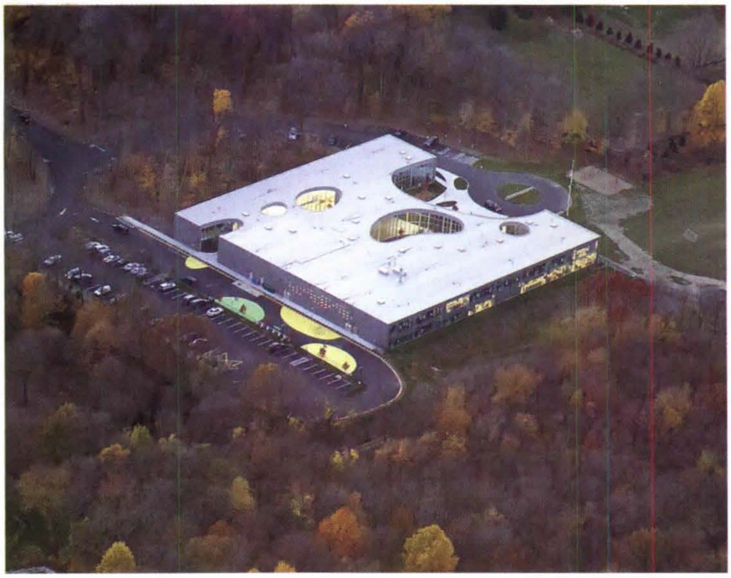
By William Weathersby, Jr.

Architect, interior designer: *Skidmore, Owings & Merrill—Roger Duffy, AIA, design partner; Anthony Vacchione, AIA, managing partner; Walter Smith, education specialist; Scott Duncan, Assoc. AIA, senior designer; Christopher McCready, AIA, project manager; Carlo Balestri, Ana Bravo, Thibaut DeGryse, Jeffrey Finegold, AIA, Andrew Hayes, Dai-yi Oh, Fe Rodriguez, Nina Roschonkowska, Joseph Walter, AIA, Woong Yang, project team*
Client: *Town of Fairfield*
Engineers: *DiBlasi Associates (structural); Altieri Sebor Weiber (mechanical); The Huntington Company (civil)*
Consultants: *Brown Sardina (landscape); Conncode (codes)*
Construction manager: *Turner Construction*

Size: *69,000 square feet*
Cost: *$14.6 million (construction)*
Completion date: *Summer 2004*

Sources
Structural system: *United Steel*
Masonry: *Westbrook Block*
Curtain wall: *Traco*
Concrete: *Connecticut Masons*
Glass: *Interpane*
Doors: *R&R Window; Traco; Weyerhauser*

For more information on this project, go to Building Types Study at **www.archrecord.com**.



Although most parents would certainly advocate educating their children in a comfortable, well-equipped school, when it comes to actually picking the community site for constructing such a building, the resounding refrain is often "not in my backyard." Yet on a wooded, 15.5-acre site adjacent to a neighborhood of upscale single-family homes in Fairfield, Connecticut, the Burr Elementary School comfortably blends into the landscape, functioning as a "good neighbor" with its unintrusive scale and subdued, clean-lined presence.

Program

Fairfield, one of the "Gold Coast" commuter suburbs about 55 miles from New York City, is undergoing an expanding demographic of families with school-age children. Burr Elementary, designed by Skidmore, Owings & Merrill (SOM), is one of two new schools recently built to support current and future growth in the township of 54,800 citizens.

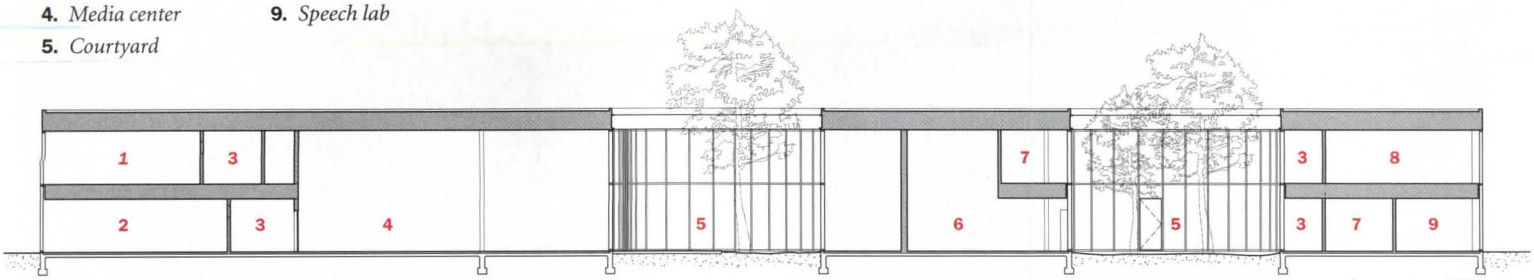
"One of the primary objectives was to integrate the architecture of the school into the preserved landscape," says SOM design partner Roger Duffy, AIA. "This was a heavily wooded, undeveloped site incorporating wetlands, so environmental conservation was a priority."

Because the public school was commissioned by the township as an expansion of the school system and not as a replacement for an existing school with a faculty already in place, the architects worked with

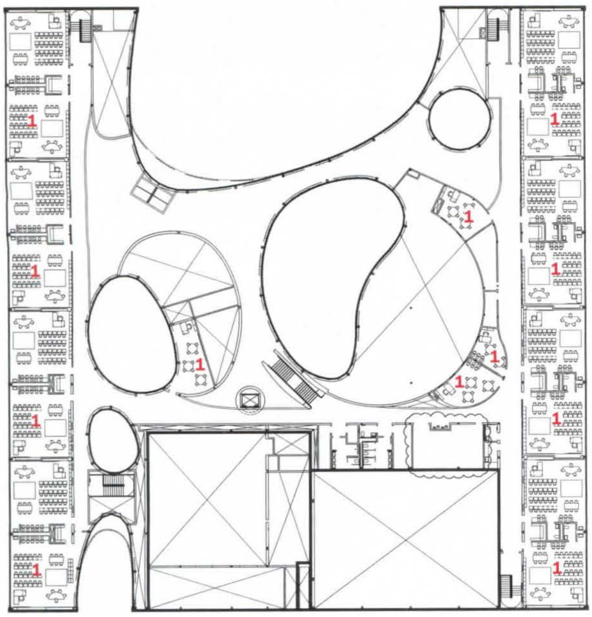
PHOTOGRAPHY: © AERIAL PHOTOS OF NEW JERSEY (LEFT); ROBERT POLIDORI (BOTTOM RIGHT SPREAD); FLORIAN HOLZHERR (OPPOSITE, TOP)

A bird's-eye view (opposite) showcases the sleek roof that suppresses all mechanical systems. The facade incorporates split-face concrete, tinted to match local stone, over a steel frame structure (right). At night, the school is a community beacon (below).

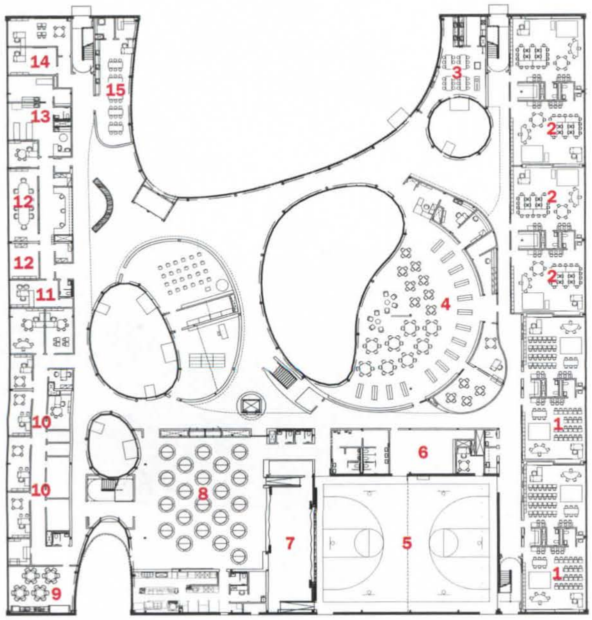
1. *Second grade*
2. *Kindergarten*
3. *Corridor*
4. *Media center*
5. *Courtyard*
6. *Music room*
7. *Special education*
8. *Fourth grade*
9. *Speech lab*



SECTION THROUGH LIBRARY LOOKING SOUTH



SECOND FLOOR



FIRST FLOOR

Burr Elementary takes advantage of the conserved natural surroundings for student study and personal development. The landscaped courtyards (opposite, top left and bottom, and this page, plans) function as auxiliary teaching spaces protected within the building footprint. Standard aluminum-framed glazing lets in views and daylight (opposite, top right and bottom) while keeping sight lines open.

1. *Classroom*
2. *Kindergarten*
3. *Science lab*
4. *Media center*
5. *Gymnasium/ auditorium*
6. *Physical education office/support*
7. *Storage*
8. *Cafeteria*
9. *Faculty room*
10. *Resource/support*
11. *Principal's office*
12. *Conference room*
13. *Nurse/psychologist*
14. *Language lab*
15. *Art room*

an ad hoc committee as their client. Design development grew out of public forums in the format of weekly town meetings, which supported engaged participation by neighbors and the local Audubon Society. A group of appointed academic advisors from other district schools assisted the architects and landscape designers in tweaking the design. Environmental specialists, including a botanist, worked through both the design and approvals processes to properly preserve the wetland and vernal pool areas on the site.

Solution

Accommodating 500 students, the school's design creates a variation on the traditional double-loaded corridor school layout, locating the communal library, art, science, and cafeteria spaces at the center of the two-level plan. Existing trees perforate the footprint, within a series of amoeba-shaped courtyards that function as outdoor classrooms contained in the building volume. In addition to the perimeter curtain walls, these atriums allow natural light and air into the building; because they reside as easily observable spaces within the building envelope, security is not an issue. Circulation routes occupy the residual spaces between the courtyards, creating a continuous space onto which all classrooms and instructional areas open. As project architect Scott Duncan points out,

PHOTOGRAPHY: © ROBERT POLIDORI (OPPOSITE, BOTTOM AND TOP RIGHT); FLORIAN HOLZHERR (OPPOSITE, TOP LEFT)

Curving balconies on the second level overlook the main entry and circulation area (top left). The pedestal for the bench is made of local stone. With curving forms cuing pathways, and many glass-enclosed corridors, young students can easily navigate their way (right). The cafeteria (bottom left) features tables with attached seats to lessen the noise and potential hazard that kids dragging chairs can cause.

PHOTOGRAPHY: © ROBERT POLIDORI (RIGHT SPREAD); FLORIAN HOLZHERR (LEFT TWO)

circulation and sight lines have few obstructions. "This is a school where it is very hard for young children to lose their way," he says.

At the center of the plan is the library/media center, which opens onto an outdoor courtyard furnished with benches. A science courtyard contains a weather station for student experiments. The bus drop-off on the building's south side and a parent carpool drop-off on the north side avoid the necessity for a perimeter road encircling the school; this traffic planning helps to preserve the view from each classroom directly to pristine woods beyond. The bus drop-off area also serves as an additional playground, minimizing paved areas and storm-water runoff.

Commentary

The Burr school is a progressive green building successfully constructed on a modest budget. Enhanced by an attractive palette of local stone and wood, the design harnesses daylight within a free-flowing plan. Sustainable components include the use of recycled materials, a waste-management plan, and irrigation systems. And an added plus: The roof encloses or "suppresses" all mechanical systems so that neighbors at higher elevations overlooking the school spy only a sculptural plane that functions as a "fifth facade." ■

Roger Ludlowe Middle School
Fairfield, Connecticut

3

PERKINS EASTMAN CREATES AN AIRY, MODERNIST LEARNING SPACE THROUGH THE MANIPULATION OF A HILLY SITE AND NATURAL MATERIALS.

By Sam Lubell

Architect: *Perkins Eastman—Aaron Schwarz, FAIA, director and design principal; Michael King, AIA, management principal; Eran Chen, Lou Bauko, Christine Schlendorf, Perry Nunez, Matthew Meyer, Gregory Willock, Jessica Kovarsky, Do-Yeon Kim, Fritz Morris, Davi Paul, Fred Petraglia, Robin Carathanasis, design team*
Client: *Town of Fairfield*
Engineers: *Weidlinger Associates (structural); Atkinson Koven Feinberg Engineers (m/e/p); Land-Tech Consultants (environmental); Frederick P. Clark Associates, Buckhurst Fish & Jacquemart (traffic)*
Consultants: *Diversified Technology Consultants (landscape); Atkinson Koven Feinberg Engineers (lighting); Creative Acoustics (acoustical)*
General contractor: *Turner Construction Company*

Size: *: 220,000 square feet*
Cost: *$38 million*
Completion date: *September 2003*

Sources
Masonry: *Belden Brick*
Metal/glass curtain wall: *Vista Wall*
Metal roofing: *Firestone EPDM*
Aluminum windows: *Vista Wall*
Stains: *Cabhots Stain (for cedar)*

For more information on this project, go to Building Types Study at **www.archrecord.com**.

In designing Fairfield, Connecticut's Roger Ludlowe Middle School, New York–based Perkins Eastman Architects—chosen via design competition—decided to ignore conventional wisdom. Contrary to the instincts of the local community, which first wanted to place a box-shaped school onto a flat field, the architects decided to nestle a long, L-shaped building onto an adjacent hillside. This siting and configuration, the architects reasoned, gave them an opportunity to enhance views and light, and vary the massing, while minimizing the impact of the large project on the residential community. Careful use of materials also help the project fit into its context.

Program

The school building committee, including members of the Fairfield Board of Education, school staff, and town neighbors, sponsored a design competition in 2001 for a new, three-story, 200,000-square-foot middle school for 875 students on about 25 acres next to the community's existing high school. The town desired top quality at a relatively low $38 million—all in about 24 months, due to the area's serious classroom shortage. Meanwhile, the architects also converted the existing middle school on the property into a high school building.

Solution

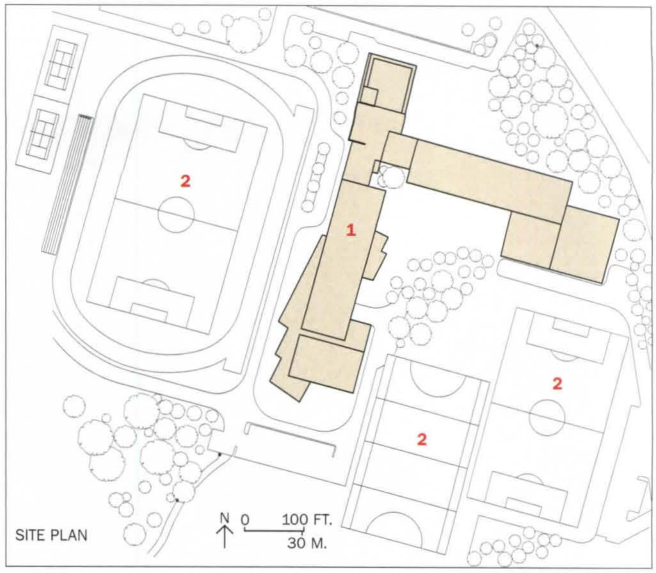
The new, steel-frame structure blends with its surroundings through simple use of cedar and red, purplish, and silvery brick facing. In order to break up the massing, the firm took advantage of the sloping site in its disposition of spaces. For example, the gymnasium is at field level, the cafeteria and public spaces are at mid-level, and the classrooms—requiring the most light and the best views—dominate the highest levels (but are still present on all floors).

The first visible element is the school's cube-shaped library. Enclosed by a two-story glass curtain wall and interior wood louvers that define the space and provide shading and depth, the library acts as an elegant symbol for the entire complex. Besides the library, the 650-seat, box-in-box auditorium and a simple, much-frequented gymnasium provide the school's other anchors, both located at ends of the L-plan arms. All three elements have dedicated entrances to encourage the community to use them without disturbing (or being disturbed by) the school itself. They also provide a sense of orientation, further enhanced by a double-height main lobby—adorned with colorful Bomonite tiles and suspended pendant globes—just east of the library.

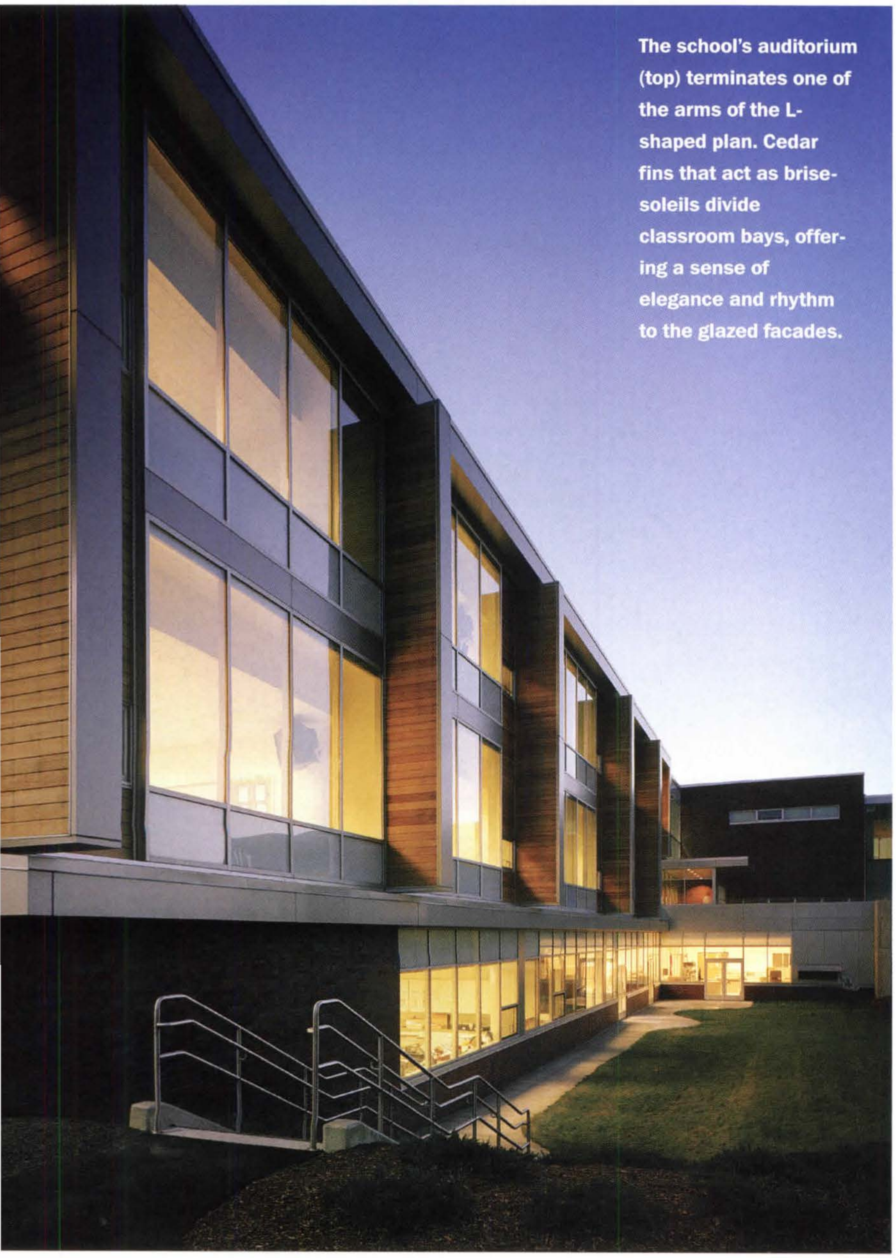
Between these points sit classrooms, hallways, computer labs, offices, music rooms, a cafeteria, and support spaces. Simple, airy classrooms collect reflected light, thanks to 11-foot, floor-to-ceiling windows

The long, L-shaped building (opposite, top) maximizes views and light but minimizes intrusion on the community. Visitors are welcomed first by the the school's glass-enclosed, double-height lobby and library.

PHOTOGRAPHY: © WOODRUFF/BROWN

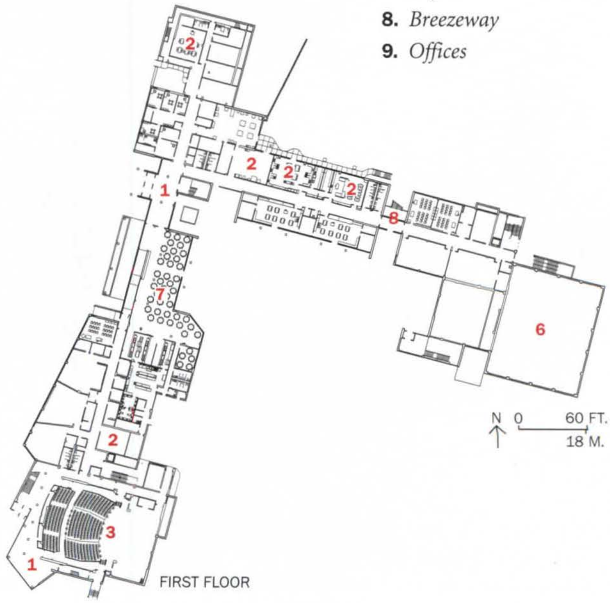


1. *Roger Ludlowe school*
2. *Playing fields*



The school's auditorium (top) terminates one of the arms of the L-shaped plan. Cedar fins that act as brise-soleils divide classroom bays, offering a sense of elegance and rhythm to the glazed facades.

1. *Lobby*
2. *Classroom*
3. *Auditorium*
4. *Auditorium balcony*
5. *Library*
6. *Gymnasium*
7. *Cafeteria*
8. *Breezeway*
9. *Offices*



and exterior cedar fins that function as brise-soleils. These fins not only minimize glare but punctuate the school's exterior and provide a vertical counterpoint to the building's horizontal masses. At first the school was hesitant to use cedar, also present in some stairways and on walls near the lobby, because of its expense and maintenance. But the firm convinced them it was worth it. "You can make a great school that's not too expensive; it's about choosing the right things to spend money on," says principal Aaron Schwartz, FAIA.

Meanwhile, the courtyard, a sloping public greenspace lined in places with picnic tables to augment cafeteria seating, has become a social center. Views onto this courtyard, and onto playing fields throughout the building (including in the lobby) provide not only a sense of location, but also foster a strong connection to nature.

Commentary

The school's simple design does not astound, but smart decisions have turned it into an attractive, exceptional space for education and community. The hillside siting was perhaps the most important choice, setting the stage for an intricate, light-infused school that offers a marked improvement over the monolithic box format. Careful placement of spaces and focal points help give it coherence. Perhaps the other key decision was the strategic use of natural materials, notably cedar, which creates a dignified, but still stylish touch. The building's ability to blend with its surroundings is not often seen in Modernist-style structures; the colored brick in particular helps (much more than can be conveyed in photographs), since it is highlighted by rich silvery tints and rhythmic patterns. Most important, the architects have proved that it's possible to build a discreetly handsome school without breaking the bank. ■

Airy classrooms (left) receive enough daylight so that interior lights are often dimmed or shut off. The light-infused library (below) is separated from its curtain wall by a staircase leading to the school's bottom floor.

Eastside Center for the Arts
Palo Alto, California

4

FERNAU & HARTMAN "SUPERSIZES" A SMALL PROJECT, CREATING A BUILDING THAT HAS BECOME THE HEART OF ITS COMMUNITY.

By Lisa Findley

Architect: *Fernau & Hartman Architects—Richard Fernau, principal in charge; Richard Fernau with Laura Hartman and Kate Biro, design team; Kate Biro, design architect*
Client: *Eastside College Preparatory School*
Engineers: *Tipping Mar & Associates (structural); Critchfeld Mechanical (mechanical); BRK Associates (electrical); Stevan Nakashima (civil)*
Consultants: *JS Nolan + Associates (lighting); Charles M. Salter Associates (acoustical); Landry + Bogan (theater)*
General contractor: *Vance Brown*

Size: *9,100 square feet*
Cost: *$ 3.4 million*
Completion date: *June 2005*

Sources
Metal/glass curtain wall: *Sherwood (aluminum storefront); Metal Sales (Galvalume)*
Built-up roofing: *Johns Manville*
Aluminum windows: *Kawneer; Sherwood*
Acoustical ceilings: *USG (acoustical panel ceilings); Ventwood (acoustical wood-slat systems)*

For more information on this project, go to Building Types Study at **www.archrecords.com**.

Among Silicon Valley's dirty little secrets are the low-income neighborhoods struggling to survive in the sea of high-tech wealth. One of these is East Palo Alto, a town of 32,000 nestled across a freeway from the affluent home of Stanford University, Palo Alto. One sixth of the community lives below the poverty line, and the last of its public high schools closed in the 1970s, forcing students into long bus commutes to schools in surrounding areas. The busing means that students cannot participate in after-school activities.

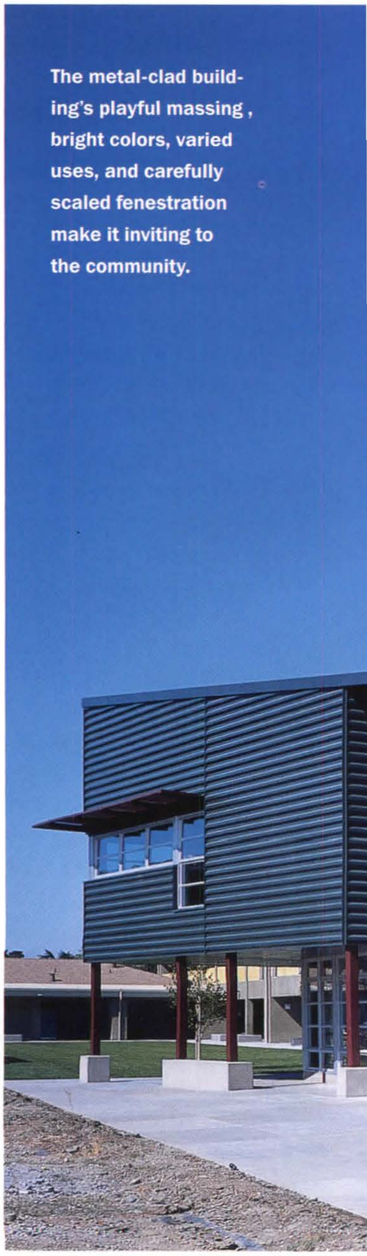
Enter Chris Bischof, who grew up nearby and played basketball in East Palo Alto during high school. In 1991, with a degree in Education from Stanford, Bischof and a friend set out to change the fact that only 35 percent of East Palo Alto students finish high school. They launched a modest after-school program called "Shoot for the Stars," which rewarded intensive study with basketball. By 1996, the popular program had become a full high school: Eastside College Preparatory School, with Bischof as its principal. With individual, corporate, and foundation sponsorship, the school provides a rigorous education for free. What began with eight students meeting in a local park now has an enrollment of 150 high school and 60 middle school students, occupying a rapidly developing campus in a residential neighborhood. Along with classrooms, a gym, a cafeteria, and administrative offices, the campus also provides housing for some students. As a testimony to Eastside's effectiveness, 100 percent of its graduates have gone to four-year colleges.

Lisa Findley is an architect and teaches at the California College of Arts and Crafts.

Eastside has maintained its tie to athletics, but recently decided to add performing arts as a motivator. The school selected Fernau & Hartman to design the Eastside Center for the Arts, which quickly became the heartbeat of the campus, as well as a draw for the entire community, where it is used for local film festivals and stage productions.

Program

Principals Richard Fernau and Laura Hartman led Eastside in a series of discussions about their needs for the modest, 9,100-square-foot building. Fernau, who has a background in theater, argued that the students would benefit greatly from having elements like a proper proscenium stage with a fly, a sound booth, a lighting grid, and greenrooms. In this way, if the students continued in theater they would have experience with the technical and physical features of the field. The architects also argued that spaces associated with the theater should be larger than necessary to provide flexibility for different types of arts study. Fernau calls this "supersizing." A darkroom was added for photography, and the scene shop, with a roll-up loading



The metal-clad building's playful massing, bright colors, varied uses, and carefully scaled fenestration make it inviting to the community.

PHOTOGRAPHY: © SHARON RISEDORPH

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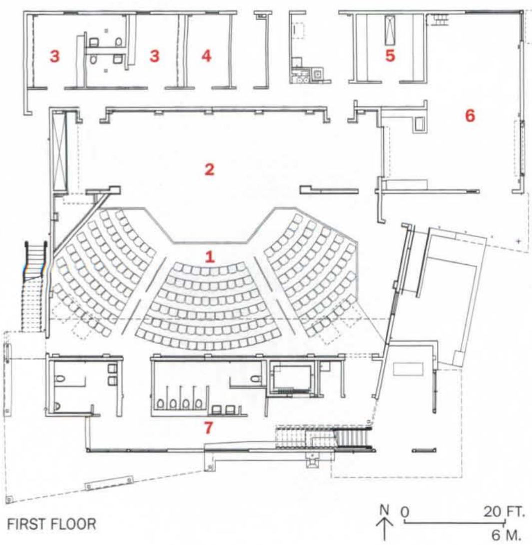

1. *Auditorium*
2. *Stage*
3. *Dressing room*
4. *Greenroom*
5. *Darkroom*
6. *Scene shop/Art room*
7. *Back of house*

The double-height lobby (top left) creates visual interaction with the outside. The "supersized" dance studio (top right) doubles as a space for theater rehearsals and performances. The theater's tall concrete-block walls are left exposed, maintaining simplicity and reigning in costs (above).

door, is also used for painting, drawing, and sculpture. An enlarged dance studio doubles as a rehearsal space and a tiny theater.

Solution

Simplicity and clarity dominate the architects' execution. The theater's tall concrete block walls are left exposed, maintaining an elegant purity and keeping costs down, while the lower support spaces are framed in steel with stucco or metal siding. The dance studio, the scene shop, and the other arts-related rooms cluster around the bulk of the theater, scaling it down to fit with the size of the neighborhood.

The building's glassy double-height lobby faces the center court of the campus. Strategically placed windows break down any closed black-box sense by allowing glimpses of the activity inside. A concrete platform adjacent to the lobby invites impromptu theater and provides outdoor rehearsal space.

In the theater, upholstered seating for 190 people forms an intimate arc around a semithrust stage that makes a flexible performance space. The building's architectural trade-offs are important to note. In the mild Bay Area climate, the lobby space is kept small but can be augmented by outdoor space covered by the overhang of the dance studio above. By shrinking the lobby, the architects were able to put more of the tight budget into better equipping the theater.

Commentary

Fernau & Hartman was a perfect fit for the building. Its method of working with clients to squeeze ambitious buildings from modest budgets yielded an important resource for the school and the community. While a serious working theater wrapped with other art activities, the building has playful massing, carefully scaled fenestration, lively colors, and a porosity of circulation that invites casual interaction and daily use. Bischof, who was initially wary of adding an arts focus, notes, "Now that this building is here and I see how proud the students are of it and how they use it, I cannot imagine Eastside without it." ■

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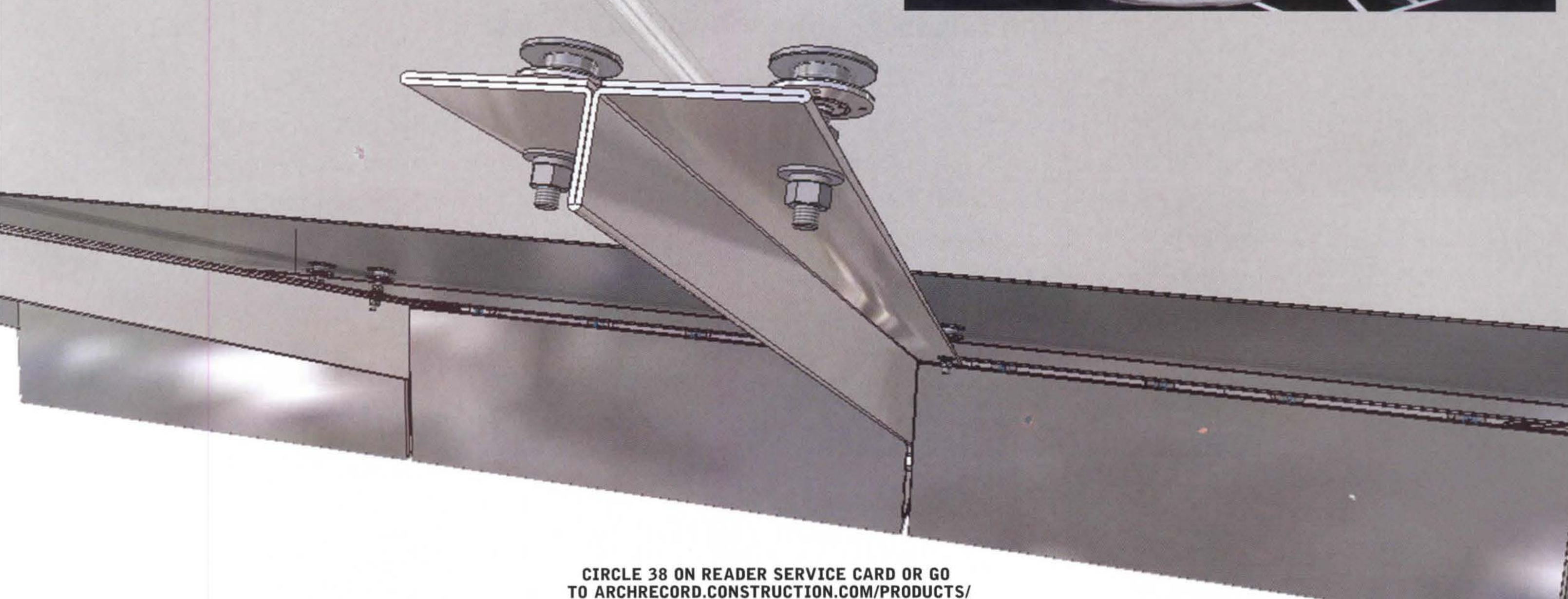

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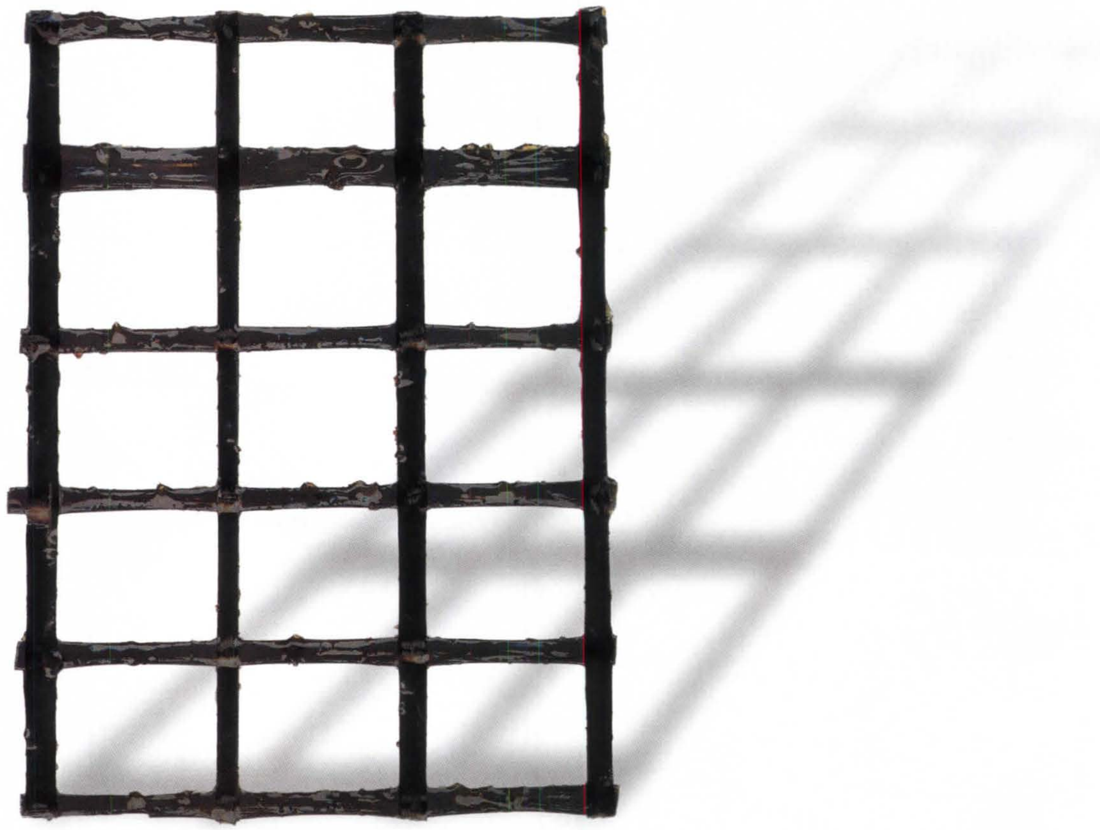

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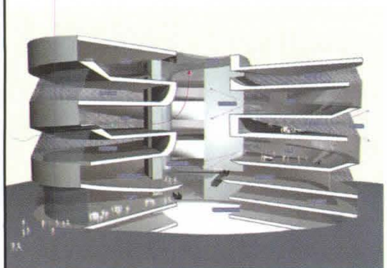
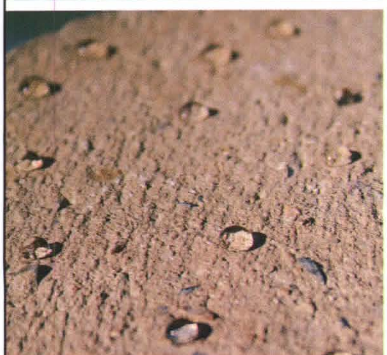


UN Studio and Werner Sobek's vision for a car museum (page 172)



A concrete additive that repels water (page 159)

IMAGES: COURTESY UN STUDIO (TOP LEFT); HYCRETE (BOTTOM LEFT); © PETER VANDERWARKER (RIGHT)

These days, it's getting more and more difficult to find an announcement about a commission, renovation, or completed building that doesn't mention the project's various green features. As RECORD editor in chief Robert Ivy, FAIA, notes in his editorial (page 19), sustainable design is rapidly becoming business as usual, and the demand for more information about how to go green increases daily. This month's architectural technology stories highlight a number of recent achievements in the area of sustainability, from projects to products and new processes.

In particular, we'd like to acknowledge the contributions of architect William McDonough, FAIA, on the 10th anniversary of the establishment of his company McDonough Braungart Design Chemistry (MBDC). Not only has MBDC created exhaustive cradle-to-cradle standards for the manufacture and recycling of building materials and products, but McDonough himself has substantially raised the international profile of architects and their contributions to curbing pollution and global warming. Every movement needs its evangelist; McDonough has stepped into that role with confidence, scientific rigor, and inspired zeal. The practice of design and construction is better for having him around.

(page 167)

Finally, to help you find our green building stories more easily, we've created a new area on our corporate Web site called GreenSource where you can access recent content about green building from ARCHITECTURAL RECORD, as well as our weekly news publication *Engineering News-Record* and other McGraw-Hill publications and groups that cover design and construction. Check it out at www.construction.com/greensource.
Deborah Snoonian, P.E.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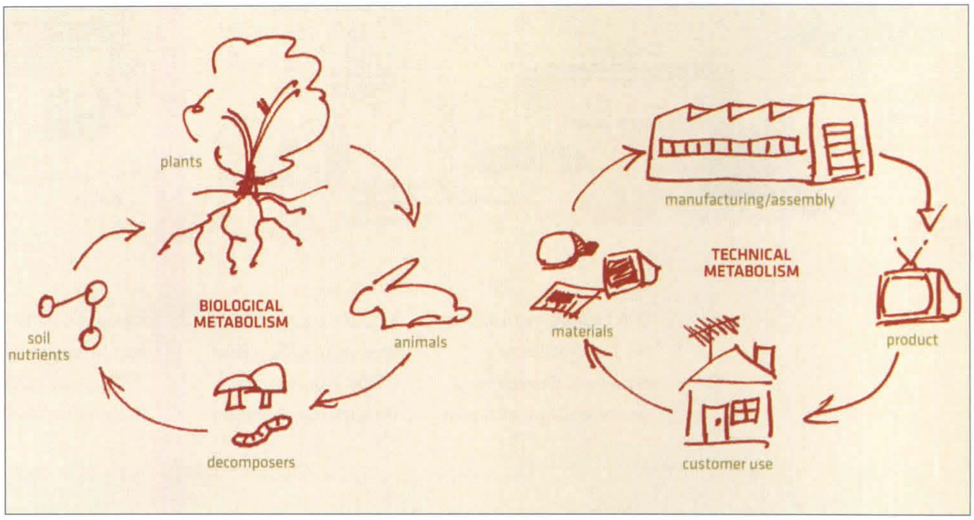
A DECADE SINCE MCDONOUGH BRAUNGART DESIGN CHEMISTRY WAS FOUNDED, CRADLE-TO-CRADLE THINKING SLOWLY PERMEATES WITHIN AND ACROSS INDUSTRIES

By Nancy B. Solomon, AIA



Natural processes have flourished through biological loops (left). McDonough and Braungart suggest the development of parallel loops (right) in which a product's parts can be utilized over and over again.

In 1995, determined to counteract the environmental, economic, and social injustices that are so often the unintentional by-products of conventional manufacturing and distribution processes, architect William McDonough, FAIA, and chemist Michael Braungart established McDonough Braungart Design Chemistry (MBDC; www.mbdc.org). The Charlottesville, Virginia–based company applies what McDonough and Braungart have termed cradle-to-cradle principles in order to help product manufacturers rethink the way they do business. The two visionaries subsequently expounded on their approach in the book Cradle to Cradle: Remaking the Way We Make Things, which was published in 2002 by North Point Press. Their revolutionary ideas, like so many significant concepts in history, are profoundly simple: Industrial production should take its cues from nature to create healthy and abundant cycles that continually and effectively reuse our finite resources.

To achieve this truly sustainable state, products must be made from either biological nutrients, which can decompose naturally without poisoning our habitats, or technical nutrients, which must be recaptured at the end of the products' useful lives so that they can be remade into the same products or ones of equal value. When substances of different chemical makeup are combined, as typically occurs in conventional recycling programs, the resulting material becomes what McDonough and Braungart dub a "monstrous hybrid." Such a concoction cannot easily be returned to its basic constituent parts and, therefore, is on its way to becoming an ineffective resource, if not an outright pollutant. For this reason, McDonough and Braungart argue that most recycling programs today are really "downcycling" initiatives: The subsequent generation of products formed from the previous one is typically of lower value.

Alas, shifting from our society's current "cradle-to-grave" framework to MBDC's "cradle-to-cradle" model is not nearly so simple as the theory itself. It requires dedication to a level of detailed research and analysis, and strong cooperation among a host of diverse and dispersed players. But MBDC continues to chip away at conventional materials and processes that—if left unchecked—may one day be the death of us all. In addition to assisting manufacturers in their optimization efforts, MBDC just launched an initiative known as Cradle to Cradle Certification.

Through this new program, a manufacturer can submit a homogenous or relatively simple product to MBDC for review of its overall health impacts and its potential for being safely composted or truly recycled. A successful candidate within this track is certified as a biological or technical nutrient. A manufacturer can also submit a more complex product with multiple material components to MBDC for evaluation of its overall health impacts; its ability to be disassembled so that its constituent parts can decompose or be reused; the quantity and source of energy required for its production; the amount of water used during

Contributing editor Nancy B. Solomon, AIA, writes about computer technology, building science, and other topics of interest to the architectural profession.

CONTINUING EDUCATION

Use the following learning objectives to focus your study while reading this month's ARCHITECTURAL RECORD/AIA Continuing Education article. To receive credit, turn to page 159 and follow the instructions. Other opportunities to receive Continuing Education credits in this issue include the several sponsored sections beginning on page 245.

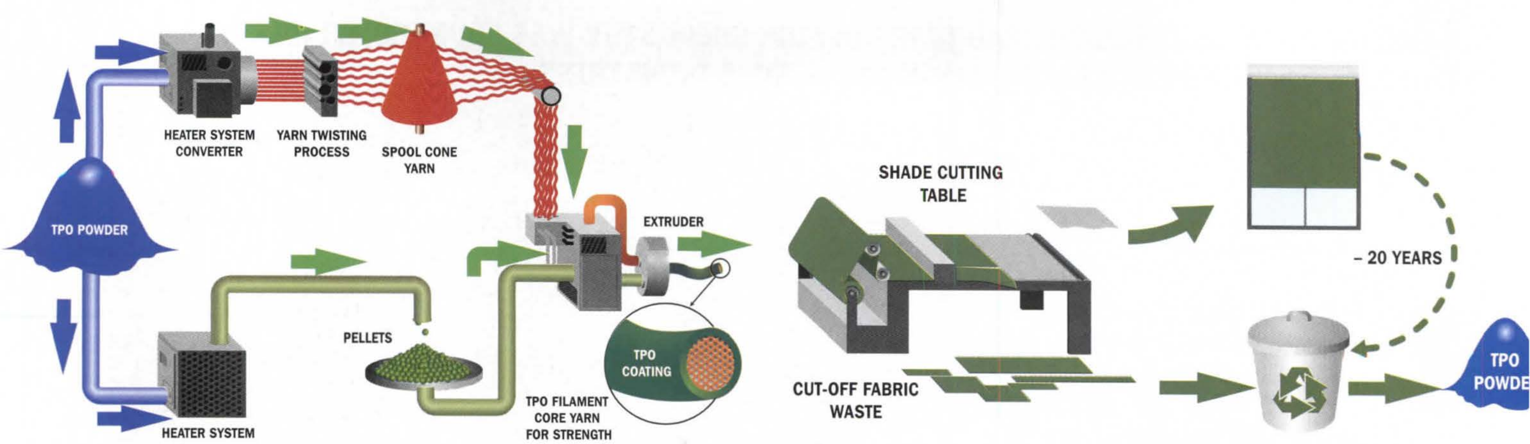
LEARNING OBJECTIVES

After reading this article, you should be able to:

1. *Define biological and technical nutrients.*
2. *Contrast conventional recycling with cradle-to-cradle principles.*
3. *Explain Cradle to Cradle Certification requirements.*

For this story and more continuing education, as well as links to sources, white papers, and products, go to ***www.archrecord.com***.

RENDERING: COURTESY MCDONOUGH BRAUNGART DESIGN CHEMISTRY



The coated-yarn fabric for MechoShade System's Ecoveil is made entirely of a non-PVC polymer called thermoplastic olefin (TPO). Homogenous throughout, an undyed sample of this fabric can be reground into TPO powder that can then be melted and reconfigured into yarn and coating, thereby starting the cycle all over again.

manufacture, and the quality of the wastewater produced; and the company's demonstrated commitment to social justice. A product within this second track is eligible to earn a silver, gold, or platinum rating.

Getting the data

To assist companies in formulating eco-effective products, MBDC evaluates the material components according to what they have termed the "Cradle to Cradle Design Protocol." All ingredients representing at least 100 parts per million of a products formulation (a quantity that is far smaller than most any other product regulation, says Steve Bolton, MBDC's manager of business development) are first inventoried. This can be challenging in itself, as many of the manufacturers' suppliers (and the suppliers to those suppliers) are hesitant to reveal proprietary information. Notes Bolton, "We can spend more than half of our time just collecting this information."

To overcome this common and understandable resistance, MBDC developed a nondisclosure agreement so that an individual supplier can comfortably send appropriate product data to MBDC with the confidence that its proprietary secrets will not find their way into the hands of a competitor. "That's one of the beauties of the MBDC system. They create a model that allows vendor information to be reviewed by an independent third party," says Jan Berman, president of MechoShade Systems in Long Island City, New York, which recently worked with MBDC to develop Ecoveil—a new, non-PVC shade system formulated from a technical nutrient. The product manufacturers themselves are not privy to the detailed information that MBDC obtains from their respective suppliers through these agreements.

Analyzing and improving formulations

MBDC then analyzes each ingredient and codes it with a color based on the chemical's documented effects on human and environmental health (see chart on page 163 for the 19 specific criteria). Green corresponds to little-to-no risk; yellow represents low-to-moderate risk; orange signifies that there is no current evidence of high risk, but a complete assessment is not possible due to a lack of available information; and red denotes high risk. After all components are assessed for a given product, MBDC and the manufacturer's chemists work to improve its overall health rating by replacing higher-risk ingredients with lower-risk alternatives.

Clients working with MBDC indicate that this evaluation and optimization effort is neither an antagonistic process nor a "pie-in-the sky" assessment, but a constructive and realistic opportunity to make incremental improvements as better ingredients or methods become available. MBDC certification may be conferred to a product with a very small quantity of a red-coded ingredient if that substance is critical to the performance of the product, no viable substitute can be identified at present, and the manufacturer demonstrates its willingness to aggressively find an alternative. "It has to be on your ongoing action plan," says Kaye Gosline, director of contract carpet for Solutia in St. Louis, Missouri. Her company produces a nylon 6,6 fiber known as Ultron, which was certified as a technical nutrient by MBDC despite the fact that one additive—a biocide used in very small quantities in the finish—was rated red. No better alternative is currently available for that critical—albeit miniscule—ingredient, but chemists at Solutia are continually on the lookout for a suitable replacement.

MechoShade faces a similar challenge with its flame retardant. The company recently switched to another retardant, which is also coded red but applied in smaller quantities. Says Berman, "It's the opinion of people at MBDC, the chief scientists at our mill, and staff at the chemical companies working with us that we have pretty much exhausted our options in current technology." Like Solutia, MechoShade researchers and staff at MBDC continue to monitor new research developments to see if a better substitute arises.

The analysis and reformulation process can be time-intensive, even for a biological nutrient such as the 100 percent pure wool fabrics

DIAGRAM: COURTESY MECHOSHADE SYSTEMS

produced by Pendleton Woolen Mills of Portland, Oregon. John Allard of Textile Solutions, the design and sales company for the contract and residential furniture divisions of Pendleton, estimates that it took about four years from the time the mill embarked on an effort to create a compostable and environmentally optimized fabric for Herman Miller's vertical panels to the time the furniture-systems company actually introduced the product.

"First of all," explains Allard, "we had to make sure that the wool came from growers that follow best practices." These range from grazing the sheep on unfertilized grass to not spraying harsh chemicals on their coats. MBDC then had to evaluate the oils used for carding and spinning the wool, the dyes used to color the woven cloth, and the surfactants that are applied to finish the fabric.

Allard notes that various items throughout the manufacturing process had to be altered in order for this product to meet MBDC's requirements. For example, they had to convert from their standard dyes to ones that had already been formulated by the chemical company Ciba-Geigy and screened by MBDC. Unlike 10 years ago, notes Allard, there are now enough approved dyes that fabric companies aren't too restricted in their color options.

Nonetheless, Allard estimates that Pendleton worked with Ciba-Geigy over a period of two years to duplicate the actual colors that Herman Miller had already been using for several of its existing vertical panel systems. "To switch their color line into one that passed MBDC was very difficult and time-consuming."

Working from this earlier experience, Pendleton subsequently spent another year developing a 100 percent felted wool seating fabric, which had to be constructed differently from the vertical fabric in order to meet more stringent abrasion requirements. The company took advantage of all the research done during the development of the eco-friendly vertical fabric to select acceptable oils, dyes, and surfactants for this new seating fabric, which was just certified by MBDC as a biological nutrient.

Construction for deconstruction

MBDC may also suggest alternative ingredients or assembly techniques so that product components have a better chance of staying on a biological or technical track after the particular assembly has reached the end of its useful life. Haworth, the furniture-systems manufacturer in Holland, Michigan, took this approach to heart when designing its new Zody chair, which earned a gold rating from MBDC. "We needed to develop an end-of-life plan," says Paul Olesh, Haworth's seating and storage product director. The chair was designed so that it could be easily disassembled, returned to Haworth (for a small take-back fee), and refurbished for another lifetime of use.

According to Mark Bonnema, Haworth's senior design for environment engineer, the goal of creating a product that the manufacturer can take back drives many aspects of design development. In creating the Zody chair, for example, the design team tried to use the same materials in as many places as possible, even though this adds an extra constraint to the design process. He estimates that there are at least 15 parts made from one particular type of nylon so that, when the chair comes back, all those parts go into the same recycling bin. "It wouldn't be worth the effort to reclaim if those three pounds of parts were made of six different materials," explains Bonnema.

Has the loop been closed?

While MBDC will make suggestions on how best to formulate a product so that its constituent parts can be reused in the future, the business policies and actual logistics to make this happen are primarily the

Steelcase's Think chair received a silver rating from MBDC. A life-cycle analysis of all the constituent parts provided information on how they affect both human and environmental health. The chair is made from up to 44 percent recycled materials, and it can be disassembled for recycling in about five minutes using common hand tools (top).

ARCHITECTURAL TECHNOLOGY

IMAGES: COURTESY STEELCASE

From the start, environmental attributes were a critical factor in the design of Haworth's ergonomically advanced Zody task chair, which earned a gold rating from MBDC. The product is assembled in a plant that runs off wind power. Changes were made in the production process to eliminate phosphate from the effluent. And, for a small fee, Haworth will reclaim the product from a customer at the end of its useful life.

Hycrete Admixture is rated by MBDC as a *biological* nutrient. It converts concrete from a hydrophilic to a hydrophobic material, so that it repels water (right). It chemically bonds with steel to create a nonsoluble layer that coats reinforcing bars (above) and lodges in the capillaries of the concrete to block water passage.

responsibility of the manufacturers and product distributors. In light of the testimonies offered by various manufacturers who have worked with MBDC, this appears to be the most challenging aspect of the cradle-to-cradle approach for a host of reasons.

One of the biggest challenges is how to isolate the homogenous material—be it biological or technical—within a larger product or assembly. As a biological nutrient, Pendleton's 100 percent wool can biodegrade pretty much anywhere—and, in essence, close its own loop. In addition, scrap wool fabric can be shredded and processed into basic fibers that can then be spun and used for other items, such as dog beds, coat lining, or even potting soil, or woven into other fabrics, such as blankets. To date, however, the manufacturer is unable to reuse the fabric after it has been subjected to the back-coatings, fire-coatings, and other treatments required in the process of making furniture. Pendleton has been having ongoing discussions with furniture companies to determine if alternative approaches can be explored.

Similarly, MechoShade can currently grind undyed fabric intended for use in Ecoveil into its constituent polymer—thermoplastic olefin (TPO)—for reuse in the production of their yarn. However, dyed fabric scraps can only be reused by manufacturers of solid components, such as automobile dashboards. Berman estimates that it will take a couple more years before they will be able to turn it back into their own yarn.

Costs, on a number of levels, can also be a deterrent. According to Gosline, it's still cheaper and easier for the general contractor to take nylon carpet to the dump and pay the current tipping fees rather than spending the time cutting the broadloom into strips and transporting it back to the manufacturing plant to be recycled. And, although Solutia has already pioneered two techniques—dissolution and discoloration—at the laboratory level to convert nylon 6,6 back to basic pellets for reuse, the company still needs to invest more money to test these patented methods at the larger scale of factory production in order to determine if they are economical methods for reclaiming its products after consumers are finished with them.

In the meantime, in an effort to keep carpet out of landfills, Solutia has established a program called Partners for Renewal, in which they identify and work with other entrepreneurs to find alternative outlets for postconsumer carpet waste. One such avenue is Covanta Energy Corporation (www.covantaenergy.com), which converts solid waste to energy for many municipalities across the country. According to Gosline, "Carpet has more BTUs than coal, without dangerous mercury. It's a clean source of energy."

About one and a half years ago, Steelcase launched its Environmental Partnership Program to help its customers figure out what to do with a Steelcase product once they have no more use for it. Although the service is based at the company's headquarters in Grand Rapids, Michigan, they rely on a national network of recyclers, resellers, and non-profit agencies to avoid sending furniture to a landfill. "Customers call daily and we help them resell their products to another business, donate them to charity, or channel them into refurbishing or recycling streams—all at the local level," says Allan Smith, director of communications and environmental strategy for Steelcase.

Tackling other environmental problems

Despite the fact that few product loops are truly closed to date, working with MBDC and its cradle-to-cradle protocol creates a huge ripple effect both within and outside of a given company. "One of the interesting things about the MBDC protocol," says Berman, "is that it encourages you to go beyond the material itself to look at other opportunities." As a small but concrete illustration, he explains that MechoShade's fabric is trucked from

The Cradle to Cradle Protocol

To assist companies in (re)designing eco-effective products, MBDC uses the Cradle to Cradle Design Protocol to assess materials used in products and production processes. The Protocol is founded on the "Intelligent Products System" developed by Michael Braungart and his colleagues at EPEA.

In applying the Protocol, materials in products are first inventoried and then evaluated according to their characteristics within the desired application, and placed into one of four categories (Green, Yellow, Orange, or Red) based on human-health and environmental-relevance criteria. After all chemicals are assessed, the materials in a product application are optimized by positively selecting replacements for chemicals characterized as Red and using Green chemicals as they are available.

The four categories are:

GREEN: Little-or-no risk. This chemical is acceptable for use in the desired application.

YELLOW: Low-to-moderate risk. This chemical is acceptable for use in the desired application until a green alternative is found.

ORANGE: There is no indication that this is a high-risk chemical for the desired application, but a complete assessment is not possible due to lack of information.

RED: High risk. "Red" chemicals (also sometimes referred to as "X-list" chemicals) should be phased out as soon as possible. Red chemicals include all known or suspected carcinogens, endocrine disruptors, mutagens, reproductive toxins, and teratogens. In addition, chemicals that do not meet other human-health or environmental-relevance criteria are red chemicals.

Human-health and environmental-relevance criteria used to rank chemicals are listed below.

HUMAN-HEALTH CRITERIA

- Carcinogenicity
- Teratogenicity
- Reproductive Toxicity
- Mutagenicity
- Endocrine Disruption
- Acute Toxicity
- Chronic Toxicity
- Irritation of Skin/Mucous Membranes
- Sensitization
- Carrier Function or Other Relevant Data

ENVIRONMENTAL-RELEVANCE CRITERIA

- Algae Toxicity
- Bioaccumulation (log Kow)
- Climatic Relevance/Ozone Depletion Potential
- Content of Halogenated Organic Compounds (AOX)
- Daphnia Toxicity
- Fish Toxicity
- Heavy Metal Content
- Persistence/Biodegradation
- Toxicity to Soil Organisms (Bacteria and Worms)

SOURCE: MCDONOUGH BRAUNGART DESIGN CHEMISTRY, LLC ©2001-2005

IMAGES: COURTESY HAWORTH (OPPOSITE, TOP); HYCRETE (OPPOSITE, BOTTOM)

the mill on rolls of long cardboard tubes. For years, the company had been paying to cut and landfill the leftover tubes that remained after the fabric was used up. After adopting cradle-to-cradle thinking, they now send the tubes back to the mill for reuse, saving both on the cost of new tubes and the landfill tipping charges.

Bonnema of Haworth reports that the MBDC's certification process made the company think about alternative energy sources and water quality. The plant that assembles its Zody chair runs off wind power. And although Haworth had no significant problems with its effluent, the manufacturer chose to eliminate phosphate from its processing line to even better protect its regional watershed.

Big furniture-systems companies such as Haworth and Steelcase are parlaying the knowledge gained through working with MBDC in the development of specific products to their management of all product design. For example, after learning about the production of PVC—"wow, that's a nasty process," exclaims Smith—Steelcase's product development team came to the decision that, despite the fact that PVC is an inexpensive and well-performing ingredient, the company wants to eliminate it from its products by 2012 so as not to continue contributing to the demand for the problematic substance. And Smith explains that, by letting suppliers know its interests and concerns, Steelcase recently identified an affordable formaldehyde-free component on the market that they now plan to substitute for one containing formaldehyde on the interior section of their panel system.

Having learned from MBDC, these enlightened manufacturers are looking at ways to educate and transform their own broader circles. As a small indication of the gradual progress being made among Haworth's suppliers, Bonnema notes that the Furniture Emissions Standard Subcommittee of Business and Institutional Furniture Manufacturer's Association (BIFMA), on which he serves, just released a draft of standard and test methods for measuring emissions from office furniture for public comment. One of the goals in this endeavor is to provide an alternative method for the testing of low-emitting products for the commercial interiors version of the U.S. Green Building Council's LEED rating system. And Smith participates in the local chapter of the Green Supplier's Network, which is sponsored nationwide by the U.S Environmental Protection Agency.

"The reaction from suppliers has been amazingly positive," reports Smith. He is referring to not only those manufacturers, which he calls "tier one," that supply components to the furniture companies, but even to the suppliers of the suppliers of the suppliers. "We have a global supply chain. The tier four are typically big companies like BASF, which is also working with MBDC. We have the same protocols in place so we can all look at them together in anticipation of our customers' needs." And, going out yet another rung, Smith just joined the Board of Councilors for the China-U.S. Center for Sustainable Development whose founding cochairs are William McDonough and Madame Deng Nan, vice minister of China's Ministry of Science and Technology. A small ripple in Charlottesville seems to be making waves across the globe. ■

AIA/ARCHITECTURAL RECORD CONTINUING EDUCATION

INSTRUCTIONS

- **Read the article "Products Made of 'Eco-Effective' Components" using the learning objectives provided.**
- **Complete the questions below, then fill in your answers (page 355).**
- **Fill out and submit the AIA/CES education reporting form (page 355) or download the form at www.archrecord.com to receive one AIA learning unit.**

QUESTIONS

1. To achieve a truly sustainable state, products must be from which?
a. relatively simple components
b. products with different chemical makeup
c. biological or technical nutrients
d. first generation components

2. The term "downcycling" refers to which?
a. a generation of products formed from a previous generation
b. combining nutrients that can decompose naturally
c. remaking products into new ones of equal value
d. combining products into a new product of lower value

3. The idea of the book *Cradle to Cradle* is which?
a. with care, our resources are infinite
b. industrial production should take its cues from nature
c. products cannot be made from technical nutrients
d. conventional recycling is good

4. To be certified as a biological or technical nutrient, a manufacturer can submit a product for review of which?
a. its safety potential
b. its energy consumption
c. its health impact and potential for composting or recycling
d. its ease in separating the nutrient from the larger product

5. Biological nutrients are described as which?
a. they can be remade into the same products
b. they can decompose naturally without poisoning our habitats
c. they are a composition of different chemicals
d. they cannot easily be returned to their basic constituent parts

6. "Cradle to grave" refers to which type of products?
a. products that you can use for your entire life
b. products that are regenerated into new products many times
c. products that cannot be recycled into another product
d. products made for infants or the elderly

7. In the McDonough Braungart Design Chemistry (MBDC) color coding for health effects, the color yellow represents which risk?
a. little-to-no risk
b. low-to-moderate risk
c. no current evidence of high risk
d. high risk

8. The ergonomically advanced Zody chair by Haworth has 15 parts made from the same type of nylon for which purpose?
a. ease of design
b. ease of assembly
c. ease of purchasing new materials
d. ease of disassembly for refurbishing

9. The biological nutrient wool can biodegrade or be reused in other fabrics unless it has been treated with which?
a. dyes
b. felting process
c. back-coating
d. shredding

10. The major deterrent to returning nylon products back to nylon pellets for reuse is which?
a. government regulations
b. costs
c. consumer apathy
d. technology

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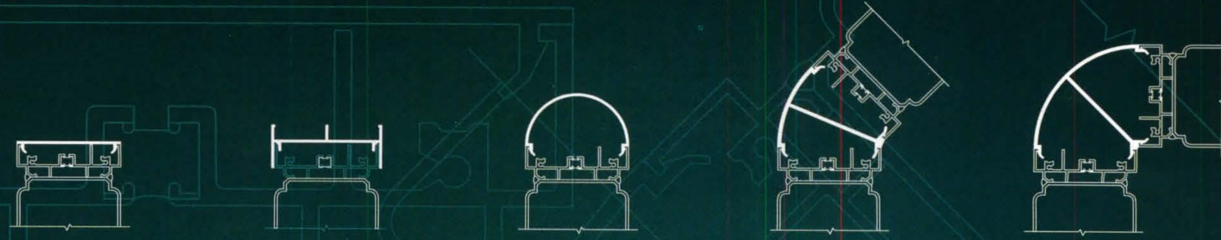

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90-degree corner caps were used to connect four acrylic block panels together to form decorative, lit towers. The panels were mounted to the base and top piece with flat caps.

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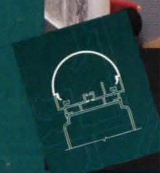

Round caps finished off the ends of this radius wa perfectly. Aluminum mulls were used to connect the three radius walls together, while a flat cap mounted the units to the top of the curved wall.

Aluminum mulls were used to connect these flat panels and radius walls together. A flat cap and mounting channel were used to mount the units t the base and the walls. Flat caps were also used to connect the desktop to the top of the panels.

HYAR0505AC

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H.H. Richardson's **Romanesque Revival Masterpiece** Prompts Inspired, Green Preservation

IN A COMPLEX PROJECT REQUIRING DESIGN SAVVY AND TIGHT LOGISTICS, GOODY CLANCY ADDS AN UNDERGROUND SPACE TO BOSTON'S TRINITY CHURCH

Trinity Church sits in the heart of Copley Square, very close to I.M. Pei's 1975 John Hancock Tower (at right in photo, above right). A model of the church's new undercroft (above left) shows the exposed granite piers and new widely spaced columns.

PHOTOGRAPHY: © PETER VANDERWARKER (RIGHT)

By Ted Smalley Bowen and Deborah Snoonian, P.E.

Renovating a national historic landmark is a high-pressure job in the best of circumstances. Throw in an awkward site and tricky subsurface conditions, along with new program, code, and energy requirements, and it becomes a monumental technical challenge. Henry Hobson Richardson's 1877 Trinity Church, which has anchored Boston's Copley Square through decades of frenetic growth and reconfiguration, has itself been a hive of activity for the past four years. Boston-based architecture firm Goody Clancy, engineers Cosentini Associates of New York and LeMessurier Consultants of Cambridge, Massachusetts, along with construction firm Shawmut Design and Construction of Boston, drew on an innovative mix of system and construction technologies to complete a sweeping restoration and expansion of the iconic and beloved building. In doing so they grappled with many of the key logistical and technical challenges that confronted Richardson and his builders 125 years ago—including the unstable soil and water table of the Back Bay's backfilled tidal flats; the tightly bounded, irregular urban plot; and scaffolding requirements intended to minimize the aesthetic impact of the renovation.

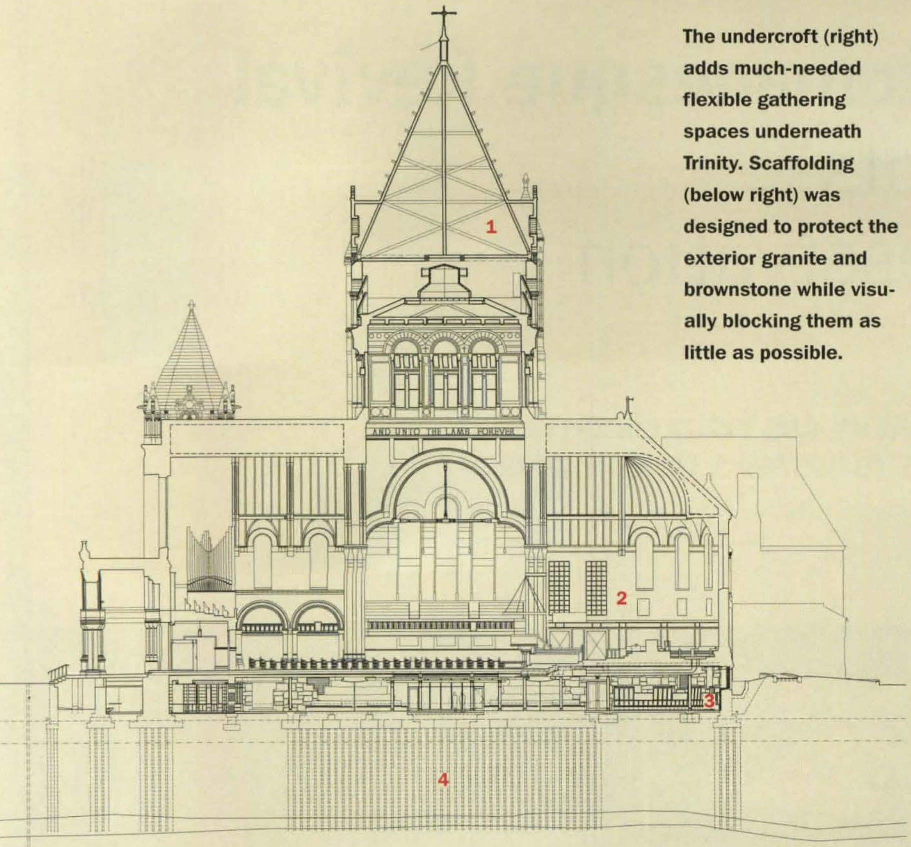
The $53 million project involved the restoration of the original buildings, consisting of the 13,500-square-foot church and adjoining 13,000-square-foot parish house, as well as expanding a shallow basement into a 13,000-square-foot undercroft, an underground meeting and activity space, complete with bookstore and kitchen facilities. The project team also brought the building up to current code, replaced its mechanical systems, and repaired damage to various portions of the exterior and foundation. The work's significant art conservation component included the cleaning and refurbishing of 9,500 square feet of murals, along with decorative painting, and 10 of the church's 33 stained-glass windows. Most of the project was completed last fall, though restoration of the stained-glass windows will continue until 2008.

Ted Smalley Bowen is a Boston-based freelancer who writes frequently for RECORD *about technology. Contact him at ted_bowen@hotmail.com.*

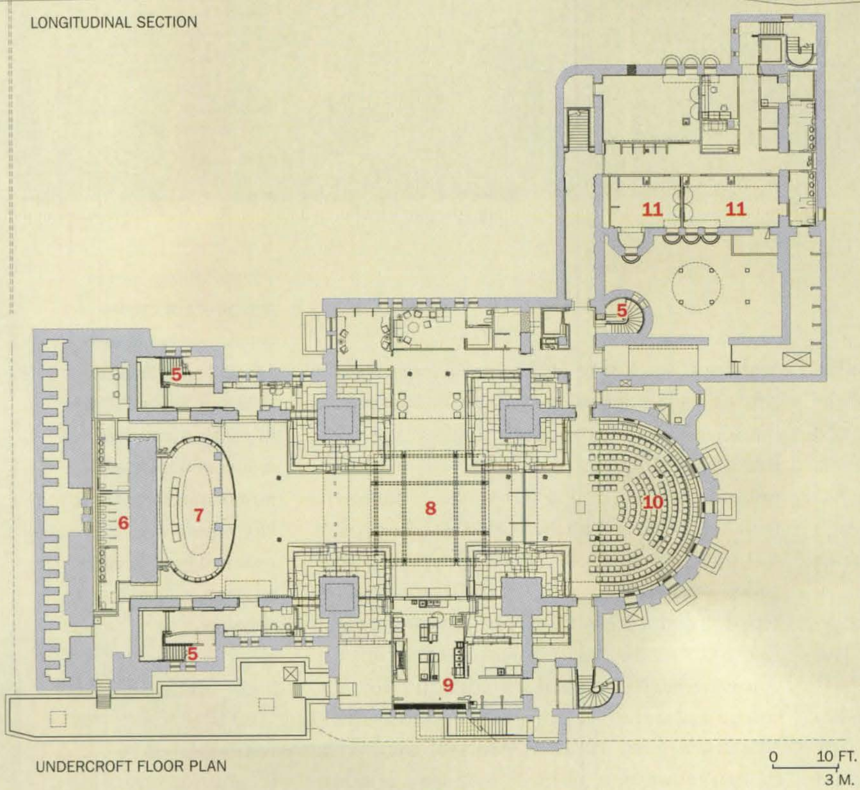
A rich history to be preserved

Built between 1872 and 1877, Trinity Church cemented Richardson's reputation and sparked widespread imitation of his Romanesque-influenced style. The church, a Greek cross in plan, is constructed of granite with brownstone trim, as is the adjoining parish house. The structure rests on a foundation comprising a forest of some 4,500 wood piles, as well as four massive granite piers located underneath the corners of the church's main

The undercroft (right) adds much-needed flexible gathering spaces underneath Trinity. Scaffolding (below right) was designed to protect the exterior granite and brownstone while visually blocking them as little as possible.

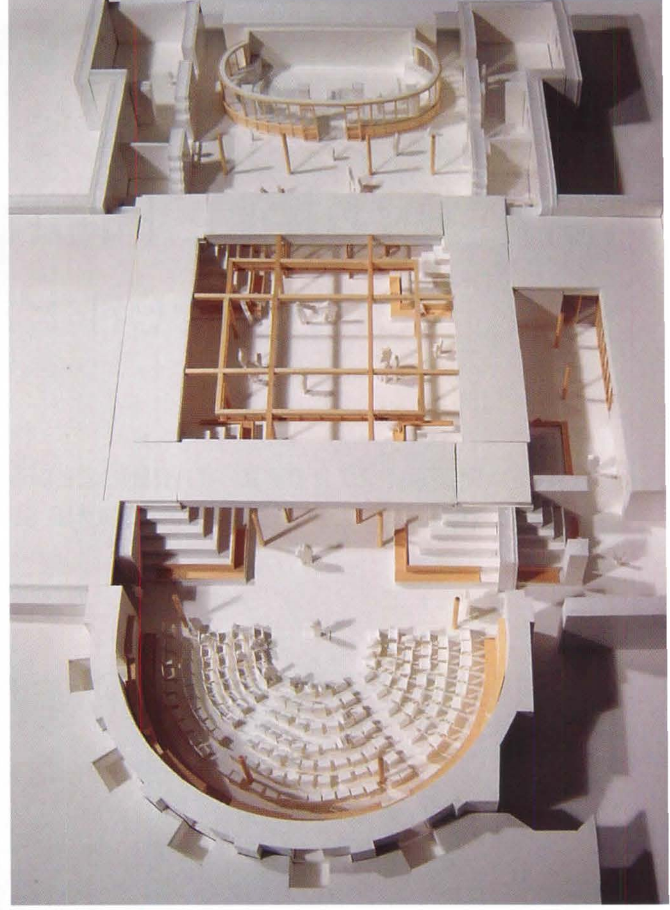


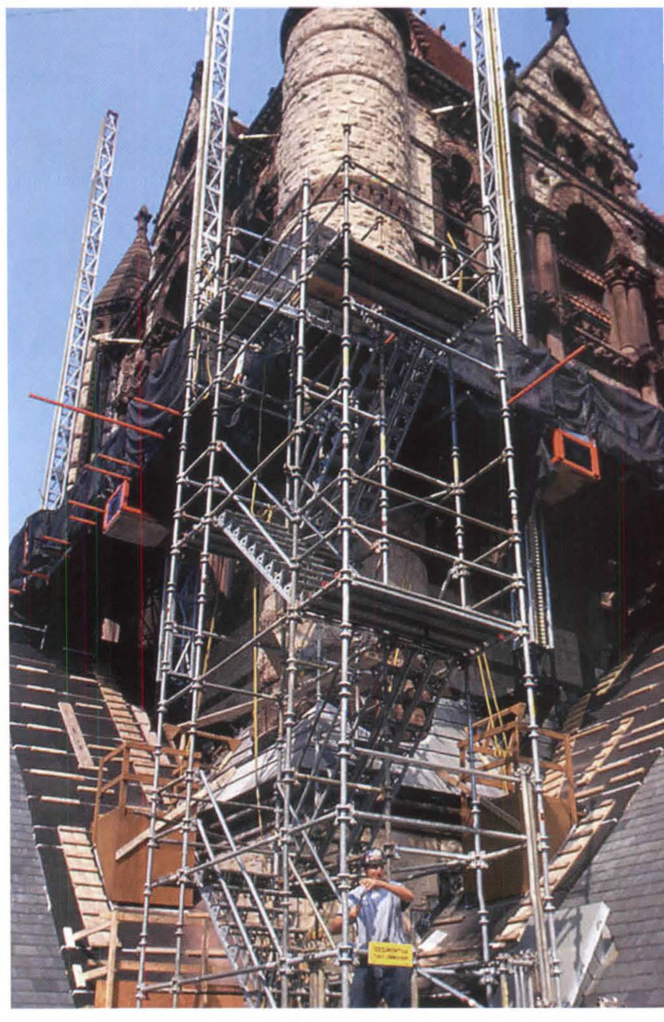
LONGITUDINAL SECTION



UNDERCROFT FLOOR PLAN

1. *Central tower*
2. *Main sanctuary*
3. *Undercroft*
4. *Wood piles*
5. *Stair*
6. *Bathroom*
7. *Bookstore*
8. *Commons area*
9. *Kitchen*
10. *Forum/chapel*
11. *Meeting/classroom*





tower. The artist John La Farge completed the murals and decorative painting. He also crafted the stained-glass windows, with the help of Eugene Oudinot, Henry Holiday, and others.

The church has been altered slightly over the years by a number of different designers. In the 1890s, the west porch was added and towers finished by Richardson's successor firm Shepley Rutan & Coolidge. The present chancel dates from the 1930s; in the 1950s, the interior of the nave was restored and the vestibule modified. The interior of the parish house has been remodeled numerous times.

Goody Clancy's restoration followed the Secretary of the Interior's standards for rehabilitating historic buildings, according to principal Joan Goody, FAIA. Normally applied in projects vying for preservation tax credits (not a factor for the tax-exempt church), the standards stipulate that a building's historic character be maintained, original features and significant historic changes be preserved, and new construction and exterior changes be distinct from existing features and reversible. "We touch anything designed by Richardson only where we have to—and with the lightest touch," Goody says.

An HVAC system that's nearly invisible

The mechanical systems at Trinity were long overdue for an upgrade, and the addition of the undercroft meant an increase in heating and cooling loads. Concerns about energy efficiency led to the installation of a geothermal HVAC system that draws on six, 1,500-foot-deep geothermal wells that tap the constant temperature of the bedrock to efficiently condition Trinity's interior [RECORD, July 2003, page 156]. While this form of heating and cooling is popular with preservationists, in part because of its relatively unobtrusive equipment, it wasn't initially part of the program for Trinity because the architects didn't realize it was feasible at the site. As the design team struggled with where to place bulky mechanical equipment and ways to disguise it, Cosentini Associates suggested using the geothermal system. "We kind of backed into it," admits Jean Carroon, AIA, a principal at Goody Clancy and head of the firm's preservation and renovation practice.

Although geothermal systems are increasingly popular in the Boston area, the Back Bay's gravel landfill and variable surface water posed problems at the site. "There's surface water down to 270 feet, so we had to seal the wells down to 280 feet until they hit bedrock," Carroon says.

As of early November, there were no performance data yet for the HVAC system, which had only recently come online, according to Carroon. The initial cost of the ground-source heat pumps for Trinity was comparable to conventional HVAC systems, which would have required structural reinforcement of the church's upper story, complex piping to reach a mechanical room, and labor-intensive camouflaging of the system, she noted.

At present, all the HVAC equipment, along with security systems, alarms, and water monitoring, are handled through a centralized direct digital control system. Such systems are standard for many types of institutional buildings, but "it's an incredible leap forward for the church because it allows the director of facilities to monitor and change fan speeds, room temperature, and security from off-site or one central location on-site," says Carroon. Lighting systems are also managed through a programmed master panel, allowing better control over, and oversight of, Trinity's energy consumption.

Digging deep to add space

Expanding the basement to create the undercroft required careful choreography to preserve the structural integrity of the building while accommodating construction work and permitting regular church services. Before the expansion, the area underneath the church was a shallow storage cellar. The contractors had to excavate 4 feet down to create enough clearance for the undercroft, which, because of the hemmed-in site, had to be fitted entirely within the confines of Trinity's existing foundation.

Shawmut dug more than 20 test pits around the foundation so that engineers could inspect the wood piles. Few of the roughly 4,500 piles under Trinity were found to be damaged, according to Carroon. The design team also discovered that redundant piles had been driven underneath the church's chancel area, evidence that Richardson's design evolved during construction.

Goody Clancy's design for the undercroft provides modern amenities while mirroring elements of Trinity's main floor. The architects replaced the thicket of brick piers that supported the cellar with widely spaced columns to create a more open, flowing interior space that can accommodate gatherings of many sizes. Some of those new columns were placed on the redundant wood beams, according to Carroon. By exposing the massive pyramid-shaped granite piers that support Trinity's 130-foot central tower, they evoke the monumental aspects of the church above while visually anchoring the space. LeMessurier's structural scheme also allowed the designers to float new steel grade beams over the four piers, instead of transferring more weight to them. The new steel grade beams and columns also carried the weight of the interior scaffolding used by painting conservationists in the central tower.

Poor soil conditions and an irregular water table made underground construction tricky, but Trinity's new undercroft can hold up to 800 people for large gatherings and special events.

The details of the new space—wooden benches, columns, and small expanses of paneling—are spare but well-crafted. Other than the granite piers, the undercroft's boldest features are a pair of intensely colorful, structural glass walls, which echo the stained-glass windows, murals, and decorative painting above. The 32-by-9-foot walls, designed by Alexander Beleschenko and Rafaella Sirtoli Schnell, each feature a pair of 8-foot-wide pivoting doors, permitting the space to be partitioned as needed. The walls are hung from the grade beams and closely fit the contours of the granite piers that the church's tower rests on.

Access to the undercroft is gained via new stairwells from the main floor to the basement. These line up below the original narthex (vestibule) stairs to the balcony and have comparably proportioned but simplified elements, in keeping with preservation goals. Similarly, a new elevator was installed in a former storage closet to minimize its visual impact; and metal handrails of a handicapped entrance that are cut into the brownstone cloister colonnade are made of a different material, and are not attached to the stone.

Working around congestion

The technical and logistical challenges of the renovation were particularly stiff because the Trinity parish continued to use the church for services and hundreds of other programs during construction. Project managers had to schedule accordingly and work around the congestion of Copley Square, with its crush of tourists, shoppers, and vehicular traffic. Space on-site was tight—the project team was able to carve out only 4,000

PHOTOGRAPHY: © PETER VANDERWARKER (OPPOSITE, BOTTOM)

In the new undercroft, Goody Clancy exposed the granite piers that support the church's main tower (above). Colorful walls of structural glass pivot open for large events, or can be closed to create more intimacy and acoustic privacy for smaller gatherings (right). Low-VOC paints and adhesives and recycled materials were used throughout.

PHOTOGRAPHY: © PETER VANDERWARKER (TOP); COURTESY RAFFAELA SIRTOLI SCHNELL (RIGHT)

square feet of temporary space for use during construction.

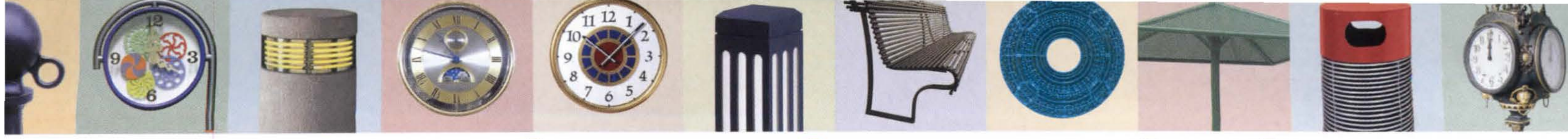
Because the church was in use throughout the project, interior spaces and sight lines had to be obstructed as little as possible. The scaffolding used for nine months during the restoration of the central tower's murals and decorative painting rested on four, 8-inch-square legs, blocking views much less than a conventional arrangement. To keep dust, fumes, and noise from occupied areas, contractors built a barrier ceiling and kept work spaces at negative pressure. For the tower's exterior, Shawmut used mast-climbing platform scaffolding to minimize damage to the masonry. Steeplejacks were employed for upgrading the tower roofs.

Green but not LEED

As with its other preservation projects, Goody Clancy looked for sustainable materials and design options. While the firm boasts some 50 LEED-accredited professionals, the project team opted not to apply to the U.S. Green Building Council for LEED certification. Overall, Carroon says, LEED's checklist system undervalues reuse and doesn't make exceptions for some of the performance characteristics of older buildings, but she adds that its popularity and catalyzing effect on the market for green design and products shouldn't be discounted. "It was just a given that if you could choose among products, you picked local, durable materials with recycled content and the potential for cradle-to-cradle lifecycling," she said.

Besides the geothermal HVAC system, other sustainability measures at Trinity include the use of recycled glass tiles in the undercroft bathrooms, low-VOC paints and adhesives, energy-efficient lighting fixtures, and water conservation measures. Runoff from the newly waterproofed roof is captured and channeled underground to maintain subsurface water levels on-site, which not only reuses the water on-site but also helps keep the wood-pile foundation fully submerged to avoid dry rot.

Trinity's restoration drew on Goody Clancy's long experience with both preservation and sustainability. While Carroon says that no single technical challenge they faced was overwhelming, the complex job required creativity in both design and logistics. Ultimately, the pieces fell into place because the project team bore in mind both the building's history and its ongoing use, according to Goody. "You always have to design to the story of the space," she said. ■



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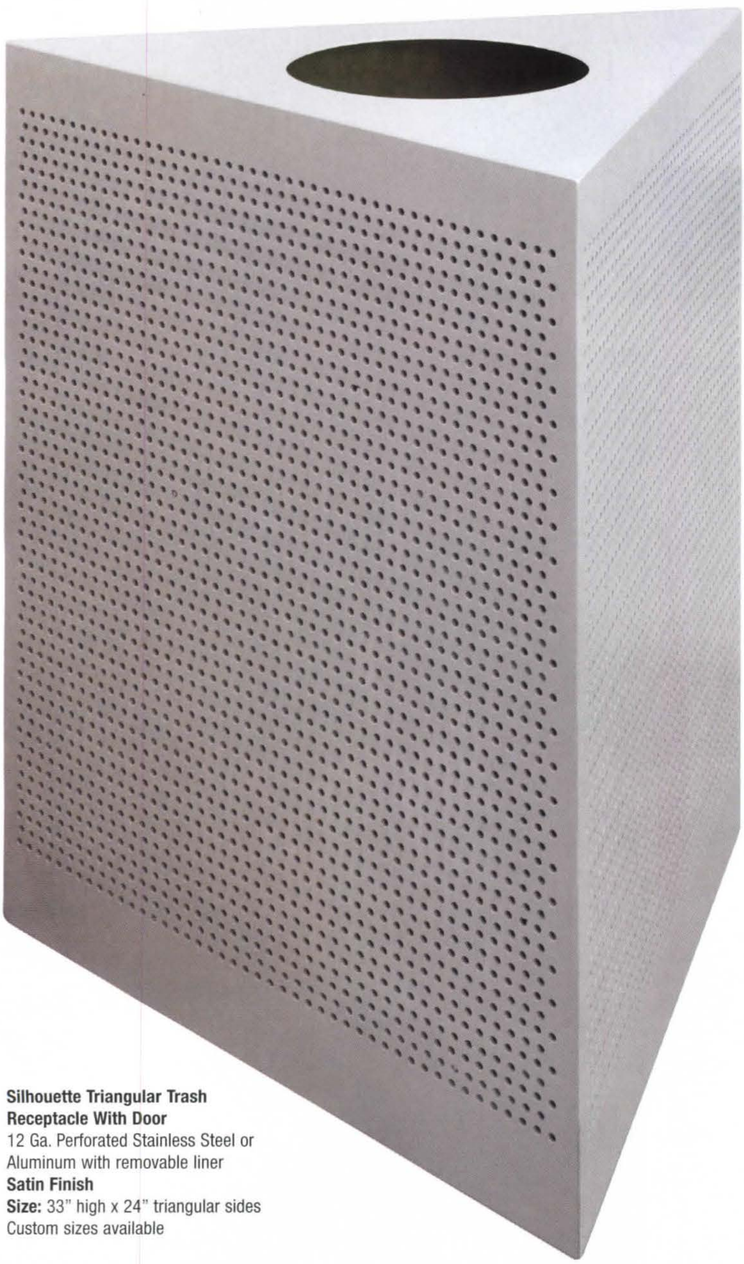

Above:
Metropolitan Bollard: Triangular
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Satin Finish
Size: 48" high x 15" triangular sides
Custom sizes available
Pipe Size: 8" Schedule 80 pipe
(to be filled with concrete)

Right:
Metropolitan Bollard: Square
Stainless Steel or Bronze
Satin Finish
Size: 48" high x 8 7/8" square sides, with slanted top
Custom sizes available
Pipe Size: 8" Schedule 80 pipe
(to be filled with concrete)

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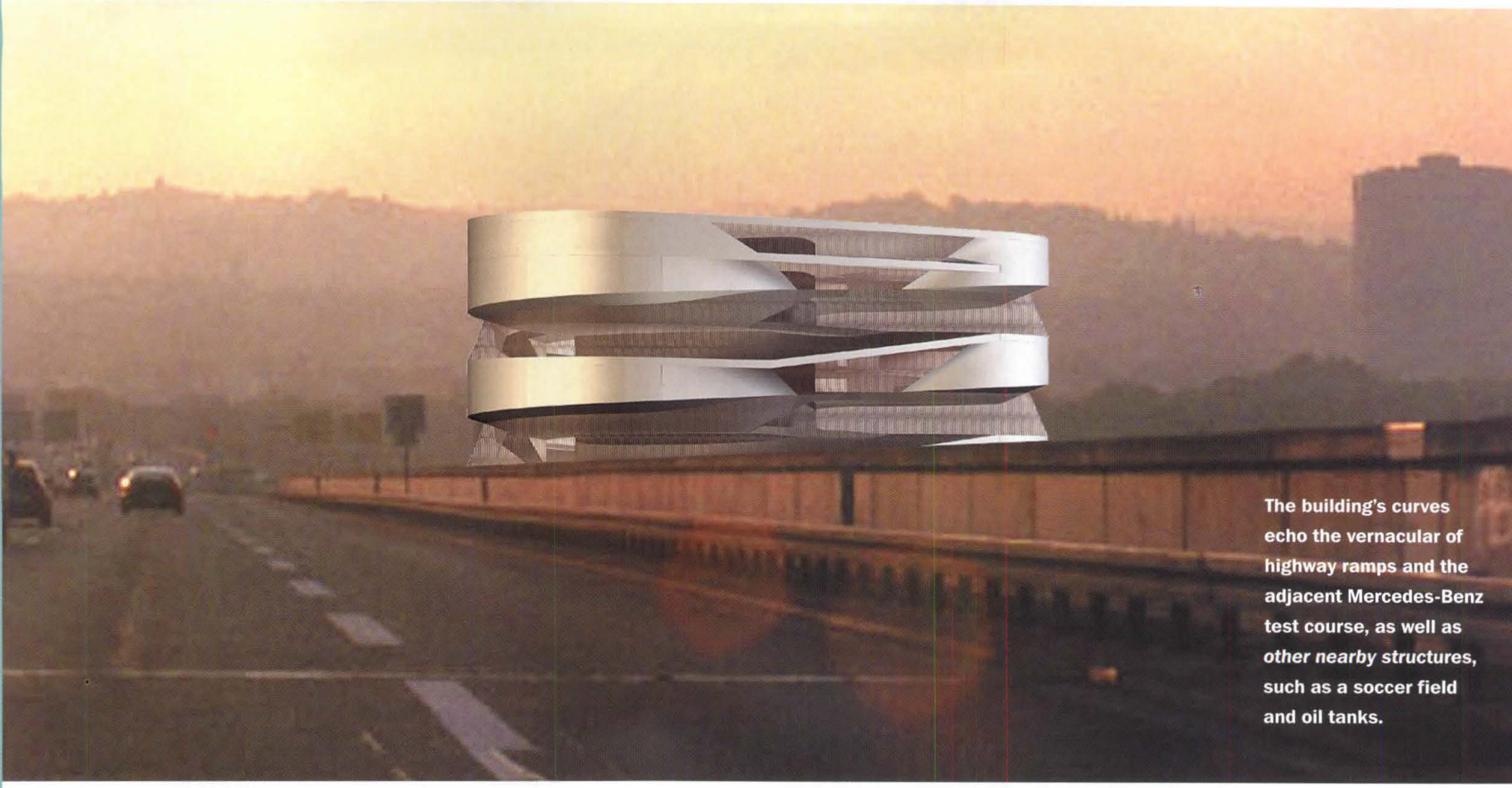


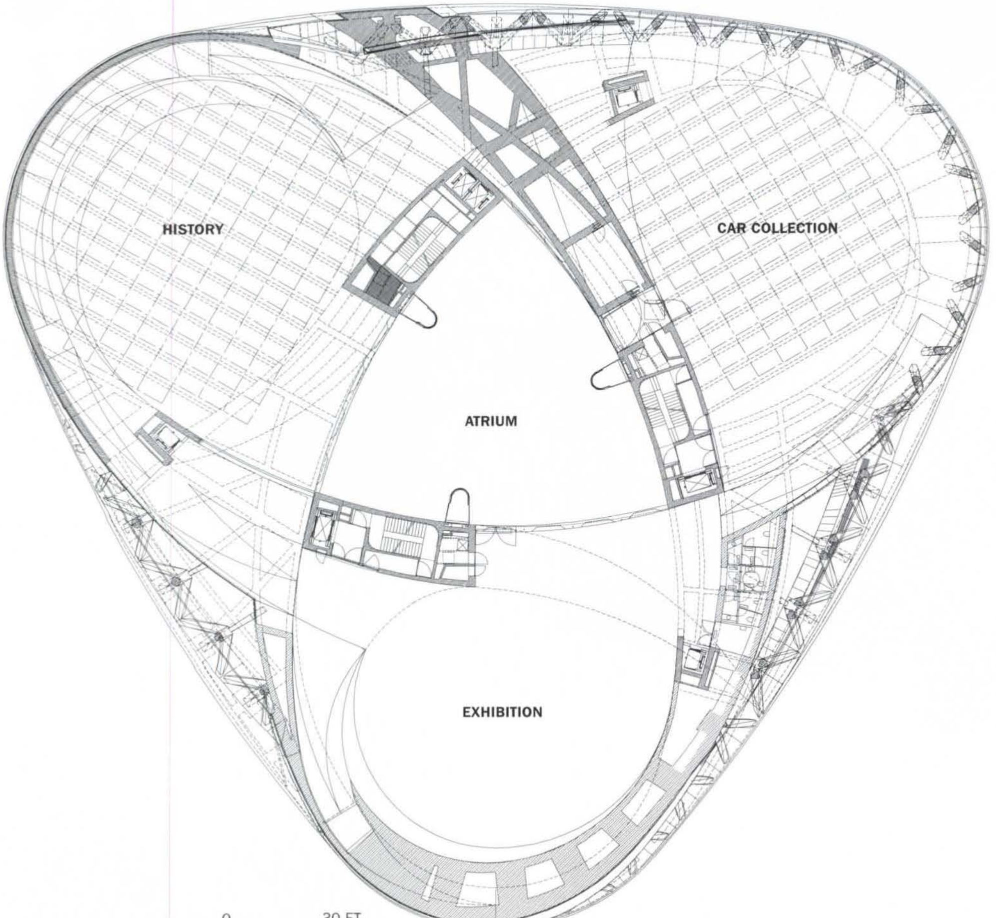
The building's curves echo the vernacular of highway ramps and the adjacent Mercedes-Benz test course, as well as *other nearby structures*, such as a soccer field and oil tanks.

Car culture gets a big boost in Stuttgart

By Deborah Snoonian, P.E.

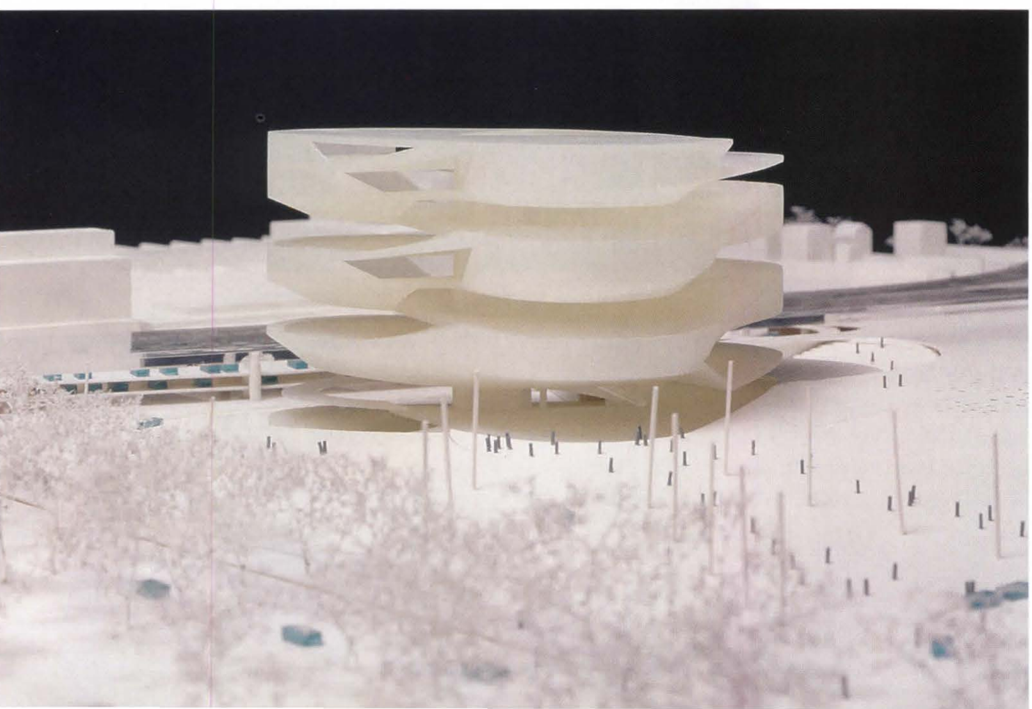
Nearly half a million people visit the Mercedes-Benz Museum in Stuttgart every year—that's three quarters of the population of the city. To accommodate growing crowds, the carmaker chose a six-story design by UN Studio and engineer Werner Sobek for a new concrete structure that will stand out prominently in its industrial setting. A trefoil design in plan, each floor consists of two propeller-shaped sections, differing in height by about 3 feet, which are rotated 120 degrees in each successive level. The rotation and vertical offsets produce a complex structure spatially that nevertheless utilizes repetitive structural elements. Circulation for the 270,000-square-foot building mimics the top-down logic of Frank Lloyd Wright's Guggenheim, but instead of a single continuous ramp, two ramps intertwine like strands of DNA around the central, triangular-shaped atrium. Exhibits will be organized chronologically from top to bottom, with model cars and trucks visible from several vantage points through walls of structural glass. The building will open in 2006.

IMAGES: COURTESY UN STUDIO, EXCEPT © CHRISTIAN RICHTERS (OPPOSITE, BOTTOM)



FIFTH LEVEL FLOOR PLAN

Visitors will see a multimedia orientation program as they ascend the atrium; the exhibitions combine model cars and trucks with storytelling and history (right). Symmetrical in plan, the building utilizes repetitive structural elements (above). The project includes sprucing up the surrounding industrial area (below).



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Tech Briefs

BYTES

Architecture firm HOK recently recognized its 50th anniversary by donating $500,000 to fund the construction and staffing of a solar-powered diagnostic and treatment center for tuberculosis patients in southeastern rural Kenya. The project will be part of a 24-building complex known as Mbirikani Clinic.

Southern California Edison and San Diego Gas & Electric are teaming with startup Stirling Energy Systems to build the two largest solar energy farms in the world, eclipsing the capacity of rival fossil-fuel driven plants. The two plants, which will have a combined capacity of 800 megawatts, will be located in southern California.

Two Canadian scientists have proposed equipping nuclear power plants with wind turbines to power electrolysis cells that make hydrogen fuel. The process would be cheaper than conventional, electricity-based methods for making hydrogen, but nuclear-power detractors say it's too dangerous.

Terra Moya Aqua has recently manufactured a vertical-axis wind turbine that they claim produces up to 80 percent more power than propeller designs. The blades move slower than those on traditional, horizontal-axis turbines, creating less noise and posing less of a hazard to birds.

The University of Colorado placed first in the Department of Energy's 2005 Solar Decathlon, held annually on the National Mall. Eighteen colleges competed this decathlon to design and build the most attractive and energy-efficient solar-powered home. Cornell University placed second while California Polytechnic State University finished third.

Architect co-founds company that will turn medical waste into energy

No matter their size or purpose, health-care facilities have two things in common: They generate lots of waste and consume huge amounts of energy. Disposing of contaminated medical waste is an expensive and growing problem for hospitals and research labs, with incineration now banned and landfilling options limited to facilities in Utah or Texas. But a process under development by a company co-founded by an architect may offer a solution.

Derek Parker of Anshen+Allen Architects proposes a design for Medergy, a company he recently founded, which offers new treatment for medical waste.

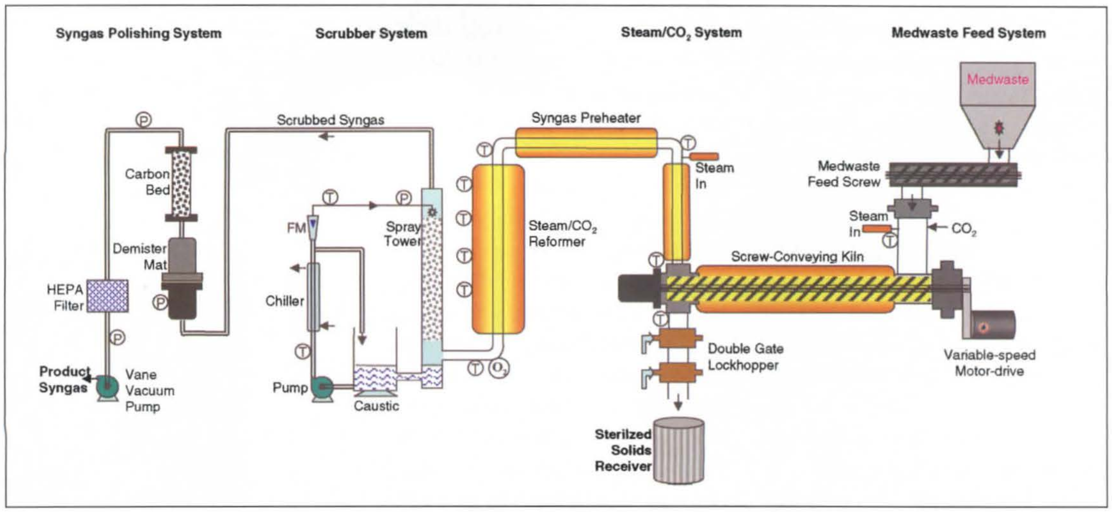
In the next 18 months, Medergy Corporation of San Francisco expects to embark on projects at two hospitals, one in Florida and one in California, to demonstrate how an existing but little-used process called "steam reformation" can detoxify contaminated and hazardous medical waste on-site. Medergy was founded by Derek Parker, FAIA, director of Anshen+Allen Architects of San Francisco, with chemical engineer and entrepreneur Terry Galloway.

Medergy's demonstration projects would feed up to 4 tons of medical waste a day into rotary kilns, which are steam-heated at 1,900 degrees Fahrenheit. The high temperature alters the chemical composition of the waste, reducing its weight by 80 percent and rendering it inert. The process produces a hydrogen-rich gas, known as syngas, that can power fuel cells, which in turn could provide electricity for the medical facilities. Carbon dioxide formed during the process could be used to produce products such as carborundum for sandpaper and abrasives or aggregate for concrete and asphalt.

According to Parker, 4 tons of waste a day—the equivalent of that produced by a 250-bed hospital—could be converted into 250 kilowatts of power without producing any greenhouse gas emissions. The projected rate of return on investment in the technology is four years, he says. Although his new company is not directly related to architecture, "It has everything to do with design and health," he says. "Architects are trained as problem-solvers, and this is simply an opportunity to use design to fix a growing problem for our clients."

A feasibility study in 2003 funded by the California Energy Commission (CEC) and the San Francisco Public Utility Commission evaluated how the treatment process might work in three San Francisco hospitals; the report summarizing the results is currently under review by CEC. The first instance of a fuel cell powered by syngas is planned for installation in Bear Creek, Tennessee, during the next six months.

The footprint of the treatment device is approximately 75 feet by 300 feet in size, and it can be located with other mechanical equipment, Parker says. As the technology advances, he adds, the size of the equipment will likely be reduced to about the size of a household refrigerator. *Larry Flynn*



A process called "steam reformation" will transform medical waste into inert by-products, producing energy.

IMAGES: © COURTESY ANSHEN+ALLEN ARCHITECTS

Tech Products

Software for both Macs and PCs

By Deborah Snoonian, P.E.

Encore DVD 1.5
Adobe Systems
www.adobe.com
Windows and Mac

Why rely on a shopworn PowerPoint presentation, when it's so easy to become a film director? Encore DVD, Adobe's authoring tool, lets you create professional-quality videos using all types of source media—from photographs and drawings to text files, audio files, QuickTime videos, and animated renderings. Simply drag and drop the source files into the authoring software, edit and compile them, and burn a DVD. The software also lets users create and customize navigation menus, and offers the ability to create templates for future videos, including the addition of standard, uneditable material like logos.

Absolute Textures
Zaragon Studios
www.absolutetextures.com
Windows and Mac

With a large customer base in Europe and a growing one in the U.S., Zaragon Studios is helping architects create renderings with a high degree of realism. An art staff trained in creating images and scenery for the high-end gaming and film industries takes high-resolution digital photographs of buildings and infrastructure, retouches them painstakingly by hand, and makes the files available for direct download through the company's Web site or on CD collections. The files can be used to render the same pattern seamlessly over a large area, such as a brick wall—a task harder to do with less costly libraries that "clip" textures from existing photos without hand corrections or adjustments.

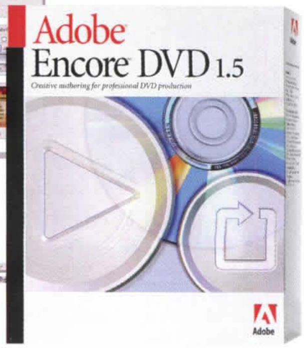
Copper 2005
Element Software
www.copperproject.com
Windows and Mac

This Australian company recently released a Web-based project and customer-relationship-management tool that's won over architectural clients because of its simple interface. An administrator creates or imports users, clients, contacts, and projects, and then project teams may log on. Functions and features include calendars, project time lines, and task management.

VectorWorks Architect 12
Nemetschek North American
www.nemetschek.net
Windows and Mac

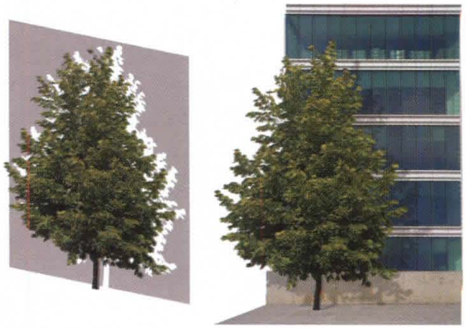
Improvements in the latest version of this CAD package focus on increasing productivity and the ability to work simultaneously with 2D and 3D information. One new feature, live sections, lets users slice 2D sectional views through a building, which are updated automatically as the building's design is modified. Developers also improved built-in libraries for building elements like wall styles, doors, windows, roofs, and stairs. Enhanced compatibility with DXF and DWG files lets users share drawings and design data more easily with clients and collaborators. The software now supports 3ds format, a popular 3D file type used online, and embeds RenderWorks radiosity for realistic presentations.

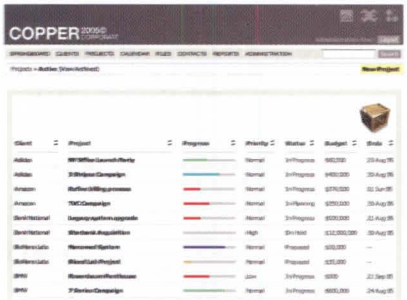
For more information on technology for architects, including reviews, vendor lists, and links, go to Digital Architect at **www.archrecord.com**.

With Encore DVD, users import text, audio, video, and image files to create professional videos.

Hand-edited objects and textures by Absolute Textures can be dropped into rendered images of projects for presentation purposes.





A clean, simple interface distinguishes the Web-based Copper 2005 from other project management software.

VectorWorks Architect 12 improves 3D modeling with 2D drawing.

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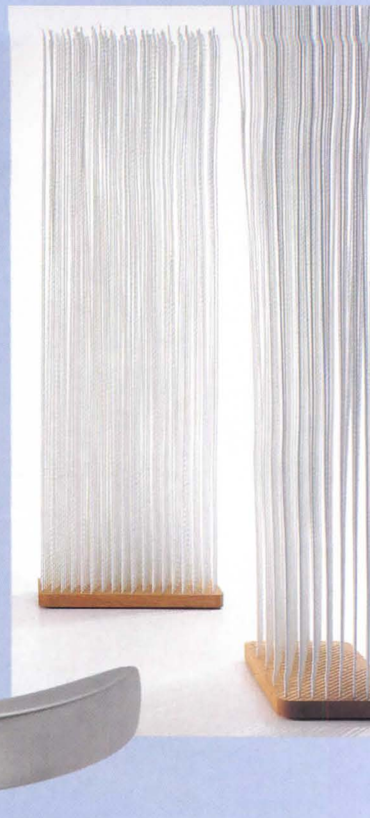
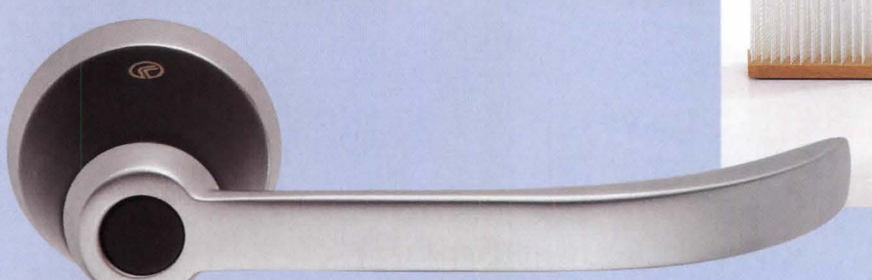
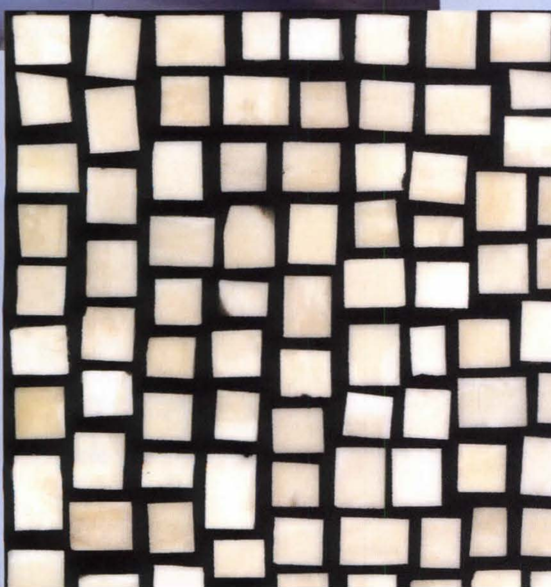




Product Reports



There is always a bit of excitement in the air at ARCHITECTURAL RECORD *on Product Reports jury day—and it's not just for the leftovers from the catered lunch. Early that morning, a conference room is arranged with hundreds of samples and submissions, organized by division, that have been collected over the previous months from the nation's leading building-product manufacturers. Once the jurors are settled, the room falls quiet as they tackle the task of helping us choose the year's most outstanding new products.*

This year, we compiled our entries according to the 2004 edition of MasterFormat, *but kept Digital Products as a separate category. Senior editor Deborah Snoonian, P.E., organized her third annual "virtual jury" to select the most innovative digital technology products. Her jury included Edward A. Goytia, AIA, director of practice operations at Mancini Duffy, New York City, and Darren J. Rizza, Assoc. AIA, firmwide director of digital design at Skidmore, Owings & Merrill, Chicago.*

Over and over again, the jurors were drawn to colorful, well-researched, and sustainable products: Some are recognized for increasing sustainability without increasing price point, while others may address a common everyday problem, such as privacy in the open workplace environment. In most cases, the winners push the boundaries of what is normally expected, rather than reinterpreting the standard.

2005

Favorites this year include interactive tiles that transfer light, described by one juror as "inventive and joyous"; a concrete technology that can be utilized as a display interface; and a rechargeable solar bollard. Finishes again emerged as one of the strongest categories due to "a great range of development and material research," according to the jury. Juror Elizabeth Weeks, AIA, noted a trend in that category toward better-designed carpets with sustainable pedigrees, but wished more tile manufacturers would follow suit. An interesting paradox: The architects loved a tile with integrated LEDs, while the lighting designers were considerably less impressed.

As always, we hope that in the following pages you will find the perfect product solution for your next project. Rita Catinella Orrell

PHOTOGRAPHY: © ANDRÉ SOUROUJON (ALL JURY/EDITOR PHOTOS)

Our 2005 Product Reports Jury

Tom Chang, AIA (seated, left), joined Helfand Architecture in New York City in 1998 and has served as project manager for clients including HBO, *TimeOut NY*, and designer Calvin Klein. Chang has managed design projects from initial design through construction administration.

Susan Kaplan (seated, center) is a LEED-accredited, certified construction specifier. In her role as director of specifications and coordinator of sustainable design at HLW in New York City, she ensures integration between members of the project team. Presently, she is environmental chair of Metro N.Y. CSI and a N.Y. Chapter USGBC board member.

Jim Conti, IALD (seated, right), is principal and director of lighting design at Jim Conti Lighting Design, Brooklyn, New York. Conti teaches lighting design at Parsons School of Design and Pratt Institute. Awards include a grant from the Nuckolls Fund for Lighting Education for a lecture series emphasizing a theoretical approach to lighting design.

Linnaea Tillett, Ph.D. (standing, left), has been principal of Tillett Lighting Design in Brooklyn since 1983. Tillett is an environmental psychologist, and her projects have received awards including the 2005 LUMEN Award for *Icepool*, *The Snow Show*, Lapland, Finland, with artist Kiki Smith and architect Lebbeus Woods.

Joseph Raia, AIA, LEED (standing, second from left), joined Leers Weinzapfel Associates Architects in Boston in 1993 and was promoted to associate in 2001. Raia is the project manager for Harvard's New College Theater at the Hasty Pudding and its Library Services Building at 90 Mount Auburn Street, Cambridge, Massachusetts, to be completed this fall.

After training as an associate with Richard Meier and I.M. Pei, David Ling (standing, center) founded David Ling Architects in New York City in 1992. Ling's project list includes galleries, retail, and high-end residential work. His list of awards includes ICFF's Best Exhibition Design (2001).

Elizabeth Weeks, AIA (standing, second from right), is an architect and associate at Gruzen Samton in New York City. For the past three years she has been responsible for organizing the resource collections at the firm. Weeks is a member of the Resource Director's Association, an organization of product and materials specialists working at A&D firms.

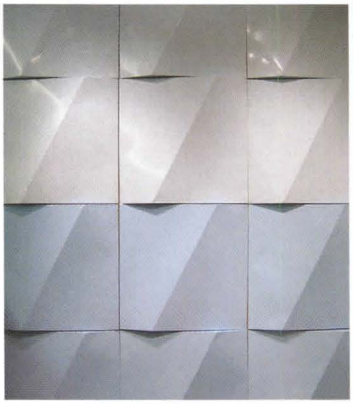
Michael Morris (standing, right) has been a partner with Yoshiko Sato in the Morris Sato Studio in New York City since 1996. Morris and Sato were recently included in the Phaidon Press publication *10x10_2* as one of 100 firms to emerge internationally during the past five years. *R.C.O.*

Editors' Picks

A baker's dozen of the year's most outstanding building product introductions

Oxygena antismog tiles, **Ideal Standard Italia**. Finishes, page 205.

Sto's Lotusan exterior coating features a self-cleaning effect modeled on the lotus leaf. [See RECORD, August 2005, page 198.]



Fry Reglet's Graph interior wall system uses a pre-engineered grid to mount modular wall panels. [See RECORD, September 2005, page 195.]

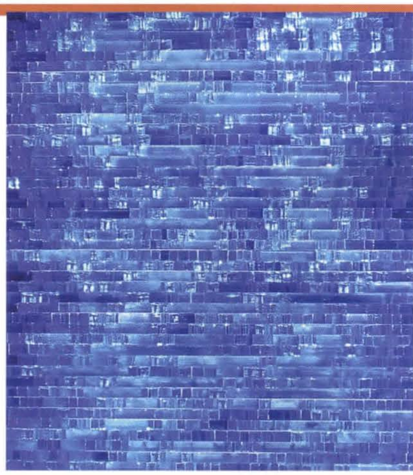
Acenti lighting controls, switches, wallplates, and GFCI receptacles, **Leviton Manufacturing**. Electrical, page 238.

Chronos Chromos Concrete display system, **Royal College of Art**. Concrete & Masonry, page 187.

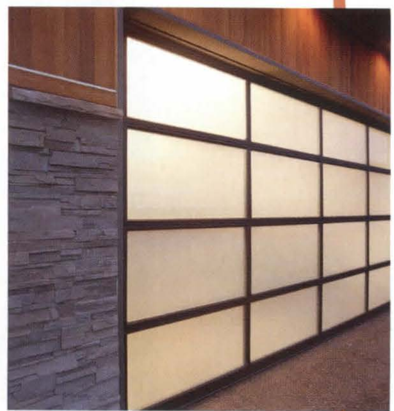
Annapolis Smart Bollard, **Landscape Forms**. Electrical, page 238.

All but one of our 2005 Editors' Picks have already made an appearance in the pages of the magazine during the course of the year. Why the encores? Sometimes we encounter a product in a trade show booth, during a presentation in our offices, or while visiting a design blog that has something about it that goes above and beyond what might be expected. We feel the selections below are standouts not only in their individual product categories—but for the building-products industry as a whole. R.C.O.

The Venting Picture Window, from **Marvin Windows and Doors**, combines unobstructed views and cross ventilation. [See RECORD, June 2005, page 207.]



SensiTile light-reacting tiles, **SensiTile Systems**. Finishes, page 209.

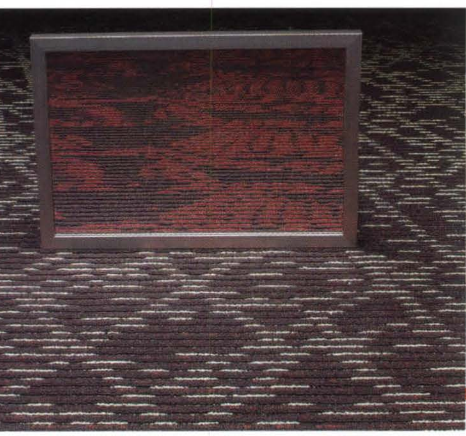


Avante Collection of garage doors, **Clopay**. Openings, page 202.

PureBond plywood and agrifiber-core panels, **Columbia Forest Products**. Top Ten Green Products, page 183.

Solarban 70 XL solar control glass offers an unprecedented combo of solar control and visible-light transmittance. **PPG**, Pittsburgh. www.ppgideascapes.com **CIRCLE 200**

Babble white noise machine, **Sonare Technologies**. Communications, Security & Exterior Improvements, page 241.

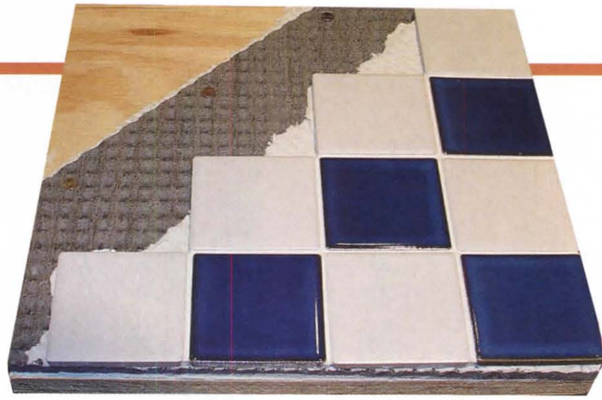


Product2Faced broadloom carpeting from **Lees Carpets** offers patterns and colors that completely evolve with differing views. [See RECORD, August 2005, page 191.]

Top Ten Green Products

Fourth annual award highlights the year's most innovative sustainable building products

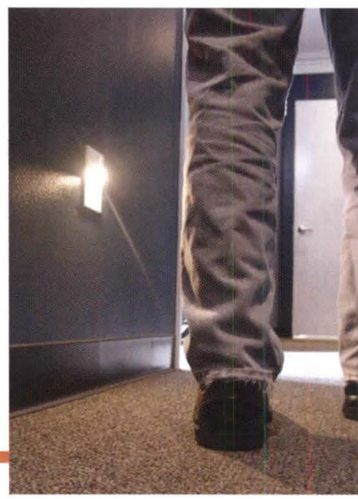
The **Aquia dual-flush toilet** can save up to 7,000 gallons of water a year for the average family of four by using a standard flush for solid waste and a lower-volume flush for liquid and paper. TOTO, Morrow, Ga. www.totousa.com **CIRCLE 201**



Nybacker tile backer-board uses postconsumer and postindustrial recycled carpet which, unlike cement-based backer board, does not release silicon dust when it is cut. The board features a rough surface with indentations for tile adhesion on one side, and easily affixes to plywood on the other. Nycore, Atlanta. www.nycore.com **CIRCLE 202**

BioNet erosion-control mats reduce pollution and are 100 percent biodegradable, with a straw core, cotton netting, and stakes made from either wood or PLA. North American Green, Evansville, Ind. www.nagreencom **CIRCLE 203**

To cool commercial buildings, the **Ice Bear thermal energy storage system** circulates refrigerant through ice that is frozen at night to an evaporator coil and blower for daytime cooling. The system reduces peak daytime electricity demand and consumption for cooling costs by 95 percent. Ice Energy, Windsor, Colo. www.ice-energy.com **CIRCLE 204**



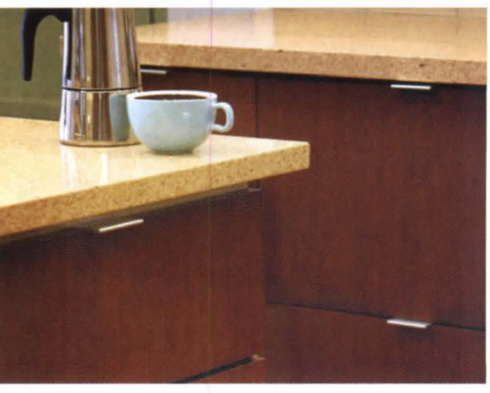
Enbryten LED luminaires use high-efficiency white LEDs, consume only 15–18 watts while producing enough light to replace incandescents, and last 30,000–50,000 hours. Permlight Products, Tustin, Calif. www.permlight.com **CIRCLE 205**

At last month's GreenBuild Conference in Atlanta, BuildingGreen, publisher of the GreenSpec Product Directory *and* Environmental Building News, *announced the year's top 10 green building products. "Most of the Top 10 products this year have multiple environmental attributes," says* GreenSpec *coeditor Alex Wilson. Products in the group save water or energy, are made from recycled waste or biobased material, offer alternatives to PVC, plasticers, or formaldehyde, or feature a combination of these attributes.* R.C.O.

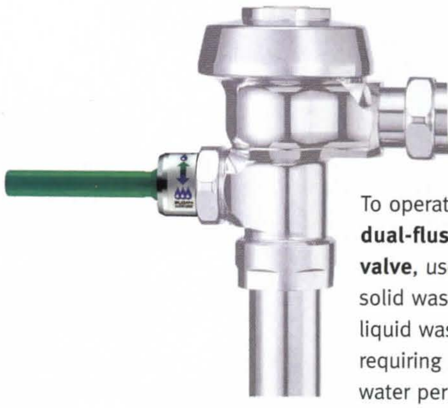
Terratex biobased textiles are made from rapidly renewable, biobased PLA derived from agricultural feedstocks. Interface, West Newton, Mass. www.terratex.com **CIRCLE 206** Carnegie, Rockville Centre, N.Y. www.carnegiefabrics.com **CIRCLE 207**

By replacing stale indoor air with fresh outdoor air, the **UltimateAir RecoupAerator 200DX energy-recovery ventilator** removes indoor pollutants. It also features high heat-recovery efficiency. Stirling Technology, Athens, Ohio. www.ultimateair.com **CIRCLE 209**

Stonescape polymer composition tile is a PVC-free alternative to VCT. Made from limestone and ethylene acrylic, the tile requires less stripping and waxing. American Biltrite Canada, Mississauga, Ontario. www.americanbiltrite.com **CIRCLE 208**



PureBond plywood and agrifiber-core panels use a soy-based binder instead of urea-formaldehyde and are water-based, nonflammable, and nontoxic. The binder, used in panels made from straw and hardwood plywood, releases only water vapor during curing. Columbia Forest Products, Portland, Ore. www.columbiaforestproducts.com **CIRCLE 210**



To operate the **Uppercut dual-flush flushometer valve,** users push down for solid waste and pull up for liquid waste, with the latter requiring a half gallon less of water per flush. Sloan Valve, Franklin Park, Ill. www.sloanvalve.com **CIRCLE 211**

Second is First.

Comfort Ti-AC 40™ on Tints from AFG Glass

- By glazing the low-e coating on the second surface of a commercial insulating unit—instead of the third surface—AFG is able to put the coating closer to the sun, resulting in enhanced solar protection and improved year-round energy efficiency.
- Compared to a third surface low-e coating, AFG's new second-surface Comfort Ti-AC 40 (on a Green tinted substrate) reduces solar heat gain coefficeint from 0.37 to 0.31—while the shading coefficient improves from 0.43 to 0.35.
- To meet a spectrum of aesthetics and design needs, Comfort Ti-AC 40 is available on Green, Dark Green, Bronze, and Gray substrates.
- For maximum flexibility and efficiency, AFG's new low-e tinted products are available with post-temperable coatings.

For more information on how you can improve your glass offering with Comfort Ti-AC 40 on Tints, contact your AFG Glass sales representative or call 800.251.0441.

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Digital Products

3D CAD • Hardware • Plug-in software • Online services • Sketching and presentation

This year's winners are used by firms of many sizes. We'd like to commend @Last Software especially, for its work with learning-disabled children. —*DEBORAH SNOONIAN, P.E.*

Sketching grows up

SketchUp has become a beloved design tool for its ease of use and simple interface. The software makers have even been working with primary-school teachers, who have found it helps children as young as five conceptualize their thoughts—even kids suffering from autism. @Last Software, Boulder, Colo. www.sketch3d.com **CIRCLE 212**

Keep in touch

The BlackBerry 8700 series ensures that users stay in constant communication with its telephone, e-mailing, browsing, and organizing capabilities. Architects will appreciate the ability to preview PDF files and images. Research In Motion, Waterloo, Ontario. www.blackberry.com **CIRCLE 213**

Sustainable samples

Tricycle's SIM offers realistic and color-accurate online carpet samples that combine both CAD and manufacturing data. The excellent printed and on-screen views eliminate the need to manufacture and mail traditional carpet samples, saving both time and carpeting waste. Tricycle, Chattanooga. www.tricycleinc.com **CIRCLE 214**

Push of a button

Pushbutton Plus makes creating PDF documents from AutoCAD files a snap. With a single mouse click, the software captures line weights and page sizes to create digital archives that nearly any computer can open. Bluebeam Software, Pasadena, Calif. www.bluebeam.com **CIRCLE 215**

Sketching like a pro

When using a tablet PC or digitized pen tablet, Sketchbook Pro lets users draw right over photographs or drawings. Layering capabilities preserve the original image and subsequent iterations for presentations and on-the-fly sketching sessions. Alias, Toronto. www.alias.com **CIRCLE 216**

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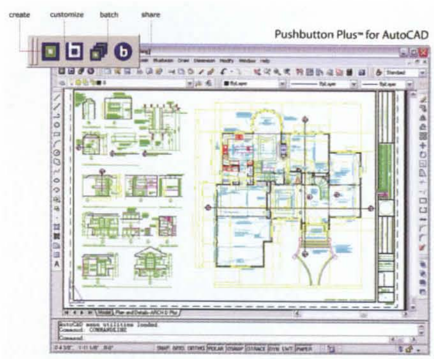

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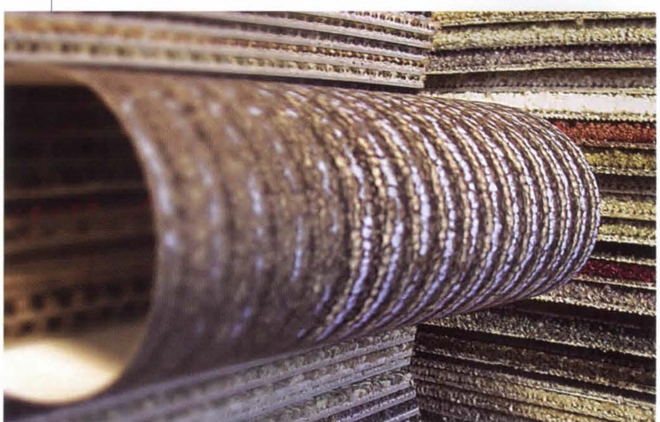

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CONCRETE THINKER JOHN BOECKER

“I BECAME AN ARCHITECT HOPING TO MAKE A MEANINGFUL CONTRIBUTION. SUSTAINABLE DESIGN HELPS ME DO THAT.”

BEAUTIFULLY SUSTAINABLE

John Boecker wants to do more than design beautiful buildings. He wants to design beautiful buildings that are healthy, profitable and most importantly environmentally responsible.

CONCRETE MAKES THE GRADE

Built with concrete, Clearview Elementary School consumes one-third less energy than a conventional structure saving the community an estimated $34,000 annually in energy costs. Insulated concrete forms (ICFs) offered energy efficiency, durability and design flexibility to this LEED-Gold-certified school in Hanover, Pennsylvania. An innovative concrete mix incorporating recycled materials contributes by reducing waste and embodied energy.

John Boecker, AIA
L. Robert Kimball & Associates

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Concrete & Masonry

High-performance structural concrete • Cast-in-place concrete • Exterior imitation stone cladding

Chronos Chromos Concrete system is a dynamic and inventive application for concrete surfaces. I am interested to see how this product further develops. —*JOE RAIA, AIA*

Creative concrete

The Chronos Chromos Concrete system can display patterns, numbers, and text in concrete surfaces for indoor or outdoor applications. Developed by Chris Glaister, Afshin Mehin, and Tomas Rosén of the Royal College of Art's Innovation Unit, the system works when thermochromic ink is mixed with concrete. Nickel chromium wires, which heat up when electric current is passed through them, are set beneath the concrete surface, and when a certain temperature is reached, the area around the wire changes color. The technology can be used where underfloor heating is installed, such as in swimming pools or bathrooms, or on concrete walls in office and public environments. Royal College of Art, London. www.innovation.rca.ac.uk/archive/students.html **CIRCLE 217**

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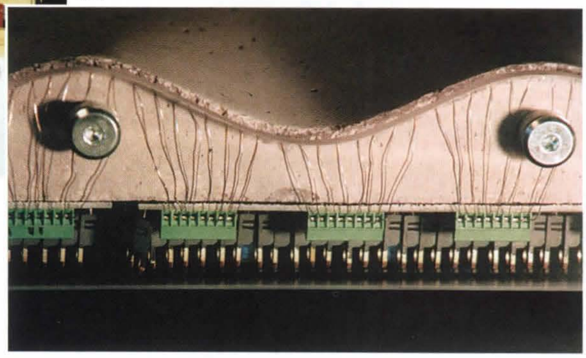

Tough stuff

Structures USA founder Andrew C. Dennis has invented a new form of lightweight concrete that does not use portland cement, sand, or gravel. Giga-Crete has a tensile capacity that far exceeds conventional concrete, does not shrink or crack, and can be made up to three times stronger. The material is usable in only eight hours, saving labor costs and making it a less expensive building solution. Structures USA, Las Vegas. www.gigacrete.com **CIRCLE 218**

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Cladding stands up to anything

With excellent UV resistance, low moisture absorption, and freeze/thaw resistance, DuPont Exterior cladding is meant to stand the test of time. Claimed to have easy graffiti removal and finish restoration, the cladding is available in a variety of shapes, contours, surface textures, and finishes. DuPont, Wilmington, Del. www.corian.com **CIRCLE 219**

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Metals, Woods, Plastics & Composites

High-pressure laminates • Stainless-steel wire rope assemblies • Veneers • Metal castings • Anodic coatings • Decorative metal • Composite fabrications

I find the Tambour paneling by Plyboo in raw black to be a striking combination of drama, texture, and sustainability. This product is a great addition to the wood vocabulary. —*DAVID LING*

Going against the grain

Lamitech, the largest exporter of decorative high-pressure laminates in Latin America, has partnered with Patrick Industries to introduce two new wood grains as well as a new solid laminate in an Acid Green color. Zebrano is the lighter of the two wood grains and comes in a matte finish, while Zebrawood is darker and glossy. Patrick Industries, Elkhart, Ind. www.patrickind.com **CIRCLE 220**

Green decor

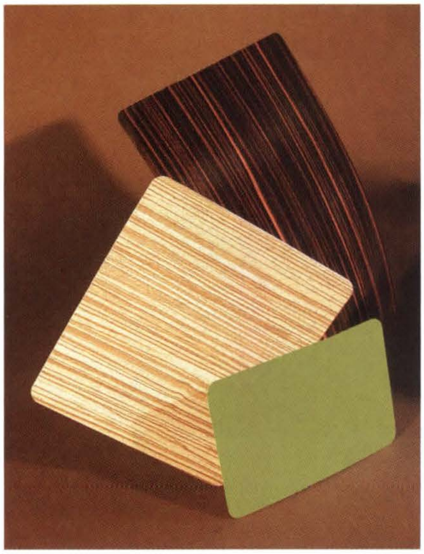
Tefor is a 100 percent recycled, non-porous, high-impact decorative surface made from phenolic dust and non-virgin polypropylene. It can be used for interior applications such as retail shelving, backsplashes, and vertical cladding. It comes in seven colors: black, brown, gray, green, navy, rust, and yellow. Abet Laminati, Englewood, N.J. www.abetlaminati.com **CIRCLE 221**

Kept in suspense

Lumicast Folio, from Skyline Design, is a new collection of objects and pigments suspended in a clear polymer. Unlike laminated sheet products, all panels are hand-cast by artisans to exact specifications, eliminating waste. Offered in standard thicknesses of ¾" and in sizes up to 55" x 117", the material's light-transmitting quality makes it appropriate for feature walls, light diffusers, and most vertical applications. Skyline Design, Chicago. www.skydesign.com **CIRCLE 222**

Seaworthy steel bracket

The I-SYS Stainless Steel Fork Bracket, an elegant adaptation of the traditional boating cleat, is manufactured from stainless steel with a lightly brushed finish. Designed for superior weight holding, it is available in two sizes: 6" long x 1¼" wide and 10" long x 2" wide. The system has a long life, requires little maintenance, and is fully recyclable. Carl Stahl Decor Cable, Chicago. www.decorcable.com **CIRCLE 223**



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Metals, Woods, Plastics & Composites

High-pressure laminates • Veneers • Anodic coatings • Decorative metal • Composite fabrications

Versatile bonded metal

Madrid is the first in a series of new Bonded Metal patterns that are lightweight yet wear-resistant and offer the appearance of solid metal. Bonded Metal is available in Aluminum, Bronze, Copper, and Nickel Silver and is an appropriate surfacing material for interiors. Forms+Surfaces, Carpinteria, Calif. www.forms-surfaces.com **CIRCLE 224**

Better than lumber

The Green collection from Tabu features a line of veneers made of Forest Stewardship Council–certified woods. These veneers enable builders and architects to earn certified-wood credit from LEED, and according to Tabu, can create yields 40 times greater than using solid lumber. Tabu/WTP, Hackensack, N.J. www.tabu.it **CIRCLE 225**

Easy as sending an e-mail

Arpa USA now offers Digital Print technology that reproduces any drawing or photograph onto high-pressure laminates. The manufacturer even accepts digital images supplied over e-mail. Arpa USA, Jacksonville, Fla. www.arpausa.com **CIRCLE 226**

Clear and present cover

BlastWrap is a blast-mitigation assembly made from two laminated films filled with blast-attenuating filler materials that can be wrapped around to conform to any shape. It effectively mitigates the explosive effects of a bomb or other fire-related disasters by reducing the blast effect, extinguishing the fireball, and capturing the deadly fragmentation without dispensing chemicals. BlastGard, Clearwater, Fla. www.blastgard.net **CIRCLE 227**

A hint of the tropics

Smith & Fong's trio of wood products—Plyboo Strand Plywood, Plyboo Black Tambour, and Durapalm Plywood—provide different options for decoration and paneling. Strand (left) is made of bamboo but is durable enough (3000 PSI) to withstand commercial environments. Black Tambour (center) is made of bamboo strips applied to a thin fabric backing with a nontoxic glue and can be used on a variety of surfaces. Durapalm Plywood (right) is made of layers of nonproductive, plantation-grown coconut palm. Smith & Fong, San Francisco. www.durapalm.com and www.plyboo.com **CIRCLE 228**

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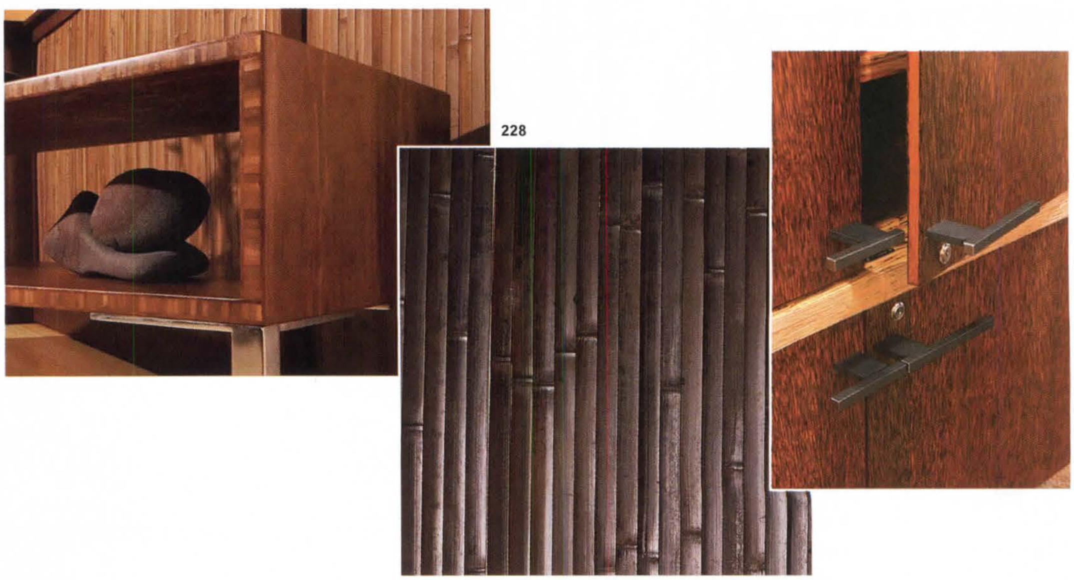

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TITE-LOC
Metal Roofing Panels

The grand Gaylord Texan Resort of the Lone Star State, references the natural materials rooted in the architecture of Texas. The Hnedak BoBo Group, Inc. chose the Tite-Loc Metal Roofing Panel in Galvalume Plus to mirror the metal roofs used throughout the region. The roofing contractor, Supreme Systems, installed 163,261 square feet of Tite-Loc Panels over this expansive roof.

Our newest roofing profiles, Tite-Loc and Tite-Loc Plus, have been designed for structural and architectural metal roofing applications and are available in a variety of materials including 22 and 24 gauge steel, and aluminum. Both profiles feature factory-applied hot melt sealant to insure weather tight performance. Panels are corrective-leveled during fabrication to provide superior panel flatness. Both profiles feature our PAC-CLAD® Kynar 500® finish, now available in 42 standard colors on steel and 37 standard colors on aluminum.

For more information regarding our complete line of metal roofing products, please call us at 1-800-PAC-CLAD or visit our website @ www.pac-clad.com.

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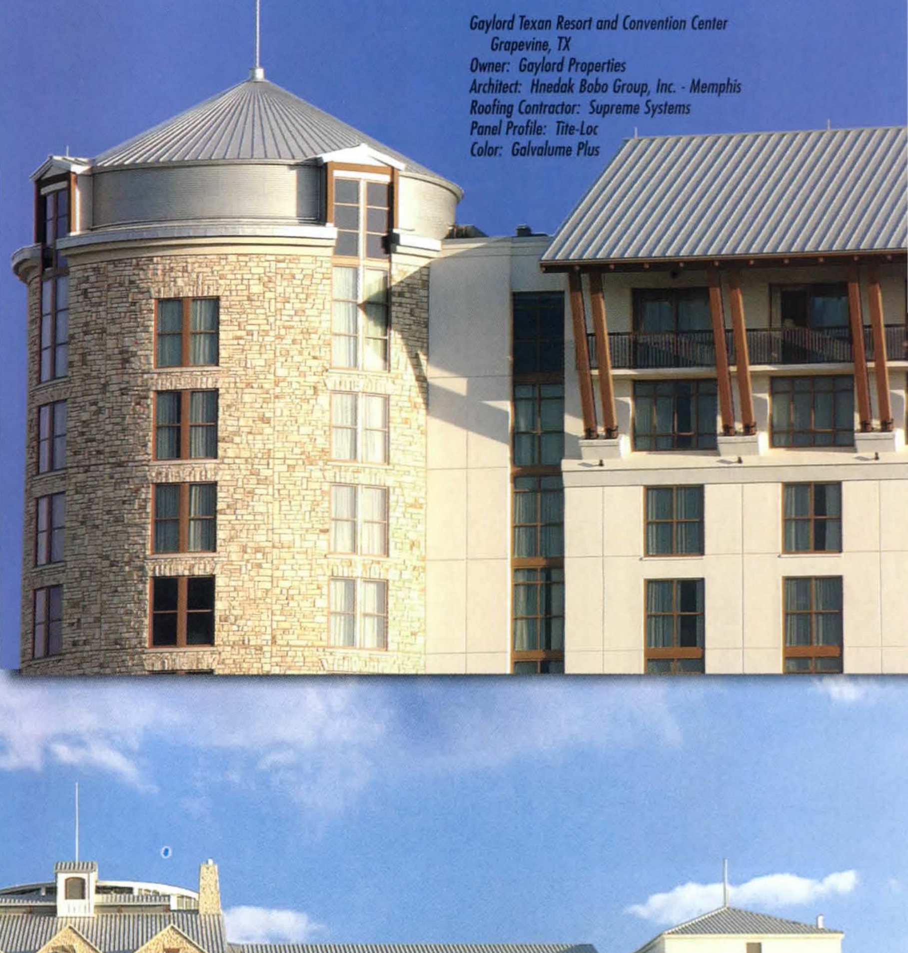
A Lone Star in the State of Texas.



Gaylord Texan Resort and Convention Center
Grapevine, TX
Owner: Gaylord Properties
Architect: Hnedak Bobo Group, Inc. - Memphis
Roofing Contractor: Supreme Systems
Panel Profile: Tite-Loc
Color: Galvalume Plus

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Metals, Woods, Plastics & Composites

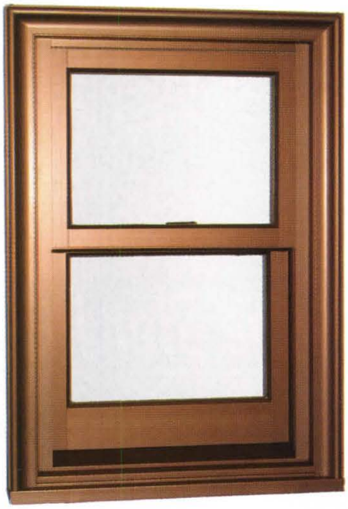
High pressure laminates • Veneers • Anodic coatings • Decorative metal • Composite fabrications

Cool copper color

Linetec has created a new copper-anodize finish that maintains its initial copper color and does not patinate over time. The product does not require ongoing treatment to maintain its color and will not leave copper salt runoff stains on a building's exterior. Linetec, Wausau, Wis. www.linetec.com **CIRCLE 229**

It's good to be green

Canopy is a resource for those interested in hard-to-source green materials. Two items in Canopy's initial portfolio include Durat (center), a durable, 100 percent recyclable, solid-surface product from Finland, and Kirei (left), an alternative wood product made from pressed, reclaimed Sorghum stalks and a formaldehyde-free adhesive. Canopy's collection of finished goods includes the 100 percent recycled, aluminum-cast-metal tiles, sinks (right), and light fixtures from Eleek. Canopy, Portland, Ore. www.canopyhome.com **CIRCLE 230**



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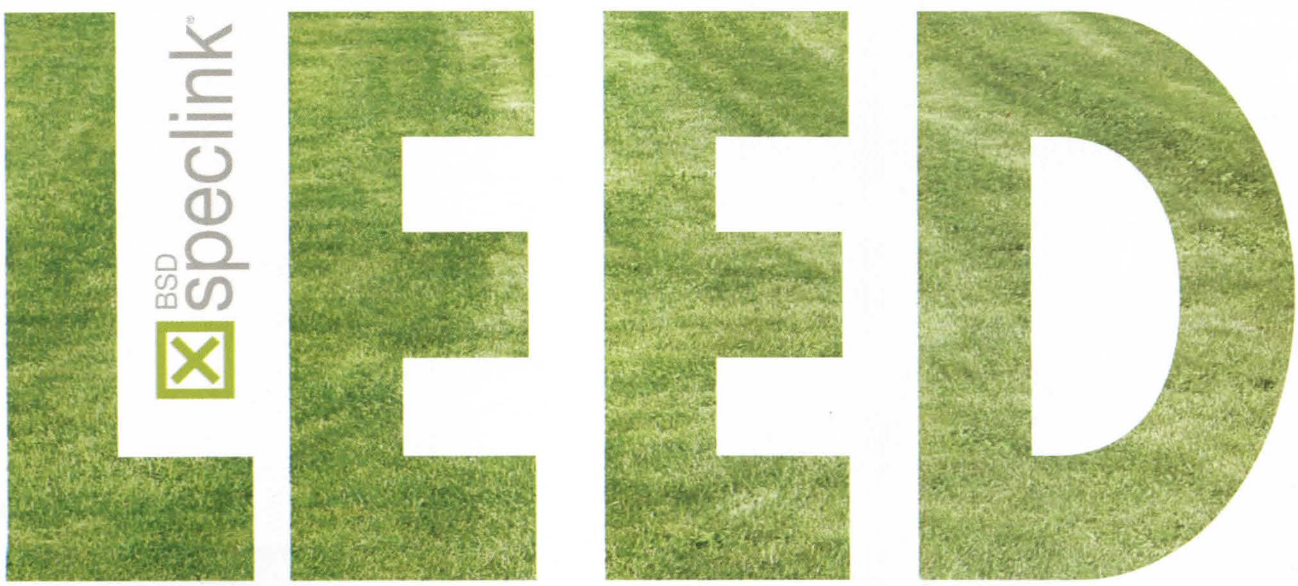

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Slip/falls cost U.S. businesses over $12 billion annually and account for 1/3 of all building insurance costs. Flooring is the cause of 50% of all slip/fall accidents.* So creating spaces with safer flooring makes economic sense. Richard Rose, director of Facility Management Systems at Canonsburg General Hospital, says, "In any public space, safety means helping people avoid slipping and falling. But in a hospital, safety is also the ability to keep an environment clean and sterile. Johnsonite flooring is ideal because it satisfies both of these requirements." Find out how Johnsonite can help you create high-performance environments that deliver economic return. 800.899.8916 www.johnsonite.com
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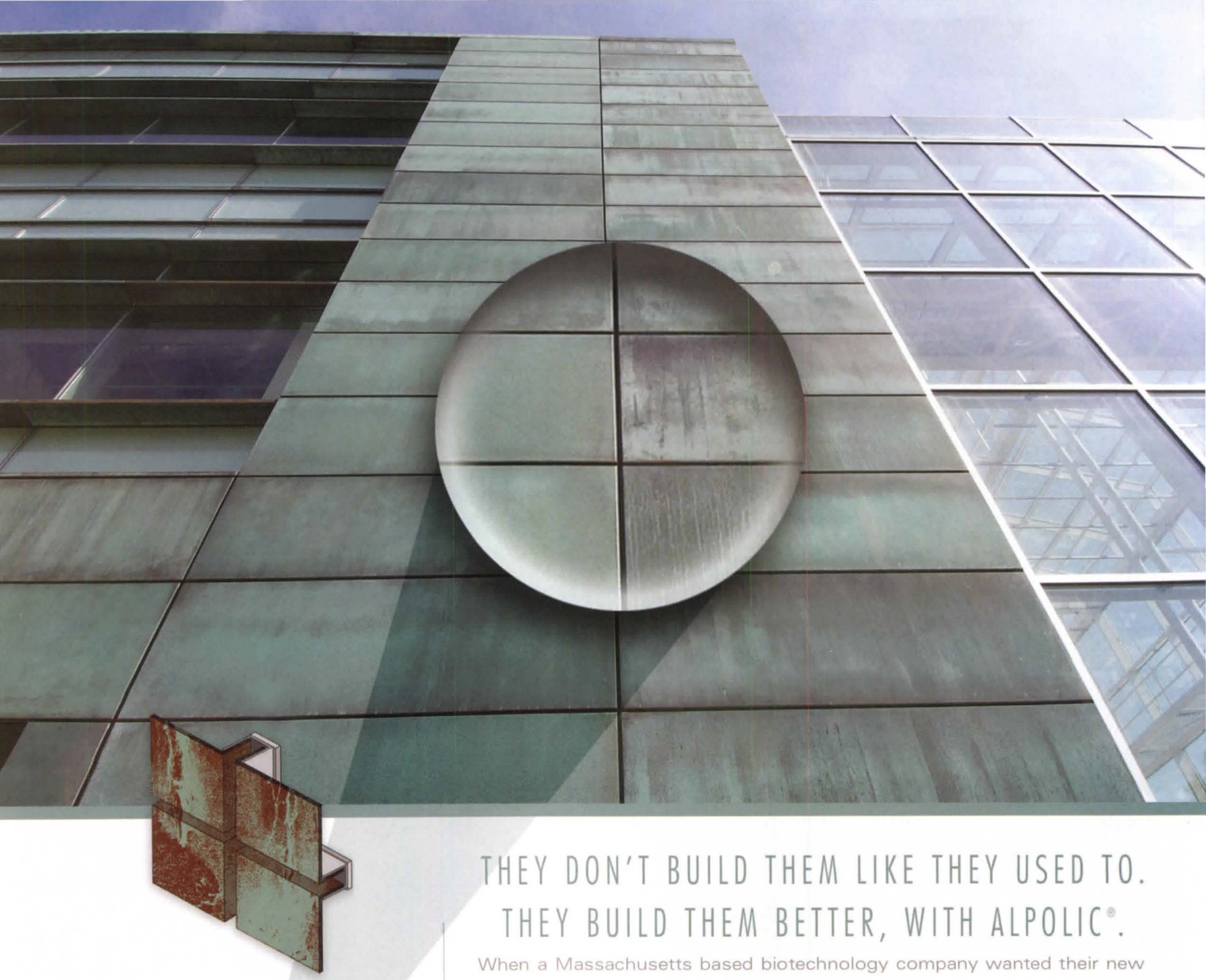

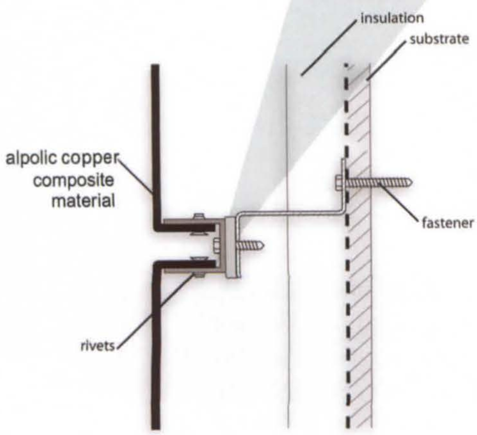

THEY DON'T BUILD THEM LIKE THEY USED TO. THEY BUILD THEM BETTER, WITH ALPOLIC®.

When a Massachusetts based biotechnology company wanted their new laboratory building to convey the company's proud heritage, their architects chose panels of ALPOLIC® Copper Composite Material (CCM), consisting of a thermosplastic core bonded between two thin sheets of copper. In addition to offering a zero maintenance finish, ALPOLIC® Copper composite panels feature the same superior durability, flatness, strength and ease of fabrication found in all ALPOLIC® Aluminum and Metal composite materials. But the ALPOLIC® Copper panels offered still another advantage: to satisfy the architect's design intent, their genuine copper surface could be treated with a unique patina process to make them look as if they had aged naturally for years! For a look that conveys the image you want, look to the global innovators of Metal Composite Material (MCM). Look to ALPOLIC®. For more information, call 1-800-422-7270 or visit us at www.alpolic-usa.com.

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ARCHITECT: Jung-Brannen Architects

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Thermal & Moisture Protection

Firestopping • Waterproofing • Shingles • Smoke containment barriers • Insulation • Roof & wall panels

There are other systems that address head-of-wall firestopping, but not in the same way as the FlameSafe FlowTrak system. —*SUSAN KAPLAN*

Where there's smoke ...

The Smoke Guard System is a safety device that prevents smoke from migrating up an elevator shaft in the event of a fire. Activated by a local smoke detector, Smoke Guard will temporarily seal an elevator door to resist the passage of smoke. The system works in conjunction with already fire-rated elevator doors to form a smoke- and draft-control assembly required by code. Smoke Guard, division of RectorSeal, Boise. www.smokeguard.com **CIRCLE 231**

Fire-resistant insulation

Metl-Span's ThermalSafe panels provide up to two hours of fire-resistance and require no additional steps to insulate walls. They are made from raw materials that are environmentally friendly and have no VOCs or CFCs. Ideal applications include industrial buildings, manufacturing plants, and warehouses. Metl-Span, Lewisville, Tex. www.metlspan.com **CIRCLE 232**

Shingles made to last

Custom-Bilt Metals and Vail Metals Systems have collaborated to manufacture two products: solid copper panels and Kynar-coated Galvalume metal panels. Their designs feature a concealed-fastener, interlocking shingle panel system that is easy to install, maintenance free, and extremely resistant to all forms of severe treatment, according to the manufacturer. Custom-Bilt Metals, Chino, Calif. www.custombiltmetals.com **CIRCLE 233**

A variety of wall panels

American Buildings Company's insulated wall panels are durable, energy-efficient, lightweight (approximately 2.2 pounds per square foot), and available in four colors: Regal White, Warm White, Light Stone, and Pearl Gray. The panels come in six finishes and can be used for interior partition walls and exterior building walls. American Buildings Company, Eufaula, Ala. www.americanbuildings.com **CIRCLE 234**

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Thermal & Moisture Protection

Firestopping • Waterproofing • Shingles • Smoke containment barriers • Insulation • Roof & wall panels

Unconventional protection

Designed for applications in head-of-wall joints between the top of fire-resistive gypsum wall and floor/roof assemblies, the FlameSafe FlowTrak system provides a faster and more accurate alternative to the conventional "stuff and spray" fire-stopping technique, according to the manufacturer. Grace Construction Products, Cambridge, Mass. www.graceconstruction.com **CIRCLE 235**

Looks like the real thing

MonierLifetile Madera is a wood-shake substitute available in a standard weight profile. The concrete shake looks like wood due to the random treatment of its texture, edges, and color. Monierlifetile, Irvine, Calif. www.monierlifetile.com **CIRCLE 236**

Transformative waterproofing

Two products from Mar-Flex—Mar-Flex 5000 and Sunflex—help transform any basement into a living level. These water-proofing membranes will not evaporate, lose flexibility, or succumb to freeze-thaw cycles. Mar-Flex, Middletown, Ohio. www.mar-flex.com **CIRCLE 237**

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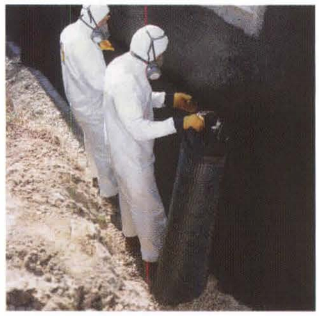

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Veneto Fieldledge with an overgrout technique

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From educational facilities to major indoor arenas, Irwin Telescopic Seating Company can provide a system to compliment any facility. The strength, durability, and aesthetics found in each system we produce far exceeds products offered by the traditional names of our industry. Please contact us to arrange for a complete demonstration of the new Irwin 5000 Telescopic System.

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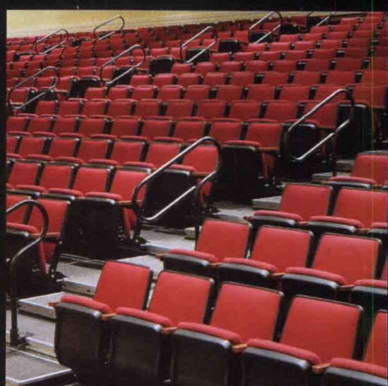
- Grease free understructure
- Special row rises and row spacing available
- Custom design capability



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Openings

Doors and frames • Garage doors • Security glazing • Entrances, storefronts, and curtain walls • Windows • Hardware • Access control hardware • Decorative glass glazing

We need to mainstream more agrifiber products.

—SUSAN KAPLAN

Slice of nature

For the Nobu 57 restaurant's private dining room, Livinglass developed a multistep preparation process that eliminates the appearance of bubbles of air released from the cellulose capsules of bamboo when encapsulated in laminated glass. An extra-thick, impact-resistant interlayer accommodates thick slices of bamboo and serves as a sound dampener. Livinglass, Dana Point, Calif. www.livinglass.com **CIRCLE 238**

Combo act

Montage Visual Effects glass can feature a combination of processes, including a choice of 12 colors, 12 standard silk-screened designs, and six rice paper patterns. Oldcastle Glass, Tampa. www.oldcastleglass.com **CIRCLE 239**

Historic profile

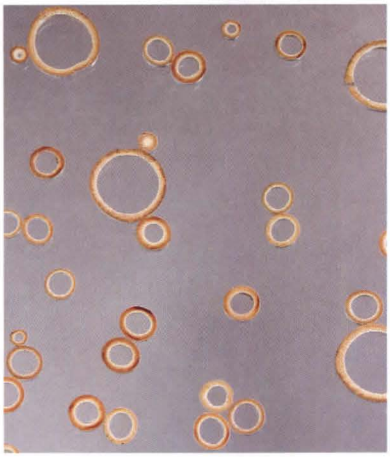
Kolbe's ⅝" Performance Divided Lite gives the window the look of a traditional putty, single-glazed window from the early 1900's. The deep coped profile creates a detailed shadow line and enhances its historical curb appeal. Kolbe & Kolbe Millwork, Wausau, Wis. www.kolbe-kolbe.com **CIRCLE 240**

Good handle on design

The H5015 door lever (top), designed by Antonio Citterio, features a cylindrical handle available in polished and satin stainless-steel finishes. The H349 door lever, designed by Chi Wing Lo (bottom), is crafted of solid brass and ebony. Valli & Valli, New York City. www.vallievalli.com **CIRCLE 241**

Clearly safer

Schott's Pyran Crystal glass-ceramic product line is UL classified, fire-rated from 20 to 90 minutes, and passes the hose stream test. Pyran Crystal product offers the highest quality of clarity, transmission, and true color rendition. Schott N.A., Louisville. www.us.schott.com/pyran **CIRCLE 242**



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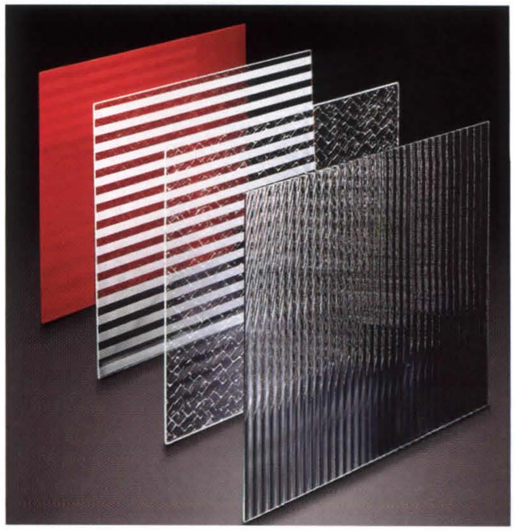

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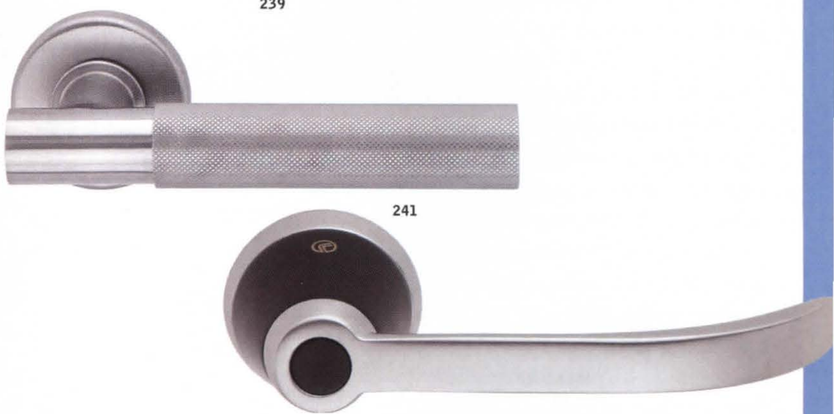

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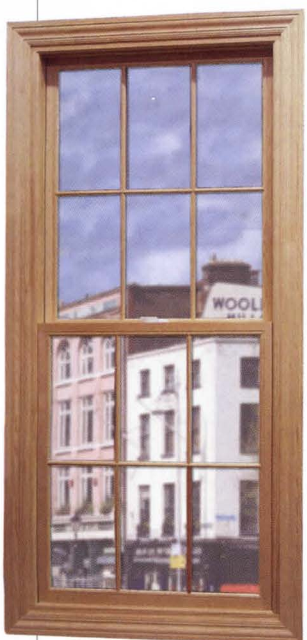

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Openings

Doors and frames • Garage doors • Security glazing • Entrances, storefronts, and curtain walls • Windows • Hardware • Access control hardware • Decorative glazing

A new tradition

Bricks, Boards, and Sticks, a new collection of textured glass panels, has the characteristics of those traditional building materials, but varying degrees of transparency. The collection is suitable for custom fabrication in a variety of interior and exterior applications. Joel Berman Glass Studios, Vancouver, Canada. www.jbermanglass.com **CIRCLE 243**

A foul-weather friend

The Racerback, a new door from Neoporte, is constructed from 100 percent stainless steel and is impervious to the effects of weather and UV degradation. It also features an automatic door bottom seal, eliminating the need for a sill plate or threshold. Neoporte, Santa Monica, Calif. www.neoporte.com **CIRCLE 244**

Warm and cozy windows

In appearance, Thermique windows are indistinguishable from ordinary glass, but the difference is they give off heat and eliminate drafts, while saving energy and money. Engineered Glass Products, Chicago. www.egpglass.com **CIRCLE 245**

When size matters

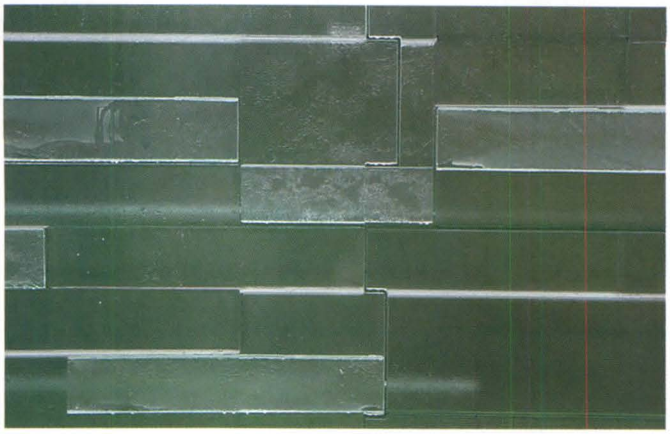
Called the Ultimate Double Hung Magnum, these Marvin windows live up to their name by providing large size without sacrificing function, durability, or a traditional appearance. The Class 5 spiral balance system provides easy sash operation and meets a commercial design pressure rating of H-C50 for window openings nearly 5' wide and 9' tall. Marvin Windows and Doors, Eagan, Minn. www.marvin.com **CIRCLE 246**

Sustainable to the core

VT Industries now manufactures wood doors with agrifiber cores made from rapidly renewable agricultural fibers. Available in high-pressure decorative laminate or a wide range of veneer species, the doors can assist with environmental certification, including LEED. VT Industries, Holstein, Iowa. www.vtindustries.com **CIRCLE 247**

Visionary windows

Wausau's Visuline windows meet or exceed the industry's most stringent testing for air infiltration, water and condensation resistance, structural integrity, and thermal performance. Wausau Window and Wall Systems, Wausau, Wis. www.wausauwindow.com **CIRCLE 248**



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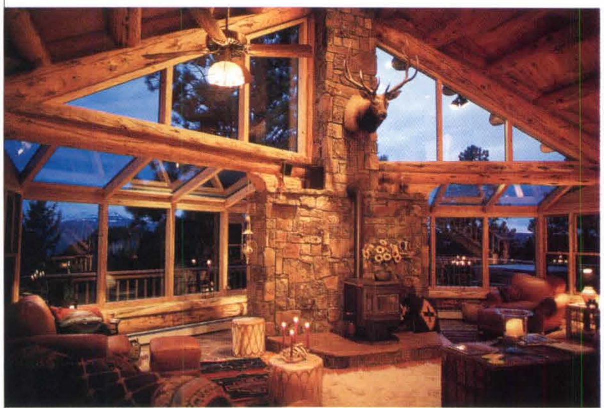

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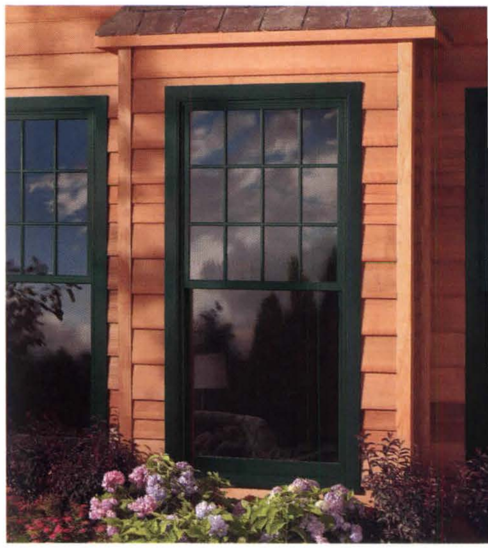

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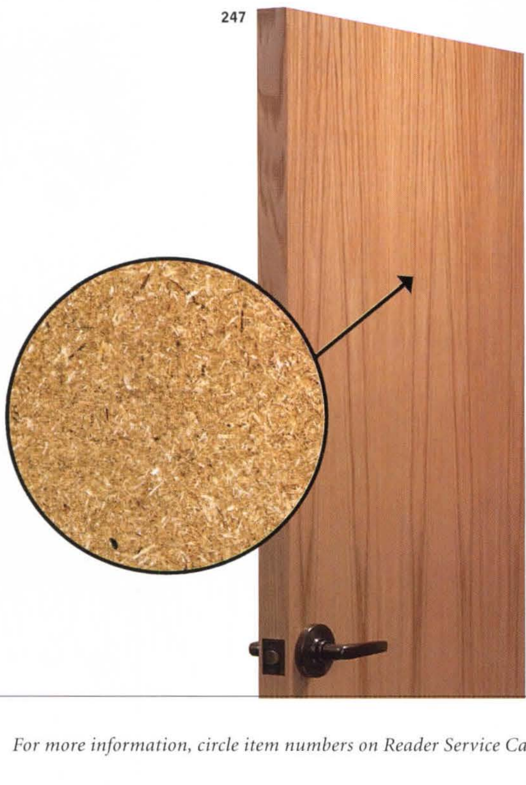

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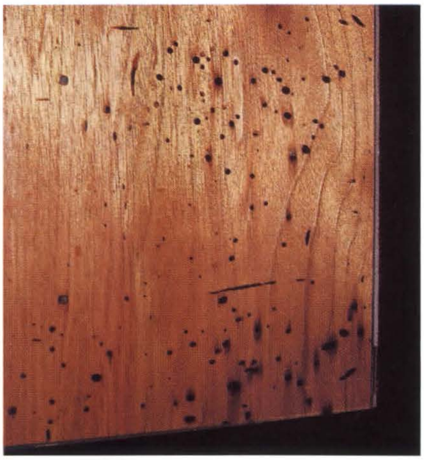
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Safer swing door

The Beyond swing door from Dorma Glas locates the pivot point of a glass door at the glass edge, thus eliminating the nip hazard. The system is not only safe, but also sleek. Dorma Glas, Millersville, Md. www.dorma-usa.com **CIRCLE 249**

Strong and structural

Two products from Dupont, SentryGlas Plus and SentryGlas Expressions, offer laminated glass interlayers that are 100 times stiffer and five times stronger than traditional interlayers. While meant for structural applications, SentryGlas Expressions allows textures, company logos, and images to be incorporated into the glass. Dupont, Wilmington, Del. www.dupont.com/safetyglass **CIRCLE 250**

Two products in one

Berman Glass, in collaboration with Pilkington Fire Protection Glass and Technical Glass Products (TGP), have developed a new series of decorative, fire-rated glass with impact safety ratings as required. TGP can provide compatible fire-rated wood or steel doors and frames. Technical Glass Products, Kirkland, Wash. www.fireglass.com **CIRCLE 251**

Wormy wood glass

Architectural Systems has created panels with salvaged butternut wood veneers laminated in glass. Natural worm holes and streaks add to the wood's beauty when the panels are lit from the front or back. Architectural Systems, New York City. www.archsystems.com **CIRCLE 252**

Easy clearance

Hope's Windows' Slide and Fold doors include a single active swing leaf that can be used for passage, in addition to the folding leaves that can be opened to achieve a maximum clearing. The doors come with an environmentally friendly, lead-free, weather-fighting coating. Hope's Windows, Jamestown, N.Y. www.hopeswindows.com **CIRCLE 253**

Security, without the fuss

ElectroLynx makes it easy to install electro-mechanical door hardware because each system component—the frame, hinge or pivot, door, and locking hardware—comes prewired with plug-in connectors that snap together to create a fully wired electrical opening. Plus, the plugs and wires remain concealed. Assa Abloy, New Haven, Conn. www.assaabloydss.com **CIRCLE 254**

Openings

Doors and frames • Garage doors • Security glazing • Entrances, storefronts, and curtain walls • Windows • Hardware • Access control hardware • Decorative glazing

Contemporary curb appeal

The Avante collection of garage doors combines aluminum and glass in a contemporary design. Many window options are available to control the degree of light transmission and privacy, including clear, frosted, tinted, mirrored, or acrylic glass. The glass is supported by a 2⅛"-thick, rust-free aluminum frame that can be custom-painted or sealed with a clear, white, or brown finish. Clopay, Mason, Ohio. www.clopay.com

CIRCLE 255

Tintable glass

SageGlass products have the ability to tint and "untint" at the touch of a button, subtly adjusting to occupants' needs. This functionality helps reduce energy bills by controlling solar heat gain and increases worker productivity by allowing additional daylighting, minimal glare, and enhanced occupant comfort. The glass is currently offered in Classic, Sea Green, Cool View Blue, and Clear-As-Day Gray. Sage Electrochromics, Faribault, Minn. www.sage-ec.com **CIRCLE 256**

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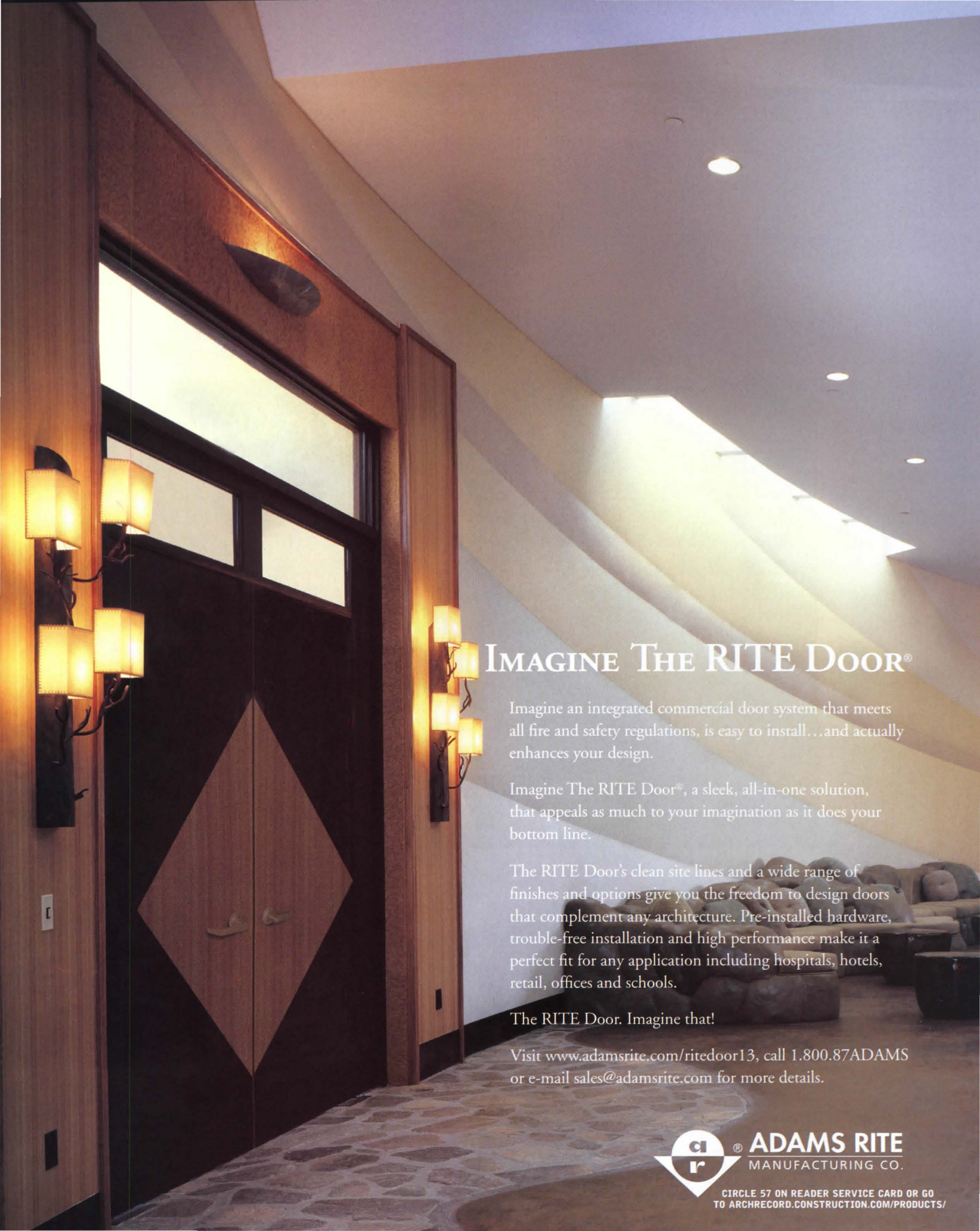
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There are many works of art by Italians that are not found in museums. Since the dawn of civilization, Italians have created and exported some of their most lasting works of art in Natural Stone: statues, mosaics, floors, balustrades, columns, countertops, stairs and facades found in buildings around the world. PIETRA NATURALE is recognized as the highest quality of Italian Craftsmanship and stone processing technology. Look for our PIETRA NATURALE trademark as your assurance of an Italian work of art in Natural Stone – the perfect encounter between man and nature.
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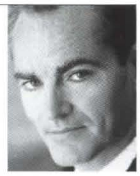
Finishes

Plastering • Tiling • Thin-set tiling • Ceilings • Resilient flooring • Terrazzo flooring • Carpeting • Wall coverings • Plastic blocks • Painting & Coating • Underlayments

I thought the most provoking products were pieces that work in quieter ways, beyond the physical dimensions, like tiles that convert oxygen or grout that resists mildew. —*MICHAEL MORRIS*



Super clean tile

Oxygena, from Ideal Standard, is an antismog tile that contains titanium dioxide, an element that oxidizes pollutants. Originally created for outdoor use, the tiles can also be laid internally. Unfortunately, the tiles are currently available only in Italy. Ideal Standard Italia, Modena, Italy. www.gambarelli.it CIRCLE 257

Photo finish

Infused Imagery uses a patented image-transfer technology to allow the image to become part of the substrate, giving it the hardness of epoxy with the flexibility of urethane. The technology carries a Class A fire rating as well as a low-VOC-emissions rating. Deepa Textiles, San Francisco. www.deepa.com CIRCLE 258

3D ceiling panels

Wireworks Forms Open-Cell Ceiling System consists of 2' x 2' lay-in panels that each feature a design from a robotically welded, curved-steel wire that forms a three-dimensional shape or is woven into an intricate weave pattern. The designs in the Forms series are named after their appearance: Weave, Ripple, Small Wave, and Big Wave. USG Interiors, Chicago. www.usg.com CIRCLE 259

Sustainable on the wall

Earthtex is a sustainable high performance woven wall covering that is durable and reliable without using PVC. It does not contain any heavy metals or plasticizers, and it doesn't release any toxins when added to landfill. Designtex, New York City. www.dtex.com CIRCLE 260

Organic inlay

The newest design in the Tropical Veneer Collection by Architectural Systems consists of a colored MDF base that accentuates inlaid organic pearlstone. Different colored fillers and materials can be used in combination for wall applications, doors, ceilings, and screens. Architectural Systems, New York City. www.archsystems.com CIRCLE 261

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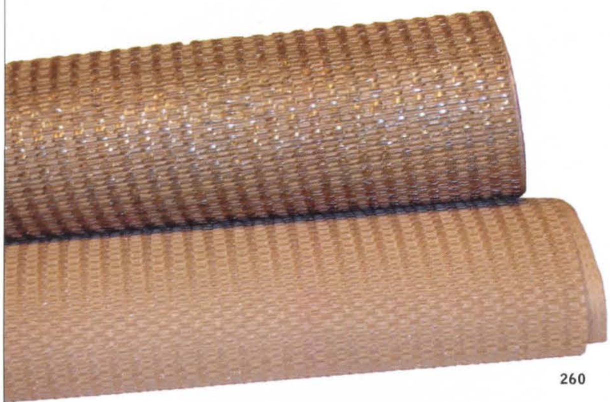

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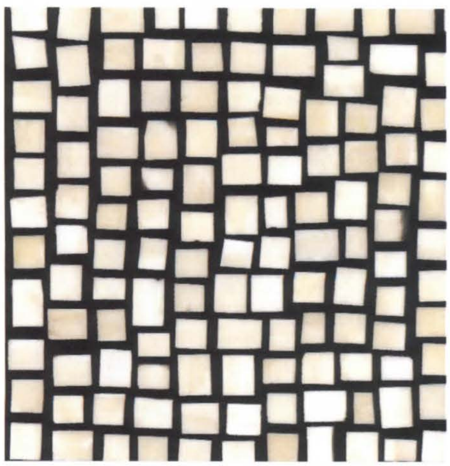

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Finishes

Plastering • Tiling • Thin-set tiling • Ceilings • Resilient flooring • Terrazzo flooring • Carpeting • Wall coverings • Plastic blocks • Painting & Coating • Underlayments

Putting the "tile" in textile

Don't be deceived—this image (right) may look like fabric but is, in fact, tile. Textura, from Viva Ceramica, comes in four textile-inspired colors in a matte finish to bring out the details. Italian Trade Commission, New York City. www.italiantiles.com **CIRCLE 262**

Slick surface

The Waterglass Mosaic Collection features lightweight glass mosaics that are mesh-mounted in custom-designed chromatic sequences in 29 color palettes. Sicis North America, New York City. www.sicis.it **CIRCLE 263**

Eco-friendly master plaster

An alternative to cement, gypsum, acrylic, or lime plasters, American Clay's Original Earth Plaster is suitable for use on internal surfaces of walls and ceilings. A combination of clays, aggregates, and natural pigments, the Earth Plasters are offered in 12 earth-inspired colors. The 100 percent natural plasters are mold-resistant, nontoxic, and use low energy and less waste during manufacturing. American Clay, Albuquerque. www.americanclay.com **CIRCLE 264**

Finishing first

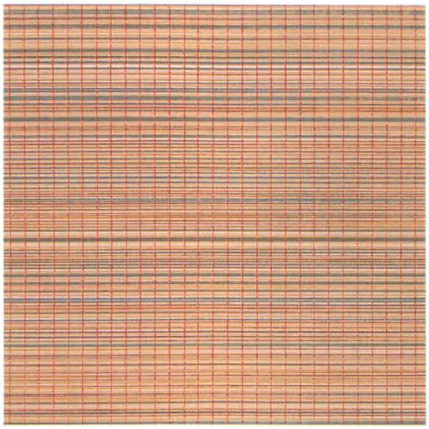
From a company whose name is synonymous with paint comes a new line of Studio Finishes that offer glaze effects, metallic looks, and highly tactile textures. The collection's Chalkboard Paint offering converts a surface into a working canvas for messages, memos, and momentary art. Benjamin Moore, Montrale, N.J. www.benjaminmoore.com **CIRCLE 265**

Slimmer slabs

Kerlite slabs, from Cotto D'Este, are a mere .12" thick, making them easy to customize by cutting and drilling. Slabs come in six colors enriched by Zirconium particles to capture light. Italian Trade Commission, New York City. www.italiantiles.com **CIRCLE 266**

Prevent callbacks

The safety siren allows tile installers to test electric floor heating during installation, by checking the continuity of the system to prevent tile installation over damaged wires. If the alarm beeps, the WarmlyYours technical support team offers installers immediate 24/7 assistance to fix problems. WarmlyYours, Buffalo Grove, Ill. www.warmlyyours.com/press **CIRCLE 267**



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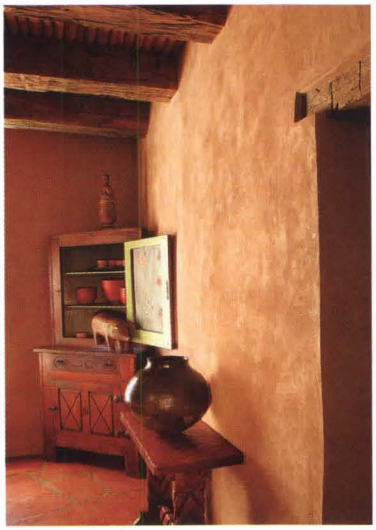

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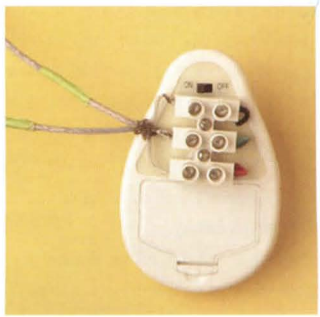

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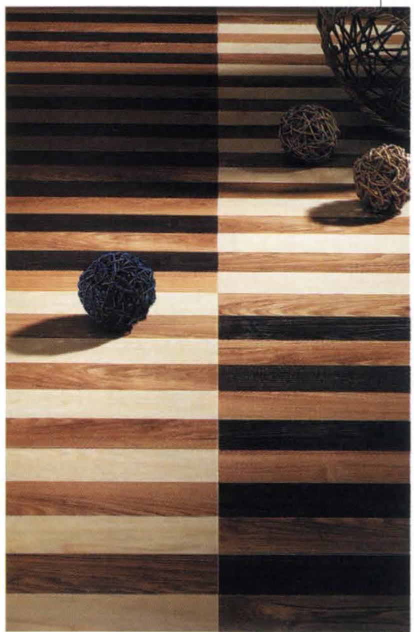

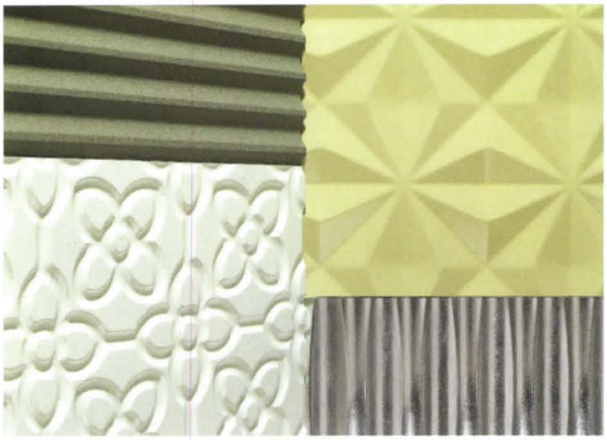

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Grout to use inside and out

Spectra Lock Pro Grout (far left) has improved workability in hot weather and an increased resistance to chemicals and stains. MultiMax Multipurpose Thin-Set Mortar (near left) fights mold and mildew problems for a variety of types, sizes, and styles of ceramic and stone tile installations. The nonsag performance ensures the product's suitability for both commercial and residential uses on interiors and exteriors. Laticrete, Bethany, Conn. www.laticrete.com CIRCLE 268

Fantastic flooring

The I.D. Moduline flooring system offers modularity, durability, and a cost-effective installation. In a variety of wood and stone looks, as well as geometric patterns, this sustainable system does not require waxes or polishes and is meant for commercial use in retail, hospitality, health-care, and office spaces. Tarkett Commercial, Houston. www.tarkett-commercial.com CIRCLE 269

New dimensions in tile

Sculptured Collection tiles offer a range of textures for interior applications, such as walls, bar fronts, ceilings, elevator cabs, and furniture. Unfinished or primed MDF, they can be customized with factory-applied wood veneers or specialty finishes. Architectural Systems, New York City. www.archsystems.com CIRCLE 270

Gypsum's second *go-round*

Made with environmentally friendly recaptured gypsum, Levelrock floor underlayment eliminates the need for manufacturers to dispose of old gypsum in landfills. Three products are available for use in light-commercial construction, residential homes, and over radiant heat tubes. USG, Chicago. www.gypsumsolutions.com CIRCLE 271

Tile sees the light

Light Tile has an integrated LED lighting component that is low in energy consumption and heat buildup. Available in white, blue, and amber, these lights can be installed without an electrician. Villeroy+Boch, Monroe Township, N.J. www.villeroy-boch.com CIRCLE 272

Finishes

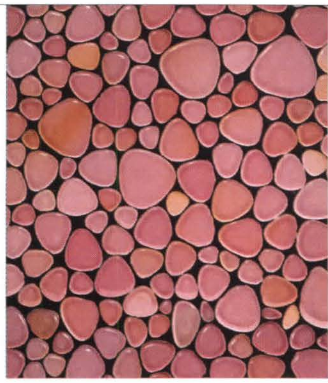
Plastering • Tiling • Thin-set tiling • Ceilings • Resilient flooring • Terrazzo flooring • Carpeting • Wall coverings • Plastic blocks • Painting & Coating • Underlayments

Color your world

The Joycolor Design line from Giaretta offers ceramic, glass, and pebble mosaic tiles for both public and private spaces in an array of vibrant colors, including Iris (shown). Euro Design Interiors, New York City. www.edigallery.com **CIRCLE 273**

Carpet that won't go to waste

Way (near right), a 36" modular carpet collection, creates visual depth with fine gradations of color and layers of visual texture that simulate dimension. Theory (far right) is a collection for educational and commercial interiors with patterns that range from loose, organic "thoughts" to definite structures, representing the development of knowledge from abstract to finite to theoretical. The various scales make the designs suitable for small student rooms as well as large auditoriums. All carpets are 100% sustainable and can be reclaimed and renewed through Milliken to avoid ending up in a landfill. Milliken, La Grange, Ga. www.millikencarpet.com **CIRCLE 274**



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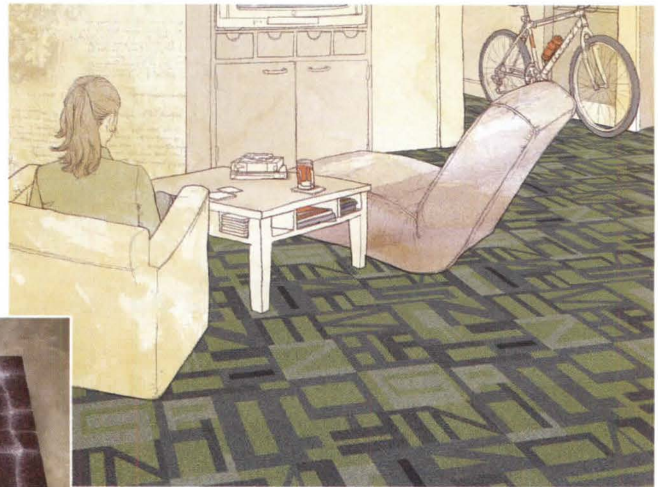

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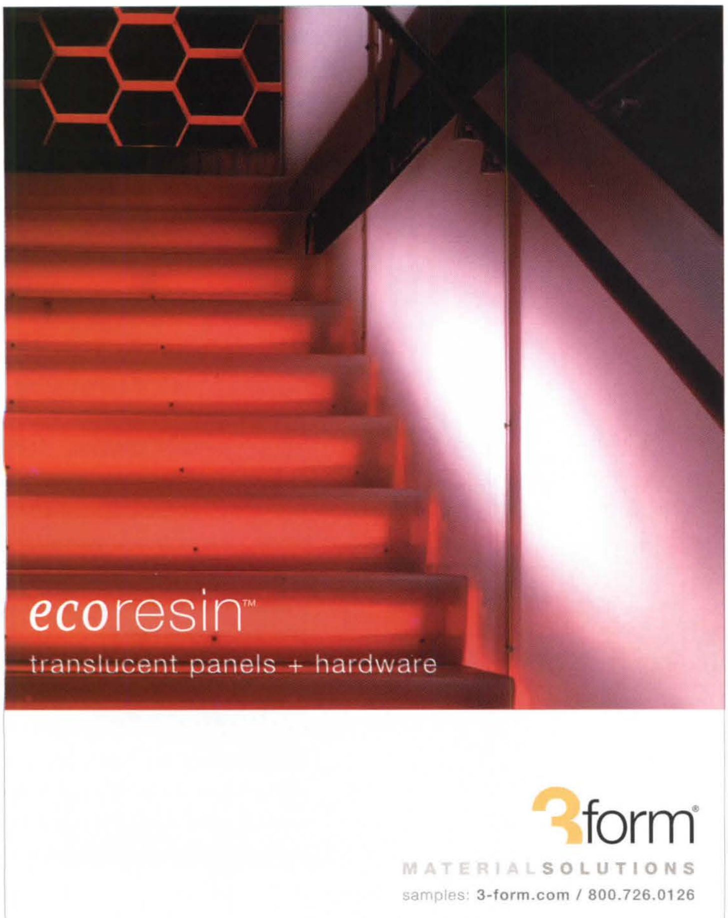

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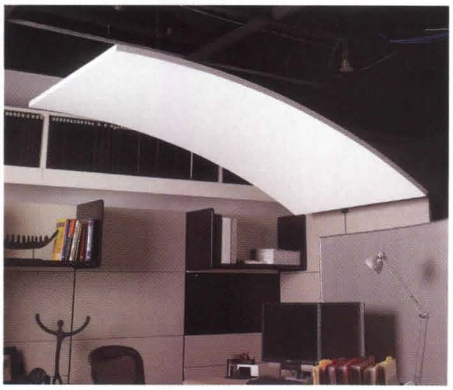

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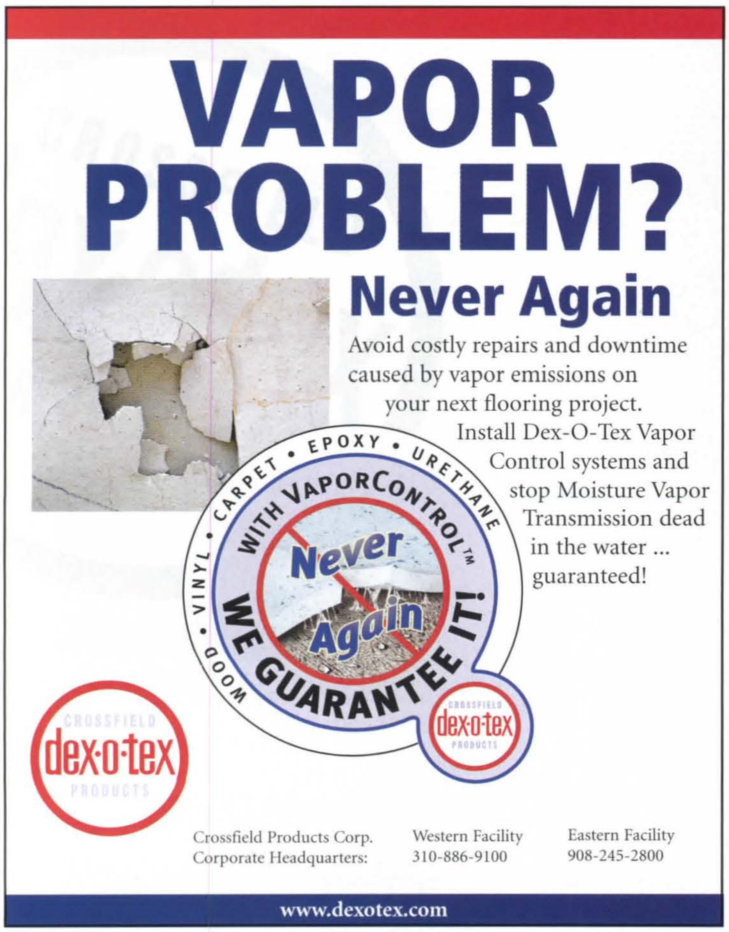
Twinkle twinkle *little* tile

Terrazzo tiles (far left) are sensitive to changes in light intensity and color, and respond to them with a dazzling set of ripples on the surface. The tiles are passively powered by daylight and ambient light and use an optical matrix in concrete to transfer light for a twinkling effect. Scintilla (top left) has all the same light-reaction properties with the addition of an acrylic polymer that allows it to be translucent. This durable product can be used on exteriors or interiors, and will not "yellow" in direct sunlight. SensiTile Systems, Detroit.
www.sensitile.com **CIRCLE 275**

Sound it out

Soundscapes Acoustical Canopies can be installed in open plenum areas, or over workstations and reception desks, to reduce reverberations in the spaces below. These attractive scrims also reflect 90 percent of light that hits them and include recycled content. Armstrong Ceilings, Lancaster, Pa.
www.armstrong.com/ceilings **CIRCLE 276**



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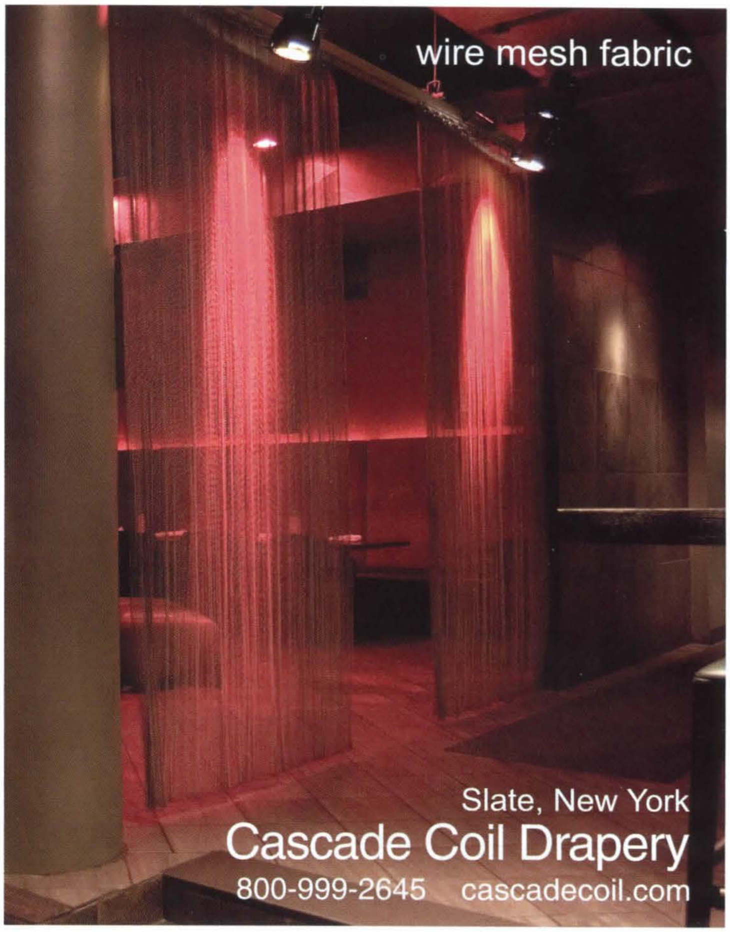

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Finishes

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Tiles, right side up

Surfaces, a new tile collection from Dom Ceramiche, includes designs that resemble cardboard *boxes, wood,* Cor Ten steel, and the imprints of large green banana leaves. Italian Trade Commission, New York City. www.italiantiles.com **CIRCLE 277**

Made in different shades

Created in collaboration with Bruce Mau Design, Shaw's L7 carpet and tile collection features two broadloom products and four tile products, all available in at least seven colors. All products juxtapose a range of hues within a limited palette. Shaw Contract Group, Cartersville, Ga. www.shawcontractgroup.com **CIRCLE 278**

Cheaper, cleaner linoleum

Marmoleum global 2, a new line of linoleum from Forbo, features a Topshield finish that reduces the need for initial maintenance and chemicals, thus lowering cleaning costs. Marmoleum, which is made of renewable materials, also has natural antistatic properties that repel dust and dirt. Forbo Flooring, Hazelton, Pa. www.forboflooringna.com **CIRCLE 279**

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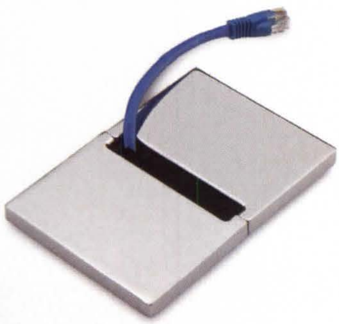
The Integrator

We call this clever design "Integrator" because of the way it integrates several parts into a single, intact little unit.

INT

There are no separate lid and base pieces to handle. To pass cables through, simply slide the two halves of the lid apart to create a sizeable opening. When closed the brushes meet in the center blocking dust and adding to the overall 'integrated' look of the grommet. Available in two shapes: Rectangular, Elliptical and two finishes: Satin Nickel, Polished Chrome.



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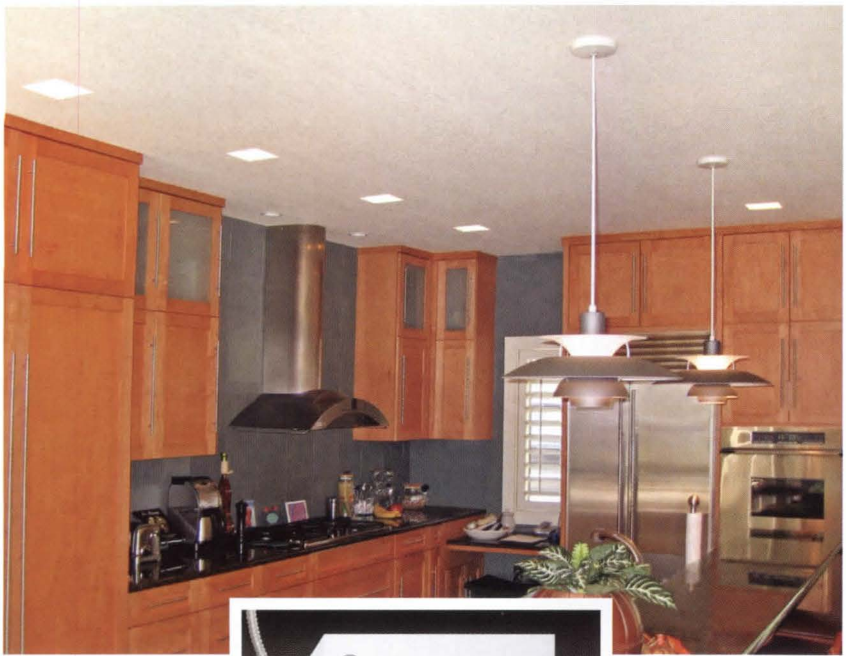
When a hole in your ceiling is *a good thing.*



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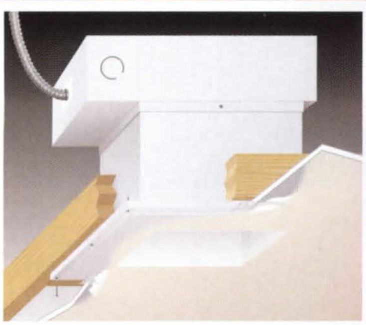

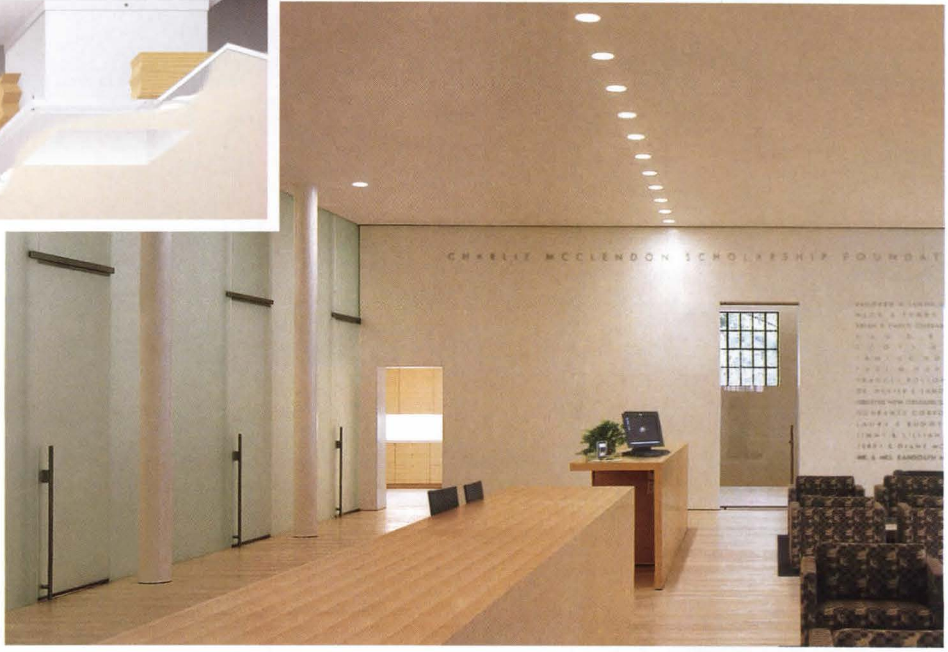

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Finishes

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Inspired by buildings

Translations, a carpet collection that imitates the colors and textures of architectural elements, was developed by architect Shashi Caan along with Karastan Contract. The four patterns in the group, Molten Weave, Glass Lines, Gridded Steel, and Ribbed Concrete, are featured in a palette of green, blue, and neutral tones. The Mohawk Group, Kennegaw, Ga. www.themohawkgroup.com **CIRCLE 280**

Shiny, happy wall coating

Perlata is a decorative wall coating with a subtle shimmer but low sheen. Available in 96 colors, the product has a finish that is full of movement and tonal interest. Armourcoat Surface Finishes, Omaha. www.armourcoatusa.com **CIRCLE 281**

See-through tiles

Designed by architect Marco Rosin, Trend Group's Brick collection is a modular system of transparent glass tiles with an interlocking plastic mechanism. The tiles are cut by hand and come in a range of colors and sizes. Italian Trade Commission, New York City. www.italiantiles.com **CIRCLE 282**

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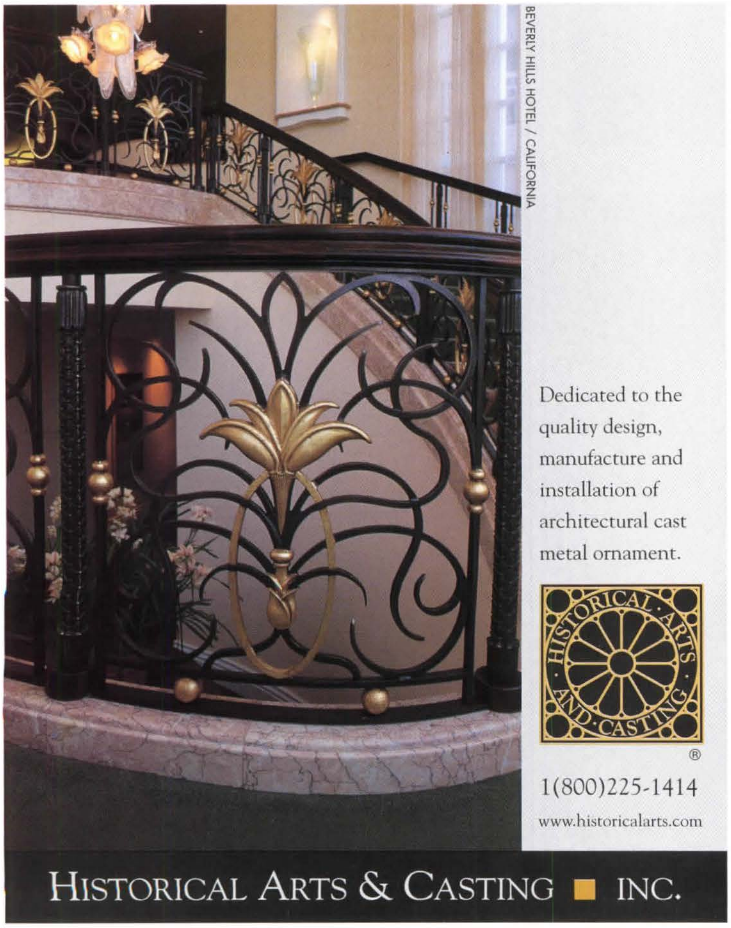

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Specialties

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Thermique's heated glass towel warmer is a good marriage of function and form. —*SUSAN KAPLAN*

Putting out fires

Minimal, a residential fire extinguisher designed by Giulio Gianturco for Boffi, features a red-handled, code-compliant tank housed by a sleek stainless steel exterior casing. Boffi Spa, New York City. www.boffi.com **CIRCLE 283**

Stick around

Sticks is an indoor/outdoor space divider that creates semiprivacy with wood or fiberglass dowels that define a space but also allow for peeping. The modular divider, designed by Hsu-Li Teo and Stefan Kaiser, comes with a wood or rubber base in two different sizes. Extremis, Albuquerque. www.extremis.be **CIRCLE 284**

Keep noise out, but let light in

Clear, frosted, or applied with graphics, the glass office systems from Adotta can be used in a variety of configurations. High sound insulation ensures peace and quiet and accompanying doors can swing, slide, or pivot. Adotta, New York City. www.adotta.com **CIRCLE 285**

Dramatic translucents

The Translucents interior wall system is shown here with a curved and backlit design. The interlocking elements allow a continuous facade without mullions or visual breaks and can be installed vertically or horizontally, spanning up to 39'. A variety of glazing and finish options are available. Duo-Gard, Canton, Mich. www.duo-gard.com **CIRCLE 286**

Towels warm up to design

The Thermique heated-glass towel warmer is available in colored or etched glass, providing a uniform source of radiant heat that is more efficient and attractive than traditional devices. The metal frame is available in a variety of finishes. Engineered Glass Products, Chicago. www.egpglass.com **CIRCLE 287**

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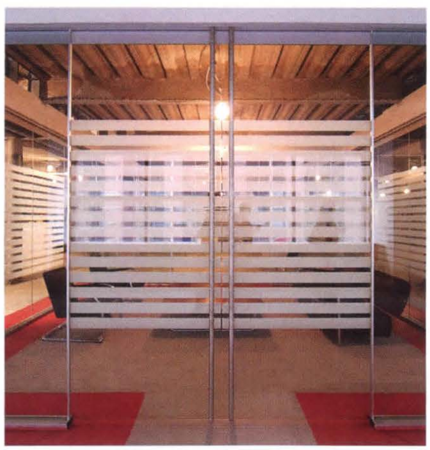


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Equipment

Residential laundry appliances • Audiovisual equipment • Unit kitchens • Ceiling fans • Health-care equipment • Residential kitchen appliances

Piero Lissoni continues his excruciatingly elegant proportional studies that prepare food as a by-product, and Sub-Zero continues to refine exposed refrigeration. —DAVID LING

Deluxe wine storage

GE's Walk-In Wine Vault, which measures approximately 7'9" x 8'8½", can hold between 975 and 1,100 bottles, depending on the configuration of the racks in the vault's interior. The 3,000-BTU cooling system keeps the vault at 55 degrees Fahrenheit and maintains the ideal humidity level for long-term wine storage. In addition, GE has developed an inventory tracking system that features a touch screen with an integrated scanner and printer. The system includes bar-code labeling to assist with locating wine and removing it from inventory, as well as programming to manage the maturity of the wine by tracking peak and past-due drink time for each wine. GE Consumer & Industrial, Louisville. www.monogram.com

CIRCLE 288

Weightless kitchen design

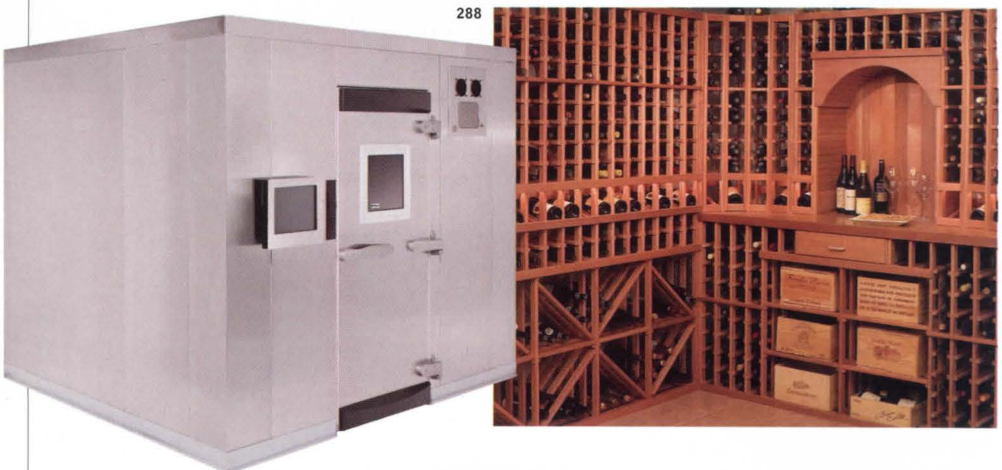
Boffi's Case System 2.3 is a sleek option for Minimalist kitchen design. Its "Blumotion" seal mechanism allows its doors to close silently, while integrated door handles become almost invisible. A light aluminum frame and a base module suspended by a built-in L-shaped steel joint give the hanging units the appearance of weightlessness. Boffi Spa, New York City. www.boffi.com

CIRCLE 289

Professional cleaning tools

KitchenAid's Pro Line Laundry Pair is designed to address laundry appliance needs at the luxury level. Its exterior cabinets are stainless steel on all surfaces and incorporate glass touch-sensitive controls in a blue LED display. The washer and dryer have a very large capacity, stainless-steel internal drums, and can come with matching stainless-steel pedestals. KitchenAid, Benton Harbor, Mich. www.insideadvantage.com

CIRCLE 290



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Equipment

Residential laundry appliances • Audiovisual equipment • Unit kitchens • Ceiling fans • Health-care equipment • Residential kitchen appliances

Serious refrigeration

Built by hand, Sub-Zero's PRO 48 is constructed of 100 percent welded stainless steel inside and out, features a dual refrigeration system and three compressors, and consumes less energy than a 100-watt lightbulb over the course of a year. Sub-Zero/Wolf Appliance, Madison, Wisc. www.subzero.com **CIRCLE 291**

Classic-styled range

The 24" depth Pro Harmony Range by Thermador, coordinates with standard size cabinets, includes all the benefits of Thermador's Professional Series collection, and features blue knobs that are a revival of Thermador's classic 1955 knob design. Thermador, Huntington Beach, Calif. www.thermador.com **CIRCLE 292**

Bodiless ceiling fan

Artemis, the latest ceiling fan from G Squared Art, does not have a "body"—the blades themselves wrap around the motor. The fan comes in translucent, mahogany, maple, and pearl-white finishes. A remote control is included. G Squared Art, Avila Beach, Calif. www.g2art.com **CIRCLE 293**

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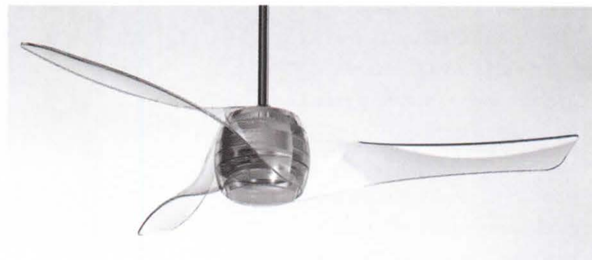

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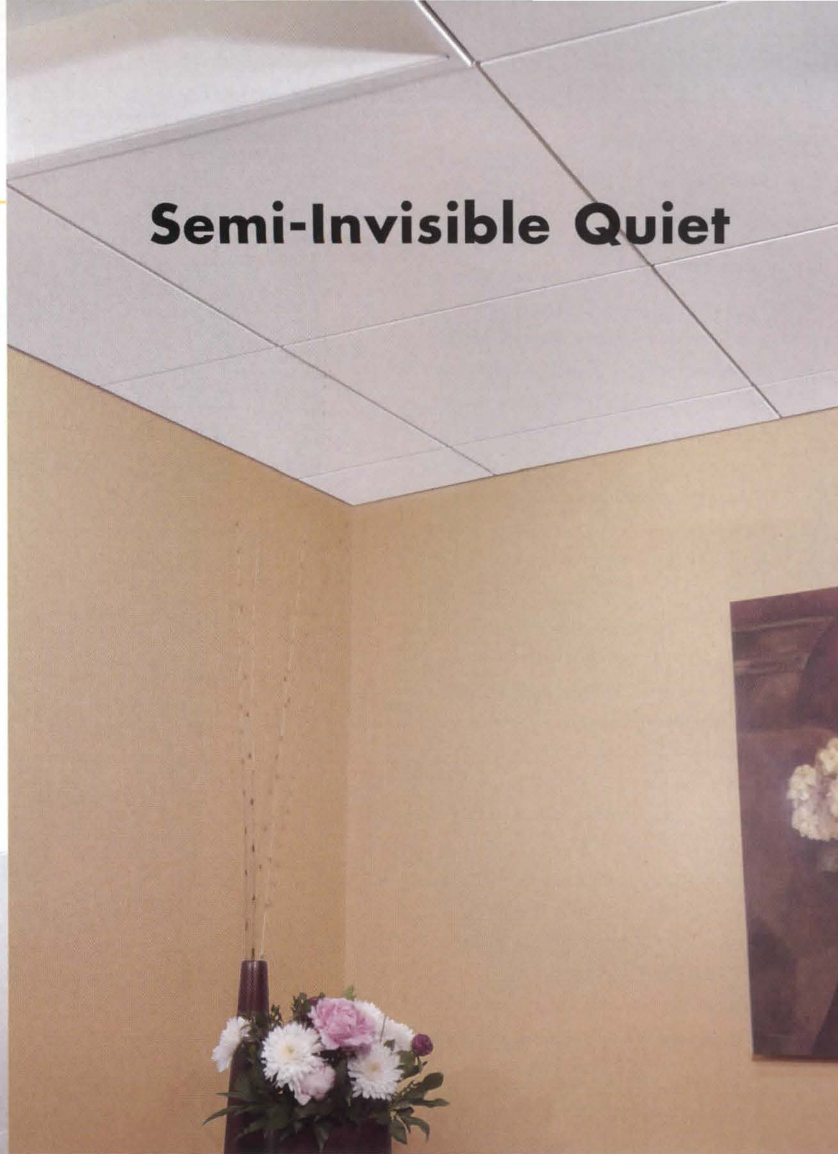
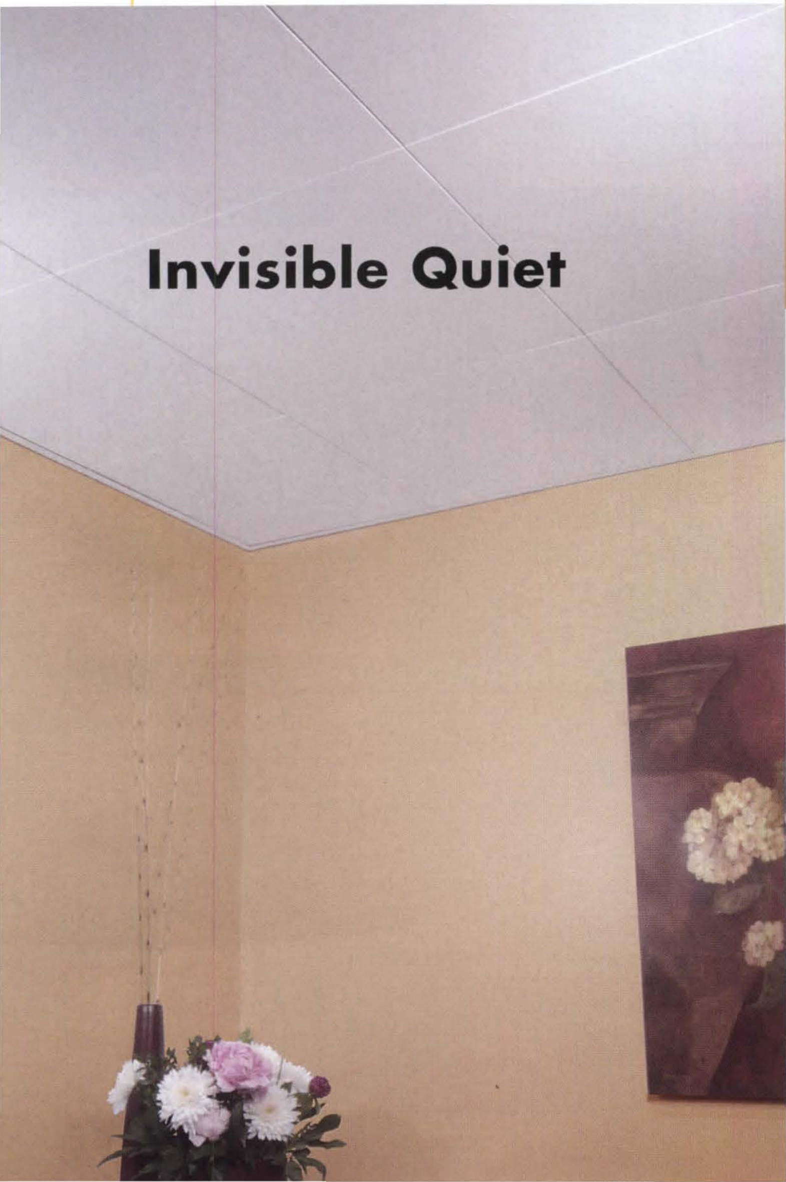


Ecophon Focus DG*

The suspension system is barely visible through a narrow gap (5/16") and the panels are easily demounted to allow access where it is required.

Ecophon Focus D*

The suspension system is fully concealed from view yet the panels are easily demounted to allow access where it is required.



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Disappearing act

Le Wing is an integrated projection TV screen and speaker mechanism that is designed for installation over a fireplace, large window, or in the center of the room. It disappears into the ceiling when the projector is not in use, and its speakers can extend independently for music listening. St. John Group, Mission Viejo, Calif. www.screenresearch.com **CIRCLE 294**

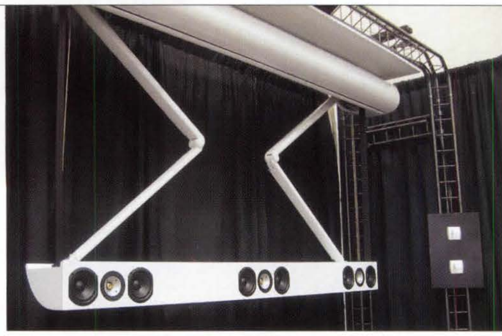
Keep dinner warm

The Thermique heated glass high shelf can be installed just above a stovetop and can reheat food or keep it warm until serving. The shelf also warms plates and utensils. Engineered Glass Products, Chicago. www.egpglass.com **CIRCLE 295**

Mobile health-care technology

Designed for PCs, tablet PCs, and notebook computers, T4 Point-of-Care Technology Cart has the smallest footprint of technology carts available and meets the ergonomic needs of 95 percent of users. Humanscale Healthcare, New York City. www.humanscale.com

CIRCLE 296



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Rakks wall-mounted shelving at Christine Desirée Collection, Sarasota, FL Interior Design: Christine Desirée

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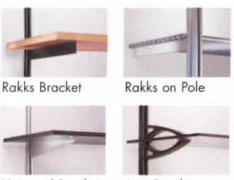

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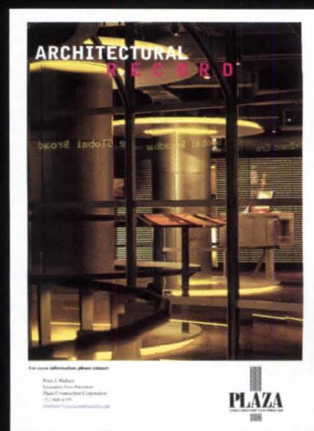

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DoNuts [by Extremis] features a playful design that combines everyday objects, creating a furniture piece that would appeal to both children and adults. —TOM CHANG, AIA

Delightful donuts

DoNuts, by Dirk Wynants of Extremis, is a playful table/seating combination. The inflatable seating donut accommodates at least 6 people, has a diameter of over 6', and carries the polyester tabletop. Extremis, Albuquerque. www.extremis.be

CIRCLE 297

Au natural

Inspired by the natural world, Conrad's new Landscapes lampshade collection comes in over 80 weaves made of renewable natural fibers, including arrowroot, natural flax, and bamboo-shoot skin. The translucent shades can be customized to fit nearly any application. Conrad, San Francisco. www.conradshades.com CIRCLE 298

Kid games

Jacks and Criss Cross are two new multicolored geometric patterns designed by Lori Weitzner. The fabrics are made of bouclé with viscose yarns that add sparkle and shine. Pallas Textiles, Green Bay, Wis. www.pallastextiles.com

CIRCLE 299

Great grades

Designed by industrial designer Cory Grosser, Gradient is the first fabric in the industry to graduate smoothly from one color to another on different scales. More than 100 yarn colors have been custom dyed to Grosser's exact specifications. A spectrum of eight gradients and 16 solids that match the end colors of each gradient are available in a subtle rib weave for seating and a smooth satin weave for paneling. Textus, Irvine, Calif. www.memosamples.com CIRCLE 300

Table matters

Created by hand, this outdoor table and bench set consists of chestnut planks reclaimed from demolished barns. The set can be made to a designer's specifications with any exterior grade hard wood. Anthony Abbate Design and Fabrication, Brooklyn, N.Y. www.anthonyabbate.com CIRCLE 301

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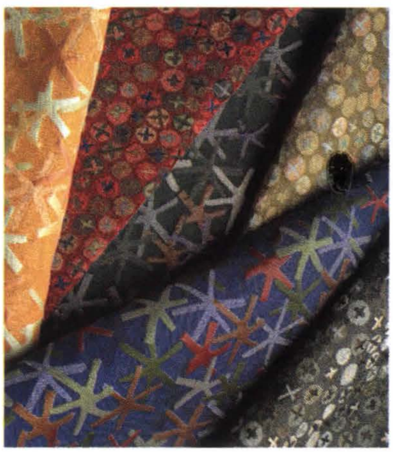

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Furnishings

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At arm's length

The M4 Flat Panel Monitor Arm is an addition to Humanscale's line of award-winning monitor supports. The adjustable arm allows users to easily customize the height, angle, depth, and viewing position of their flat panel monitor. Humanscale, New York City. www.humanscale.com CIRCLE 302

Docking station

The Docking Pedestal Table by Robert Martin Designs is a versatile piece that docks with the company's Folding Table #1. Designed for outdoor areas, the table is available in teak and other woods with an anodized aluminum base. Robert Martin Designs, Brooklyn, N.Y. www.robertmartindesigns.com CIRCLE 303

Fresh air

The Tradewinds Collection of jacquard and dobby upholstery offers a range of innovative weaves that provide movement, soft textures, and bright, light colors. The collection comes in four designs that reflect this fresh attitude: Billows, Breeze, Whisk, and Thunder. Pallas Textiles, Green Bay, Wis. www.pallastextiles.com CIRCLE 304

Good enough to eat

Ingeo, a textile from Designtex, is a truly closed-loop sustainable product. The fabric is made from corn kernels and thus is safely biodegradable at the end of its useful life. Designtex has introduced three versions of the fabric: Masa, Tamale, and Empanada. Designtex, New York City. www.dtex.com CIRCLE 305

An imprint worth leaving

The Imprint chair, awarded the Best of NeoCon Innovation Award last June, is made of CelluPress, a mold mat of compressed wood that has technical performance and design detailing at zero environmental cost. Lammhults/ICF, Taftville, Conn. www.icfsource.com CIRCLE 306

Three views, one shade

Trio, from Hunter Douglas, features 1⅜" individual, hexagonally shaped horizontal vanes that open and close even when the shade is partially raised, giving many options for light control. Hunter Douglas, Upper Saddle River, N.J. www.hunterdouglas.com CIRCLE 307

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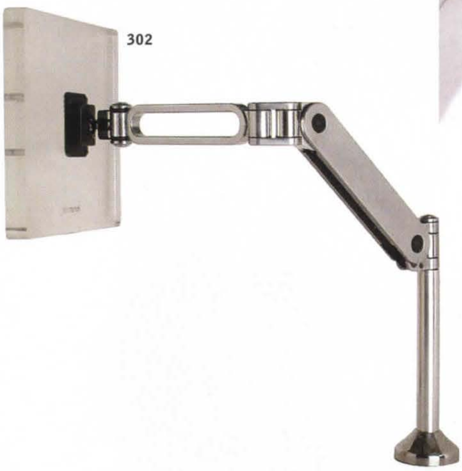

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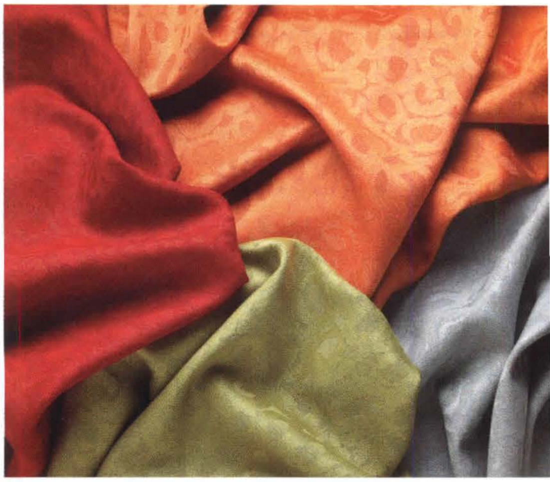

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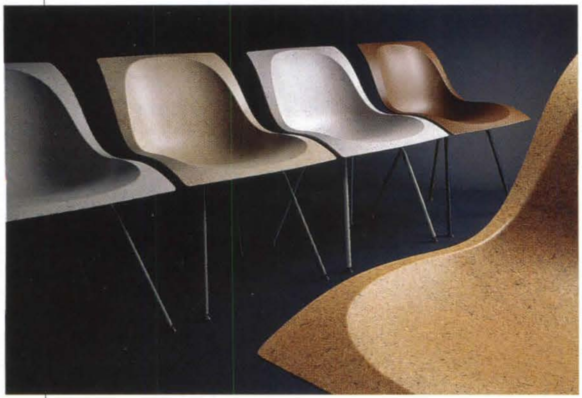

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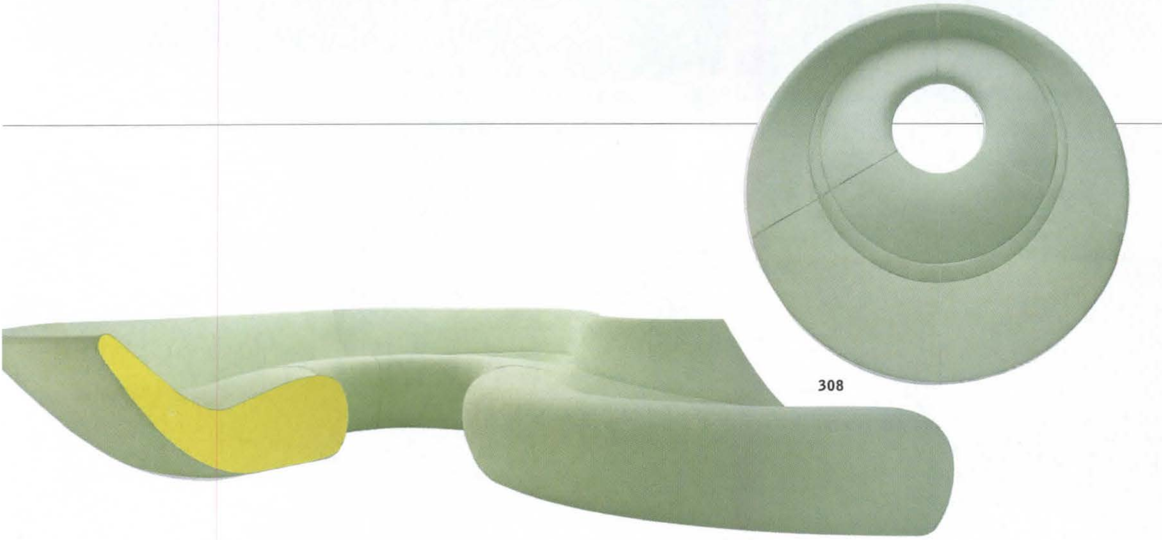

308

A seating circle

Circle, a seating unit designed by Ben van Berkel for Walter Knoll, is composed of four parts: Two can be combined to create a semicircle or all four form a round seating "sculpture." The seating will be initially offered in two color combinations, green/yellow and slate/red. Walter Knoll, Herrenberg, Germany. www.walterknoll.de **CIRCLE 308**

309

Environmentally intelligent

Designtex has produced another environmentally friendly product, Eco-Intelligent Polyester. The product is manufactured without the use of heavy metals, assuring that it will be suitable for reclamation at the end of its useful life. Designtex, New York City. www.dtex.com **CIRCLE 309**

310

Versatile vinyl

Chilewich, a manufacturer of woven vinyl table mats, flooring, and decorative accessories, is now offering its coveted material called By the Yard. The material resists stains and spills and is appropriate for indoor or outdoor use. Chilewich, New York City. www.chilewich.com **CIRCLE 310**

311

A princely product

Louise Campbell's Prince chair, manufactured by the Danish company Hay, cuts a dramatic profile, with a perforated black-rubber surface overlaying a metal foundation. The abstracted floral pattern and the unusual finish add a layer of mystery to this modern lounge chair. Hay, Copenhagen. www.hay.dk **CIRCLE 311**

312

Crystal clear fabric

The award-winning Krystal Weave Collection by Kova Textiles is made from completely clear extruded polymer yarn that looks like drawn glass yet acts like a textile. A combination of traditional cut-glass vases and chandeliers from the Czech Republic inspired the product. Kova Textiles, New York City. www.kovatextiles.com **CIRCLE 312**

313

On the move

Transit Seating, from Forms+Surfaces, is a durable, stainless-steel seating system designed for airports, bus stops, railway terminals, and other high-use environments. Made from a kit of parts, it may be configured in nine standard versions for maximum adaptability. Forms+Surfaces, Carpinteria, Calif. www.forms-surfaces.com **CIRCLE 313**

SAFTI *FIRST's* SuperLite I-W™, fire rated from 20-90 minutes, is the only product that meets the highest impact safety rating of Category II (400 ft.lbs). Other recently introduced replacement options just meet the lower Category I (150 ft.lbs), and code limits them to smaller opening sizes. Category I just doesn't make the grade when it comes to safety.

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Spiral escalators offer architects new design opportunities, especially for large public spaces. It will be interesting to see what technical challenges arise from these designs. *—JOE RAIA, AIA*

Tub for two

Kohler's Consonance whirlpool features distinct bathing spaces that accommodate the individual preferences of two bathers. Within the whirlpool's bathing well are three areas: a deep-soaking area just shy of 4' deep with a lumbar panel angled at 60 degrees for comfort; a standard-soaking area featuring a 43"-long bench with a 55-degree angle back and lumbar support; and a cool-off area with a raised bench that runs parallel to the dual-soaking areas. The whirlpool measures 70"-square and comes with customizable electronic controls, including two floating remote controls. Kohler, Kohler, Wis. www.kohler.com **CIRCLE 314**

Illuminated wall system

CPI Pentglass and Quadwall products can be used in a variety of applications, including illuminated ceilings, interior walls, and curved partitions. These products incorporate Danpalon Multicell standing-seam polycarbonate panels. CPI's customization options allow architects and designers control over light transmittance, light quality, thermal performance, insulation, and color. CPI International, Lake Forest, Ill. www.cpidaylighting.com **CIRCLE 315**

Turning up in more places

Mitsubishi Electric debuted a set of spiral escalators at the grand opening of the Forum Shops at Caesars in Las Vegas in October 2004. The four custom escalators, configured in tiers, feature graceful curves that offer panoramic views of the surrounding shops and create the illusion of being suspended in midair. Mitsubishi Electric is the world's only manufacturer of spiral escalators. Before, there was only one site in the U.S. with a spiral escalator in operation, the San Francisco Centre (installed in 1988). Mitsubishi Electric & Electronics USA, Cypress, Calif. www.mitsubishielectric.com **CIRCLE 316**

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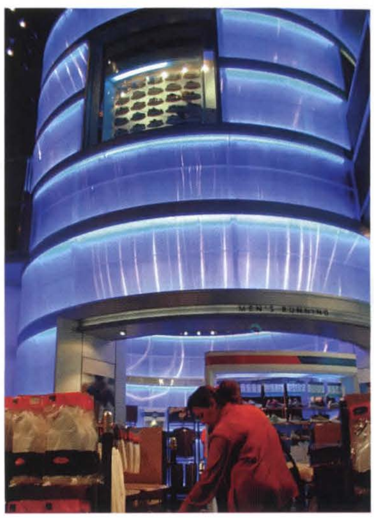

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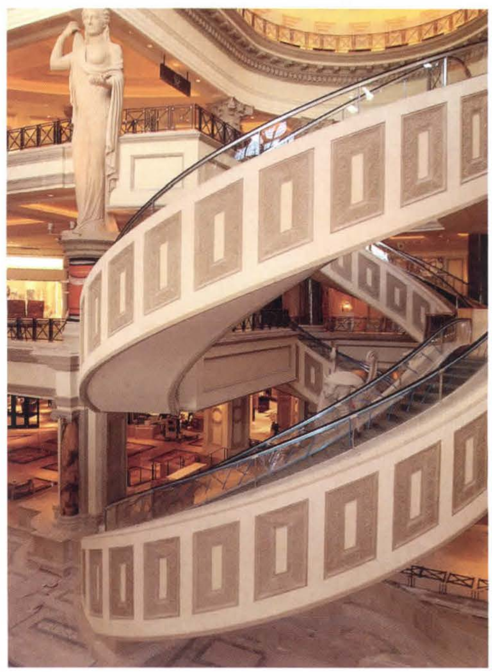

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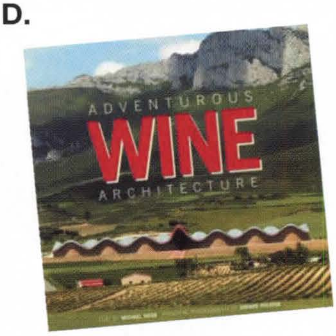

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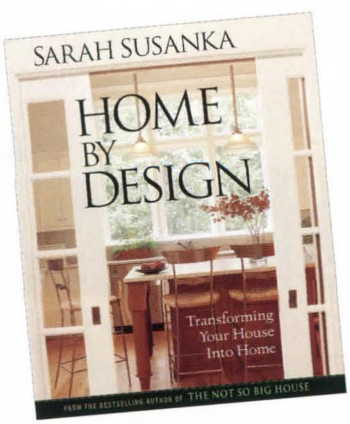

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C. *Home by Design,* by Sarah Susanka, presents the 30 key concepts that can be applied to any home—no matter what the style or size.

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D. *Adventurous Wine Architecture,* by Michael Webb with photography by Erhard Pfeiffer, is a beautiful coffee table book that explores the new wave of winery design.

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E. The Cream Soup Cup, with its integrated handles, is designed to work with or without a spoon.

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F. *The* Café XL Set includes two cups, two plates, and two spoons.

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G. The Caffe Macchiato glass, suitable for hot or cold beverages, is also dishwasher safe.

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At last, a friendly piece of HVAC equipment [Lochinvar's Knight heating boiler]. —*ELIZABETH WEEKS, AIA*

New for the loo

The Lulu collection of faucets, fittings, and accessories, designed by Michael Sieger, includes this slender, single-lever, floor-mount tub filler. Available in *polished chrome and platinum matte finishes, the line* is designed to attract a younger generation of consumers. Dornbracht, Duluth, Ga. www.dornbracht.com **CIRCLE 317**

Starck and square

Designed by Philippe Starck, the 15¾"-high, cube-shaped Starck X toilet and bidet were inspired by ancient cleansing rituals. The covered bidet features an opening through which the recessed flat tap is visible. Duravit, Duluth, Ga. www.duravit.com **CIRCLE 318**

For dry spells

JustRain is one of three new, rainlike shower panels and fittings from Dornbracht that fit directly into the architecture of the ceiling. With jets configured to match the human form, the temperature and intensity of the shower's spray can be controlled by an xTool thermostat module. Dornbracht, Duluth, Ga. www.dornbracht.com **CIRCLE 319**

Wash up like the pros

The KWC Matterhorn is a deep, heavy-gauge stainless-steel sink that is the first in a line of KWC Performance Series sinks. Superior construction, including 16-gauge, 18/10 chromium stainless-steel, sound-deadening padding, and a double Dinaphon undercoating, add to the sink's performance. KWC America, Norcross, Ga. www.kwcfaucets.com **CIRCLE 320**

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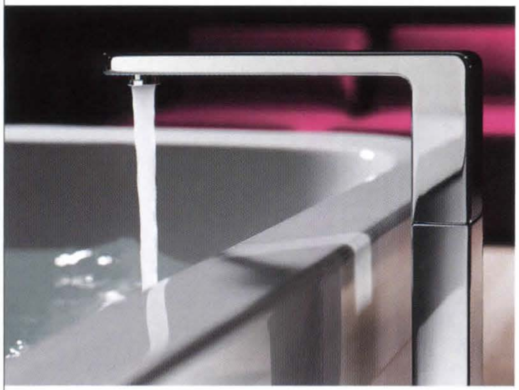

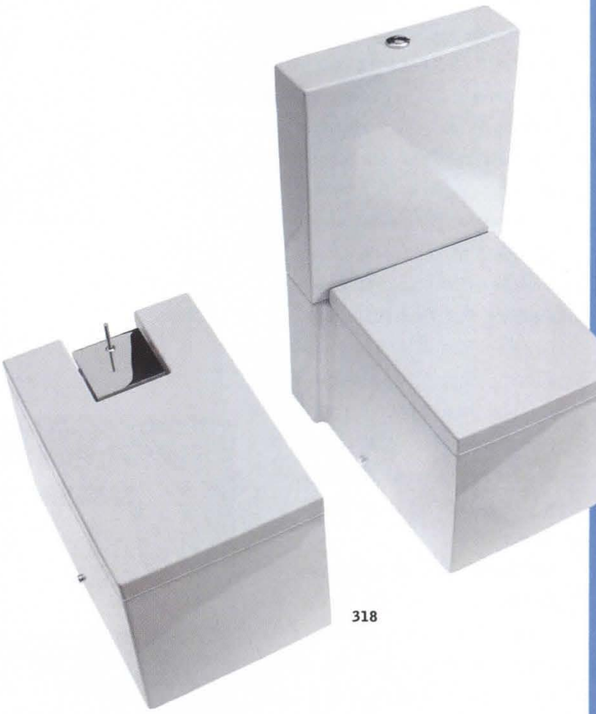

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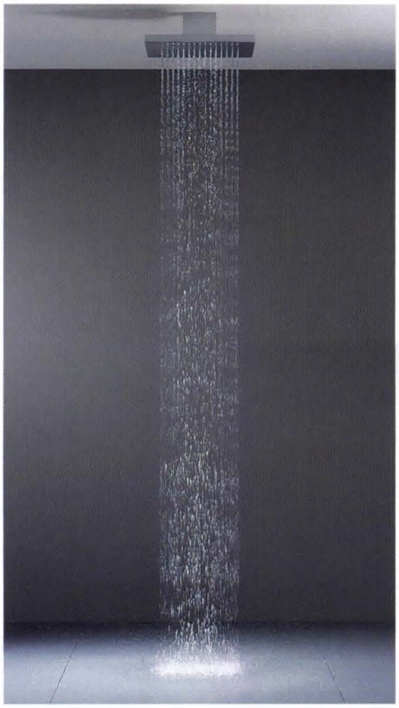

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A place for everything

Julien's Undermount collection offers sinks with clean lines; smooth, rounded corners; and integral tilt-out drawers. Available in single and double bowls, the sinks can accommodate large pans and bulky equipment. Julien, Quebec City, Quebec. www.julien.ca **CIRCLE 321**

Quiet as can be

An efficient, lightweight, and compact model, Lochinvar's Knight heating boiler is available in seven models with inputs from 80 to 500 MBH (1,000 BTUs). According to the manufacturer, it features a whisper-quiet operation and can be installed anywhere in a home. It also generates as much or as little heat as necessary to provide a consistent indoor temperature. Lochinvar, Lebanon, Tenn. www.lochinvar.com **CIRCLE 322**

Falling for flat design

Flat Kap is a roof or wall hood with a variable length of up to 9.84'. Without compromising its suction and intake capabilities, the hood retains a thin profile. Boffi Spa, New York City. www.boffi.com **CIRCLE 323**

Understated sleekness

Two new products from Kohler feature sleek, Minimalist designs. The WaterTile body spray is nearly flush to the wall and can be installed in a variety of locations in a shower. The WaterTile sprays are made of brass and consist of a 5" x 5" escutcheon and a 3" x 3" MasterClean spray face for easy cleaning. Kohler's Purist Hatbox toilet is similarly simple looking and features a "tankless" design. The toilet uses a quiet .2-horsepower electric pump that is fully enclosed in the toilet bowl and features an electronic actuator on the side of the toilet. Kohler, Kohler, Wis. www.kohler.com **CIRCLE 324**

Quieter ventilator

Abbaka's "hyper quiet," low-profile, exterior ventilator series, Hy-Ex, produces no more than 60 decibels of ambient white noise (comparable to a window air conditioner). The ventilator is 9" at its peak, in a "millennium curve" design dipping to 7". Finishes include metallic, weathered copper, bronze, and custom colors. Abbaka, San Francisco. www.abbaka.com **CIRCLE 325**

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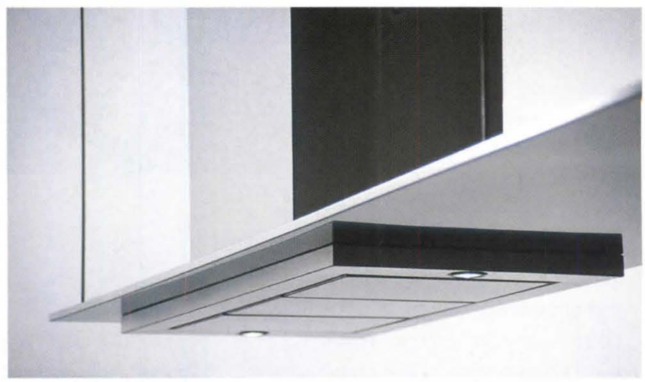

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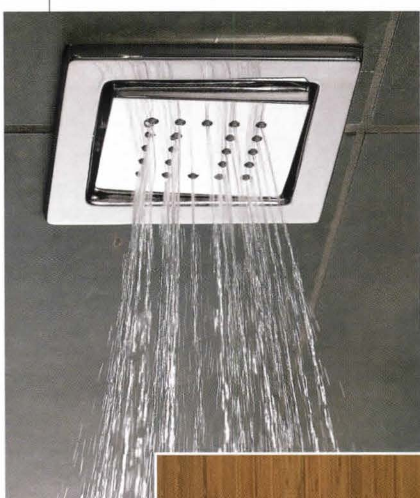

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Plumbing & HVAC

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Stainless-steel all the way

MGS has launched a new line of wholly stainless-steel faucets for kitchens and baths. The Randa K kitchen faucet offers a pullout spout with a stainless-steel flexible hose. The spout is equipped with an anti-lime aerator and a check-valve that prevents the backflow of impure water. MGS's thermostatic shower column is offered as an exposed and in-wall thermostatic mixer. The valve incorporates a volume control that is operated independently of the temperature control. MGS, Studio City, Calif. www.mgsdesign.com **CIRCLE 326**

Multiple modular options

The Catalano C Program is a modular collection of curvilinear basins, toilets, and bidets made of durable white fireclay. Available in a wide range of sizes for wall-hung, semi-encased, and countermount installations, the oval and round basins can be arranged in a variety of ways. Hastings Tile and Bath, Freeport, N.Y. www.hastingstilebath.com **CIRCLE 327**

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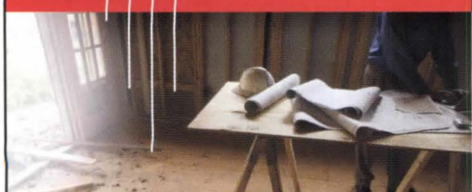

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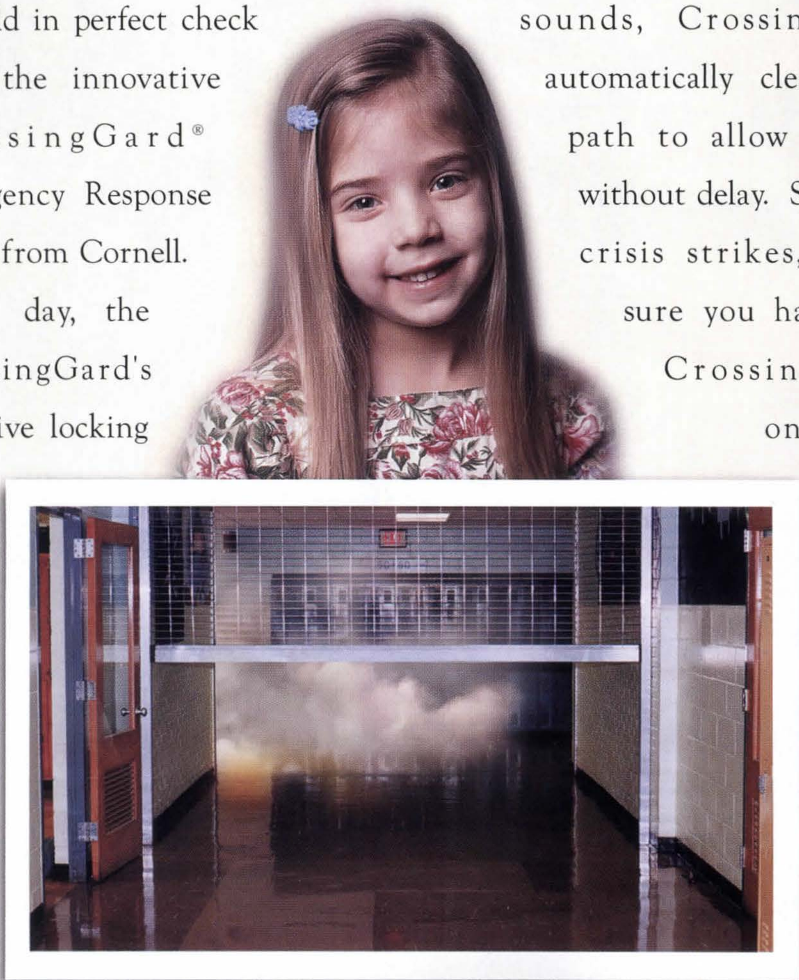

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Electrical

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The Halley lamp [by Lucesco] is the Tizio for the 21st century.

—*JIM CONTI, IALD*

No ugly duckling

The Arketto LED task light by Luxo is characterized by its flexible "swan neck" arm, which provides vertical, horizontal, and rotational adjustments. The product produces more light than a 40-watt halogen with virtually no heat or required maintenance. Luxo, Elmsford, N.Y. www.luxous.com **CIRCLE 328**

Shimmering ceiling lamp

Designed by Patricia Urquiola and Eliana Gerotto, the Caboche ceiling lamp by Foscarini is composed of 189 transparent acrylic balls that multiply the brightness of the central halogen bulb. Modern Living, Los Angeles. www.modernliving.com **CIRCLE 329**

True colors

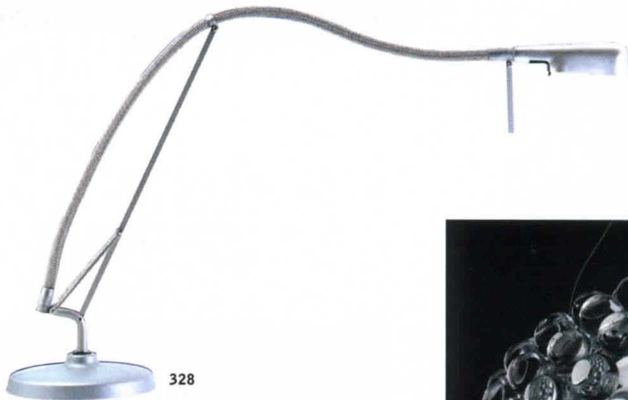
Venture Lighting has introduced two new products: the 350-watt Natural White lamp (shown), which is ideal for applications where simulation of natural sunlight is beneficial (such as retail and grocery stores); and the 320-watt e-Lamp, which reduces yellowing or fading of merchandise and signage by blocking out nearly all UV rays. Venture Lighting, Solon, Ohio. www.venturelighting.com **CIRCLE 330**

Innovative in an emergency

Lightolier's LP Series of emergency lighting uses three high-performance white LEDs to provide illumination for indoor or outdoor low-level applications, such as stairwells, wheelchair ramps, and exit corridors. Lightolier, Fall River, Mass. www.lightolier.com **CIRCLE 331**

Thinking outside the box

The Remake Light is a 9" x 6" illuminated cube available in orange, pink, red, white, gray, and black. The translucent, modular lighting units can create illuminated structures that double as furniture, partitions, or shelving. One plug-in cord can power from 8 to 24 modules. Remake Design, Paris. www.remake-design.com **CIRCLE 332**



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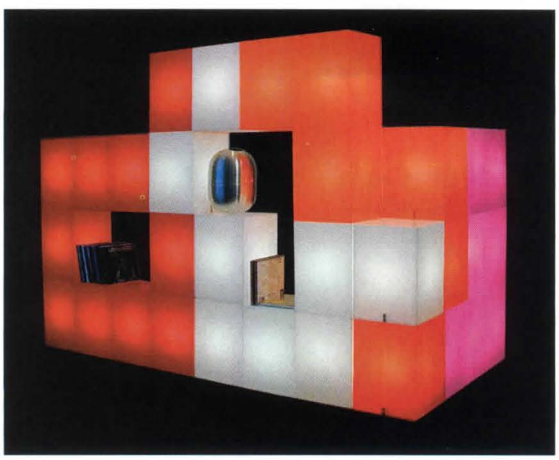

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Electrical

Lighting control devices • Interior lighting fixtures, lamps, and ballasts • Emergency lighting • Exterior and landscape lighting

Radiantly reliable

The Radiante emergency light uses two 5-watt LEDs in combination with a specular reflector to maintain one foot-candle up to 50'. The architectural design and available decorative finishes make Radiante suitable for upscale interiors. Lightolier, Fall River, Mass. www.lightolier.com **CIRCLE 333**


333

Unparalleled light

Parallels, an indirect lighting product from Peerless, does not require cables, wiring, housing, or integral ballasts. The lamp bathes the ceiling and space below with soft, uniform light while its remote-mounted ballast design improves efficiency and allows simple high-low step switching at the wall switch. Peerless Lighting, Berkeley, Calif. www.peerless-lighting.com **CIRCLE 334**


334

A versatile LED

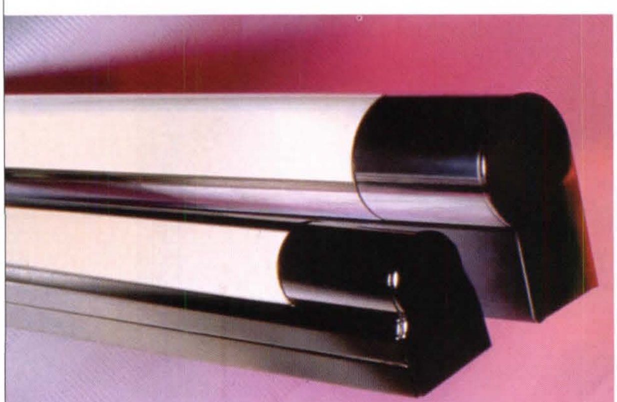
The DRAGONtape LED system packages bright LED light sources in a very flat module, enabling the design of smaller, sleeker, and more innovative luminaires. The product features flexible tape with an adhesive backing that makes for easy installation. Osram Sylvania, Danvers, Mass. www.sylvania.com

CIRCLE 335

335


Small-scale sleekness

Tabbi, a new product from Alkco Lighting, is characterized by its unobtrusive extruded-strip housing that measures less than 2" high and 2¼" deep. These miniature, rotatable, surface-mounted, linear fluorescent luminaires are also user-adjustable and highly energy-efficient. They can be used vertically or horizontally, under cabinets and work-stations, in kitchen and baths, or in any application where low-scale and low-heat is desirable. Alkco Lighting, Franklin Park, Ill. www.alkco.com **CIRCLE 336**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A family of wall luminaires

AH Wall is a family of semirecessed wall luminaires designed by Alfred Homann. Available in two sizes, Maxi and Mini, the product is made with a copper-free aluminum alloy that resists corrosion. Maxi is available with up to a 35-watt halogen light source, while Mini is available with a 20-watt halogen light source. Louis Poulsen Lighting, Fort Lauderdale, Fla. www.louispoulsen.com **CIRCLE 337**


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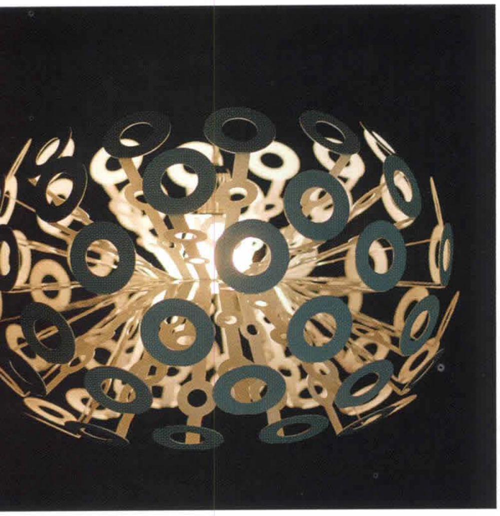

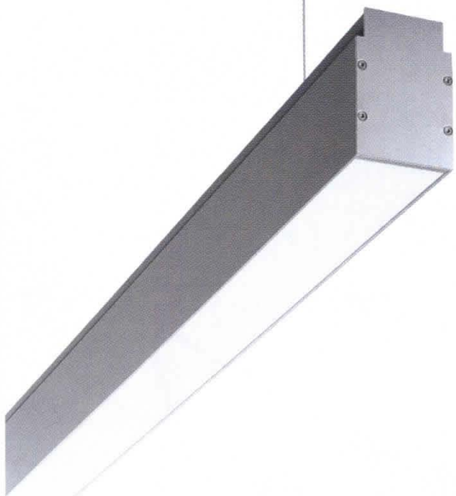

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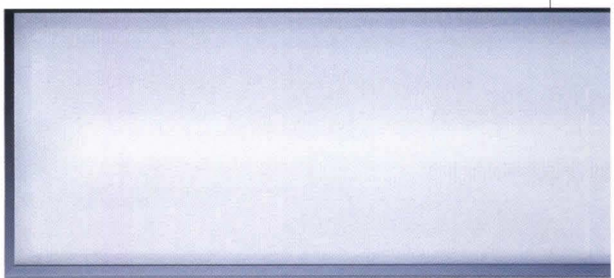

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Dandy light

Designed by Richard Hutten and distributed by Moooi, the Dandelion is a hanging lamp made of white laser-cut, powder-coated steel that measures approximately 31.5" x 21.65". Moooi, Amsterdam. www.moooi.nl **CIRCLE 338**

A duo for the office

Zumtobel Staff has introduced two new products, Slotlight and Light Fields, appropriate for office applications. Slotlight (top) is an unobtrusive option with a minimal 2" or 4" aperture that can be suspended or recessed. Light Fields (bottom) is a micropyramidal lighting system available as a recessed, suspended, or surface-mounted luminaire. Zumtobel Staff, Highland, N.Y. www.zumtobelstaff.com **CIRCLE 339**

Uses less energy

Energos is a comprehensive, easy-to-install linear pendant fluorescent lighting system designed to be highly energy-efficient and bidirectional. To fine tune the lighting performance, Energos offers over 100 high-performance lamp and ballast configurations to achieve ideal lighting without wasting power. Lightolier, Fall River, Mass. www.lightolier.com **CIRCLE 340**

Sweet as honey

The Italian architecture team of Dante Donegani and Giovanni Lauda have created a collection of honeycomb-pattern luminaries, called Honey. All models provide ambient lighting that is suited to a variety of upscale commercial and residential interiors. The product is composed of snap-together, three-dimensional, triangular-shaped, polycarbonate light-reflecting forms. Rotaliana of Italy, Danbury, Conn. www.rotaliana.it **CIRCLE 341**

On the right track

Alcyon, a new family of specification-grade track fixtures and accessories, is being hailed by Lightolier as "the apex of 50 years of incandescent track lighting development." The result is the latest selection of low-voltage and line-voltage fixtures that are suspended from a narrow, wireless, bladelike stem that allows the heads to fully rotate. Lightolier, Fall River, Mass. www.lightolier.com **CIRCLE 342**

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Electrical

Lighting control devices • Interior lighting fixtures, lamps, and ballasts • Emergency lighting • Exterior and landscape lighting

An energy-efficient T8

The 25-watt Alto Energy Advantage T8 system is the lowest energy-consuming 4-foot T8 system on the market. Philips Lighting, Somerset, N.J. www.philips.com **CIRCLE 343**

New design icon

Richard Sapper, designer of the Tizio lamp in 1972, has designed Halley, a lamp line constructed of aluminum and steel primary components. Light equivalent to a 35-watt halogen is produced by 16 LEDs consuming only 18 watts of power. Lucesco, Palo Alto, Calif. www.lucesco.com **CIRCLE 344**

An address for innovation

Harnessing the power of a single T5/T5HO lamp, Avenue A utilizes a precision-formed micro-optic that delivers high levels of vertical illumination and washes walls with shadow-free light. Focal Point, Chicago. www.focalpointlights.com **CIRCLE 345**

Off the grid

The Annapolis Smart Bollard is the first bollard with integrated solar-powered lighting provided by LEDs. Under typical conditions, it will run up to 15 hours per day and requires 3 hours of daylight to recharge. Landscape Forms, Kalamazoo, Mich. www.landscapeforms.com **CIRCLE 346**

Complete control

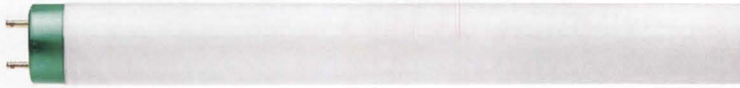
Accenti lighting controls, switches, wallplates, and GFCI receptacles are available in custom premium colors and feature flawless multigang installation with no dividers between devices. Leviton Manufacturing, Little Neck, N.Y. www.leviton.com/accenti **CIRCLE 347**

Pure white light

The PureFX recessed lighting system offers controlled brightness and significant energy savings over traditional recess fixtures. The product uses MesoOptics technology, a holographic material that produces diffuse patterns of pure white light. Ledalite Architectural Products, Langley, British Columbia. www.ledalite.com **CIRCLE 348**

Lighting control redefined

The EcoSystem ballast connects directly to IR receivers, occupant sensors, and wall stations without interfaces, power packs, or controllers, then interprets the data to adjust light levels. Lutron Electronics, Coopersburg, Pa. www.lutron.com **CIRCLE 349**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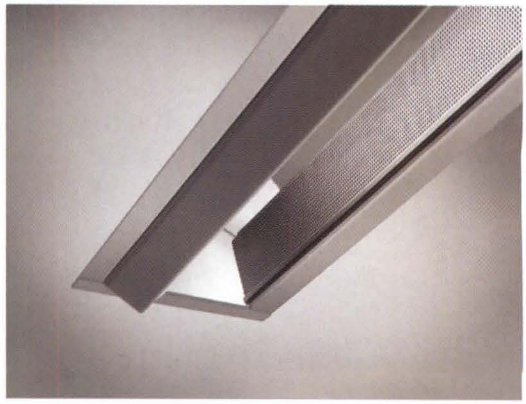
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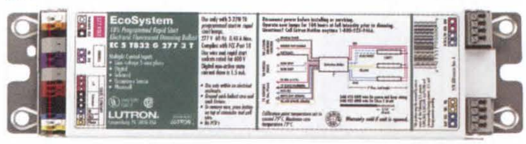

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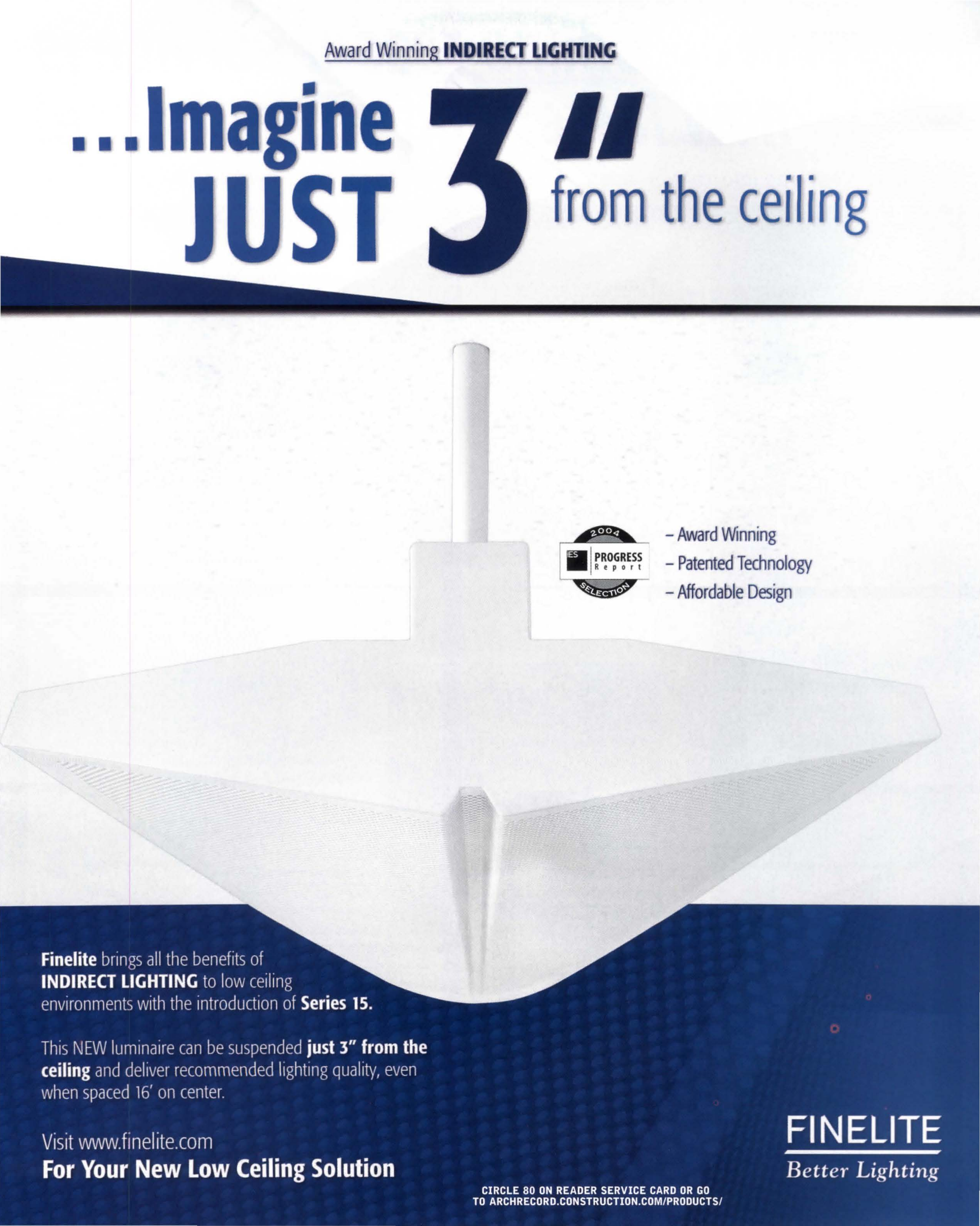
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▴▸ Wider and more colorful

Junckers Hardwood introduces five "custom" colors to its Olde World Collection of antique sculpted hardwood flooring. Sienna (above left), one color in the collection, features both medium red and brown tones. Junckers has also introduced its first wide-plank engineered product line, the Woodland Collection. The 14 products in the collection are divided into two offerings, ½" smooth surface and ¾" hand-scraped products. Peruvian Walnut-Designer's Touch (above right) has a color similar to Peruvian Walnut, with the exception of blonde figuring. Junckers Hardwood, Anaheim, Calif. www.junckershardwood.com CIRCLE 214

▾ Certified solid oak flooring

Earlier this year, Smith Flooring completed its first run of FSC-certified oak flooring since achieving Chain-of-Custody certification from the Forest Stewardship Council (FSC) in 2004. The flooring is produced from trees grown in a privately held forest in Missouri's Ozark Mountains. According to the FSC, there are fewer than 12 certified flooring manufacturers in North America supplying certified solid oak. Smith Flooring is the largest producer overall. Smith Flooring, Mountain View, Mo. www.smithflooring.com CIRCLE 215

◂ Expanding palette

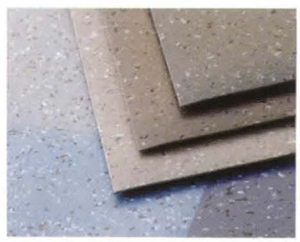
Created by Amtico's design team, Color Zone (left) offers a new palette of nine subtle shades. Specifiers can choose any one of nine color options and then customize it by adding a sparkle (MicroSpec) or selecting a finish such as press plate, rib, or a 3D effect. Amtico's Amtico and Stratica flooring brands have met the requirements of the new FloorScore testing program, a voluntary certification program that identifies flooring products that meet stringent air-quality requirements. Amtico, New York City. www.amtico.com CIRCLE 216

▸ Breathe easier

Ultrabond ECO 972 is the latest in Mapei's ECO series of environmentally friendly floor-covering adhesives that are low in VOCs. The formula was developed for the installation of engineered wood and parquet flooring. Ultrabond incorporates Mapei's BioBlock antimicrobial technology to provide an additional line of defense by inhibiting the growth of odor- and stain-producing mold, mildew, and bacteria. Mapei, Deerfield Beach, Fla. www.mapei.com CIRCLE 217

▸ Flooring déja vù

Relay sheet flooring is manufactured using 40 percent preconsumer (postindustrial) recycled content. The scrap material is sent through a grinding process that produces a mixture of fluff from the carpet face and chunks from the carpet backing. The mixture is heated and pressurized into cord-shaped pieces that are colored and ground into chips, which are used in place of virgin raw materials to produce color pellets for Relay. Mannington Commercial, Calhoun, Ga. www.mannington.com CIRCLE 218



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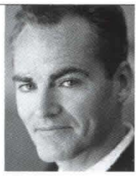
Communications, Security & Exterior Improvements

Access control • Smoke detection sensors • Noise pollution control • Bollards & anti-ram protection

Babble is an answer to the open office problems concerning privacy. Any research into acoustics should be applauded and supported. —*MICHAEL MORRIS*



Beneficial babble

Babble provides voice confidentiality in open-plan work environments by connecting to the telephone and sending the user's voice out in multiplied and "babbled" form through proprietary speakers arranged in the work area. Those in the user's immediate area hear what sounds like an indiscernible, low-volume group conversation. Sonare Technologies, A Herman Miller company, Chicago. www.sonaretechnologies.com **CIRCLE 350**

Flush with style and safety

The Modern Smoke detector uses a patented design to lie recessed and flush-mounted to the surface of the wall or ceiling. The detector can be hardwired, hardwired with battery backup, or battery-powered, and it can be made part of a whole building alarm system. The detector uses recyclable plastic and a photoelectric sensor rather than older technology, which contains small amounts of radioactive material. Architectural Devices, San Francisco. www.architecturaldevices.com **CIRCLE 351**

Self-charging smoke alarm

The DuPont self-charging smoke alarm is charged by the home's electricity, screwing directly into ceiling-mounted light sockets and track lights without lampshades. They are ideal for use in unprotected, at-risk areas such as laundry rooms, basements, and garages. DuPont, Wilmington, Del. www.dupont.com **CIRCLE 352**

Secure successors

Siedle has extended its in-home range by adding a more affordable internal station complete with a monitor (left). The unit can be assembled quickly and installs with only two wires. The FPM 611 (right), Siedle's latest fingerprint reader model, can be used for multiple doors. SSS Siedle, Broomall, Pa. www.siedleusa.com **CIRCLE 353**

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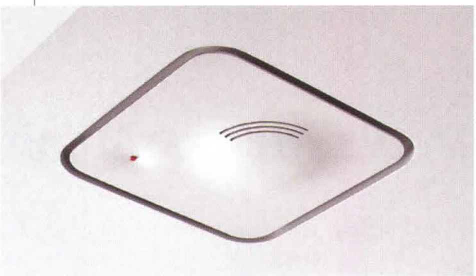

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Communications, Security & Exterior Improvements

Access control • Smoke detection sensors • Noise pollution control • Bollards & anti-ram protection

Modern perimeter protection

SO Works is a product-design firm specializing in modern bollards and anti-ram protection. The sculptural stainless-steel or bronze bollards (far right) are built to the specifications of Weidlinger Associates, a consulting firm nationally recognized for work on security projects. A stone and metal vehicular anti-ram bench (near right) was designed by company owner/architect Fredrick Reeder, AIA, for the Fleet Bank Headquarters in Boston. SO Works, Boston. www.soworks.net **CIRCLE 354**

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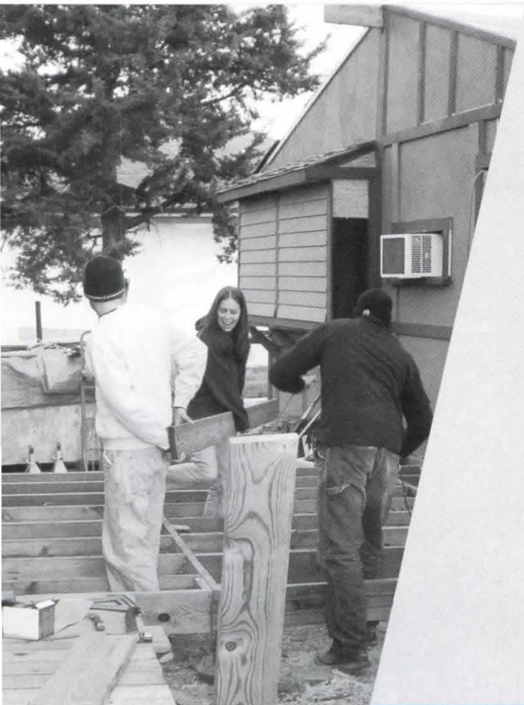

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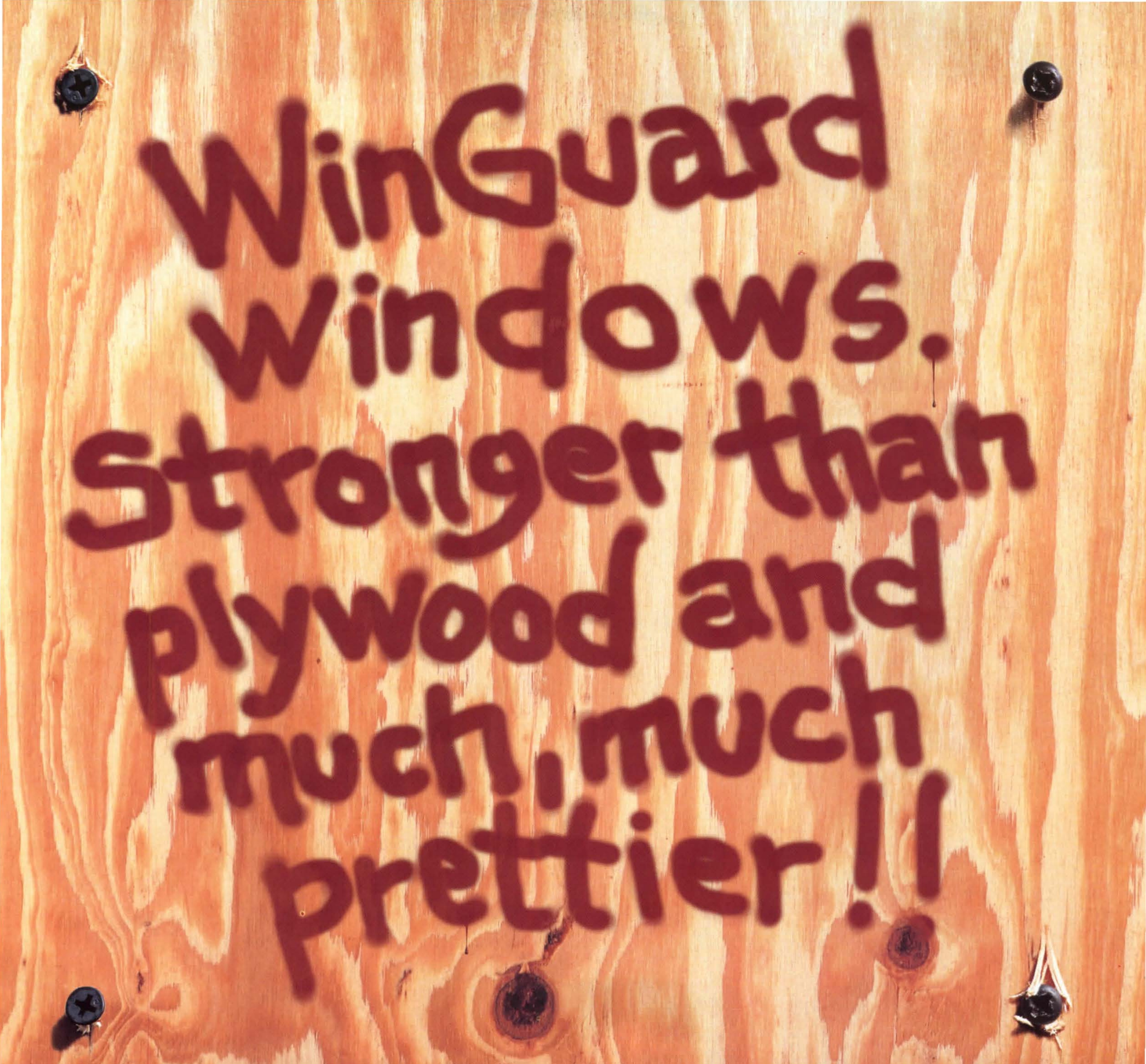

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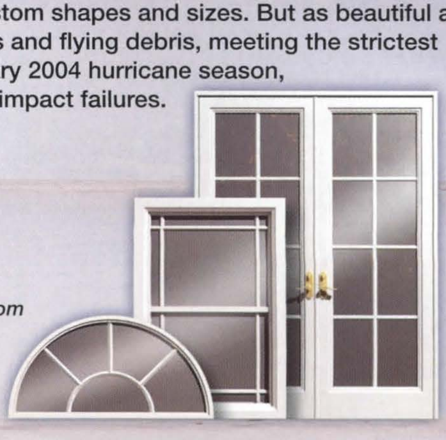

New Life for the 'Big Easy'

An international competition for new housing in New Orleans

Sponsored by *Architectural Record* and McGraw-Hill Construction in partnership with Tulane University School of Architecture

New Orleans. The Crescent City. Now, wounded by Hurricane Katrina–leaving in its wake widespread damage to homes, lives, and futures–needs your 'hearts and minds' to reassess, re-envision and redesign the region's housing. To breathe new life and rebuild lives.

Architectural Record and McGraw-Hill Construction, in partnership with Tulane University School of Architecture, invite you to submit your ideas to help design the future of New Orleans. Participants in this competition will design housing for an actual block in the city of New Orleans. Winning designs will be published in *Architectural Record* and presented at the 2006 AIA Convention and Expo. Selected submissions will appear on McGraw-Hill Construction web sites.

Programmatic elements include:
- Single family housing
- Multi-family housing
- Mixed-use urban planning

Other programmatic elements:

- This competition encourages close attention to issues of sustainability, both in urban planning and architectural design.
- Contestants are encouraged to incorporate modular or prefabricated building products and processes wherever possible.

Important Note: While the competition welcomes visionary or hypothetical proposals, contestants are encouraged to consider that New Orleans faces a severe and immediate housing crisis, and is in need of practical, affordable solutions to this problem.

Competition Entry:

Go to **www.architecturalrecord.com** for submission requirements and more specific programmatic information. Competition specifics will be included in the competition packet. All entries must be received no later than **March 1, 2006.**

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CONTINUING EDUCATION

AIA/*ARCHITECTURAL RECORD* **CONTINUING EDUCATION** Section: December 2005

You can earn Continuing Education Learning Units by reading designated articles and sponsored sections in *Architectural Record*. This month's sponsored Continuing Education section covers a range of architectural and design challenges and innovations. They are presented by manufacturers and professional organizations who share *Architectural Record's* strong commitment to serving the educational needs of architects.

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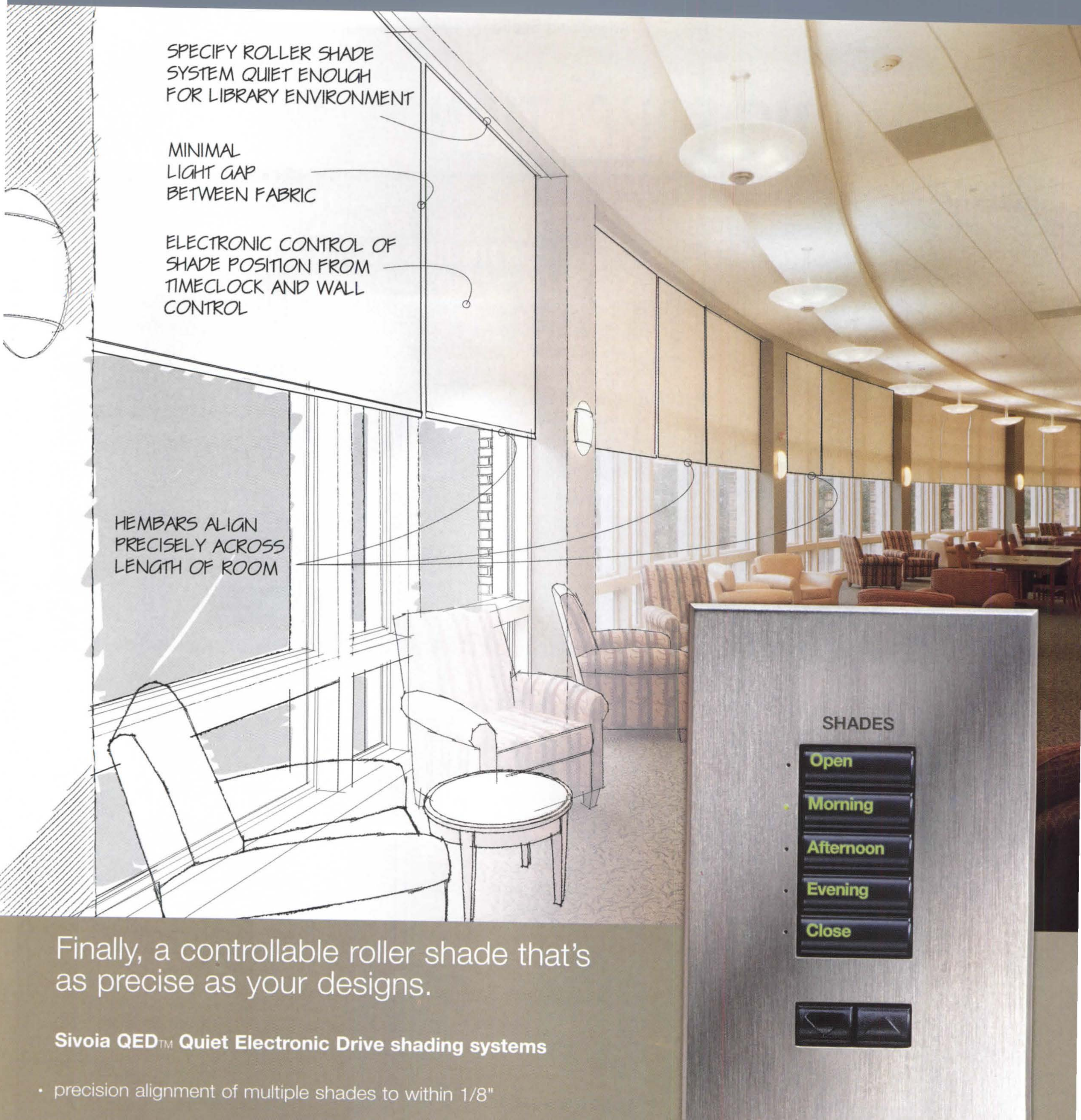
Barbara A. Nadel FAIA, Consulting Editor
Continuing Education Section



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Daylighting in Schools, Grades K-12

Assisting daylight delivery while controlling electric light

Provided by Lutron

By Susan K. Oldroyd, AIA

Benefits for incorporating daylighting principles into schools grades K-12 are twofold: reduction of energy consumption and costs by greater reliance on natural light, and improved human performance.

Schools typically relied on daylighting as the primary source of illumination before fluorescent lighting became common. The California Department of Education required daylighting standards in school construction, so that all California classrooms built to handle the postwar baby boom in the 1950s and early 1960s were examples of daylit schools. The "Finger Plan" schools with rows of single classrooms with exterior corridors on both sides became a standard for grades K-12. However, in the late 1960s, air conditioning became common and school design changed. Classrooms were designed with less glass and lower ceilings, and rooms were grouped together in tighter configurations, without solar orientation in mind. The finger plan school design was largely abandoned, and many of the classrooms built since then do not have daylighting, and some rooms have no windows at all.

Photographer: Jamie Myers Forsythe

Southwest Community Center Gymnasium, Seattle, WA: This gymnasium uses fabric skylight baffles to diffuse glare and make electric lighting unnecessary during daylight hours. Architect: Weinstein A|U

School districts across the country are experiencing K-12 construction starts in the first half of 2005 averaging four percent higher than the same period in 2004. $15.6 billion in constructions starts have begun to address overcrowding and inadequate facilities by constructing or renovating school buildings. The need for new facilities will continue to increase, according to Engineering News-Record and McGraw-Hill Construction Research & Analysis, especially in southern regions of the United States experiencing increases in school age populations due to relocation and immigration.

Initial costs are traditionally the most important in school construction budgets, but districts are increasingly focusing on sustainability, as case studies prove incorporating sustainable features into new K-12 schools can be realized within construction budgets, thus providing a more effective learning environment and saving resources. A sustainability measure increasingly integrated into building design is the use of daylight as a primary lighting element in classrooms, common areas, and even gymnasiums. Design features such as light shelves filter and reflect light to control glare and maximize diffuse natural light during K-12 operating hours, which coincide with daylight hours. Lighting controls, such as dimming ballasts, improve the light distribution when daylight is insufficient, and manage energy by turning off lighting by means of occupancy sensors. Clients from K-12 schools are learning the advantages of lighting controls such as energy savings and energy code compliance, while seeking simple, low-cost solutions.

CONTINUING EDUCATION

Use the learning objectives below to focus study as you read **Daylighting in Schools, Grades K-12.** To earn one AIA/CES Learning Unit, including one hour of health safety welfare credit, answer the questions on page 251, then follow the reporting instructions on page 346 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify benefits of incorporating daylighting principles into schools grades K-12.*
- *Describe architectural features used to increase effectiveness of daylighting in interior spaces.*
- *Determine appropriate building controls for different types of school spaces.*

Increased Student Performance

A 1999 study funded by the Pacific Gas & Electric Company and completed by Heschong-Mahone Group found that students get higher test scores when they learn in classrooms illuminated by daylight. This study of the correlation between daylight availability and test scores showed that natural daylighting in schools resulted in documented increases in student performance regardless of school design and climate. Three elementary school districts (Orange County, California; Seattle, Washington; and Fort Collins, Colorado) were studied. In Orange County, controlling for all other factors, students with the most daylighting in their classrooms progressed 20 percent faster on math tests and 26 percent faster on reading tests in one year than those students in classrooms with the least daylight; students in classrooms with the largest window area progressed 15 percent faster in math and 23 faster in reading than those with the least window area. In Seattle and Fort Collins, students in classrooms with the most daylighting had tests scores seven to eighteen percent higher than students in classrooms with the least daylighting. The authors conclude that there is a valid and predictable effect of daylighting on student performance.

Reduction of Energy Consumption

A white paper by Vivian Loftness, FAIA, titled Improving Building Energy Efficiency in the U.S.: Technologies and Policies for 2010 to 2050 (2005) lists the combination of daylighting and natural ventilation as one of the five most important directions for energy conservation in the following half century. "More than ten percent of all U.S. energy is used for lighting buildings, much of this during the day when daylight is abundant.... Effective daylighting can yield 30-60 percent reductions in annual lighting energy consumption, with average energy savings for introducing daylight dimming technologies in existing buildings at more than 30 percent.... Research using an advanced electric lighting control system has found that daylight-linked control systems can bring about sustainable reductions of 30–41 percent in electrical energy for an outermost row of lights in a perimeter zone, and 16–22 percent for the second row of lights."

Code Compliance

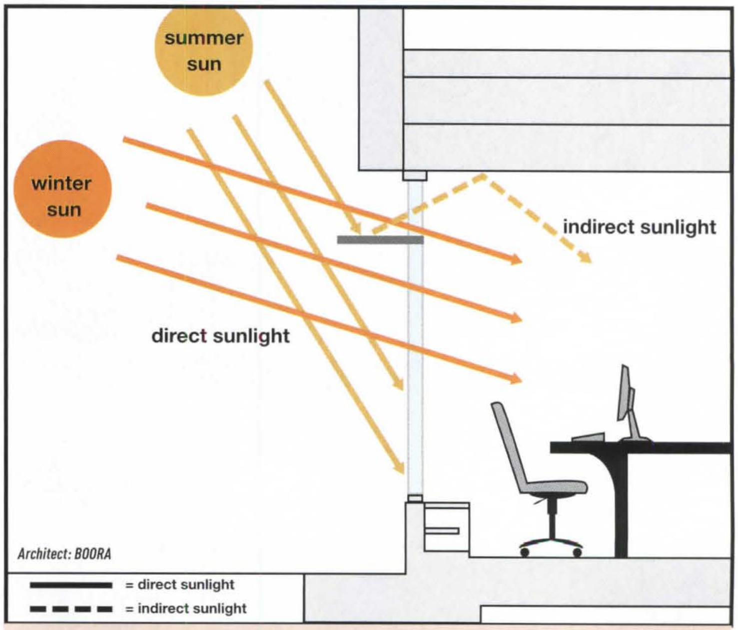
Energy efficiency is rapidly becoming the design requirement of the new millennium. Many states and cities have already adopted specific energy-saving guidelines. The following are examples of codes and standards that are being instituted in the United States:

- American Society of Heating, Refrigerating and Air-Conditioning Engineers/Illuminating Engineering Society of North America (ASHRAE/IESNA): This standard encourages the use of energy efficient-lighting controls in design practice for both interior and exterior lighting. Most states have or will adopt energy codes based on the standard.
- Leadership in Energy and Environmental Design (LEED): Efficient lighting controls may contribute to obtaining up to 22 points in five of six LEED credit categories. A minimum of 26 points is required for Leadership in Energy and Environmental Design certification. LEED is a rating system sanctioned by the United States Green Building Council (USGBC) that provides a national standard for what constitutes a green building.
- Title 24: California's building efficiency code (along with those for energy-efficient appliances) has saved more than $36 billion in electricity and natural gas costs since 1978.

Architectural Features

Daylighting control principles have two major requirements: directing diffuse daylight delivery into interior spaces and the control of electric lighting output in response to the available daylight. An integrated approach must be conceived from the beginning of the project including building siting and orientation, window and/or skylight design, and lighting and shading control systems design, as well as ongoing maintenance. Daylight, electric lighting, and shading systems *cannot be* considered separately because daylighting affects electric lighting use and has the potential of introducing direct sunlight and glare that may be uncomfortable for building occupants. This requires cooperation between architects and lighting engineers. Daylight, electric lighting, controls and building design features must be seen as an integral part of the overall energy optimization program.

Building form and orientation can be designed to capture more daylight opportunities. The floor plan configuration should maximize the perimeter daylight zone. This may result in a building with a higher skin-to-volume ratio than a typical compact building design. Other examples of design elements used in effective daylighting include light shelves, glazing modulation, and light monitors. A standard window can produce useful illumination to a depth of about one and one-half times the height of the window. As a general rule-of-thumb, the higher the window is placed on the wall, the deeper the daylight penetration. With lightshelves or other reflector systems this can be increased to two times or more. A light shelf is a horizontal light-reflecting overhang placed above eye-level with a transom window placed above it. This design, which is most effective on southern orientations, improves daylight penetration, creates shading near the window, and helps reduce window glare. Exterior shelves are more effective shading devices than interior shelves. A combination of exterior and interior shading devices will work best in providing an even illumination gradient. Carefully select and detail glazing and location and design of window openings. Glazing specification depends on the exposure; Low E glazing with light transmission of 50 percent should be used on the vision panels with 68 percent or greater transmission on glazing above the light shelf. No light shelves or shading devices, and all 68 percent or greater light transmission glazing should be used on the north side.



Section through exterior wall showing light shelf, Clackamas High School, Portland, OR: This section indicates daylight bouncing off light shelf onto ceiling, diffusing light throughout the space.

Light monitors can follow an east-west axis to maximize exposure to the southern sun. Top-lighting provides interior light that is significantly different from that provided by windows: it can provide relatively uniform light distribution throughout a space, and it is often easy to integrate with electric lighting because light originates from the ceiling in both cases. Roof monitors can be designed to admit daylight and sunlight, although sunlight is difficult to control and best avoided; a roof aperture should be between four to eight percent of the floor area. Shape the roof monitor to admit only daylight from the north. Splaying walls and using matte white reflecting surfaces around the monitor improves light distribution and reduces glare. Using diffusing glass gives better distribution of light if a view of the sky is not critical. Horizontal skylights may result in excessive solar gains in summer. Brighter sky visible through skylights can also cause glare problems. In addition to maximizing the penetration of diffuse light, the building features must diffuse or block direct rays of the sun. Glare and overheating from the sun's *direct rays inhibits* the performance of visual tasks in classrooms, offices and other similar spaces. In order for spaces to be considered daylit, The USGBC LEED Standard requires that no direct sunlight be admitted to critical task areas.

Control of Electric Lighting Output

Control of electric lighting output saves energy and improves the overall distribution of light when daylight is insufficient. A building designed for daylighting but without an integrated electric lighting system may even be a net energy loser because of the increased thermal loads. Only when the electric lighting load is reduced will there be more than offsetting savings in electrical and cooling loads. The benefits from daylighting are maximized when both lighting and occupancy sensors are used to control the electric lighting system. Combining lighting control strategies enhances building performance: Using occupancy sensors, daylight sensors, and time clocks with fluorescent dimming can help manage the lighting in an entire building and further reduce electric demand. Energy savings result when sensor and control technologies are employed in each classroom; maintenance is reduced because of less wear and tear on fixtures from using dimmers rather than on/off switches; and student productivity is increased through use of daylight and exact light levels for task needs.

Options for common school lighting control functions in classrooms, common areas, and other types of school areas can provide significant benefits. (Table 1.)

Common School Lighting Control Functions	Benefits
Daylight Sensors and Dimming Ballasts	Reduced energy use Even light level throughout classroom Non-distracting light level changes Increased productivity
Occupant sensing	No wasted energy when classrooms are empty
Dimming wall controls	Saved scenes for various presentation and computer/classwork needs

Table 1

Mt. Angel high performance prototype classroom, Mt. Angel, OR: A rectangular suspended device dubbed "the halo" is made of translucent material that reflects part of the light onto the ceiling and walls, while letting part of the light into the room. Design team: BOORA, SOLARC, Prof. Charlie Brown of the Seattle Daylighting Lab, and SRG Partnership

New installations and retrofits require different approaches. With a new installation, performance targets can be set and a light source and shading device can be chosen based on economic, ergonomic, and technical considerations, e.g., an acceptable payback period. With existing installations, choices will be limited by the building constraints, the availability of daylight, and the lighting controls used.

Modeling Daylight in Interior Spaces

Joel Loveland, director of the Seattle Daylighting Lab, oversees his group's consultations with architects and lighting designers to shape school designs for maximum daylighting capability. The consultants prioritize daylighting as a building design goal, while working with the budget and programmatic requirements. Some of the design principles of the

Daylighting Lab are:

- Treat the building as a luminaire.
- Separate the vision and daylight glazings.
- Position the daylighting apertures to create mood and visual focus.
- Address the requirements of the visual task.
- Integrate the daylighting system with the architecture.
- Integrate the daylighting system with the other building systems.

The Daylighting Lab uses modeling to predict exact natural lighting levels so that electric lighting and controls can be specified to work with and complement the daylight.

Prototype Classroom

A high performance prototype classroom in Mt. Angel, Oregon, created through the combined efforts of many experts and design firms, including BOORA, SOLARC, Prof. Charlie Brown of the Seattle Daylighting Lab, and SRG Partnership seeks to light a classroom during daylight hours without any electric light, with minimum cost. Electric light was added for the infrequent occasions when the classroom was used at night, but the large skylight opening on the ceiling distributes light to the entire classroom. A rectangular suspended device dubbed "the halo" is made of translucent material that reflects part of the light onto the ceiling and walls, while letting part of the light into the room. The edges of the room receive two sources of light, from the reflection and the direct light. This prototype is designed for single story ground floor buildings in moderate climates but the model could be adapted into two story buildings with light shafts, and other region and climate types.

Clackamas High School, Portland, OR

BOORA, Portland, OR, has developed successive daylit schools grades K-12 including Ash Creek Intermediate School, Monmouth, OR and Clackamas High School, Portland, OR. Most buildings spend more on cooling than on heating, so daylighting principles in schools typically focus on bringing in light rather than heat. In the case of Clackamas High School (completed in 2002 for $127.71 /s.f.) control of daylight was accomplished using light shelves and shading devices. Light bounces off the top of the light shelf into the ceiling of the first floor spaces. The overhang shades the window below it. This allows a higher visible transmittance glazing in the daylight aperture if it is out of normal sight lines. Since the ceiling is the most important light-reflecting surface, using this surface to bounce daylight deep into the room can be highly effective. Both of these strategies are utilized in light shelf designs. Rooms in this facility use occupancy sensors, timers and daylight sensors to control output of electric light. Two rows of suspended T-5 fixtures running parallel to exterior windows are used for supplemental lighting, with the inner row on dimming ballasts. Ceilings are shaped to reflect light more evenly throughout rooms. The cafeteria uses virtually no electric light yet offers a variety of light and dark options for students through means of mechanized window shades. (Figure 4.) Heinz Rudolph, FAIA, principal of BOORA, states, "When everything is said and done a building needs a mixture of daylight and electic light, and good control devices."

"When everything is said and done a building needs a mixture of daylight and electic light, and good control devices"

Cafeteria, Clackamas High School, Portland, OR: The cafeteria uses virtually no electric light. Architect: BOORA

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***http://archrecord.construction.com/resources/conteduc/archives/0512lutron-1.asp***. To receive AIA/CES credit, you are required to read this additional text. The quiz questions below include information from this online reading. To receive a faxed copy of the material, contact Jeanette Fitzgerald at Lutron, (610) 282-6661 or fax (610) 282-6437.

AIA/ARCHITECTURAL RECORD
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LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify benefits of incorporating daylighting principles into schools grades K-12.*
- *Describe architectural features used to increase effectiveness of daylighting in interior spaces.*
- *Determine appropriate building controls for different types of school spaces.*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 346. Follow the reporting instructions, answer the test questions and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. Which of the following is not a benefit of integration of daylighting principles?
a. Reduction of energy consumption and costs.
b. Improved mechanical systems lifespan.
c. Improved human performance.
d. Energy code compliance.

2. The 1999 study by Heschong-Mahone Group made what correlation?
a. Students got lower test scores when affected by glare.
b. Students got higher test scores in classrooms illuminated with daylight.
c. Students' test scores were affected by type of subject matter.
d. Students' test scores depend on climate.

3. Average energy savings for introducing daylight dimming technologies in the perimeter daylight zone of existing buildings are more than __ percent:
a. 10 percent
b. 25 percent
c. 30 percent
d. 20 percent

4. Energy codes based on this standard have been adopted by most states:
a. National Electrical Code (NEC)
b. Universal Building Code (UBC)
c. American Society of Heating, Refrigerating and Air-Conditioning Engineers/Illuminating Engineering Society of North America (ASHRAE//IESNA)
d. International Energy Agency Solar Heating and Cooling (IEA SHC)

5. Two major requirements of daylighting control principles are directing diffuse daylight delivery into interior spaces and the control of electric lighting output in response to the available daylight.
a. True
b. False

6. Which of the following architectural features is not useful for maximizing building daylighting potential?
a. Light shelves
b. Building form and orientation
c. Light monitors
d. Dark finish materials

7. The USGBC LEED Standard requires what in order for spaces to be considered daylit?
a. That a roof aperture not exceed eight percent of the floor area.
b. That roof monitors admit only daylight from the north.
c. That no direct sunlight be admitted to critical task areas.
d. d. That occupant sensors be used in classrooms.

8. What percent of dimming is recommended for classrooms?
a. One percent architectural dimming
b. Five percent high performance dimming
c. Ten percent lighting management dimming
d. Twenty percent lighting controls

9. Which of the following is NOT an example of lighting controls suitable for schoolroom use?
a. Dimming ballasts
b. Photoelectric light sensors
c. Motion detectors
d. d. Occupancy Sensors

10. What is the most common daylight control lamp source?
a. Fluorescent
b. HID
c. Incandescent
d. High pressure sodium

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Exploring the High-Performance Benefits of Laminated Glass

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Provided by Solutia Inc. and Viracon

San Francisco International Airport, San Francisco, California.
Architect: Skidmore, Owings & Merrill LLP.; Photographer: Richard Barnes

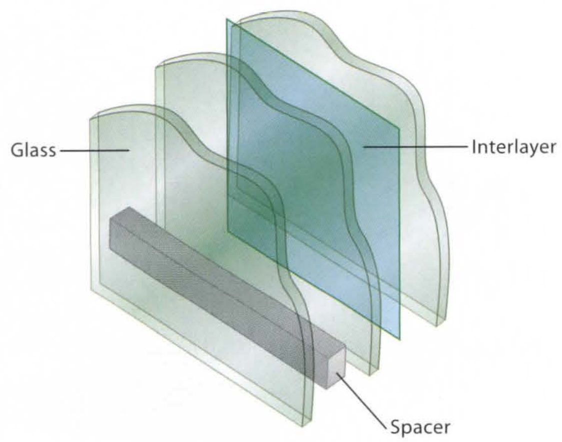
Global terrorism and natural disasters have emphasized the need for architects to address emerging design challenges regarding safety, security, sustainability, and energy efficiency. As the building industry examines these performance issues and design criteria, architects are increasingly turning to laminated glass because of its many high performance benefits.

While laminated glass is a relatively new architectural product in the United States, it has been a popular design tool in Europe for many years. Europe's experience with blasts and natural disasters has led many countries to place a premium on the safety and security of their citizens, especially in public buildings. Standards vary by country, but generally all government and public buildings including hospitals, daycare centers, airports, post offices, and train stations, must be built to withstand blast. In addition to the safety, security, and sound reduction benefits it affords, laminated glass also contributes to sustainability goals, which has further driven demand in many European countries.

Laminated glass is formed by permanently fusing an interlayer between two pieces of glass under heat and pressure. It is rapidly becoming a popular alternative to the often-specified tempered glass in safety and security applications. Unlike tempered safety glass, which breaks into small pieces instead of sharp shards, laminated glass remains in the frame, maintaining the building envelope and protecting building contents. Laminated glass also offers multiple security, sound, safety, daylight, and energy benefits, unlike tempered glass.

Safety

Safety glazing refers to the reduction of the risk or occurrence of injury or loss from accidental or natural causes, while security glazing refers to the reduction of the risk or occurrence of injury or loss from the deliberate or intentional human actions. Safety glazing is specified to protect people from injuries due to accidental glass impact, breakage or fallout, and laminated glass is rapidly emerging as a powerful and versatile safety glazing option. Upon impact, ordinary glass typically shatters and falls from the window frame, which can result in serious or even fatal injuries to building occupants and passers-by. Used in a properly designed system, laminated glass windows may crack, but fragments tend to adhere to the interlayer, reducing hazards associated with falling or flying glass.



PVB is the main component in laminated glass. The fused interlayer and glass function as a single unit and can be used in almost any configuration. Used in an insulating glass assembly (pictured above), laminated glass can help improve the thermal and sound-reduction performance of a glazing unit.

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Laminated Glass.** To earn one AIA/CES Learning Unit, including one hour of health safety welfare credit, answer the questions on page 256, then follow the reporting instructions on page 346 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Understand how laminated glass addresses design and safety challenges.*
- *Recognize the benefits of laminated glass during hurricanes and earthquakes.*
- *Explain why laminated glass offers a high degree of security protection.*
- *Discuss how laminated glass reduces sound transmission.*
- *Identify the sustainable, energy-efficient performance qualities of laminated glass.*

Laminated glass is versatile and suitable for almost any desired *configuration*. By using laminated glass as the inboard component of an insulating unit, the assembly provides the thermal performance of an insulating air space along with the safety glazing of the inboard laminate.

In appropriate configurations, laminated glass meets all requirements set forth in architectural glazing safety sections of major model building codes and test standards such as the Consumer Product Safety Commission (CPSC). Category I certification requires the glazing to withstand one 150 foot-pound impact, produced by impacting a 100-pound shot bag from a vertical height of 18 inches. Category II certification requires the glazing to withstand one 400 foot-pound impact, produced by impacting a 100-pound shot bag from a vertical height of 48 inches.

SAFETY GLAZING REQUIREMENTS - CONSUMER PRODUCTS SAFETY COMMISSION	CATEGORY I	CATEGORY II
Definition	9 sq. ft. or less, except patio doors, shower and tub enclosures	Greater than 9 sq. ft. and patio doors, shower and tub enclosures of any size
Test Requirement*	Break safely at 150 ft.-lb. impact	Break safely at 400 ft.-lb. impact
Test Standard	CPSC 16CFR 1201 Category I or equivalent model code standard	CPSC 16CFR 1201 Category II or equivalent model code standard
Complying Laminated Glass Made with PVB	Two-ply with 0.015 in. PVB interlayer or greater	Two-ply with 0.030 in. PVB interlayer or greater

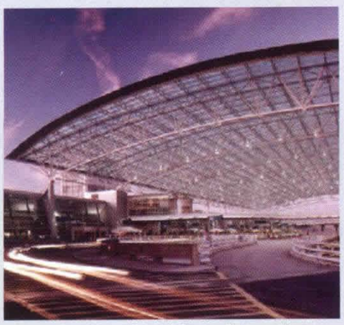
Safety Glazing Requirements – Consumer Products Safety Commission

Laminated glass has also been shown to meet Underwriters' Laboratories (UL) standard UL972 for security glazing, as well as Class I of the American Society of Testing and Materials (ASTM) International's F1233 security glazing test standard.

In vertical safety glazing applications, laminated glass has proven to be a unique design tool for entrance doors, shower and bath enclosures, storm and patio sliding doors, sidelights, and fixed glazed panels. The glass also meets significant design and safety challenges presented by sloped and overhead glazing surfaces.

Portland International Airport

Air travelers arriving at Oregon's Portland International Airport, designed by Zimmer Gunsul Frasca Partnership, are welcomed by a dramatic, 100,000-square-foot laminated glass canopy that covers and connects the parking garages, floating pedestrian bridges, and roadway leading to the terminal. Because of the sheer volume of glass overhead, safety was paramount in material selection. Laminated glass was chosen because it adheres to the interlayer and remains in its frame if impacted or broken, which makes it safe for overhead glazing applications. In Portland, the laminated glass canopy also provides acoustic insulation from the noise of overhead air traffic and allows natural light in, creating a bright, pleasant environment for travelers arriving at the airport.



Architect: Zimmer Gunsul Frasca Partnership
Photographer: Wes Thompson

Portland International Airport, Portland, Oregon.

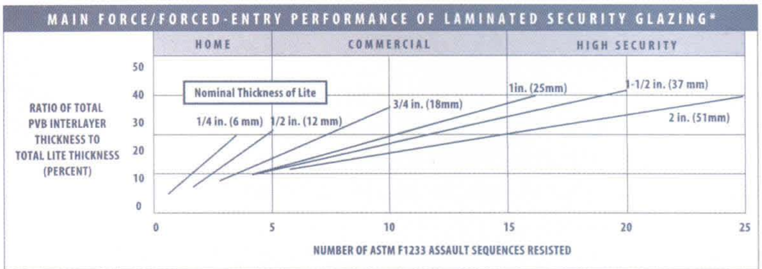
Security

Around the world, architects and building owners are seeking to balance the desire for living and working in bright, daylit spaces with the need for security protection against criminal and terrorist attacks.

Burglary and Forced Entry Resistance

Burglaries in commercial buildings and residences are usually directed towards targets of easy opportunity and low perceived risk. The most critical step of a burglary is entry, and the most common means of entry is a window or door.

In correct configurations, laminated glass meets the requirements of significant test standards including: UL972 of laminated glazing products against forced entry, ASTM International and other test standards for security in Home, Commercial and High Security categories. While many forms of laminated glass are considered strong enough to prevent "smash and grab" burglaries, systems can be designed with appropriate glazing thicknesses to resist most weapons used to force entry, including: rocks, hammers, screwdrivers, bricks, pry bars, sledgehammers, pipes, battering rams, chisels, axes, thermal stress weapons (CO2, fire extinguishers or propane torches), and chemical deterioration weapons (gasoline and acetone). Even quiet glass cutters become useless tools because laminated glass cannot be cut from only one side. Security glazing products with the greatest overall thickness and largest percentage of interlayers



* Data is based on samples tested and is not guaranteed for all samples or all circumstances which may vary from those present during testing.

Main Force/Forced-Entry Performance of Laminated Security Glazing

offer the best resistance to forced entry.

Because it withstands most forms of attempted entry, laminated glass is frequently used for enhanced security in residential and commercial windows, doors, and storefronts, providing an aesthetically superior alternative to iron bars. Unlike burglar alarms and other security systems, security glazing provides continuous passive security that is not subject to human error or electronic failure. It ultimately provides greater protection by preventing entry instead of reacting to an entry.

Ballistic Protection

In addition to withstanding the blows of a variety of objects during an attempted burglary, laminated glass offers protection against ballistic (bullet) attack. In specific ballistic configurations, laminated glass can reduce the risk of injuries from a ballistic attack without compromising the complete visual clarity afforded by a glass system. It can also resist penetration by high-velocity ballistics when constructed in multiple alternating layers of glass and interlayers.

UL test 752 tests the ability of glazing to withstand penetration by various classes or levels of firearms. In order to pass certification for a certain level, the projectile (bullet) must not penetrate the glazing and must not result in large fragments of glass being forcibly thrown from the witness side of the sample for a distance of 18 inches or more. Based on the UL tests, certain laminate thicknesses are needed to resist specific ballistic impact. Thicker security glazing will exhibit greater resistance to both penetration and glass spall (tiny slivers of glass).

TEST REQUIREMENTS FOR UL 752 - BULLET-RESISTANT EQUIPMENT

UL 752 TESTS*	TYPICAL WEAPON	AMMUNITION CHARACTERISTICS	MINIMUM VELOCITY (FPS)/GRAIN	TYPICAL LAMINATE THICKNESS**
Level 1 Medium Power - Small Arms	Super .38 Automatic/9 mm	9 mm full metal copper jacket with lead core	1,175/124	1-1/4 inches
Level 2 High Power - Small Arms	.357 Magnum Revolver	.357 Magnum jacketed lead soft point	1,250/158	1-1/2 inches
Level 3 Super Power - Small Arms	.44 Magnum Revolver	.44 Magnum lead semi-wadcutter gas checked	1,350/240	1-3/4 inches
Level 4 High Power - Rifle	.30-06 Rifle	.30 caliber rifle lead core soft point	2,540/180	2 inches

*Test are conducted at approximate temperature conditions expected in use.
**The projectile must not penetrate the glazing, and the impact must not result in large fragments of glass being forcibly thrown from the rear of the sample for a distance of 18 inches or more.

Notes:
Higher rating levels are available. Consult the laminated glass manufacturers for appropriate configurations of glazing to pass these levels. Table shows typical laminate thickness needed to resist specific ballistic impact. Thicker security glazing will exhibit greater resistance to both penetration and glass spall.

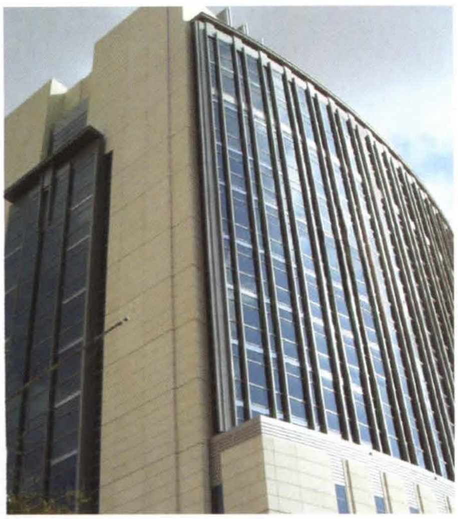
Test Requirements for UL 752 – Bullet-Resistant Equipment

Because of its demonstrated ability to withstand ballistic penetration, laminated glass is often used to provide round-the-clock protection to employees in high-risk facilities such as banks and prison control rooms, which require extreme ballistic protection and complete visual clarity.

Blast Resistance

Several of the survivors of the September 11, 2001 Pentagon attack credit blast-resistant laminated glass with saving their lives. The impacted section of the building had just been renovated for security upgrades, which included windows manufactured with a laminated glass component. After the explosion, these windows remained in the frames, providing building occupants protection from flying glass shards.

Experts at Texas Tech Glass Research and Testing Laboratory estimate that approximately 75 percent of all damage and injury from bomb blasts can be attributed to flying and falling glass following an explosion. They note that a single square foot of unprotected glass can project as many as 100 sharp shards of glass flying at speeds of up to 300 feet per second. Laminated glass provides passive protection and can mitigate the effects of a blast in several ways. Most importantly, it protects people, both within the targeted building and in the surrounding area and structures. Because laminated glass stays within its frame during the initial blast wave and when impacted by flying debris, it reduces or eliminates flying glass to prevent injuries, and provides protection against flying debris. The glass also protects the building, reducing collateral damage, opportunity for looting, and costs to repair the targeted and surrounding buildings. The performance of laminated glass is often compared to ordinary monolithic glass based on retentivity, or ability to stay in the opening or hold on to glass fragments.



United States Federal Courthouse, Jacksonville, Florida.
Architect: HLM Design. Photo courtesy of ©Solutia Inc.

Typical Glazing Retentivity Under Blast Load
This courthouse uses insulating laminated units with low-e coatings to address safety and security, and optimize energy performance.

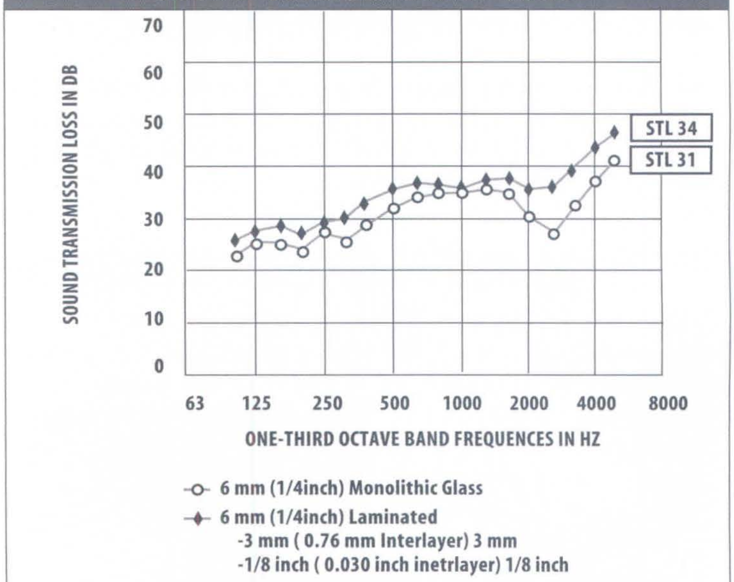
Because of these characteristics, laminated glass meets stringent blast-resistant standards outlined by the U.S. Department of State and the U.S. General Services Administration (GSA), and is used in many federal buildings.

Sound

Anyone who has ridden in a luxury automobile has likely noticed the dramatic difference in perceived interior noise between luxury and economy cars. Today, the same technology used to dampen noise in cars is being used in building architecture. In many building types ranging from concert halls and office buildings to homes and schools, isolating interior spaces from exterior noise is critical, and laminated glass effectively reduces sound transmission between indoor and outdoor spaces.

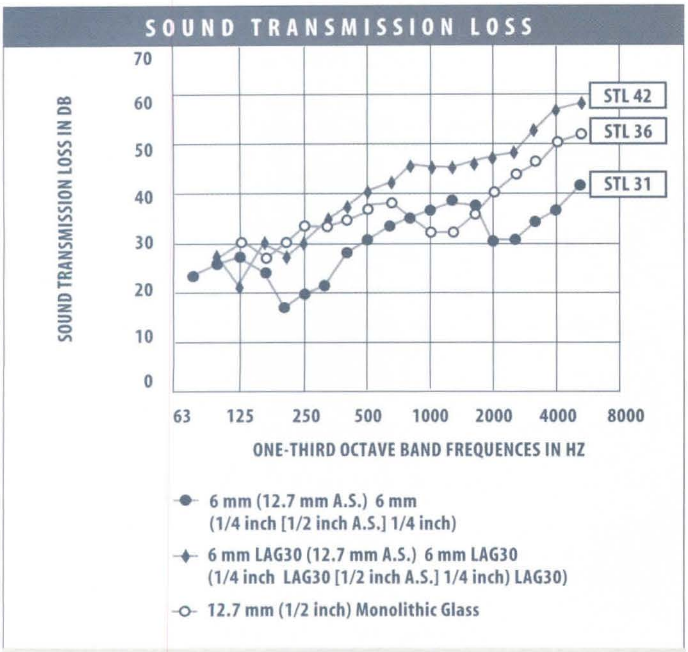
Sound transmission through glass or any other building material is related to the limp/mass law. The heavier and more flexible the building material is, the better it will be at reducing sound transmissions. Because ordinary monolithic glass is essentially lightweight and very stiff, it tends to transmit more sound than other building materials.

SOUND TRANSMISSION LOSS



A PVB interlayer increases glazing Sound Transmission Loss (STL) without significantly increasing the glass thickness or mass of a glazing system.

As with monolithic glass, the sound isolation performance of insulating glass can be increased significantly through the use of laminated glass.



A This figure presents a comparison between two 25.4mm (1 inch) insulating glass configurations, one using two lites of 6mm (1/4 inch) monolithic glass and the other using two lites of 6mm (1/4 inch) laminated glass (LAG). The 6mm (1/4 inch) laminated glass consisted of two lites of 3mm (1/8 inch) monolithic glass laminated together with 0.76mm (0.030 inch) PVB interlayer. As a reference, the STL for 12.7mm (1/2 inch) monolithic glass is provided.

The three glass configurations have nearly the same overall glazing weight, but the combination of air space (A.S.) and interlayer results in an STL for the double laminated insulating configuration which is significantly higher than that for either standard insulating or monolithic glass.

Adding laminated glass to a glazing system is one of the best ways to optimize performance. The PVB interlayer effectively absorbs significantly higher levels of soundwaves than monolithic glass, thus creating a greater sound barrier. Adding a pane of laminated glass to an insulating glazing system gives the unit an even higher Sound Transmission Class (STC), blocking more soundwaves.

The key to creating an acoustically insulated indoor environment is to select products with a high STC, which is used by acoustical engineers as a measure of a building materials' resistance to the passage of sound. The higher the STC, the better the sound barrier.

Acoustic performance is especially critical in airports and surrounding structures, hotels, restaurants, and schools. At the San Francisco Airport International Terminal, designed by Skidmore, Owings and Merrill, LLP, laminated glass dampens noise of runway activity and overhead air traffic and provides seismic protection. On the other coast, the Westin New York hotel in Times Square, designed by Arquitectonica, uses insulating laminated glass with high-performance coatings to minimize outside noise from busy midtown Manhattan. The innovative design features a colored glass panel exterior that blocks sound and provides guests with a quiet indoor oasis in New York City.

Use of laminated glass for noise reduction provides building occupants with the highest level of environmental comfort. The glass blocks noise and lets in natural light. In addition to walls and windows, laminated glass can also be used in interior applications such as floors, shower and bath enclosures, partitions and room dividers, elevators, and doors.

Westin New York at Times Square, New York, NY.
Architect: Arquitectonica. Photographer: Norman McGrath

In these applications, laminated glass helps eliminates the "cocktail effect" in interior spaces, in which multiple voices, noise sources, and reverberations occur in an occupied space. A room with high noise absorption will yield an environment that is conducive to improved hearing and higher productivity.

Sustainability

The sustainability movement has become one of the world's leading architectural trends. In the U.S., buildings account for 39 percent of total energy use and 68 percent of total electricity use. Sustainable design supports efforts to conserve and restore natural resources and reduce waste. The resulting benefits include enhanced occupant comfort and health, energy efficiency, and improved quality of life.

Laminated glass usage contributes to sustainability goals by maximizing natural light in a building while minimizing heat gain. The laminate interlayer provides a number of options when specifying laminated glass for daylighting. Various laminates, including colored or textured interlayers, can let in appropriate amounts of light and diffuse the light throughout interior spaces. Tinted glass substrates, coatings, and silkscreen patterns may also be used. Ultimately, daylighting may reduce cooling costs, as natural light produces less heat than artificial light. Various studies, including one by the Rocky Mountain Institute, have noted that this may also improve occupant productivity and health, and create a more pleasant environment.

Daylighting with laminated glass can also reduce energy costs associated with lighting and cooling a building. A standard light bulb produces 85 percent heat and 15 percent light. In the U.S., 40 to 50 percent of total energy consumed by buildings is for electric light and to remove the heat it produces. Reducing the amount of artificial light reduces both electricity costs and cooling costs associated with removing the heat from the electric lights.

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***http://archrecord.construction.com/resources/conteduc/archives/0512solutia-1.asp***. To receive AIA/CES credit, you are required to read this additional text. The quiz questions below include information from this online reading. To receive a faxed or emailed copy of the material, call 877-674-1233 or email glazin@solutia.com.

AIA/ARCHITECTURAL RECORD **CONTINUING EDUCATION** Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Understand how laminated glass addresses design and safety challenges*
- *Recognize the benefits of laminated glass during hurricanes and earthquakes*
- *Explain why laminated glass offers a high degree of security protection*
- *Discuss how laminated glass reduces sound transmission*
- *Identify the sustainable, energy-efficient performance qualities of laminated glass*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 346. Follow the reporting instructions, answer the test questions, and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. Upon impact by an object, laminated glass is likely to:
a. Break into small, compact pieces
a. Exit the framing system
a. Crack, but adhere to the interlayer
a. Discolor, due to exposure to the elements

2. Laminated glass has been tested and approved for use in safety glazing applications including:
a. Shower and bath enclosures
b. Overhead and sloped canopies
c. Entrance, storm, and patio doors
d. All of the above

3. Which of the following are true about glass performance following an explosion?
a. Typically, 40 percent of injuries are caused by broken or flying monolithic (ordinary) glass.
b. Monolithic glass can project at speeds of up to 300 feet per second.
c. Framing systems do not impact the ability of laminated glass to resist explosions.
d. The General Services Administration does not require the use of blast-resistant glazing system in high-risk government buildings.

4. Benefits of using laminated glass to protect against ballistic intrusion include:
a. Complete visual clarity
b. Reduces possible injuries due to ballistic attack
c. Can provide secure, around-the-clock protection for employees of high-risk facilities
d. All of the above

5. During a hurricane, the force of winds entering the building through windows broken by high winds or flying debris can have the following effects on the building structure:
a. Allow for a dramatic increase in internal pressure inside the structure
b. May allow the roof to be lifted off
c. May exert pressure on the outside walls, causing structural failure
d. All of the above

6. Laminated glass can be an effective safety measure during earthquakes because:
a. It tends to stay in the frame following an earthquake, thereby protecting people from falling or flying glass.
b. It consistently performs better than structural wall systems.
c. It breaks into small shards of glass that are easy to remove after a quake.
d. It flexes in concert with the racking movement of the earth.

7. To create an acoustically insulated interior environment, it is important to specify products with:
a. A low Sound Transmission Class
b. A negative Sound Transmission Class
c. A high Sound Transmission Class
d. A neutral Sound Transmission Class

8. Glazing units with at least one pane of laminated glass provide greater reductions in sound transmission than ordinary monolithic glass.
a. True
b. False

9. Adding a low-e coating to a laminated or insulating laminated unit can:
a. Reduce energy consumption
b. Increase energy consumption savings
c. Pay for itself within a number of years
d. All of the above

10. Laminated glass can contribute to credits in the following LEED system categories:
a. Local and Regional Materials
b. Indoor Environmental Quality
c. Energy and Atmosphere
d. All of the above

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VIRACON
"The Leader in Glass Fabrication"™

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Solutia Inc. is a world leader in performance films, producing Saflex®, Vanceva® and KeepSafe® brand polyvinyl butyral interlayers (PVB) for laminated glass in automotive and commercial and residential architectural applications.

Viracon is an international company of Apogee Enterprises, Inc. Viracon produces high-performance glass products, including tempered, laminated, insulating, and silk-screened glass, and high-performance coatings. Apogee Enterprises, Inc., is a leading fabricator, distributor, and installer of value-added glass products and systems.

For more information on Solutia or Viracon, visit their web sites at www.solutia.com and www.viracon.com.

CIRCLE 84 ON READER SERVICE CARD OR GO TO ARCHRECORD.CONSTRUCTION.COM/PRODUCTS/

Raised Access Floors: The Foundation of Flexibility and Efficiency

Economical modular systems simplify facility management and increase indoor air quality

Provided by Steelcase Corporation

By Peter J. Arsenault, AIA, NCARB, LEED-AP
Joel Zwier, AIA, Steelcase, Inc.
Architectural Products Catagory Manager

Many architects practicing over the past 20-30 years or so have seen the appearance of raised flooring systems that allow for flexible access to the space below. One of the first applications of this type of flooring was for large, complex, mainframe computer systems that usually required separate rooms with specific climate control and wiring requirements. Today access floor systems are becoming increasingly common for a variety of reasons.

General overview shot of office space with access floor.

Access floors are defined as a system of panels and supports that create a raised floor above the actual structural floor. By raising the floor up, a space is created in between the raised floor and the building structural floor where functional components like wiring for power, voice, and data can be routed and plumbing lines located. This space in between has also become increasingly valuable for heating, ventilation, and air conditioning (HVAC) distribution either as a plenum space or with defined ductwork. The United States Green Building Council (USGBC) has identified this type of HVAC system as a way to improve indoor air quality through their Leadership in Energy and Environmental Design (LEED) program.

Access floors are defined as a system of panels and supports that create a raised floor above the actual structural floor.

Access Floor Construction

Access floors include two different types made up of several components with various options as follows.

Access Floor Types. There are two types of access floors: full-height and low-profile.

Full-height access floors are ideal for new construction. This type needs to be used if underfloor HVAC routing is desired. Also, this type needs to be coordinated early in the development or schematic design phase of the process to allow for drops in the floor and smooth transitions to eliminate excessive ramping.

Low-profile access floors can be used in both new buildings and renovation work, but they are optimal for renovations due to their minimal impact on the floor-to-ceiling cavity.

CONTINUING EDUCATION

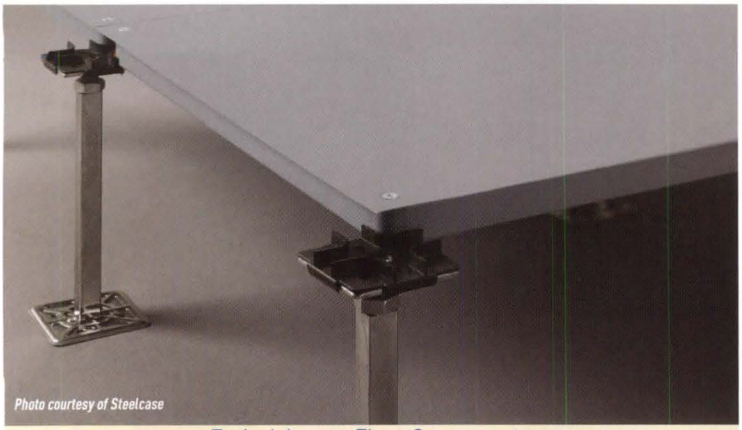
Use the learning objectives below to focus your study as you read **Raised Access Floors: The Foundation of Flexibility and Efficiency.** To earn one AIA/CES Learning Unit, including one hour of health, safety, welfare credit, answer the questions on page 261, then follow the reporting instructions on page 347 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Learn what constitutes an access floor system.*
- *Identify the key advantages of using an access floor vs. a traditional floor.*
- *Understand how access floors can contribute to Leadership in Energy and Environmental Design (LEED) certification as developed by the United States Green Building Council (USGBC).*

Access Floor Components: Access floors consist of two primary components: the floor panel itself, which comes in various types and surfaces, and the pedestal supports, which also come in various types and adjustment options. Both are described further below:



Typical Access Floor Components

- **Floor Panels:** Panels are fairly standardized, regardless of manufacturer, and have the following attributes:

  Sizes: Generally two feet by two feet for full-height access floors.

  Materials: Most panels have a steel exterior with either a cement fill or wood core. A typical cement-filled panel has a top and a bottom steel pan. The bottom pan is comprised of a series of domes for structural efficiency. The panel works like a miniature waffle-slab, which creates the most efficient strength to material ratio.

  With the various types and adjustment options of access floors, different finished floor height requirements can be achieved.

  Surface options: The most common finish option is to use painted panels, particularly if the floor will be carpeted. High pressure laminate (HPL) panels are also available and dissipate static, preventing damage to sensitive electronic equipment when used in computer environments.

  HVAC floor diffusers: When the access floor includes an underfloor HVAC system, adjustable air diffusers can be placed in the floor panels to allow supply air from the underfloor plenum to enter the workspace. In this manner, occupants may readily control airflow volume and direction through the adjustable portions of the diffusers. More diffusers allow for more individual control within space.

- **Pedestal Supports:** Pedestal supports are the pieces that hold the floor panels and raise them up above the structural floor of the building. They are typically made of galvanized steel and include a threaded head to allow for specific height adjustment and floor leveling.

  Standard height pedestals: Standard sizes allow for finished floor heights (FFH) *between six inches and* 24 inches in one-inch increments. The addition of a threaded rod allows for final adjustments in one-eighth-inch increments to ensure a level floor. Typical applications are up to 24 inches, but some applications will go even higher to accommodate additional utility routing.

  Low-profile pedestals: They are typically used in applications where there are building structure floor-to-ceiling height restrictions or where a facility is looking to more easily upgrade its wiring and technology infrastructure. Typically, these pedestals allow for finished floor heights (FFH) between two *and one-half inches* and five inches. However, it should be noted that, since typical panels are one and one-half inches thick, the actual clearance can be less than one inch on a two and one-half inch FFH due to uneven floors. This can add significant technical challenges and coordination issues in routing utilities. In these cases, a true fixed-height low-profile floor may be a better solution.

  Other Options: Additional types of pedestal supports are available to address specific building needs. For example, ramp type pedestals use a swivel head to allow for an adjustable slope or a 1:12 ramp slope for ADA compliance. Similarly, seismic pedestals have larger bases and thicker steel walls to withstand lateral forces. Usually adhesive attachment will be adequate to comply with many seismic code requirements. Occasionally, in higher seismic zones, fasteners and stringers may need to be applied.

Specification and Design Considerations: Based on the information described above, some relevant details are important when designing or specifying access floor systems:

Finished Floor Height (FFH) Requirements: With the various types and adjustment options of access floors, different finished floor height requirements can be achieved.

Five-inch minimum FFH is needed for adequate clearance to route wires.

Eight-inch minimum FFH is needed for pressurized plenums to distribute underfloor HVAC systems in small floor plans.

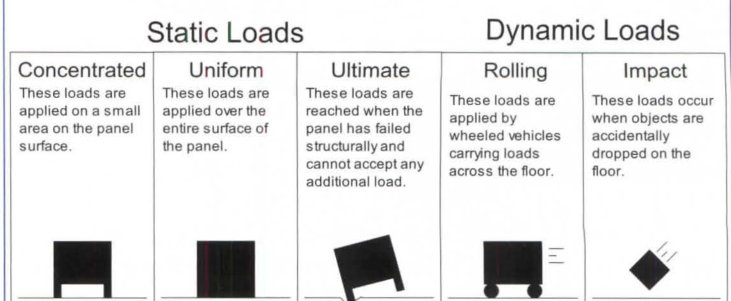
Twelve-inch minimum FFH is needed for most underfloor air distribution (UFAD) systems and horizontal wire management.

Load Ratings and Surface Type: Access floors are categorized or referenced by their load ratings and/or surface type. Floors are referred to in terms of concentrated load rating, with 1,000, 1,250, or 1,500 pounds; and finished surface type, for bare or HPL.

For example, a high-pressure laminate floor panel with a 1,000 pound load capacity is referred to as a "1,000-pound HPL." Similarly, a bare panel with a 1,250 pound load rating is referred to as a "1,250-pound bare."

The various types of load testing used by the Ceilings and Interiors Systems Construction Association to determine panel load capacity (Figure 1 – Access Floor Load Testing) are based on "Recommended Test Procedures for Access Floors" published by the Ceiling & Interiors Systems Construction Association (CISCA).

Figure 1: Access Floor Load Testing



Source: "Recommended Test Procedures for Access Floors" published by the Ceiling & Interiors Systems Construction Association (CISCA)
These test procedures do not set standards for test results.

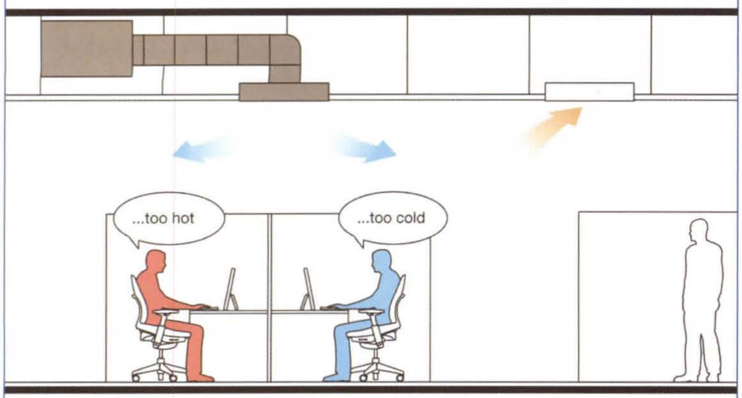
Advantages of Using an Access Floor

There are six main advantages to using access floors.

1. Higher quality underfloor air distribution compared to overhead air distribution. In order to understand the differences, an examination of both traditional overhead air distribution and underfloor air distribution is in order.

Overhead air distribution: Traditionally, in commercial and institutional environments, conditioned supply air is delivered into an occupied space through ductwork and diffusers spaced evenly in the ceiling overhead. Prior to reaching individuals within the space, the supply air is mechanically mixed, making it uniform in both temperature and pollutant distribution. Just as the supply air is delivered at the ceiling level, so too, the return air is often collected at the ceiling and exhausted through the plenum that is created in the space between the suspended ceiling and the structure above. This common method of conditioned air distribution has resulted in a few well-known issues, however (Figure 2-Traditional Overhead Air Distribution Issues):

Figure 2: Traditional Overhead Air Distribution Issues

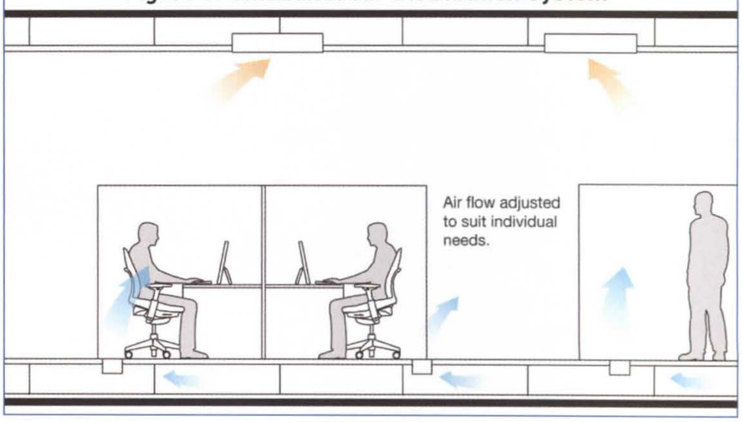


- ***Air quality:*** When heated air rises, it also carries dust particles (pollutants) up toward the supply air ceiling diffusers. Then, in turn, the pollutants are pushed back into user occupied space by the supply air. This can contribute to a build-up of poor air quality in the space.
- ***Temperature control:*** Because the mixed air is uniform in temperature, there is usually no opportunity for user adjustment or control. This results in the single most common occupant complaint that the air temperature is either too hot or too cold.
- ***Energy use:*** Because warmed air naturally rises, more energy is required to push cooler, conditioned air down into the user zone. Thus, air needs to be cooler than otherwise desired to overcome the hot air barrier so that it reaches users at the necessary comfort level.

Underfloor Air Distribution (UFAD): Underfloor Air Distribution (UFAD) allows for a preferred method of air distribution to take place. Referred to as "displacement ventilation," this process locates air supply vents at the bottom of the occupied space and the return air vents at the top of the space. Hence, a UFAD system allows ducted supply air from the HVAC equipment to enter into the space between the access floor and the structural slab creating a continuous volume low-pressure plenum. From there, the conditioned air rises easily into the user's zone through diffusers located strategically in the floor. As the air moves through the room, it gains heat from users, computers, equipment, and lighting. It continues to move upward until it is exhausted out of the space through the return air plenum in the ceiling. This type of conditioned air distribution has been shown to provide the following benefits and advantages (Figure 3-Underfloor Air Distribution System):

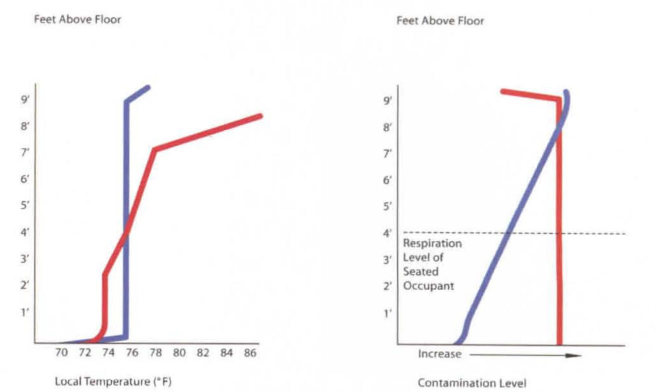
Underfloor Air Distribution (UFAD) allows for a preferred method of air distribution to take place.

Figure 3: Underfloor Air Distribution System



- ***Improved air quality:*** With underfloor air distribution, there is an increase in the total amount of air flow and ventilation since room air and supply air are more thoroughly mixed and more complete air changes are possible. Thus, as the conditioned air rises up throughout a room, it collects more particles and pollutants pulling them away from the user directly into the return air system where pollutants can be removed or reduced. This reverses the tendency of overhead systems to push pollutants down towards the users in the space and creates lower levels of contaminants in the occupied spaces and rooms. Independent studies have documented these results. (Figure 4-Air Quality Comparison):

Figure 4: Air Quality Comparison



- ***Improved thermal comfort:*** In addition to improved air quality, underfloor air distribution can offer a more comfortable range of air temperatures. Because the air does not need to be pushed down to reach users in the space, *as is the case in overhead* distribution, the air temperature does not have to be heated or cooled as much. Hence, the plenum temperature can be adjusted to simply allow for the normal variations within occupied rooms and be set closer to typical desired levels. Therefore, the air temperature ranges are much smaller, allowing for greater thermal comfort. Further, by properly locating floor and ceiling diffusers, drafts and cold spots can be virtually eliminated.

- ***Temperature control:*** Providing adjustable floor diffusers that allow users to control the volume of air entering their space gives them the ability to determine their own individual comfort level. It has been generally acknowledged that greater worker productivity results when a user has the ability to control the air in their work space. This makes sense in light of the fact that the number one and number two complaints at work are "I am too cold" and "I am too hot." Occupants with no control are believed to be twice as sensitive to temperature changes while those with more control have fewer complaints. While more diffusers allow for more occupant control, they do not add to the total overall air flowing into the space; that is determined by the pressure within the plenum beneath the floor.

- ***Energy use:*** Underfloor air distribution has been tested and shown to reduce the amount of energy used for heating and cooling typical commercial and institutional spaces. First, less energy is needed to deliver the air through the underfloor plenum compared to overhead systems. Typically, HVAC system fans and motors can be reduced in size, since only .05 inches of static pressure is necessary to deliver air through an underfloor plenum. Additionally, overhead distribution systems require cooler temperatures, meaning bigger chillers and more energy use. (Figure 5- Less energy is used with underfloor air):

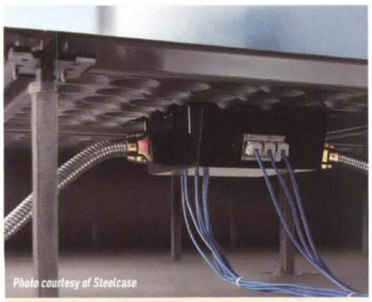
Air diffusers located in floor panels for greater air flow and temperature control.

Figure 5: Less energy is used with underfloor air

	UFAD	OHAD
Supply Air Temperature	63° F	55° F
Return Air Temperature	82° F	75° F
Chilled water supply temperature	55° F	45° F
Chilled water return temperature	65° F	55° F
Chiller efficiency	0.37 kW/ton	0.60 kW/ton
Builder Chiller Power	160 kW	260 kW

2. Flexible power and data management

Another advantage of access floors is the easier management of power and data, both during construction and afterwards during occupancy. Access floors create an open cavity for fast and easy distribution, and management of power and data cables.



Modular wiring systems allow for improved management of power, voice, data and other wiring needs.

At installation, wires and cables can be run on the building's structural subfloor with virtually no obstructions. When moves, changes, or additions are needed, power and cable can be easily accessed through the floor panels. By contrast, traditional methods require removing suspended ceiling panels, pulling wires through conduit, disrupting the workplace all while working on ladders versus picking up an access floor panel, disconnecting the modular wiring and moving it.

3. Increased space flexibility

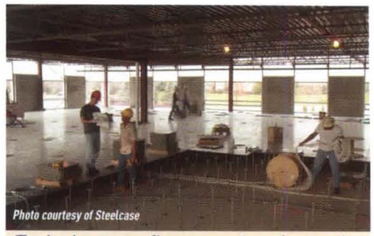
Overall, access floors provide a clear increase in space flexibility over traditional flooring methods. When relocating, panel locations and types are easy to change and exchange. When expanding spaces, more floor boxes can be added for power, voice, and data systems. In either case, air quality and temperature control can be maintained by simply adding adjustable floor diffusers.


Workspace flexibility is enhanced through the use of raised access floors.

And when it comes time for a facility to upgrade itself, easy underfloor access to building services means easy updates to technology with minimal disruption.

4. Reduced construction time

Access floors are installed after the wiring, HVAC, and plumbing are installed. That means each of these trades has easy and open access to the structural floor, saving coordination time. Significant time reductions are possible by eliminating the need to hang things in the air, meaning no need to "fish" wires through a suspended ceiling, and not having to use ladders or lifts. And, because less ductwork is required for underfloor HVAC systems, less time is needed for ductwork fabrication and installation. Finally, because access floors have the capability for nearly perfect level floors, the remaining construction above them can go smoother and faster.



Typical access floor construction and installation.

5. Reduced building height

By requiring less building materials, e.g., building ductwork, the overall floor-to-floor height can be reduced, contributing to overall cost savings. In traditional overhead HVAC distribution, a large plenum space is required for supply air and return air ductwork, wiring, and sprinklers. In access floors, underfloor plenum heights are determined by the largest HVAC components (note that minimal ductwork is used in the underfloor plenum), requirements for underfloor cabling, and clear space for underfloor airflow. Similarly, a smaller ceiling space is required for return air and wire distribution. All of these factors make a five to 10 percent reduction in floor-to-floor heights possible when using access floors with underfloor air distribution compared to overhead distribution. (Figure 6-Building height comparison):

Figure 6: Building height comparison

Building Elements	Steel Beam Construction with Overhead Air Distribution		Concrete Flat Slab Construction with Underfloor Air Distribution	
	Concrete	2.5 in.	Concrete floor	8 in.
	Metal deck	2.5 in.		
Structure	Steel beam	21 in.	Concrete beam	12 in.
	Insulation	2 in.		
Ceiling Plenum		26 in.		0-12 in.
Floor-to-Ceiling		9 ft.		9 ft.
Underfloor Plenum	N/A			12-18 in.
Total Floor-to-Floor Height		13 ft 6 in.		11ft 8 in. – 13 ft 2in.

*Typical floor-to-floor dimensions for a midsize (5-10 stories), high-tech class A office building (assuming a 40-ft clear span between columns) - study performed by the Center for the Built Environment at University of California Berkeley

6. Reduced costs

Access floors can generate a positive impact on first costs of building construction, and on life cycle building costs.

Construction Costs: Numerous cost comparisons from development and construction companies have shown that access floors can be highly cost competitive with traditional construction methods for the shell, fit-out, HVAC, plumbing, lighting, electrical, and communications utilities.

Life cycle costs: Beyond first costs, access floors can also help reduce on-going costs. (Figure 7) Cost of change benchmarks and (Figure 8) Cost of change Trends illustrate the

Figure 7: Cost of change benchmarks

Source: International Facilities Management Association (IFMA) Benchmarks II & III

Average Cost Per Type of Move

Type of Move	1994 Benchmarks II	1997 Benchmarks III	'97 to '94 $ Change	'97 to '94 % Change
Existing	$168	$149	($19)	(11%)
Furniture	$489	$523	$34	7%
Construction	$3,409	$4,194	$785	23%
Average	$1,063	$1,207	$144	14%

rising cost and rate of change in typical office layouts. The cost per change has gone up 22 percent and the rate of churn has increased three percent. Access floors make the changes easier, require less time, and hence, less cost to perform.

Figure 8: Cost of change Trends

Year	Average Cost ($)	Average Churn Rate	Per 100 People	$ Change	% Change By Cost & Rate	Versus 1997 to 1994 Churn Rate Only
1994	$1,063	41%	$43,583			
1997	$1,207	44%	$53,108	$9,525	22%	3%

The article continues online at ***archrecord.construction.com/resources/conteduc/archives/0512steelcase-1.asp***. To receive AIA/CES credit, you are required to read this additional text. The quiz questions below include information from this online reading. To receive a faxed copy of the material, call 1-800-921-9622.

AIA/ARCHITECTURAL RECORD **CONTINUING EDUCATION** Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Learn what constitutes an access floor system.*
- *Identify the key advantages of using an access floor vs. a traditional floor.*
- *Understand how access floors can contribute to Leadership in Energy and Environmental Design (LEED) certification as developed by the United States Green Building Council (USGBC).*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below.
Go to the *self report form* on page 347. Follow the reporting instructions, answer the test questions and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. Full-height access floors need to be used in:
a. Existing buildings that wish to upgrade
b. New buildings all the time
c. New buildings where underfloor HVAC is to be used
d. All buildings

2. The two primary access floor components consist of:
a. The floor panel itself and the pedestal supports
b. The structural floor and the access floor
c. Air diffusers and modular wiring
d. Overhead return air and underfloor supply air

3. An access floor capable of supporting 1,500 pounds per square foot with a painted finished surface would be referred to as:
a. 1,500 HPL
b. 1,500 pound bare
c. 1,500 bare HPL
d. 1,250 pound bare

4. An underfloor air distribution system provides improved indoor air quality because:
a. It filters the air.
b. It eliminates particles and pollutants in the air.
c. The USGBC prefers it.
d. Room air and supply air are more thoroughly mixed and more complete air changes are possible.

5. Adjustable air flow diffusers in the floor do everything except:
a. Improve worker productivity
b. Provide more control over the airflow and temperature
c. Increase the total volume of air in a space as the number of diffusers increase
d. Reduce worker complaints

6. Construction time can be shortened by using raised access floors for all of the following reasons except:
a. Less ductwork fabrication and installation time is needed.
b. Wiring and other utilities can be installed on the floor easily instead of overhead.
c. Fewer trades are required to install the access floor.
d. A level floor allows the rest of the work to go faster.

7. When designing raised access floors with underfloor air distribution, a five to 10 percent decrease in floor-to-floor height is possible compared to traditional floor systems and overhead air distribution systems.
a. True
b. False

8. A building owner concerned about the cost of making layout changes during the life of the building benefits from access floors because they:
a. Reduce the churn rate.
b. Have competitive first costs during construction.
c. Make the changes easier, require less time, and hence, less cost to perform.
d. They can contribute to energy savings.

9. The most significant benefits of a USGBC LEED certified building include:
a. Getting points.
b. Real energy savings, environmental preservation, healthier work spaces for people, and greater value to the building.
c. National recognition.
d. The use of LEED credits.

10. LEED points are possible in each of the following categories using access floors except:
a. Sustainable Sites.
b. Materials & Resources
c. Indoor Environmental Quality.
d. Innovation and Design Process

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Site Lighting: Optical Systems Design and Application Guide for Site and Roadways


Photo Courtesy Kim Lighting

Selecting the right type of site lighting enhances building design, efficiency, and safety

Provided by Kim Lighting

Architecture and light: The two are intertwined in good design of all buildings, but the same is true of building sites. Outdoor spaces frame and enhance any building design. Depending on the lighting used, these outdoor spaces can create settings that might be attractive or mysterious, inviting, or secluded, secure-feeling or foreboding. With buildings and spaces being used during more hours of the day and night, good site lighting design becomes as important as good building lighting design.

Outdoor lighting, like all artificial illumination, is based on an understanding of light principles and the specification of luminaires that meet one's objectives. A luminaire is defined by the Illuminating Engineering Society of North America (IESNA) as "a device to produce, control, and distribute light. (It is) a complete lighting unit consisting of the following components: one or more lamps, optical devices designed to distribute light, sockets to position and connect the lamps to a supply of electric power, and the mechanical components required to support or suspend the housing above grade."

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Site Lighting: Optical Systems Design and Application Guide for Site and Roadways.** To earn one AIA/CES Learning Unit, including one hour of health, safety, welfare credit, answer the questions on page 268, then follow the reporting instructions on page 347 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify the lighting requirements in each area of site lighting*
- *Describe different methods to direct light toward intended areas or away from areas not to be illuminated*
- *Describe lighting distribution types and how they are best suited for lighting outdoor environments*
- *Explain how isofootcandle plots are used to design site lighting*

From a pure lighting standpoint, the main items that differentiate luminaires are the internal optical system and the lamp (bulb) unit. The function of an optical system is to direct light energy emitted by the lamp into desirable areas. This function can be accomplished through reflection, diffusion, baffling, refraction, or transmission through a lens. Lamp placement within the luminaire also plays a significant role in determining optical system performance. Using the lamp's natural distribution pattern to its greatest advantage produces the most effective optical designs. For example, a horizontal lamp orientation produces asymmetric light distribution patterns, while vertical lamp orientation produces a strong symmetric pattern. Reflector and lens designs that enhance these characteristics produce the most efficient results.

IESNA also identifies performance and design considerations as follows, "Luminaire performance can be considered a combination of photometric, electrical, and mechanical performance. Photometric performance of a luminaire describes the efficiency and effectiveness with which it delivers the light produced by the lamp to the intended target." Luminaire manufacturers need to consider a wide variety of factors in designing and producing their products. Architects and other design professionals need to be aware of fundamental criteria in designing lighting layouts and specifying luminaries for use on their projects.

I. SITE LIGHTING AREAS AND DESIGN INTEGRATION

Any given building site usually has differing uses and conditions—each has differing lighting requirements as well. Therefore, meeting the diverse needs of site illumination requires a variety of different solutions that can be coordinated and integrated to complement the building design. Such an integrated site lighting design begins with first *identifying the specific* lighting requirements for each portion of the site, then selecting luminaires that combine appropriate aesthetic design with relevant lighting performance features.

Conceptually, project sites can be classified into four basic lighting areas; roadways, open areas, pedestrian areas, and the site perimeter, each representing a unique set of lighting circumstances, as described below and shown in Figure 1.

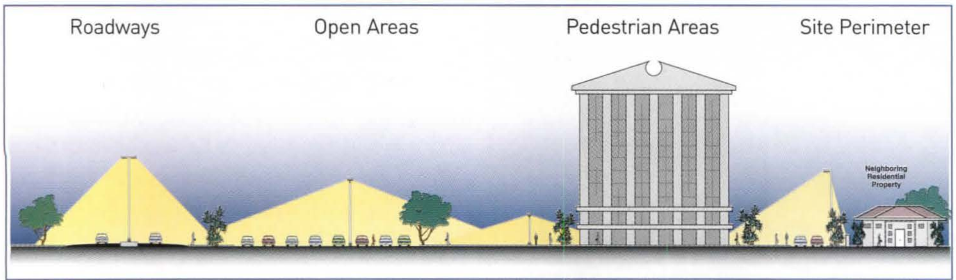


Figure 1: Typical Site Lighting Areas

1. Roadways

Lighting for roadways, including private drive lanes, usually requires uniform light distribution and glare control with wide pole spacings to minimize the total number of luminaires needed. Luminaire selection criteria include overall performance, consideration of maintenance, lamp choices influenced by utility or owner interests, and the ability to remain in service for long periods with minimal attention. Reflectors and optical designs within the luminaires include an array of possible light distribution patterns in order to illuminate varied roadway widths and traffic patterns with narrow perpendicular and wide lateral beam spreads.

2. Open Areas

Lighting of open areas requires careful consideration of illumination requirements, uniformity, and brightness control. These areas are usually subject to scrutiny relevant to the safety and security of site occupants and the interaction between vehicle and pedestrian traffic. Parking areas and connecting walkways, in particular, are a potential source of litigation and liability for the project owner, requiring accurate prediction of illumination levels and dependable performance. In order to optimize visibility for all users, it is important to control illumination levels, uniformity of light distribution, and glare. At the same time, an economical layout will be based on maximizing the spacing of luminaires.

3. Pedestrian Areas

The transition between the surrounding site and the building itself defines the pedestrian area, including plazas, courtyards, and pathways. These spaces require the widest range of lighting solutions since they combine the concerns of open areas and the integration of luminaire appearance with the building's architectural design. Luminaires in this area are usually highly visible, requiring attention to finish quality and detail. Illumination of irregularly shaped spaces, and a need to control stray light, requires optical diversity, particularly since fixture placement may be influenced by aesthetic concerns. Ideally, if the appearance and design components of the luminaires specified in these areas are shared with other site luminaires, the integration of the lighting system for the entire site is enhanced.

Any given building site usually has differing uses and conditions—each has differing lighting requirements as well.

4. Site Perimeter

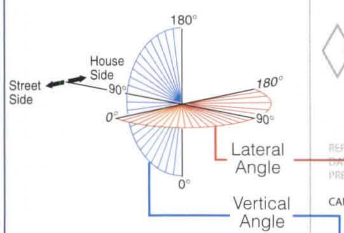
Lighting the site perimeter includes requirements to control or eliminate illumination from "trespassing" onto adjacent properties. Light trespass ordinances, and courtesy to neighboring property occupants, require tight control of light emitted behind the luminaire. Efficient design satisfies some of this demand, while optics inside the luminaire that cut off light distribution in certain areas provide an additional level of control. House-side shields may also be required to provide even tighter control by trimming the distribution pattern. These concerns must be satisfied, of course, without affecting overall system performance.

II. PHOTOMETRY INFORMATION

The design of site lighting requires an understanding of the unique information used to represent elements of optical performance. Photometry, or the measurement of light intensity and relative illuminating power, is the foundation on which any evaluation of luminaire performance is based. Use of independent testing labs to conduct the measurements and compile the information ensures that the photometry information is accurate and reliable.

Basic Language and Presentation

In order to properly select luminaires appropriate to the specific locations and requirements of a building site, an understanding of some of the basic language and ways that information is presented is required.



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REPORT NUMBER: ITL44999
PREPARED FOR: KIM LIGHTING INC.

CANDELA TABULATION

LATERAL ANGLE (STREET SIDE / HOUSE SIDE)

VERTICAL ANGLE	0.0	15.0	35.0	55.0	71.0	75.0	95.0	115.0	135.0	155.0	180.0
180.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
155.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
125.0	0.	0.	0.	5.	0.	5.	9.	9.	9.	0.	0.
115.0	0.	0.	0.	9.	0.	9.	12.	12.	12.	0.	0.
105.0	4.	7.	9.	12.	9.	15.	15.	15.	15.	9.	12.
95.0	7.	9.	15.	15.	15.	18.	18.	18.	18.	12.	12.
85.0	18.	24.	27.	36.	36.	45.	36.	45.	55.	45.	36.
75.0	327.	491.	700.	1701.	3893.	3993.	810.	500.	300.	518.	382.
66.0	728.	746.	2492.	4011.	8595.	8232.	3183.	1783.	1674.	1437.	1037.
65.0	782.	810.	2465.	4339.	8295.	8141.	3429.	1810.	1737.	1483.	1110.
55.0	1674.	1983.	2610.	4066.	7104.	[illegible]631.	3029.	2001.	2010.	1655.	1492.
45.0	2219.	2192.	2310.	2392.	2301.	2228.	1974.	1865.	1865.	1719.	1674.
35.0	2110.	2165.	2092.	2092.	2056.	2047.	1956.	1910.	1846.	1774.	1746.
25.0	982.	964.	1137.	1674.	1946.	1956.	1956.	1874.	1792.	1728.	1674.
15.0	582.	600.	664.	655.	582.	600.	746.	1101.	1264.	1392.	1346.
5.0	491.	491.	491.	491.	455.	464.	418.	364.	327.	318.	309.
0.0	363.	363.	363.	363.	363.	363.	363.	363.	363.	363.	363.

Maximum Candela

Figure 2: Candela Tabulation Data

Candela Tabulation

One of the fundamental units of measurement is the candela, which in 1979 became the international standard to define luminous intensity. Figure 2 shows a typical candela tabulation data sheet prepared by an independent lab with a luminaire orientation diagram for reference.

The Candela Tabulation Data Sheet presents the raw data used for all illuminance calculations and is tabulated with the vertical angles in rows and lateral angles in columns. As the diagram indicates, lateral values from 0° to 90° are in front of the luminaire and referenced as "Street Side." Lateral values from 90° to 180° are behind the luminaire and referenced as "House Side."

Vertical values from 0° to 90° are below the fixture, while values 90° to 180° are at the fixture level and above. As we will see, candela data is also used to define a luminaire's light distribution type and cutoff characteristics.

Footcandle Calculations

The data provided in Candela Tabulation Data Sheets is used to calculate footcandle levels within a proposed lighting design. Generally, this is accomplished by using computers to make calculations, which are, in turn, dependent upon the accuracy of the data. Figure 3 illustrates the relationship of the calculated illumination at a single point to the information provided in the candela tabulation. (See Figure 7 later in this article for the correlating location on an isofootcandle plot.)

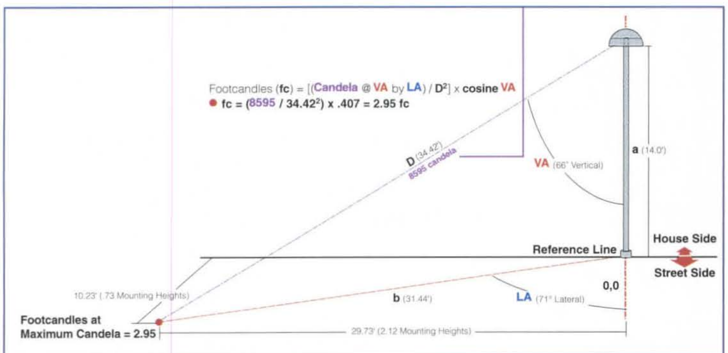

Figure 3: Footcandle representation based on Candela Tabulation Data

Candela Plots

Candela plots are graphical representations of candela tabulation data (figure 2). Outdoor lighting produces unique light patterns which are difficult to represent in a flat two-dimensional plane. Therefore, to create distribution plots that illustrate luminaire performance, curves are plotted with a three-dimensional dynamic. An example, based on the candela tabulation data above, is presented in the charts shown in Figure 4.

Using the tabulated maximum candela value, which in this example is 8595, two planes are identified: a lateral angle of 71°, and a vertical angle of 66°. The vertical angle is used to create a cone, with its slope equal to the vertical angle of maximum candela (66°). On this cone, all lateral candela distribution values from the tabulated data row at 66° are plotted. The result is shown on the right side of the cone chart. The two-dimensional view looks down at the top of the constructed cone.

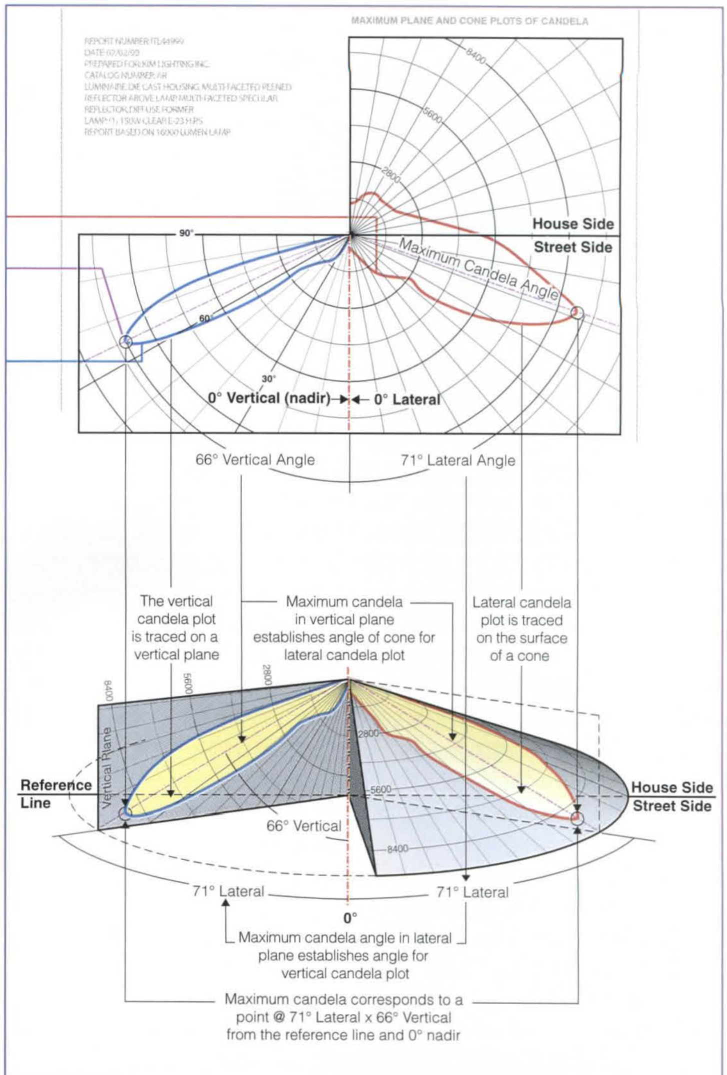

Figure 4: Maximum Plane and Cone Plots of Candela

The second value, the lateral angle of 71°, is used to construct a vertical plane off the lateral baseline. The result is shown on the left side of the cone chart. On this surface, all vertical candela distribution values from the tabulated data column at 71° are plotted. For purposes of presenting the plot, the vertical plane is flattened, or laid back 90°, to show it in the same plane as the right side plot.

The chart is also shown in a perspective view, to help visualize the relationship between the two plotted curves. The combination of the two curves represents luminaire performance in three dimensions.

III. LIGHT DISTRIBUTION PATTERNS

Outdoor luminaires produce lighting patterns that can be identified first by their reach in front of a single fixture location and second by their reach on each side of that location. **"Distribution types" describe the reach of the luminaire's light pattern forward of each fixture, while "distribution ranges" define the reach to either side.**

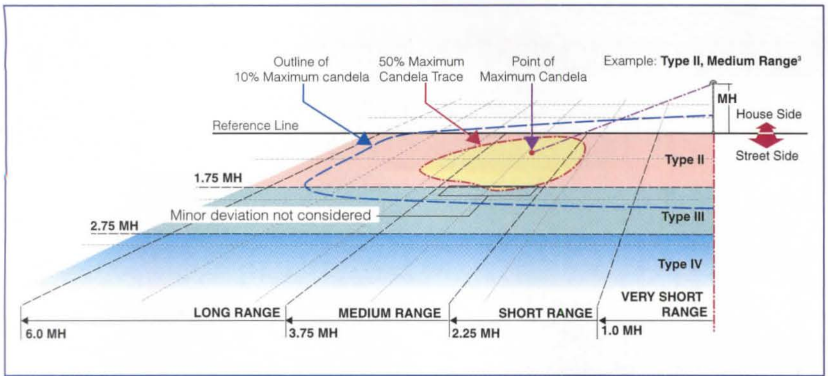

Figure 5: Grid and light patterns to determine Distribution Type

Distribution Types

(Refer online for example illustrations of each Distribution Type).

The term "distribution type" defines how far forward of the luminaire (i.e., on the street side) the effective output reaches. The specific classification of distribution types is based on locating the luminaire's effective major output pattern on a grid representing distances in units of Mounting Height (MH) from the luminaire. This pattern is defined by tracing an area representing light distribution at 50% of maximum candela. By measuring where the bulk of this pattern falls on the grid, a luminaire can be classified as follows and as shown in Figure 5. Refer to illustrations of definitions online. (Note that in some cases, minor deviations in a beam pattern may cross the boundary from one type into another. While this has a nominal effect on applied performance, it should not be considered for classification purposes.[1]):

- **Type II** defines shallow reaches, when the 50% maximum candela trace lies within1.75 MH on the street side of the reference line.[4]
- **Type III** is a mid-range, when the 50% maximum candela trace lies within 2.75 MH on the street side of the reference line.[4]
- **Type IV** identifies luminaires with a definite forward-throw distribution, when the 50% maximum candela trace lies beyond 2.75 MH on the street side of the reference line.[4]
- Distribution is classified as **Type V** Square for horizontal lamp luminaires when the 50% maximum candela trace is symmetric in four quadrants. This distribution is characterized by four candela peaks, diagonal to the reference line.
- **Asymmetric[5,6] Distribution** (similar to Type III): This distribution is for vertical lamp luminaires when the 50% maximum candela trace lies beyond 1.0 MH on the street side of the reference line, and inside 1.0 MH on the house side of the reference line. Narrow range distribution is identified when the point of maximum candela falls inside of 2.25 MH; wide range is identified when the point of maximum candela falls beyond 2.25 MH.
- **Symmetric[5,6] Square Distribution** (similar to Type V Square): Distribution is classified as symmetric square for vertical lamp luminaires when the 50% maximum candela trace is symmetric in four quadrants on both street and house side of the reference line. Narrow range distribution is identified when the candela peaks fall inside of 2.25 MH along the reference line; wide range is identified when the candela peaks fall beyond 2.25 MH.

Distribution Range

Distribution range defines how far the distribution pattern reaches laterally, perpendicular to the axis used to identify general type. The ranges used are defined as follows and indicated graphically in Figure 5.

Long Range: A distribution is identified as long range when the point of maximum candela lies from 3.75 to 6.0 MH from the luminaire's centerline, along the reference line.

Medium Range: A distribution is identified as medium range when the point of maximum candela lies from 2.25 to 3.75 MH from the luminaire's centerline, along the reference line.

Short Range: A distribution is identified as short range when the point of maximum candela lies from 1.0 to 2.25 MH from the luminaire's centerline, along the reference line.

Very Short Range[2]: A distribution is identified as very short range when the point of maximum candela lies from 0 to 1.0 MH along the reference line.

Distribution types only generally describe a distribution pattern. To establish the suitability of a luminaire for a specific application, an evaluation must be completed using actual photometric data for the specific fixture and lamp combination being considered.

"Distribution types" describe the reach of the luminaire's light pattern forward of each fixture, while "distribution ranges" define the reach to either side.

IV. CUTOFF

Beyond distribution and range, luminaires are defined by how well they control or cut off light at selected vertical angles. Typically this reference point is referred to as zero degrees vertical or "nadir". Designs without significant cutoff characteristics distribute light in zones unlikely to contribute to useful visibility, contribute to light pollution, and are inefficient.

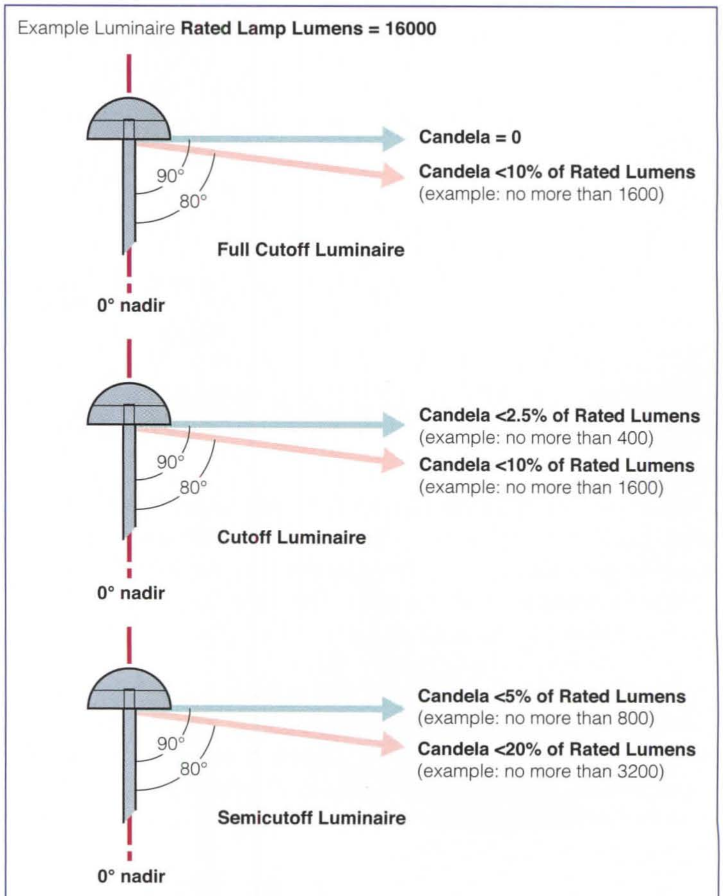

Figure 6: Definitions of Cutoff Luminaires

...Cutoff is based on what proportion of a luminaire's output is being distributed at 80° and 90° above nadir.

Definitions

The definition of **cutoff is based on what proportion of a luminaire's output is being distributed at 80° and 90° above nadir.** See figure 6 for graphic examples of some of the luminaire cutoff types defined below. (Extracted from IES Publication RP33-99 (2/99))

Noncutoff

A luminaire's light distribution is designated as noncutoff when there is no limitation of illumination in any zone.

Full Cutoff

A luminaire's light distribution is designated as full cutoff when the candela at 90° *above nadir* is 0 and less than 10% of rated lamp lumens at 80° above nadir.

Cutoff

A luminaire's light distribution is designated as cutoff when the candela at 90° above nadir is less than 2.5% of rated lamp lumens, and less than 10% of rated lamp lumens at 80° above nadir.

Semicutoff

A luminaire's light distribution is designated as semicutoff when the candela at 90° above nadir is less than 5% of rated lamp lumens, and less than 20% of rated lamp lumens at 80° above nadir.

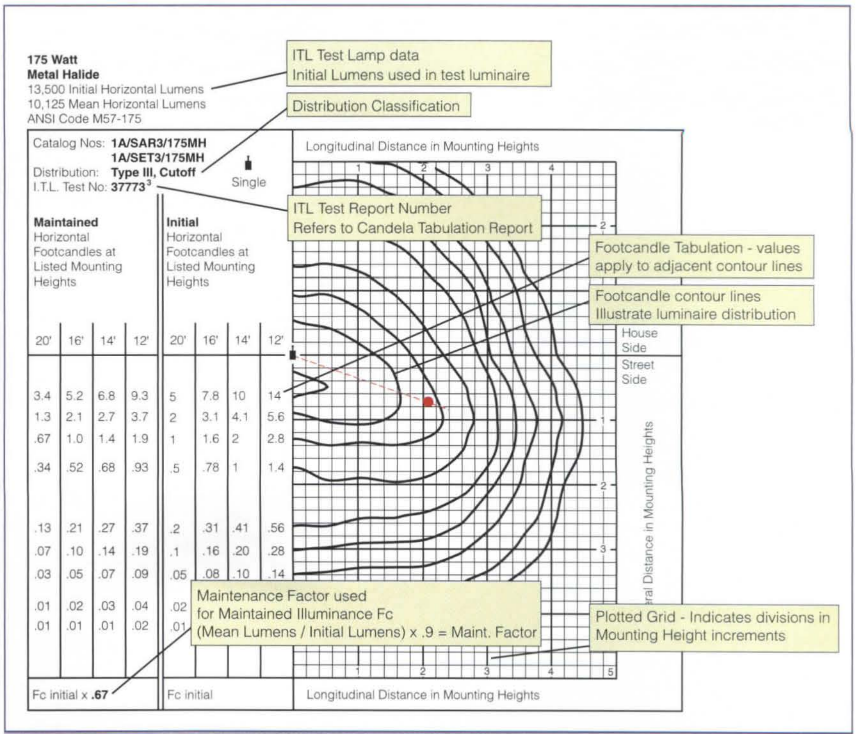

Figure 7: Elements of a typical Isofootcandle plot

Example:

A luminaire with tested data showing a total of 16,000 Rated Lamp Lumens has a candela tabulation that produces 18 candela at 90° (<2.5% of Rated Lumens) and 55 candela at 80° (<10% of Rated Lumens). These values fall within the defined ranges shown in Figure 6, classifying this as a cutoff luminaire.

VI. ISOFOOTCANDLE PLOTS

Isofootcandle plots are a common tool for evaluating and comparing different luminaires for a given application. These plots are often provided by luminaire manufacturers for architects and engineers to use in selecting and specifying appropriate lighting products. An example is shown in Figure 7.

Usage

Isofootcandle plots graphically represent a particular luminaire's lighting pattern, in illuminance, as the light strikes a horizontal surface. These plots are scalable as they are represented in mounting height increments. An approximation of pole spacings required to attain a desired light level can easily be determined from the information provided. These plots also provide a productive tool for the comparison of various luminaires. The easily read visual reference indicates beam patterns graphically, where other information (such as candela tabulations and isocandela curves) may be less clear.

Conventions

Isofootcandle plots include footcandle calculations shown with the luminaire at various mounting heights. Contour lines are drawn through illuminance values. Each contour, from the center out, represents approximately 50% of the value of the previous contour. The plot of contours is placed over a grid indicating mounting height divisions to demonstrate the luminaire's applied performance.

Estimated Spacing and Uniformity

As early as the schematic design phase of a project, isofootcandle plots can be used for rough luminaire layouts for site lighting.

EXAMPLE: Refer to the isofootcandle plot in Figure 8 and assume a desired minimum initial illuminance of 2.0fc, using luminaires mounted on 14' poles. To estimate a fixture layout, start from the perimeter, where the 2.0fc isofootcandle trace crosses the reference line, to establish the maximum single fixture distance to the site perimeter (1.6 MH). In order to attain the minimum illuminance (2.0fc) between fixtures, the 1.0fc traces of two fixtures must intersect at the site perimeter and interior. Therefore, lateral spacing is determined where the 1.0fc trace intersects the reference line (2.2 MH), and maximum forward spacing is identified where the lateral spacing line intersects the 1.0fc trace on the street side of the luminaire (1.8 MH). These two dimensions indicate the mid-points between luminaires, in mounting heights. Multiplying these mounting height (MH) dimensions by the pole height (14') defines the maximum luminaire spacings in both directions. In this example, 60' (4.4 MH x 14') x 50.4' (3.6 MH x 14').

Approximate Illuminances and Uniformity

By overlaying isofootcandle plots, a rough idea of illuminances can be determined by adding the values of each contour where they intersect as shown in the lower portion of the example in Figure 8. Through observation of the overlapping of the isofootcandle plots, approximate uniformity can also be estimated. More accurate calculations (computer generated evaluations) will generally return levels higher than those achieved using this method, as smaller contributions from every adjacent luminaire would be included.

VII. APPLICATION IN DESIGN

Distribution Pattern Uses

Ideally, all light energy produced would be focused into desired lighted zones with

no wasted energy being directed elsewhere. This would require an infinite array of distributions, and the ability to tune them to every site condition. While this is not realistic, the combination of careful luminaire selection, mounting height, and luminaire placement can produce very efficient designs, using just four basic distribution patterns, as shown in Figure 9. For each of the basic distributions, variations such as range and the characteristics of horizontal vs. vertical lamp optics produce additional choices. Further fine tuning can be attained with house-side shields and reflector orientation. ■

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***http://archrecord.construction.com/resources/conteduc/archives/0512kim-1.asp***

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AIA/ARCHITECTURAL RECORD
CONTINUING EDUCATION Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify the lighting requirements in each area of site lighting*
- *Describe different methods to direct light toward intended areas or away from areas not to be illuminated*
- *Describe lighting distribution types and how they are best suited for lighting outdoor environments*
- *Explain how isofootcandle plots are used to design site lighting*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 347. Follow the reporting instructions, answer the test questions and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health, safety, welfare credit.

QUESTIONS

1. Site lighting is classified into what four basic areas?
- **a.** Long, medium, short, and very short
- **b.** Building areas, shopping centers, courtyards, and path areas
- **c.** Roadways, open areas, pedestrian areas, and site perimeter
- **d.** Type II, Type III, Type IV, and Type V areas

2. Candela data is used:
- **a.** to define a luminaire's distribution type
- **b.** to define cutoff characteristics
- **c.** for all illuminance calculations
- **d.** all of the above

3. _____ areas require careful consideration of illuminance requirements, uniformity, and brightness control.
- **a.** Heavy traffic areas
- **b.** Wide areas
- **c.** Open areas
- **d.** Walk areas

4. What do distribution types describe?
- **a.** the reach of the luminaire's light pattern forward of each fixture
- **b.** the reach of the luminaire's light pattern behind each fixture
- **c.** the reach of the luminaire's light diagonal to the reference line
- **d.** the reach of the luminaire's light centerline, along the reference line

5. Type II Distribution is when the 50% maximum candela trace lies within _____ MH (Mounting Height) on the street side of the reference line.
- **a.** 1.75 MH
- **b.** 2.25 MH
- **c.** 2.75 MH
- **d.** 3.75 MH

6. What does distribution range describe?
- **a.** how well luminaires control light at angles above 80° from nadir
- **b.** how far the distribution patterns provide maximum pole spacing in both lateral and longitudinal directions
- **c.** how distributions are well suited for site / area perimeters, wide roadways, and open areas
- **d.** how far the distribution pattern reaches laterally, perpendicular to the axis used to identify general type

7. When is a distribution identified as Very Short Range?
- **a.** When the point of maximum candela lies from 3.75 to 6.0 MH from the luminaire's centerline, along the reference line
- **b.** When the point of maximum candela lies from 2.25 to 3.75 MH from the luminaire's centerline, along the reference line
- **c.** When the point of maximum candela lies from 1.0 to 2.25 MH from the luminaire's centerline, along the reference line
- **d.** When the point of maximum candela lies from 0 to 1.0 MH along the reference line

8. What is cutoff based on?
- **a.** the proportion of a luminaire's output distributed at 90° and 90° above nadir
- **b.** the proportion of a luminaire's output distributed at 80° and 90° above nadir
- **c.** the proportion of a luminaire's output distributed at 80° and 80° above nadir
- **d.** the proportion of a luminaire's output distributed at 90° and 80° above nadir

9. When is a light distribution designated as cutoff?
- **a.** When the candela at 90° above nadir is less than 2.5% of rated lamp lumens, and less than 10% of rated lamp lumens at 80° above nadir
- **b.** When there is no luminous limitation in any zone
- **c.** When the candela at 90° above nadir is less than 5% of rated lamp lumens, and less than 20% of rated lamp lumens at 80° above nadir
- **d.** When the candela at 90° above nadir is 0 and less than 10% of rated lamp lumens at 80° above nadir

10. What do isofootcandle plots represent graphically?
- **a.** the luminaire's lighting pattern at various mounting heights
- **b.** the luminaire's lighting footcandle levels within a proposed lighting design
- **c.** the luminaire's requirements to control illumination onto adjacent properties
- **d.** the luminaire's lighting pattern as it hits a horizontal surface

KIM LIGHTING

For the past 70 years, Kim Lighting has produced innovative, architecturally relevant, performance oriented lighting products designed for the outdoor environment. Kim combines high performance optical systems, the highest quality materials, the latest manufacturing technologies and practices to complement the architecture in a variety of applications. Kim Lighting is the recognized industry leader in outdoor lighting products that include roadway, area, site, pedestrian area, pathway landscape, building mounted, and parking garage lighting applications.

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Designing with Fire-Rated Glass: Integrating Life Safety, Transparency, and Aesthetics

Technology creates new glazing options

Provided by Technical Glass Products
By Jerry Razwick

Developments in glazing techniques and technology are providing new design opportunities for use of fire-rated glass. Traditional wired glass, as opposed to newer laminated wired glass, has long been the only glazing material permitted in fire-rated areas, as set forth by local building codes. Complying with a fire rating often meant giving up clear visibility through doors and windows, due to the wires, and sacrificing impact safety, since wired glass is easy to break. Design choices often consisted of creating a solid wall without windows, or an opening with institutional-looking wired glass, with its inherent performance limitations.


Photographer: Stephen and Gil Amiaga.

Project: Tommy Hilfiger in New York. Architect: Bridges & Lavin.

As a result, glass manufacturers have created new solutions, thereby providing more options and a sophisticated range of materials for a variety of applications. These choices offer many levels of performance that directly influence project design and construction requirements.

Glass manufacturers have created new solutions, thereby providing more options and a sophisticated range of materials for a variety of applications.

Fire-rated glass has two primary functions: to protect life and property in the event of a fire, and to allow visibility. A solid barrier wall can often give adequate fire protection, but it blocks light and vision from one space to another. At the other end of the spectrum, ordinary window glass lets the light in but does nothing to stop the spread of a fire. Fire-rated glass combines both functions in a single product, maintaining a barrier to flames and smoke while at the same time opening up a room visually.

Glass must undergo rigorous testing to earn a fire rating. Several pieces of different sizes are installed in a test furnace and then subjected to a blaze that exceeds 1600° F. To successfully pass the test, glass must remain in the frame for the duration of the test. The longer it can withstand the heat, the higher the fire rating it can be given, from 20 minutes to 3 hours.

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Designing with Fire-Rated Glass: Integrating Life Safety, Transparency, and Aesthetics.** To earn one AIA/CES Learning Unit, including one hour of health safety welfare credit, answer the questions on page 273, then follow the reporting instructions on page 348 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify key categories of fire-rated glazing*
- *Evaluate viable fire-rated options for various applications*
- *Understand the relationship between glass and sprinklers*

After the fire test, if the glass is to be given anything above a 20-minute rating, it must also endure a hose stream test. While the glass is still hot, it is doused with a blast from a fire hose. Most glass cannot tolerate the difference in temperatures and will shatter. This can be a critical factor in a real-world fire, where hot glass may be exposed to water from hoses, sprinklers or extinguishers. The rare types of glass that are able to survive these grueling conditions earn the right to be considered "fire-rated."

Once thought of as a design limitation, fire-rated glass has become a resource for innovative design concepts. Meeting life safety and building code requirements can be integrated with creative design alternatives, rather than purely functional solutions.

Building codes are beginning to reflect the changes in the industry. Revisions to the 2003 International Building Code (IBC) have eliminated the use of traditional wired glass for hazardous locations in schools, daycare centers, and athletic facilities. These changes will apply to all types of construction in 2006.

This marks a significant shift, because wired glass, a product once mandatory in all glazed fire-rated openings, is no longer considered adequate for many building types.

Mary & Leigh Block Museum of Art, Northwestern University, Evanston, IL
Architect: Dirk Lohan
Photo: Steinkamp/Ballogg

Newer fire-rated glazing materials carry high ratings and may be used in larger sizes than wired glass.

Larger Size Glass

The vast majority of the newer wireless fire-rated glass products are listed with independent testing laboratories for use in larger sizes than polished wired glass. Larger sizes offer more flexibility for design concepts where ratings must be provided. The maximum dimensions for glass in fire doors and windows have been greatly increased.

For example, when wired glass is used in a 45-minute opening (a typical requirement in fire-rated corridors), codes have historically limited the size to 1,296 square inches (9 square feet), the maximum size successfully fire tested by Underwriters' Laboratories (UL), or other independent labs. Since wired glass was such a dominant product for years, many building codes established 1,296 square inches as the maximum allowable size for any type of fire-rated glass.

As new products became available, they were capable of exceeding the existing code limitations. Standards had to be rewritten accordingly. Today, depending on the product and application, a window requiring a 45-minute rated product may have a single piece of glass over 40 square feet. These increases in allowable glass size have given tremendous design flexibility to architects and designers, by minimizing the amount of required framing, while maximizing transparency and aesthetic appeal.

Overall allowable glass size in doors has also increased. In the past, a typical steel fire door with a 90-minute fire rating would often have used a 100-square-inch vision panel. Whether the door lite was 10-inch by 10-inch or a narrow 4-inch by 25-inch strip of wired glass, vision through the door was minimal. When combined with the industrial look of a steel fire door, the overall aesthetics were limited. Fire-rated ceramics have greatly increased the allowable glass size in steel or wood fire doors. Instead of 100 square inches, 90-minute steel doors may now incorporate ceramics exceeding 9 square feet per glass lite. For lower fire ratings, such as 45- or 60-minute doors, allowable glass sizes are even larger.

Increased allowable glass sizes provide architects with greater design flexibility. By using ceramics that allow larger sizes and wireless vision panels, doors, windows, and entryways can blend seamlessly with non-rated systems used throughout a building. However, with increases in glass sizes, other important aspects of fire-rated glass must also be considered, including the ability to withstand human impact and overall performance during a fire.

Impact Resistance

Fire is a major concern in all buildings. Yet in public facilities with high traffic volumes, injuries from glass breakage are often much more of a risk. Although wired glass offers excellent fire ratings, it cannot withstand much in terms of human impact. In fact, once broken, wired glass can be more dangerous than ordinary window glass, since the broken wires can create sharp snags.

For years, this posed a dilemma as to which need was more critical, since no glazing material could provide both fire and impact protection. The codes came down on the side of fire, determining that the threat of damage from fire was greater than the threat of injury from glass breakage. So in the 1970s, the Consumer Product Safety Commission (CPSC) granted a temporary exemption to wired glass, allowing its use despite its inability to earn high impact ratings. With limited options that could meet fire codes, there was little choice.

As time has gone by, the demand for safer facilities has continued to fuel increasingly stringent code requirements, making it more difficult to focus on a single safety need to the exclusion of another. Seeing the opportunity for innovation, manufacturers began developing products that could better serve dual roles of fire and impact protection.

As a result, most fire-rated glass products available today satisfy CPSC 16CFR1201 (Category II), the highest standard of impact safety for window glass. Whereas wired glass can only withstand approximately 100 foot-pounds (ft.-lbs) of impact, materials satisfying the Category II requirements are subjected to an impact approximating a full-grown adult running into the glass, or 400 ft.-lbs of impact. This means many of today's fire-rated glazing products exceed the safety impact resistance of traditional wired glass by four times, or more.

Performance improvement has led to increased impact safety. The newer fire-rated glazing materials surpass traditional wired glass in terms of fire safety as well. Some of the new glass ceramic products highlight this point. Ceramic materials are well known for being able to withstand heat. From cooktops to car engines, manufacturers have taken advantage of the fact that ceramic has a very low coefficient of expansion when heated. Fire-rated glass composed of transparent ceramic has been able to earn fire ratings as high as 3 hours, making it an outstanding thin and wireless alternative to wired glass. In fact, the use of ceramic to hold the flames in the 2002 Olympic Cauldron during the Winter Games in

Many of today's fire-rated glazing products exceed the safety impact resistance of traditional wired glass by four times, or more.

Project: Ohio State University, Columbus, OH
Photo: OSU Photo Services

Ohio State University Fire-rated glazing offers high impact resistance.

Salt Lake City shows that containing fire for days, rather than hours, is not a problem. Such performance is not possible with wired glass.

When determining allowable ratings of windows in a fire-rated corridor, design professionals often note that windows are required to provide 45 minutes of fire protection, when the corridor is rated for 1 hour. This condition relates to the historic performance limitations of wired glass. Like its size limitation of 9 square feet, the 45-minute rating was established because that was the longest duration wired glass could perform during a fire. Any longer, and the panel of wired glass would tend to slump from the opening, allowing passage of smoke and flames. As a result, building codes were developed in consideration of this performance limitation. While wired glass couldn't provide the optimal result by matching the 60-minute performance of the surrounding wall, some level of protection was considered to be better than none at all.

Transparent ceramics, however, have no such performance limitation and can provide a fire protection rating that matches the surrounding wall. By using ceramics, corridors rated for 60 minutes can now have openings that also provide a 60-minute rating. The weak link of allowing 45-minute windows in a 1-hour corridor is no longer necessary when architects and specifiers use ceramics that provide a full 60 minutes of fire protection.

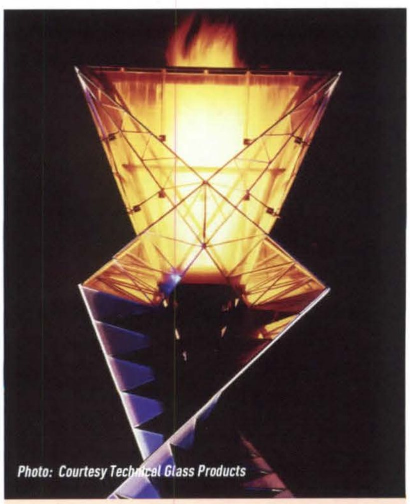


Photo: Courtesy Technical Glass Products

Fire-rated ceramic contained the continuous flame of the 2002 Salt Lake City Winter Olympic Games.

Occasionally, the need for higher fire ratings is accompanied by the requirement to block the passage of heat, in addition to flames and smoke. Heat can build up quickly in stairwells and other areas where building occupants could become trapped for long periods of time. Extremely high temperatures transferring through the glass could be just as devastating as the fire itself. For this reason, certain types of fire-rated walls do not allow openings of any kind. For many years, this requirement put severe design limitations on architects who desired transparency in these areas. Be it a three-story exit stairwell or two-hour occupancy separation, *solid cinder* block or sheetrock walls were the primary means of meeting code requirements. With developments in fire-rated glass and framing, however, these design limitations no longer exist.

Glass fire walls (sometimes called transparent wall units) address this issue directly. They are composed of multiple layers of glass with a layer of an intumescent material in between, which turns to foam during a fire. Glass fire walls are tested to the same standards as barrier walls. This means that while allowing full vision for aesthetic and security reasons, they perform in a manner similar to cement block walls during a fire.

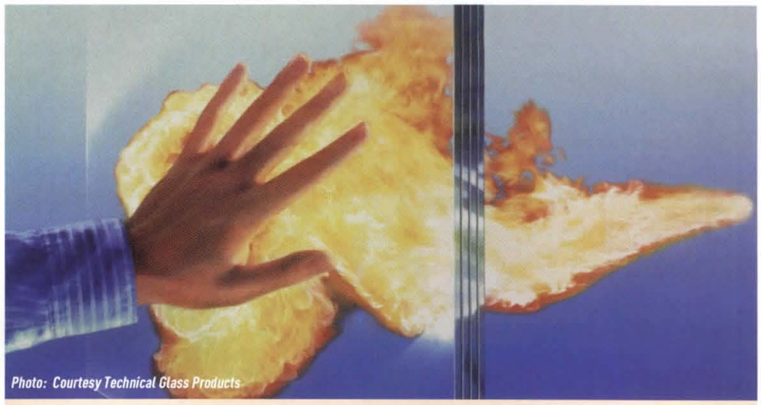


Photo: Courtesy Technical Glass Products

Glass fire walls block the transfer of heat.

These products greatly reduce heat transfer and therefore can be used in applications where other types of fire-rated glass would not be sufficient. And because they're not considered an opening, glass fire walls allow an unlimited amount of glazing in a wall, making it possible to design with floor-to-ceiling glass, while maintaining a 2-hour fire rating. Full-lite doors can also be utilized within these transparent fire walls.

Multiple Functions of Fire-Rated Glass

Product and technology improvements have resulted in a degree of hybridization, combining multiple characteristics in fire-rated glass. Often, building materials must address several design issues on a project, such as energy conservation, acoustic control, hurricane resistance or security needs. In each case, fire-rated glass products are available to provide additional benefits.

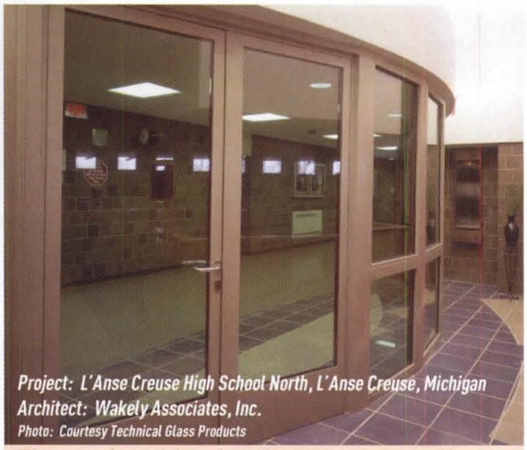
One way this has been accomplished has been through the introduction of fire-rated insulated glass units (IGUs). This enables a tremendous amount of flexibility, since the second piece of glass in the IGU can be virtually any type of product: tinted, coated, or mirrored. The IGUs offer energy code compliance and sound control, which expands the capacity of fire-rated glass beyond containing flames and smoke.

Greater attention is being paid to security risks as well. Some fire-rated glazing materials have earned a Level 3 bullet resistance classification, meaning they can stop a .44 Magnum bullet, and greater resistance levels are possible when combined with other glazing products.

Framing Developments

Until recently, fire-rated framing was not keeping pace with innovation in glass products. Using traditional hollow metal steel framing was as predictable a choice as using wired glass. Despite the track record of proven performance, hollow metal doors and frames have limitations.

Hollow metal frames and doors exhibit a bulky appearance due to the method of construction. Rather then being extruded, hollow metal frames are formed from flat sheets of steel, cut to size, then bent into the desired shape. Due to this manufacturing process, hollow metal steel doors and frames lack the crisp edges provided by extruded aluminum systems. In addition, window glass is held in place using glass stops with exposed fasteners. With exposed screws placed approximately every 12 inches to 16 inches, aesthetics are noticeably compromised. The design of hollow metal steel frames makes it difficult to match the appearance of aluminum systems as well. Unlike aluminum frames that sit within a finished opening, hollow metal frames wrap entirely around the surrounding wall.


Project: L'Anse Creuse High School North, L'Anse Creuse, Michigan
Architect: Wakely Associates, Inc.
Photo: Courtesy Technical Glass Products

Fire-rated steel framing offers narrower profiles than traditional hollow metal steel frames.

Although steel remains the most widely used material for fire-rated framing, significant advancements have also been made using wood. For many interior applications, nothing can compare to the warmth and beauty of natural wood. With recently developed systems, wood doors and frames can be used in fire-rated openings. Available with fire ratings from 20 to 60 minutes, these hardwood framing systems can incorporate a wide range of fire-rated glazing materials with glass sizes that surpass traditional systems. Hardwood frames are typically available in a wide variety of species, from red oak or cherry, to mahogany and maple.

In the last few years, however, framing options have emerged to allow more aesthetic applications of fire-rated glazing. New types of steel framing systems have been introduced in North America that were previously available only in Europe. Similar in appearance to aluminum storefront framing, these narrow profile frames are nearly extruded from steel tubes, providing aesthetics and performance unmatched by ordinary steel frames. This modern manufacturing process provides a narrower, more streamlined appearance.

For example, 45- to 90-minute rated window frames are often available with a width and depth of less than 3 inches by 2 inches. In addition, door stiles and rails need only be 3 inches wide, rather than 6 inches to 8 inches typically required with hollow metal doors. Further, glass stops use hidden fasteners and the frames install into the wall assembly like a typical aluminum storefront. When finish-painted at the factory, these steel framing systems are difficult to distinguish from ordinary aluminum storefronts. Despite the sleek appearance, tremendous strength is retained in these new systems, because the profiles are formed, rather than bent steel.

New narrow profile "storefront", or floor-slab-to-floor-slab, door and frame systems provide additional design options, and are available with fire ratings of 20 to 90 minutes. As with hollow metal steel, these frames do not provide a barrier to heat transfer. They are most commonly used with thin fire-rated glazing products, like ceramics. Due to their visual appeal, narrow profile doors and frames are sometimes used throughout a building, in fire-rated and non-fire-rated areas, to achieve a consistent appearance.

Some fire-rated steel framing systems utilize an insulated steel profile, and have achieved ratings up to 90 minutes in doors, and up to 2 hours for other applications. Acting as a barrier to heat transfer, these frames and transparent panels allow an unrestricted amount of glass in walls and doors, and are compatible with glass fire wall products.

Such systems allow for full-lite doors and large expanses of glass, creating new possibilities for designers. For example, in a 4' x 8' door, it is now possible to have a single piece of glass providing a full-lite, narrow-stile door.

As with other recent developments in steel framing, solutions now address curtainwall applications as well, including a fire-rated framing system spanning several stories, like an aluminum curtainwall. Whether interior stairwells or exterior property line applications, curtainwalls have been developed with up to 2-hour ratings. Similar to the fire-rated storefront systems, these steel curtainwalls are difficult to distinguish from aluminum systems.

Glass and Sprinklers

A comprehensive fire protection program should address three basic needs: detection, suppression, and compartmentation. Components in the first two categories generally require some type of activation, while components of the third category work without any type of trigger. For instance, smoke alarms, which provide detection, and sprinklers, which provide suppression, both require a signal to switch into active mode. Smoke or heat sets them off. In contrast, fire walls, doors, and ceilings compartmentalize and contain smoke and flames without any activation process. They offer passive, round-the-clock protection by acting as physical barriers to fire and smoke.

With active systems, there is always the danger of mechanical failure, human error, or poor maintenance interfering with the way the systems function. A sudden loss of power or an unexpected drop in water pressure can render smoke alarms or sprinklers ineffective. Manufacturing defects can further interfere with product performance.

With active systems, there is always the danger of mechanical failure, human error, or poor maintenance interfering with the way the systems function.

The National Fire Protection Association (NFPA) Journal has cited numerous additional causes that have resulted in inoperable sprinklers in building fires, stemming from valves painted over, systems shut down during construction, fire burning through PVC supply pipe, and fire fighters diverting water.

Like any fire protection system, sprinklers have limitations. Relying solely on a single method of fire protection, especially one requiring activation, may not be the best design solution. Examining the relationship between sprinklers and fire-rated building materials, such as glass, allows a greater understanding of how these systems work.


Photo: Courtesy Technical Glass Products

Deluge sprinklers bathe glass surfaces entirely to keep them cool.

Deluge sprinkler systems are a case in point. Occasionally, in lieu of fire-rated glass, code officials approve the use of deluge sprinkler systems with non-rated glass. Deluge sprinklers are highly specialized, and function in a dramatically different way than regular sprinklers, by producing a directed spray that bathes window glass with water during a fire.

This can pose a significant problem, due to an issue known as thermal shock. Most glass cannot tolerate drastic variations in temperature on the surface. If one area is hot and another is cool, the glass doesn't expand or contract, but instead typically shatters and falls from the opening. This principle is visible when water is sprayed on the glass doors of a fireplace when a fire is going.

Even when water isn't present, ordinary float glass breaks at about 250 degrees Fahrenheit, and tempered glass at about 500 degrees Fahrenheit. In contrast, fire-rated glass is often capable of withstanding temperatures above 1600 degrees Fahrenheit. With temperatures in a building fire often exceeding 1000 degrees Fahrenheit during the first 5 minutes, these figures indicate that window glass cannot provide significant fire protection. ■

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***http://archrecord.construction.com/resources/conteduc/archives/0512technical-1.asp***. To receive AIA/CES credit, you are required to read this additional text. The quiz questions below include information from this online reading. To receive a faxed copy of the material, call Technical Glass Products at 1-888-397-FIRE (3473).

AIA/ARCHITECTURAL RECORD **CONTINUING EDUCATION** Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify key categories of fire-rated glazing*
- *Evaluate viable fire-rated options for various applications*
- *Understand the relationship between glass and sprinklers*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 348. Follow the reporting instructions, answer the test questions, and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. Historically, what has been the maximum allowable size for traditional wired glass in 45-minute fire-rated applications?
- **a.** 100 square inches
- **b.** 1,296 square inches (9 square feet)
- **c.** 40 square feet
- **d.** There is no limitation

2. What level of impact are glass products that meet 16CFR1201 (Category II) subjected to?
- **a.** 80 ft.-lbs
- **b.** 100 ft.-lbs
- **c.** 150 ft.-lbs
- **d.** 400 ft.-lbs

3. What glass technology has been developed to provide a thin and wireless alternative to traditional wired glass?
- **a.** Low-Emissivity (Low-E) glass
- **b.** Glass ceramics
- **c.** Glass fire walls
- **d.** Laminated glass

4. What glass technology greatly reduces radiant heat transfer during a fire and allows unrestricted amounts of glazing in a wall?
- **a.** Glass fire walls
- **b.** Insulated Glass Units (IGUs)
- **c.** Glass ceramics
- **d.** Low-Emissivity (Low-E) glass

5. At what approximate temperature will ordinary float glass break?
- **a.** 1,500 degrees Fahrenheit
- **b.** 1,000 degrees Fahrenheit
- **c.** 500 degrees Fahrenheit
- **d.** 250 degrees Fahrenheit

6. In a building fire, what approximate temperature can a fire exceed within 5 minutes?
- **a.** 500 degrees Fahrenheit
- **b.** 800 degrees Fahrenheit
- **c.** 1000 degrees Fahrenheit
- **d.** 1,500 degrees Fahrenheit

7. A comprehensive fire protection programs addresses what three basic needs?
- **a.** Detection, suppression, and compartmentation
- **b.** Detect, activate, extinguish
- **c.** Alarm, activation, extinguish
- **d.** Suppression, evacuation, containment

8. What are the two primary functions of fire-rated glass?
- **a.** To provide smoke containment and heat protection
- **b.** To enhance energy performance and provide security
- **c.** To provide fire protection and visibility
- **d.** To break safely and allow for quick evacuations

9. What may occur when deluge sprinklers activate and water bathes non-rated glass during a fire?
- **a.** Obscured visibility for rescue personnel.
- **b.** Glass shatters due to thermal shock.
- **c.** Uncontrolled flaming on the non-fire side of the glass.

10. Revisions to the 2003 International Building Code (IBC) have eliminated the use of traditional wired glass for hazardous locations in what type of buildings:
- **a.** Senior centers and nursing homes
- **b.** Gymnasiums and office buildings
- **c.** Office buildings, universities
- **d.** Schools, daycare centers and athletic facilities

TGP Technical Glass Products™

Technical Glass Products (TGP) is a leading North American distributor of fire-rated glass and framing materials. Since 1980, TGP has been providing architects, code officials, and glazing contractors with innovative solutions for their specialty glazing needs. The company offers a wide range of products as well as CAD drawings, project consultation, and industry education. Today's fire-rated glazing choices are complex. TGP acts as a one-stop resource, supplying thorough information and assistance. For complete details on their comprehensive product line, visit www.fireglass.com, or call 1-800-426-2789.

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Perforated Metal and Wood Ceilings: Sustainability, Acoustics, and Aesthetics

Raising the standards for acoustical performance and design flexibility

Provided by Ceilings Plus

By Michael Chusid, RA, FCSI

Ceilings account for about a third of interior surface areas in most buildings and are often a building's largest and most visible interior surface. As a result, ceiling design and specifications decisions are among the most important prerogatives of design professionals.

A plethora of ceiling systems is available to contemporary designers. While each type may have its place in the contemporary palette, it is arguable that perforated ceilings most fully express the adventurous spirit of contemporary architecture.

Consider:

- Advances in computer-aided design and manufacturing (CAD/CAM) techniques make it affordable to create ceilings of almost any size and shape, ending the aesthetic tyranny of the 2 x 4 feet grid.
- High-speed and versatile perforating equipment allows designers to create an almost unlimited range of visual textures and patterns.
- A new type of wood panel makes it practical to perforate wood, creating exciting new design and performance options for wood ceilings.
- Perforated ceilings can meet the objectives of sustainable construction and are being used in LEED certified buildings.
- New acoustical technology makes it possible to use perforated panels to satisfy the need for improved acoustics in architectural projects.

Form-Giving Potential

Rapid advances in computer-aided manufacturing (CAM) and product engineering have made it possible to fabricate customized perforated panels. Ceiling panels can now be fabricated to almost any size and shape, with design information from architectural drawings used to produce the automated fabrication instructions. This new design process allows architects to break away from the regimentation of traditional grids by using larger panels that better fit the scale of a room and by creating panels with radii and compound curvatures that can flow throughout a freeform space.

Automated punches can make as many as 7,000 perforations per minute. To satisfy the designer's vision, each hole can be in a unique size, shape, and location. This allows panels to be perforated with an unlimited variety of patterns and unique designs. For example, perforations can be slots, polygons, and oblongs, as well as more traditional circles and squares. Custom perforation patterns can create corporate logos or graphic motifs on the ceiling, and the density of holes can vary from one end of a panel to another to create the illusion of motion.

Photo Courtesy: Ceilings Plus

The planetarium in the Rose Center at the American Museum of Natural History, New York, established a benchmark for perforated acoustical panels. Designed by Polshek Partnership, the 87 ft. diameter sphere is clad with pearlescent metal panels and perforated to absorb noise in the resonant glass-box enclosure. Fabricating the precise compound curvature of the panels was only possible with recent advances in computer-assisted manufacturing.

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Perforated Metal and Wood Ceilings: Sustainability, Acoustics, and Aesthetics.** To earn one AIA/CES Learning Unit, including one hour of health safety welfare credit, answer the questions on page 279, then follow the reporting instructions on page 348 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Recognize how advances in computer-assisted fabrication create new options for the design of customized ceilings.*
- *Understand how perforated ceilings contribute toward Leadership in Energy and Environmental Design (LEED) credits and environmental considerations beyond the scope of LEED.*
- *Know about new hybrid wood panels using wood or bamboo veneer on recycled aluminum cores.*
- *Understand how the acoustical characteristics of perforated panels can be used to meet a variety of architectural challenges.*

The same machinery that punches the perforations can also be used to create openings for the installation of lighting and other ceiling-mounted fixtures.

Perforation size, layout, and spacing can vary to create an open area as large as 50 percent or more of a panel. In addition to affecting appearance, this open area has practical implications such as whether fire sprinklers can be installed above a ceiling or whether panels can be backlit to create a luminous ceiling.

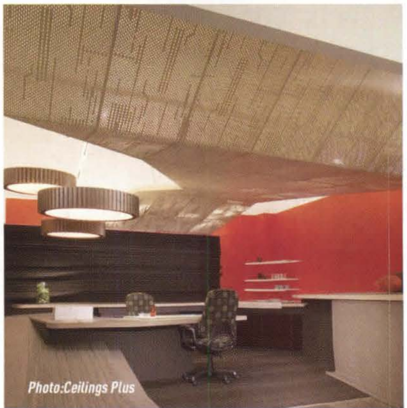


Photo:Ceilings Plus

Customized perforations are a new medium for design expression, as demonstrated in this showroom at Neocon West.

Automated equipment can perforate panels at 7,000 holes per minute.

Perforations are also the key to boosting the acoustical performance of panels. In a post-occupancy evaluation of over 180 workplaces, the Center for the Built Environment found that building occupants reported more dissatisfaction with


Photo:Ceilings Plus

In addition to acoustical perforations, panels can be prefabricated with precision-located holes for lighting, fire sprinklers, public address speakers, and other ceiling penetrations, as demonstrated by Skidmore, Owings and Merrill's new AOL Time Warner Building in New York City.

acoustics in their workplaces than any of the other parameters measured. Architectural acoustical demands are higher today due, in part, to the challenges of improving employee satisfaction in open office environments, maintaining patient privacy in healthcare settings, and addressing new noise sources such as cell phones and desktop multimedia.

***Researchers found* building occupants report more dissatisfaction with acoustics than any other parameter measured.**

Perforated ceiling systems deliver outstanding acoustics. Perforated panels typically achieve noise reduction coefficients (NRC) of NRC .75, and even as high as NRC .95 with additional insulation. More importantly, perforated panels can be tuned to satisfy the acoustical requirements of different rooms, such a providing speech privacy in an open office, clarity in a meeting room, and richness in a concert hall. Tuning an installation is accomplished by changing the perforation pattern, the type and placement of any acoustical insulation, and the distance from the panels to the structure above the ceiling. Noise reduction


Photo:Ceilings Plus

High levels of noise reduction and glare-free illumination were required in the First Alliance call center in Irvine, CA. To satisfy both requirements, a white non-woven acoustical fabric was attached to the top of perforated ceiling panels and back-lit to create a soft, luminous ceiling.

characteristics can vary significantly among similar ceiling products. When specifying ceiling products, architects should review test reports and available information to assess performance qualities. On complex projects, an acoustical consultant can be an invaluable member of the design team.

Perforated Metal and Wood

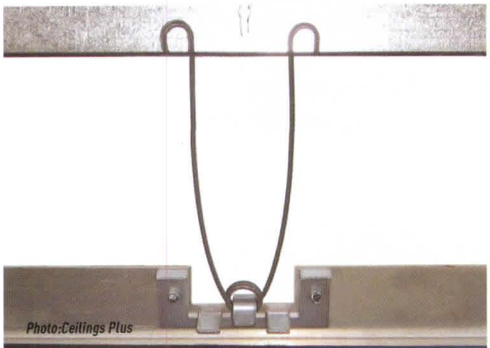
Most perforated ceilings are made of sheet metal. While perforated steel panels are available, the trend is towards the use of aluminum panels that are lighter in weight and can have higher recycled-material content. Metal ceilings are available prepainted in a wide spectrum of colors, with mirrored or anodized surfaces, and with other unique finishes to fit almost every style or taste.

Recent advances in perforating wood ceilings expands design options still further. Until recently, wood panels were made with wood veneers laminated to wood or particleboard cores. The resulting panels were heavy, especially where large panels were required, and difficult to fabricate into curved surfaces. The acoustical performance of wood panels was limited by the cost to drill holes in the panels. Even with "gang-drilling," making holes in wood panels was slow. The heat from high speed drilling could char a wood core. This meant that perforated wood panels were practical with only limited design options and a relatively small percentage of the open area necessary for a full range of noise control options. Drilled panels, for example, are typically limited to NRC .45, far below the NRC .75 to .95 required in rooms with critical noise control requirements.


Photo: Ceilings Plus

A new type of architectural wood panel is made by laminating 1) real wood veneer to 2) light gauge sheet aluminum. For acoustical performance, panels can be perforated and used in combination with 3) an non-woven acoustic fabric insulation.

This has changed, however, with the development of wood panels with wood architectural veneers laminated to lightweight cores of sheet aluminum. Until recently, it has been difficult to get enough adhesion between wood and aluminum to meet the challenges of architectural service. This problem has been overcome through the use of new adhesives and a substrate pretreatment that changes the molecular texture of the aluminum sheet for improved tenacity. Aluminum cores, unlike typical wood and particle board cores, are non-combustible, will not support mold, and do not warp when exposed to changes in humidity. This last point means that panels can be installed even before the HVAC conditions in a building are fully stabilized to accelerate construction schedules.



Torsion springs hold panels snugly against a concealed grid. With a gentle force, however, panels can be pulled away from the grid so that the springs can be squeezed and released from the grid. Panels can then be removed or swung out of the way for maintenance.

The new wood-metal hybrid panels can be fabricated on the same machinery used to perforate and shape metal panels. The result is real wood panels that weigh as little as one pound per square foot, a fraction of the weight of panels with conventional wood cores. Their light weight makes them easy to handle and install, reduces the cost of the substructure from which a ceiling is suspended, and makes it possible to use wood ceilings in remodeling projects where the existing structure could not carry the weight of conventional wood panels. While the weight of conventional wood panels typically required them to be mounted permanently in place, hybrid panels can be mounted with torsion springs or other simple connections that allow panels to snap into place and to be removed as required for convenient access above a ceiling. The new type of perforated wood panels also display the same high acoustical performance and design flexibility as metal panels.

Wood panels can provide high acoustical performance and design flexibility.

Despite these innovations, new wood panels still meet the quality standards of traditional architectural woodwork. For example, veneers have different grain characteristics depending upon whether they are plain sliced or rotary, quarter, or rift cut. Different visual effects can also be achieved by specifying the panels to have book, slip or random matched leaves of veneer. In addition to use on ceilings, these new wood panels are increasingly used on walls for wood paneling.

Book-matched, quarter-cut eastern hard maple was selected by Yost Grube Hall Architecture for the Kelly Engineering Center at Oregon State University in Corvalis, OR. The project is expected to receive LEED Silver certification.

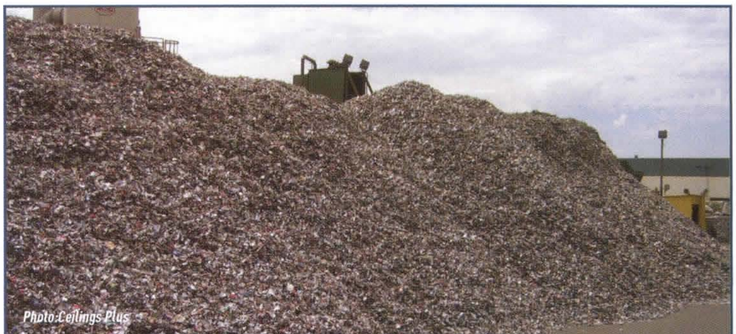
Going beyond tradition, however, the wood-metal hybrid panels offer superior sustainable qualities, such as finishes with zero volatile organic compounds (VOCs) and, when specified, veneers from sustainable forests or rapidly-renewable sources, in addition to the recycled content of their aluminum cores. And while urea formaldehyde, considered a "probable human carcinogen" by the Environmental Protection Agency, is still used in many conventional wood products, the new wood panels have no added formaldehyde.

SUSTAINABLE CEILINGS AND LEED

Environmental characteristics can be critical to the design of a building seeking to comply with the U.S. Green Building Council's (www.usgbc.org) Leadership in Energy and Environmental Design (LEED) program. LEED provides a framework for achieving sustainability. The program is based upon a checklist of criteria that, if met, earn credits toward LEED certification of the project as a sustainable building.

Over a dozen LEED prerequisites and credits can be impacted by a building's ceilings. Ceiling systems can contribute directly towards LEED credits. This analysis is based upon LEED for New Construction, Version 2.1; . Version 2.2 is scheduled for release in 2006.

Recycled Material Content (LEED Credit MR-4): Ceilings are now manufactured with a wide range of recycled materials, including metal, paper, glass, and slag. Of these, metal



About 18 beverage cans are recycled per square foot of aluminum ceiling. Used cans and other scrap are taken to local reclamation plants where they are shredded, melted, formed into ingots, and rolled into sheets. Since a relatively small amount of energy is necessary to melt and reuse aluminum, aluminum ceilings have only low entrained energy content.

ceilings can have the greatest recycled content; some ceilings are now produced with up to 85 to 98 percent recycled aluminum, including as much as 75 percent post-consumer recycled content primarily from beverage containers. Steel used in ceiling suspension systems can have between 25 percent and 30 percent recycled material content.

There are ready markets for scrap aluminum, and the material can be recycled repeatedly without degradation of its metallurgical properties. Recycled aluminum requires only five percent of the energy needed to make aluminum from bauxite ore. Recycling is a relatively clean process that produces little pollution other that that associated with the energy used to melt and process the metal.

Perforated ceilings can be made with 85 to 98 percent recycled aluminum.

Local/Regional Materials (LEED Credit MR-5): Using materials produced near the location of a project supports the region's economy, stimulates regionally-responsive architecture, and reduces the energy consumed in transport. Ceilings can help a building qualify for this

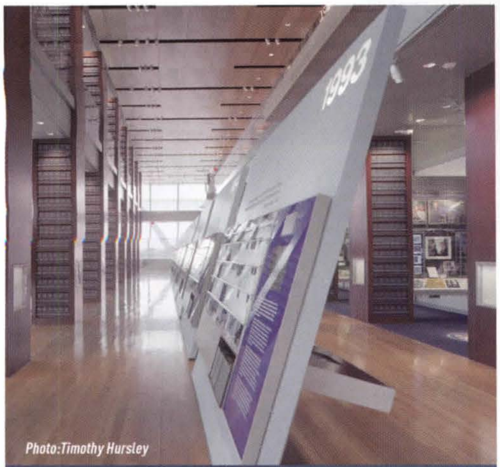


Photo:Timothy Hursley

Perforated ceilings made with rapidly renewable bamboo and recycled aluminum helped earn a LEED Silver Rating for the recently completed Clinton Presidential Library in Little Rock, Arkansas. Designed by Polshek Partnership, bamboo in the 9,000 sq. ft. ceiling was carbonized by heat-treating until it obtained the rich amber color desired by the architect. The bamboo was laminated to recycled aluminum and custom perforated to provide the desired appearance and a high noise reduction coefficient. And because the panels are so lightweight, they could be provided in sizes up to twelve feet long by four feet wide to fit the large scale of the Library's exhibit halls.

credit if raw materials are extracted or the place of final manufacturing is within 500 miles of the project. Aluminum ceilings can be especially attractive with regards to local extraction of materials. This is because aluminum made from locally collected beverage containers can be converted back to sheet material at small, often local, reclaimers.

Rapidly Renewable Materials (LEED Credit MR-6): Bamboo can grow to harvestable size in as little as three years, regenerates without replanting, and requires minimal fertilization or pesticides. As an ecologically-friendly material, bamboo enjoys growing acceptance as an architectural finish and an alternative to wood in products such as flooring. Recently, bamboo has been introduced as a finish for ceiling panels. Veneers of bamboo are laminated to recycled aluminum cores in the same way described above for wood panels.

Certified Wood (LEED Credit MR-7): To encourage environmentally responsible forest management, wood ceilings can be made with veneers from sources certified to maintain sustainable forests. For assurance that wood products delivered to a project are actually from sustainable forests, the ceiling fabricator must be listed with the Forest Stewardship Council (FSC) and must prepare a chain-of-custody certificate for wood building components.

Low-Emitting Materials, Composite Wood (LEED Credit EQ-4.4): Whether made from trees or bamboo, the new wood panels contain no added urea-formaldehyde resins in either the aluminum core or the glues used to laminate the veneers.

Photo: Ceilings Plus

Even large perforated panels can be installed with torsion springs that allow panels to swing out of the way for above-ceiling maintenance. This photo from the Clinton Library also shows one way that lighting can be integrated into an attractive design.

OTHER LEED CREDITS

The performance of a ceiling system has a significant impact on a number of other criteria within the LEED program, even if the ceiling itself is not the direct basis for evaluating claims for LEED credits. For example:

Building Systems Commissioning, Measurement and Verification (LEED Prerequisite EA-1 and Credit EA-5): For optimum energy efficiency, HVAC and other building systems must be readily accessible for adjustment and maintenance. This means that ceilings must allow access to mechanical or electrical equipment located above the ceiling and that ceiling panels must be easily removable and resilient enough to be handled without damage.

While lay-in grid ceilings allow panels to be removed and replaced, conventional mineral fiber panels are frangible and can be easily damaged. And traditional wood ceilings allow only limited access because such panels are heavy.

Photo:Ceilings Plus

Indirect lighting takes on a soft, ambient quality when reflected off the curved wood ceiling in the American Airlines Admirals Club at Los Angeles International Airport. According to Rivers & Christian, project architects, conventional acoustical materials would have absorbed soot from the jet exhaust that pervades aviation facilities; perforated wood panels, however, can be easily cleaned. They selected hybrid wood/metal panels because conventional curved wood panels were too expensive, heavy, and could not provide sufficient noise reduction.

These limitations have been overcome by the new generation of metal and wood ceilings. These ceiling systems have exceptionally lightweight panels that reduce the effort required for installation and handling. Their light weight also makes it practical to use larger-than-normal panels to permit improved access to above ceiling equipment. They are mounted onto a concealed grid with torsion springs that allow panels to swing out of the way or to be removed and replaced without special tools.

Improved Energy Performance (LEED Prerequisite EA-2 and Credit EA-1): Lighting accounts for an estimated 20 to 25 percent of annual energy consumption in the United States. Improving the light reflectance of ceilings can help conserve this energy. Depending on the finish selected, metal ceilings can provide outstanding light reflectance values. The highest levels of reflectance are provided by polished metals with mirror-like finishes. While these are visually exciting, they create too much glare for use in most spaces. Instead, a light-collored matte finish should be used to diffuse light and create conditions for better visual acuity.

Indirect lighting can often provide better-quality, glare-free illumination than old-style troffer luminaires. Their performance, however, depends upon having a reflective ceiling that will diffuse light uniformly. In addition, a ceiling must be easy to clean to prevent degradation of the lighting.

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***http://archrecord.construction.com/resources/conteduc/archives/0512ceilings-1.asp.*** To receive AIA/CES credit, you are required to read this additional text. The quiz questions below include information from this online reading. *To receive a faxed copy of the material, call Ceilings Plus at 1-800-822-3411 or e-mail info@ceilingsplus.com.*

AIA/ARCHITECTURAL RECORD **CONTINUING EDUCATION** Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Recognize how advances in computer-assisted fabrication techniques create new options for the design of customized ceilings.*
- *Understand how perforated ceilings contribute toward Leadership in Energy and Environmental Design (LEED) credits and environmental considerations beyond the scope of LEED.*
- *Know about new hybrid wood panels using wood or bamboo veneer on recycled aluminum cores.*
- *Understand how the acoustical characteristics of perforated panels can be used to meet a variety of architectural challenges.*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 348. Follow the reporting instructions, answer the test questions, and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1 Which of the following is not true about the new generation of perforated ceilings?
- **a.** They allow designers to break away from the regimentation of the 2 x 4 foot grid ceiling
- **b.** Panels can be curved to create a third dimension as part of the ceiling design
- **c.** They allow for easy access for maintenance of above-ceiling equipment
- **d.** Panels are easily damaged by changes in humidity

2. Perforated ceilings may help a project qualify for which of the following LEED credits?
- **a.** Recycled Material Content (LEED Credit MR-4)
- **b.** Certified Wood (LEED Credit MR-7)
- **c.** Daylight & Views (LEED Credit EQ-8)
- **d.** All of the above

3. Which of the following is an environmental benefit of perforated ceilings that go beyond current LEED criteria?
- **a.** Restoration of strip mined landscapes
- **b.** Designing for Salvage and Reuse
- **c.** Radio-frequency shielding
- **d.** All of the above

4. Automated, high-speed manufacturing techniques create which of the following benefits?
- **a.** Customized fabrication of ceilings at more affordable prices
- **b.** Factory preparation of openings for light fixtures and other ceiling penetrations reduce installation time and costs
- **c.** Less waste due to field cutting to simplify job-site recycling
- **d.** All of the above

5. Which of these statements is true about the new hybrid wood panels on an aluminum core?
- **a.** They are heavier than conventional panels
- **b.** They are difficult to curve
- **c.** They can be perforated in a wide range of whole sizes, shapes, and patterns
- **d.** The adhesives used to produce them contain urea-formaldehyde

6. Which is not an acoustical use for metal panel systems?
- **a.** Amplify sound
- **b.** Reflect sound
- **c.** Attenuate sound
- **d.** Allow transmission of sound

7. Which type of acoustical panel can be repainted without losing acoustical performance?
- **a.** Acoustical tile
- **b.** Glass fiber insulation
- **c.** Perforated metal panels
- **d.** All of the above

8. What type of acoustical insulation is increasingly being used instead of traditional glass and mineral fiber insulation increase the noise reduction of perforated panels?
- **a.** Wheat straw agriboard
- **b.** Non-woven fabric
- **c.** Lead sheet
- **d.** Autoclaved aerated concrete

9. In which building type might a long reverberation time be desirable?
- **a.** Lecture hall
- **b.** Open plan office
- **c.** Church
- **d.** Broadcast and Recording Studio

10. Why is it good practice to select acoustical products based upon test reports and not just an NRC?
- **a.** NRC results are difficult to interpret
- **b.** Testing is required by building codes
- **c.** Idiosyncrasies at certain frequencies could be obscured by an NRC's averaging
- **d.** Test laboratories guarantee the acoustical performance of a building

CEILINGS PLUS™

Ceilings Plus (www.ceilingsplus.com) is the leading specialty ceilings producer. Using computer-assisted design and manufacturing, the company fabricates ceilings and walls that are architectural, functional, and affordable. Products include curved Radians™ and extensible Runways™ panels, plus Arboreal® panels with wood veneers on aluminum cores. Panels can be almost any size or shape and perforated to enhance appearance and acoustics.

For sustainability, Ceilings Plus panels can have recycled content as high as 85 to 98%. Arboreal veneers can be FSC-Certified or rapidly-renewable bamboo. Panels have no-added formaldehyde and zero VOCs. Ceilings Plus products are durable, easy to maintain, accessible and offer outstanding life-cycle value.

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Full Circle: Fenestration for the Complete Building Envelope

Windows, doors, and unit skylights comprise one performance standard highlighting integral components.

Provided by WDMA

By Jeffrey F. Lowinski

Released and ready for specification, a new standard has hit the streets, and it's sure to be noticed by the architectural design community and building code officials in the U.S. and Canada.

The completion of AAMA/WDMA/CSA 101/I.S.2/A440-05, Standard/Specification for Windows, Doors, and Unit Skylights marks a unique turning point for the industry. Developed by representatives from the Window & Door Manufacturers Association (WDMA), the American Architectural Manufacturers Association (AAMA), and the Canadian Standards Association (CSA), the standard is the first edition jointly published by all three organizations. More importantly, it is the first standard that gives manufacturers the tools to produce products under a single standard that can be distributed in the U.S. and cross-border to the neighboring building and construction communities of Canada.

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Full Circle: Fenestration for the Complete Building Envelope.** To earn one AIA/CES Learning Unit, including one hour of health safety welfare credit, answer the questions on page 284, then follow the reporting instructions on page 349 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify products included in the Standard/Specification.*
- *Understand gateway performance requirements and product classes.*
- *Be aware of significant changes, revisions and new inclusions.*
- *Acknowledge basic terms and testing procedures.*

Photo courtesy of Marvin Windows and Doors

Five different performance classes of windows, doors, and unit skylights are included in the standard/specification.

The release of AAMA/WDMA/CSA 101/I.S.2/A440-05, completed earlier this year, is pivotal to WDMA's ongoing success in offering and promoting performance-based standards, developed by a consensus of input from various representatives of the fenestration industry. WDMA worked laboriously with the other associations over the last decade to develop a standard/specification for windows, doors and unit skylights that harmoniously crosses association lines, as well as borders. AAMA/WDMA/CSA 101/I.S.2/A440-05 brings to the architectural and building codes community a compendium of specifications that reflect current, real-world performance standards.

At the end of last year, WDMA released a major revision to their standards on interior architectural doors called the Industry Specification for Architectural Wood Flush Doors or I.S. 1A-04 (see Architectural Record magazine, November 2004, pages 269-273). This revised standard focuses on distinct performance levels and application-driven specifications. I.S.1A now joins with AAMA/WDMA/CSA 101/I.S.2/A440-05 to provide the industry and the end-user with complete and comprehensive standards that ultimately aid the construction community in specifying fenestration products thoroughly, precisely, and accurately.

Unit Skylights

Unit skylights are one of the many noteworthy inclusions in AAMA/WDMA/CSA 101/I.S.2/A440-05 Standard/Specification for Windows, Doors, and Unit Skylights. "It's the first complete, performance-based fenestration standard that includes unit skylights," said Roland Temple, Compliance and Certification Coordinator, VELUX America, Greenwood, S.C.

Temple is a member of WDMA's Exterior Fenestration Standards Committee and also served as the skylight representative to the U.S./Canadian Structural Harmonization Task Force. "This is the first complete guide for skylights. Previously, there was no single, unified standard on how unit skylights should perform," he said. "There have been references in predecessor documents, but nothing as complete and encompassing as this. This standard/specification gives manufacturers one document to test to for all the performance requirements for skylights," Temple added.

"It's the first complete, performance-based fenestration standard that includes unit skylights," said Roland Temple, Compliance and Certification Coordinator, VELUX America, Greenwood, S.C."

Unit skylights, said Temple, are defined as factory-assembled fenestration consisting of a single panel of glass or plastic installed in a sloped or horizontal orientation. Unit skylights are fixed (non-operable) or venting (operable). They are designed to allow for natural daylighting and ventilation in operable units.

Temple added that the specification covers a range of applications, from residential to commercial. "The standard identifies different performance criteria, which allows manufacturers to have products rated for various levels, depending on the application," he said. "For the building code community, it's something they've been looking for — a way to identify different characteristics of skylights and other products and how they should perform," he added.

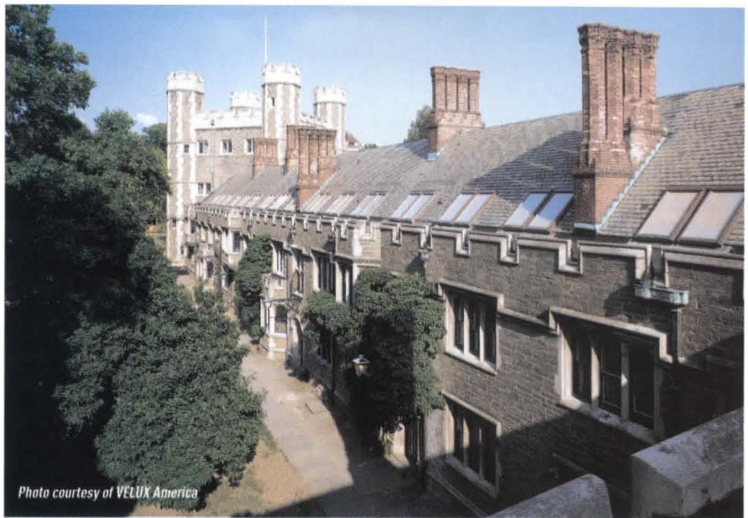
Side-hinged Exterior Doors

Prior to the release of AAMA/WDMA/CSA 101/I.S.2/A440-05, there was some confusion in the construction community about what specific performance criteria were necessary for side-hinged doors. When ANSI/AAMA/WDMA 101/I.S.2-97 and AAMA/WDMA 101/I.S.2/-NAFS-02 were put into the IBC and IRC, an exemption was created for exterior side-hinged doors and other products outside the scope of the standards, allowing them to be tested using ASTM E330 structural testing only. This exemption created some confusion for code officials, especially regarding exterior side-hinged doors containing glazing. Some jurisdictions insisted any swinging door containing glazing should meet 101/I.S.2-97 or 101/I.S.2/NAFS-02 standards, while others exempted some types of swinging patio doors from the requirement.

The recently completed AAMA/WDMA/CSA 101/I.S.2/A440-05 includes a specification section specifically for side-hinged exterior doors, and it is hoped its inclusion in the 2006 edition of the IBC and IRC will rectify any remaining problems. AAMA and WDMA jointly developed a Technical Position Statement regarding "Exterior Side-Hinged Door Systems" to address concerns regarding the applicability of 101/I.S.2-97 and 101/I.S.2/NAFS-02 to side-hinged exterior door systems that contain glazing. They agreed that these specifications were intended to apply to sliding glass doors containing certain typical elements including framed lower track systems. These types of framed sliding glass doors operate in a manner consistent with horizontal sliding window units, and as such, it was determined reasonable to expect that they would be able to perform in a similar manner during water penetration testing. (This Technical Position Statement is available at www.wdma.com).

The requirements in AAMA/WDMA/CSA 101/I.S.2/A440-05 governing side-hinged exterior door systems clear up some of the ongoing confusion about side-hinged doors and what types are addressed by the Standard/Specification. The standard/specification includes side-hinged exterior doors, sliding doors (often referred to as patio doors), dual-action side-hinged doors, and fixed doors (not interior doors). More importantly, the standard makes specific recommendations based on the type of door and where it is used. As in this standard and others developed recently by WDMA, performance and applicability to the built environment are critical components of the documents.

One of the most significant changes is the inclusion of requirements for side-hinged exterior doors. Side-hinged exterior door systems have requirements that are quite different from window, sliding door, and unit skylight products, both in design and application. As the primary means of entry to a building, exterior doors are *required to not only protect* against the elements, but are also required to allow for ease of access and emergency escape and rescue. Issues concerning accessibility by the disabled also need to be addressed in product design. In addition, consideration must be given to escape during emergencies such as fire, and in some cases, the door system is required to act as a barrier to fire. An exterior door system can be expected to be operated a significantly greater number of times and to a greater severity during its design life than a typical window or unit skylight assembly. As a result, cycling performance is evaluated, as well as other criteria specific to these types of fenestration products. Finally, it is not always feasible or necessary for side-hinged door systems to meet the substantial water penetration resistance requirements of other fenestration products in cases such as but not limited to, accessibility requirements and/or the application of products in weather-protected areas.



The Standard/Specification gives manufacturers one document to test to for all the performance requirements for skylights.

Enter the Next Generation

"This is a 'next generation' standard, completely revised and updated," said Joe Hayden, Senior Certification Engineer, Pella Corporation, Pella, Iowa. "It now includes all types of hinged doors, formerly known as patio and terrace doors and encompasses entry doors as well. In addition, this is an international standard, with the new version adopted by the Canadian Standards Association. It's a single-source specification for windows, doors, and unit skylights for both the U.S. and Canada," he said. Hayden chairs WDMA's Exterior Fenestration Standards Committee.

Addressing Doors in the Real World

Overall, AAMA/WDMA/CSA 101/I.S.2/A440-05 contains provisions for side-hinged exterior doors that are more appropriate for their typical design and intended use. However, hinged doors, whether used as a required exit, as is the case with most entry doors, or as part of non-required exit systems as is often the case with "patio doors" or French doors (and other similar terms), do not typically include track systems that would permit the same level of water penetration resistance as sliding glass doors. In fact, entry doors used as required exits also have threshold limitations imposed to allow for ease of access and emergency escape and rescue. AAMA and WDMA memberships did not intend and do not expect hinged doors to meet the same level of water penetration as sliding glass doors. For this reason, and because a side-hinged exterior door can be expected to operate a significantly greater number of times, the introduction of a Cycling Performance category and a "Limited Water" (LW) rating was developed.

Limited Water Penetration Resistance Testing and Performance

The "Limited Water" (LW) rating for exterior side-hinged doors is an important part of the document, again, focusing on real-world applications. The LW product type designation concludes that the water penetration resistance performance is achieved by testing at a pressure less than the minimum test pressure required for the indicated performance class and performance grade (design pressure). LW ratings are only permitted for side-hinged door systems and are not allowed for any other product type.


Photo courtesy of Pella Corporation

Each product type in the window, door and skylight specification has specific performance requirements.

Performance Classes and Levels

Five performance classes of windows, doors, and unit skylights are included in the Standard/Specification. The performance classes are designated R, LC, C, HC, and AW. This classification system provides for several levels of performance. Flexibility in the standard and determining applicability, depending on the environment, is critical to the proper implementation of the standard. For example, the performance class rating should be regarded as an indication of the level of performance, with the least stringent requirements established for the R performance class and the most stringent for the AW performance class.

The following descriptions can be used as a general guide in helping to determine which class is likely suited for a particular application:

R: commonly used in one- and two-family dwellings.

LC: commonly used in low-rise multi-family dwellings, low-rise professional offices (doctor, dentist, law), libraries, and low-rise motels.

C: commonly used in lighter-use industrial buildings and factories, hotels, and retail sales buildings.

HC: commonly used in hospitals, schools, institutions, dormitories, government or public buildings, and other facilities where heavy use of the fenestration products is expected. Also, commonly used on mid-rise buildings with increased loading requirements.

Table 1
Gateway Requirements

Product performance class	Minimum performance grade	Minimum design pressure, Pa (psf)	Minimum structural test pressure, Pa (psf)	Minimum water resistance test pressure, Pa (psf)
Windows and doors				
R	15	720 (15.0)	1080 (22.5)	140 (2.90)
LC	25	1200 (25.0)	1800 (37.5)	180 (3.75)
C	30	1440 (30.0)	2160 (45.0)	220 (4.50)
HC	40	1920 (40.0)	2880 (60.0)	290 (6.00)
AW	40	1920 (40.0)	2880 (60.0)	390 (8.00)
Unit skylights and roof windows				
R	15	720 (15.0)	1440 (30.0)	140 (2.90)
C	30	1440 (30.0)	2880 (60.0)	220 (4.50)
HC	40	1920 (40.0)	3840 (80.0)	290 (6.00)

Each product has a defined gateway set of primary requirements.

AW: commonly used in hospitals, schools, institutions, and public buildings, or on high-rise, and mid-rise buildings to meet increased loading requirements; also used in buildings where possible misuse of the fenestration products is expected.

Other design criteria include minimum design pressures, uniform load structural test pressures, and water penetration resistance test pressures for the fire performance classes. (Table 1)

The architect and specifier can select the appropriate level of performance depending on map wind speed, climate conditions, height of installation, type of building, type of window, door or unit skylight, durability, and other factors. In many cases, the appropriate level of performance classification will not correspond with the general use of the building or the use group occupancy assigned to the building in accordance with the local building code. For example, many residential buildings are constructed in locations subject to severe weather that require high-performance fenestration products rather than those that meet only the R requirements. On the other hand, many hospitals, schools, and institutions may successfully use products meeting R, LC, and C requirements. In other words, it's up to the architect and specifier to fine-tune their selection for the application, and this standard/specification will help them do just that.

Performance Grade Designations

Performance grades in AAMA/WDMA/CSA 101/I.S.2/A440-05 are based on design pressure, which is designated by a number following the type and class designation. For example, a double-hung R-class window designed H-R15 or H-RM720 establishes the design pressure of 15 pounds per square foot (psf) or approximately 720 pascals (Pa). If the rating is desired in SI (metric) units, the design pressure in pascals (Pa) is preceded by an "M." In its most basic sense, design pressure is the wind load pressure a product is rated to withstand. Products included in the standard/specification are designated by the performance grade or design pressure for which they have been successfully tested and noted in pascals or psf. The uniform load structural test pressure for windows and doors is 150 percent of the performance grade (design pressure) and 200 percent for unit skylights and roof windows. The water penetration test pressure is 15 percent of the performance grade (design pressure) for R, LC, C, and HC products and 20 percent of the performance grade (design pressure) for AW products but never less than 140 Pa (2.9 psf) except limited water on side-hinged door systems only. In addition, products shall be permitted to be tested to optional performance grades (design pressures) higher than the minimum performance grades (design pressures) specified. (Table 1)

Gateway Requirements

Each product type has a defined "gateway" set of primary requirements for the applicable product type before the manufacturer's tested product is allowed into the performance class. Gateway performance requirements are the minimum allowable performance levels that a gateway test specimen achieves in order to be rated with a particular classification of R, LC, C, HC or AW. The gateway test specimen size must be equal to or larger than the specified designation parameters in both height and width. Generally, the minimum allowable performance levels and the gateway size change as the classification changes. All gateway test specimens shall achieve certain minimum performance levels for air leakage resistance, water penetration resistance, uniform load, and where required, forced-entry resistance and operating force. All gateway test specimens shall achieve certain additional minimum performance levels of auxiliary (durability) and material tests specific to the product operator type.

Specialty type products are also included in the standard/specification. Examples of specialty products are non-standard geometric shapes such as, but not limited to, circle tops, ellipsoids, and other non-rectangular shapes. Specialty products shall comply with all applicable material, component, and hardware requirements of this Standard/Specification. However, specialty products shall not be required to comply with any minimum gateway width and/or height requirements of this Standard/Specification. (See page 114 of standard.)

Maximum Size Tested

The maximum size tested, or MS, is required on designations reporting or recording individual product performance. The MST shall be designed by width times (x) height in millimeters, e.g., 705 x 1503. The MST shall be permitted to be additionally shown in inches, e.g., 705 x 1503 (28 x 59).

Test size is a critical factor in determining compliance with the standard/specification. Each product has a defined gateway set of requirements. One of the gateway requirements is minimum gateway test size. Products are to be tested at the minimum gateway test size or a larger specimen size as a condition of entering the performance class. After passing all of the performance requirements for the product type, performance class, and performance grade, the product shall be designated with the appropriate primary designator. (Figure 2) This designation shall only be applied to production sizes of identical construction equal to or smaller than the size tested in both width and height. There are some glazing exceptions noted in the standard/specification. For downsized door products where structural material within the leaf has been removed to accommodate a lite insert equal to that of a larger leaf, an additional positive and negative uniform load structural test will be conducted on the downsized specimen to verify the structural performance.

Figure 2
Primary designator

Casement Window **R25 760 x 1520 (30 x 60)**		**C – R25 760 x 1520 (30 x 60)**
or	or	or
Casement Window **RM1200 760 x 1520**		**C – RM1200 760 x 1520**

Legend:

Casement Window or C	— product type (see Clause 4.4.2.1)
R	— performance class (inch-pound) (see Clauses 0.2.1 and 4.4.2.3)
RM	— performance class (SI) (see Clauses 0.2.1 and 4.4.2.3)
25	— performance grade (design pressure) (inch-pound) (see Clauses 0.2.3, 4.4.2.4, and 4.4.2.6)
1200	— performance grade (design pressure) (SI) (see Clauses 0.2.3, 4.4.2.4, and 4.4.2.6)
760 x 1520	— maximum size tested (SI) (see Clause 4.4.2.5)
(30 x 60)	— maximum size tested (inch-pound) (optional) (see Clause 4.4.2.5)

Both primary and secondary designators indicate the type of product, size, and other testing parameters.

Users shall not be confused by the terms "minimum test size" and "maximum size tested." In order to claim that a product is entitled to be included in a given performance class, it needs to meet or exceed all of the minimum requirements for the performance class. This set of minimum requirements is the gateway requirements for the performance classes. After achieving the performance class, the manufacturer is permitted to test a second time at a reduced specimen size. The first test at the "minimum gateway size or larger" provides apples-to-apples comparisons of products rated in the same performance class. Since the second test is not required to be at the minimum test size, it becomes necessary to report to the user the actual specimen size during the second test. Indicating the "maximum size tested" fulfills this reporting function. For this reason, the MST is a mandatory part of the product rating, but should never be included in a project specification.

Those who wish to prove compliance with both the gateway and the optional performance requirements (Table 3) on the same test specimen will test a specimen equal to or greater than the minimum gateway test size for that product type.

Any geometric shape that fits within the rectangular gateway size (or larger test size) for a particular product type is permitted to be qualified by the rectangular shape, provided that the frame, sash, leaves, panels, hardware, hardware location, components, and construction remain the same.

Table 2
Product Types

AP	= Awning, hopper, projected window	LW SHD	= Limited water side-hinged door
ATD	= Architectural terrace door	RW	= Roof window
BW	= Basement window	SD	= Sliding door
C	= Casement window	SHD	= Side-hinged door
DASHD	= Dual-action side-hinged door	SHW	= Side-hinged (inswinging) window
DAW	= Dual-action window	SKG	= Unit skylight — glass glazed
FD	= Fixed door	SKP	= Unit skylight — plastic glazed
FW	= Fixed window	SLT	= Side lite
GH	= Greenhouse window	SP	= Specialty product
H	= Hung window	TA	= Tropical awning window
HE	= Hinged rescue window	TH	= Top-hinged window
HP	= Horizontally pivoted window	TR	= Transom
HS	= Horizontal sliding window	VP	= Vertically pivoted window
J	= Jalousie window	VS	= Vertical sliding window
JA	= Jal-awning window		
LW DASHD	= Limited water dual-action side-hinged door		

Product designations indicate the type of window, door or unit skylight.

Other Standard/Specification Significant Changes

In addition to the specific changes noted, the following revisions have been included in the new standard/specification:

- The expansion of the product rating system to provide a primary designator similar to that in current use and a new secondary designator that allows reporting of performance criteria such as negative design pressures, water penetration resistance test pressures, and optional performance tests;
- Revision of gateway requirements to an SI (metric) basis, while still maintaining the inch-pound (psf) nominal rating intervals common to previous standards/specifications;

- The increase in the number of product operator types from 26 to 30 (Table 2);
- The addition of Canadian air infiltration/exfiltration levels and operating force requirements;
- The revision to U.S. operating force requirements to initiate motion to "Report Only";
- Updated glass strength standard, as the basis for glass selection, to ASTM E 1300-02;
- Introduction of cycle/operation testing for side-hinged doors;
- Introduction of hardware water testing, vertical load, and forced entry resistance testing for doors;
- Addition of numerous new sash, frame, and glazing material requirements;
- Elimination of the words residential, light commercial, heavy commercial, and architectural from the performance class definition and their replacement by the simple designations R, LC, C, HC, and AW;
- The addition of six new requirements for plastic glazing;
- Skylight structural test load changed from 1.5 times design pressure positive, 2.0 times design pressure negative to 2.0 times design pressure both positive and negative;
- Specimen structural damage limiting retests due to glass breakage or hardware failure to two; and
- Finished framing and cladding materials not allowed to contain more than 0.02 percent lead by weight.

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***archrecord.construction.com/resources/conteduc/archives/0512wdma-1.asp***. To receive AIA/CES credit, you are required to read this additional text. The quiz questions below include information from this online reading. To receive a faxed copy of the material, contact Jim Ahtes at WDMA 847-205-5689.

AIA/ARCHITECTURAL RECORD **CONTINUING EDUCATION** Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify products included in the Standard/Specification*
- *Understand gateway performance requirements and product classes*
- *Be aware of significant changes, revisions and new inclusions*
- *Acknowledge basic terms and testing procedures*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 349. Follow the reporting instructions, answer the test questions and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. Which of the following might best describe AAMA/WDMA/CSA 101/I.S.2/A440-05?
  a. Standard for Windows and Doors
  b. Standard for Windows and Skylights
  c. Standard/Specification for Windows, Doors and Unit Skylights
  d. Specifications for glazed units

2. Which of the following organizations were involved in the development of the consensus standard?
  a. Canadian Standards Association
  b. Window & Door Manufacturers Association
  c. American Architectural Manufacturers Association
  d. All of the above

3. 101/I.S.2/A440-05, Standard/Specification for Windows, Doors and Unit Skylights includes side-hinged exterior doors.
  a. True
  b. False

4. The standard makes specific recommendations based on the type of door and where it is used.
  a. True
  b. False

5. Which of the following descriptors refers to an architectural window commonly used in hospitals, schools, institutions, and public buildings, or on high-rise and mid-rise buildings to meet increased loading requirements?
  a. LC
  b. CC
  c. HC
  d. AW

6. An "LW" rating refers to:
  a. Low-weight fenestration
  b. Low-weather infiltration
  c. Limited water rating for side-hinged exterior doors
  d. Limited weather fenestration

7. AAMA/WDMA/CSA 101/I.S.2/A440-05, Standard/Specification for Windows, Doors and Unit Skylights is referenced in the 2006 edition of the International Codes, including the International Building Code and the International Residential Code.
  a. True
  b. False

8. AAMA and WDMA jointly developed a Technical Position Statement regarding "Exterior Side-Hinged Door Systems" to address concerns regarding the applicability of 101/I.S.2-97 and 101/I.S.2/NAFS-02 to side-hinged exterior door systems that contain glazing.
  a. True
  b. False

9. Which of the following types of side-hinged doors is included in the standard/specification?
  a. Side-hinged exterior doors
  b. Sliding doors (patio doors)
  c. Fixed doors
  d. All of the above

10. The fenestration standard/specification, AAMA/WDMA/CSA 101/I.S.2/A440-05, applies to both operating and fixed, prime and replacement windows, doors and unit skylights installed into exterior building envelopes.
  a. True
  b. False

WDMA
Window & Door Manufacturers Association

The Window & Door Manufacturers Association (WDMA) is a trade association representing the leading U.S. and Canadian manufacturers and suppliers of windows, doors and skylights for the domestic and export markets (www.wdma.com). For further information, contact WDMA at: 1400 E. Touhy Ave., Suite 470, Des Plaines, IL 60018; phone 847-299-5200; e-mail: admin@wdma.com.

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AIA

Strengthening the Performance of Laminated Glass

Structural interlayers add protection against hurricane and blast forces

Provided by DuPont Glass Laminating Solutions, E.I. du Pont de Nemours and Company

Technological advances in the polymer "interlayer" in laminated glass panels—the material that bonds sheets of glass together and then is sealed tight in the fabrication process—have enhanced strength, safety and security performance, and allowed design professionals to use laminated glass in many new applications.

Advances have opened up new possibilities for professionals expanding the use of laminated glass in cutting-edge design.

Over the last several decades, the most common interlayer material has been polyvinyl butyral, or PVB, a plasticized film that is sealed under heat and pressure to form a cohesive laminated glass panel. The best-known safety application is the automotive windshield. The chief advantage is that when laminated glass made with PVB interlayer breaks, the glass fragments adhere to the interlayer, greatly reducing the risk of cutting and piercing injuries.

But PVB's limitations include reduced strength under some design conditions and restricted high-temperature structural performance, especially after glass breakage has occurred. So scientists have developed a new, advanced polymer interlayer, that increases strength in laminated glass panels to such a degree that they can be used without conventional supports and in a wide variety of new applications, including glass stairs, floors, canopies, and curtain walls.

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Strengthening the Performance of Laminated Glass.** To earn one AIA/CES Learning Unit, including one hour of health safety welfare credit, answer the questions on page 291, then follow the reporting instructions on page 349 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Understand the development and strength performance of laminated glass*
- *Identify the advantages of advanced polymer interlayers in laminated glass*
- *Gain a perspective on the varied applications where laminated glass with advanced polymer interlayers can be used, for protection against natural and man-made disasters*

Yorkdale Mall skylight closeup

The new, advanced polymer interlayer—also referred to as a structural interlayer, because its properties impact structural performance—is sufficiently strong that the laminated glass panels can be thinner and structurally more efficient, and the glass also maintains transparency and remains clear. The construction is more resistant to moisture penetration and is compatible with most silicone sealants.

The advances have opened up new possibilities for professionals expanding the use of laminated glass in cutting-edge design, while at the same time improving safety performance in this age of monster storms and international terrorism.

A transparent evolution

Ever since a French chemist knocked over a bottle of cellulose acetate from a shelf in 1903 and noticed how the shattered fragments stuck close together, laminated glass has had many applications. It was first used in the lenses of gas masks during World War I, and just before World War II, in the automobile windshield. The interlayer used was a flexible plastic sheet made of polyvinyl butyral (PVB), which *could* be sandwiched between glass. The PVB adhered well to the glass, was durable in terms of its weather performance, and maintained transparency in the car windshield application. The safety benefits—no shattering on impact—secured the position of laminated glass as an industry standard.

The use of laminated glass in buildings became more common as designers added skylights and built atriums and glass-enclosed walkways with canopies. The glass in these applications needed to be strong and withstand pressure from snow or high winds, and it couldn't shatter into pieces and fall on building occupants in the event of breakage. There were also other advantages to laminated glass in terms of reducing noise, the blocking of harmful ultraviolet rays, glare reduction, and even for protection against break-ins.

A turning point

However, architects and engineers found that to increase strength, making the glass panel thicker was often the only solution. And in some cases, the glass panels also had to be supported continuously on four sides to meet the load requirements.

Meanwhile, two trends were underway. One was that design professionals wanted to use glass in new ways, as stairs, floors, large overhead constructions, and curtain walls. But at the same time, glass had to be stronger than ever, because of evolving standards related to hurricane impact resistance. Rather than make laminated glass thicker, scientists began thinking that what was needed was an improved interlayer. A new, advanced polymer interlayer, or structural interlayer, was developed that was stiffer and stronger than PVB, and laminated glass entered a still-unfolding era of new applications and expanded design performance.

According to Dr. Stephen J. Bennison, Senior Research Scientist at DuPont, "Many structural engineers involved in the design of glass structures have readily embraced the performance benefits of the new structural interlayer." But, he said, "The advances in the laminated safety glass industry are often underestimated. There is a great deal of R&D going on that is related to extending interlayer performance beyond what PVB can do."

The interlayer imparts superior strength and stiffness without increasing overall laminate thickness. This strength benefit is so significant that glass panels may not need to be supported in the conventional four-sided manner anymore, enhancing the use of glass as a structural element. Laminated glass with advanced polymer interlayers is less sensitive to moisture on the edge and appears ultra clear, especially in combination with low iron glasses.

Battering winds

One of the most vivid examples of the use of advanced polymer interlayers in laminated glass applications is meeting strict requirements for hurricane resistance.
The Wilkie D. Ferguson United States Courthouse in Miami [Figure 1], designed by Arquitectonica and the Miami office of Helmut, Obata + Kassabaum (HOK) and completed in 2005, is a leading example of the need for strength in key glass elements. The $163 million, 14-story, 577,000-square-foot facility is adjacent to six courthouse-related buildings constructed between 1910 and 1975 in a downtown area covering two blocks. The new building houses 14 courtrooms, 16 chambers for the U.S. District Court, space for the U.S. Marshals Service, the federal public defender, the U.S. attorney, and the building's owner, the General Service Administration.

The primary architectural feature is comprised of two limestone towers, said to represent the two sides to every argument, connected by a single, curved glass prism that houses the public circulation and waiting spaces. The breezeway marks the entrance to the new courthouse and the entire two-block campus, and it needed to be light and open and transparent. But it also needed to be strong.

The interior atrium prism is about 130 feet tall, starting at the seventh floor and terminating in a skylight at the top of the structure. The design team conducted wind-tunnel studies

Wilkie D. Ferguson, Jr. U.S. Courthouse, Miami, Florida.
The structural glass interlayer provides combined benefits of blast and hurricane protection. Architects: Arquitectonica and HOK, Miami

using a scaled mock-up of the building to establish wind loads and impact that were to be accommodated on each part of the exterior wall system. As a result, the building envelope uses laminated glass with a structural interlayer to provide greater strength and to protect against large storms.

The design challenge was met in the context of evolving building codes and strict standards for withstanding hurricanes in regions of the country most prone to catastrophic weather.

Tests for missile impact and pressure cycling are spelled out in the Florida Building Code, which includes the high velocity wind zone that applies to Miami Dade and Broward counties. ASTM test method E1886, Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials is referenced in both the Florida Building Code and the International Residential and Building Codes.

Laminated glass with an advanced polymer interlayer is becoming a key solution in expanding design innovation with glass.

The large missile impact test, consisting of a 9 lb. 2" x 4" fired from an air cannon at 50 feet per second, is conducted for areas of the building below 30 feet. The small missile impact test consists of a two-gram steel ball fired from an air cannon at 130 feet per second, and is conducted for elevations above 30 feet. Either missile impact test is followed by 9000 cycles of positive and negative pressure; additional tests for air, water, and structural integrity are required for product certification.

According to the 2004 Florida Building Code, all Florida counties within the 110-150 - m.p.h. wind zones as defined by American Society of Civil Engineering ASCE 7-98, have mandatory impact standards. With the adoption of the 2000 International Residential and Building Codes, other states have begun to enforce windborne debris protection requirements in windows.

Following Hurricane Wilma in October 2005, a commission of glass-industry experts surveyed the damage in Miami-Dade and Fort Lauderdale, Fla. They reported that several high-rise buildings had sustained glass-related damage from the hurricane. The buildings with blown out glass used tempered or insulating glass, rather than laminated glass installed in certified window systems. Buildings that were constructed with impact resistant glazing systems withstood Wilma's 120-mile-per-hour winds.

Facing the terror threat

Hurricane resistance was not the only benefit to using laminated glass with enhanced polymer interlayers, at the Miami courthouse and indeed at federal facilities across the country. The other major consideration was protection against the blasts of a terrorist's bomb.

In 1998, terrorists bombed the U.S. embassies in Nairobi, Kenya, and Dar es Salaam, Tanzania. One hundred ninety-seven people were killed and over 5,000 people were injured, many from flying glass shards. To combat a growing wave of terrorist attacks and to protect U.S. embassies abroad, the U.S. State Department began an estimated $21 billion embassy construction program the following year.

The State Department recognized the advantages of the advanced polymer interlayer over PVB interlayer to provide retention and resist tearing under high pressures, impulse loading typically associated with truck bombs. The interlayer was incorporated into structural muntin windows intended for use in embassies. These new blast windows utilize steel elements behind the glazing to give the appearance of true divided lites. A characteristic of this window system is that it exhibits substantial deformation at allowable design loads and effectively absorbs the blast energy.

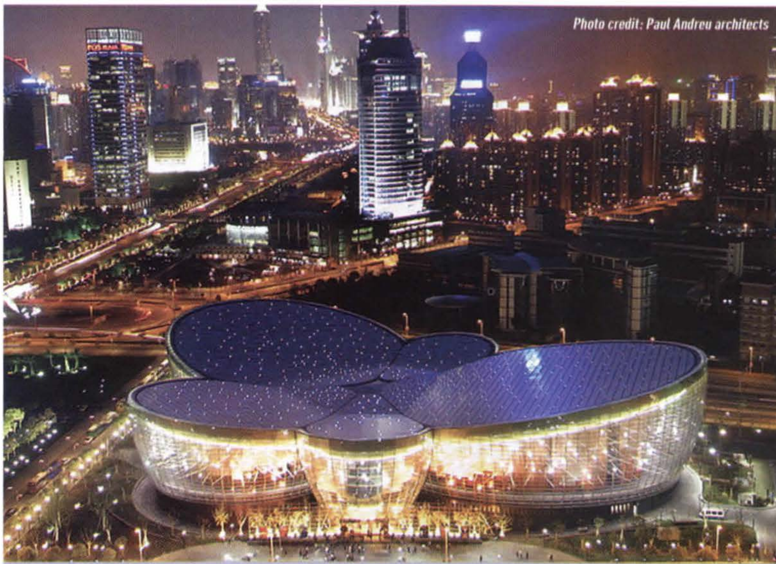
While PVB interlayers are effective in laminates requiring lower levels of blast resistance, the stiff, advanced polymer interlayer has the ability to increase blast mitigation capacity of laminated glass facades. This benefit is derived from its increased polymer tear energy. In addition, attachments can be integrated into the laminate during or after laminating that adhere well to the interlayer and can allow secure attachment of the laminate to the frame, maximizing the full membrane strength of the glazing element.

From security to design

The focus of the use of laminated glass with advanced polymer interlayers at courthouses and in new embassy construction is on safety and security in the context of natural and man-made disasters. But laminated glass with an advanced polymer interlayer is becoming a key solution in expanding design innovation with glass. Some of these solutions incorporate energy efficiency goals and "green" design strategies such as the greater use of daylighting.

The Shanghai Oriental Arts Center in China, completed in 2004, and designed by Paul Andreu, chief architect of Aeroports de Paris, is Shanghai's new cultural center [Figure 2]. The complex includes three halls: a 2,000-seat symphony hall, a 1,100-seat opera hall, and a 300-seat auditorium. It also features assorted public facilities, including music shops, a restaurant, and an arts library.

For the design concept, the architect wanted the building to glow at night. The design consists of large panels of perforated, galvanized steel metal encapsulated in laminated glass for the façade to create a shimmering effect. The metal featured varying sizes of holes and spacings to reduce solar heat gain and for aesthetics. Laminated safety glass was used for the façade, and the structural interlayer was chosen because it was compatible with the metal and provided all of the desired strength and security features.



Shanghai Oriental Arts Center, Shanghai, China
Metal mesh screens were laminated between structural interlayers to provide glare reduction and daylighting benefit. Architect: Aeroports de Paris, Paris

The design team cited four reasons for using the material. First, the structural integrity provides high rigidity and strength of the stiff interlayer. Second, the interlayer demonstrated no edge delamination after many years of exposure to very humid conditions. Third, the structural interlayer provided an effective ultraviolet (UV) barrier that prevents the aging and discoloration of fabrics and fibers. Lastly, laminated glass provided the optimum light transmission of any material tested.

The structural interlayer provides the necessary additional strength required to accommodate the dominant bending stresses in the construction. The glass construction is 12 mm heat-soaked fully-tempered glass + 1.52 mm structural interlayer + 0.5 mm perforated metal sheet + 1.52 mm structural interlayer + 15 heat-soaked fully tempered glass. The polymer flowed well during laminating, allowing it to completely fill in the holes in the metal mesh. The panel design was minimally supported and attached to one glass ply only, which allowed for a smooth outer glass skin. Most importantly, the structural properties of the interlayer allow the thinnest, strongest design of such a laminate.

Laminated glass can now be stronger, thinner and more transparent than scientists could have imagined only a few decades ago

According to Andreu, functionally and visually, the space links the auditoriums to the city, which are visible from the surrounding landscape.

Snowy loads

A structural interlayer was essential to bringing light into the Yorkdale Shopping Centre [Figure 3, Figure 4]. Originally built in 1964, the mall was once the largest enclosed shopping center in the world, but after 2000, it needed an upgrade. MMC International Architects Ltd. of Toronto renovated the mall with the addition of a 60-foot-high, barrel-vaulted atrium of laminated glass, running 300 feet in length, and soaring above an 180,000-square-foot portion of the mall. The architect wanted to create an uncluttered sense of being outside.

Without the structural interlayer, a heavier steel truss or membrane support system would have been required, that would have altered the design concept.

Yorkdale Mall, Toronto, Canada.
Laminated glass with advanced polymer interlayers enabled a bolted-glass system to meet snow load requirements, resulting in a thinner, lighter skylight system.
Architect: MMC International Architects Ltd., Toronto

"This application required laminated glass due to the fact that the glass is an overhead application," said John Kooymans, a structural engineer at the engineering firm Halcrow Yolles, based in Toronto and London. "The code requires the glazing design incorporate a provision for preventing broken glass from falling. Laminating the glass is the preferred method when transparency is critical in the design application."

The laminated glass used in the mall contains a structural interlayer that is roughly 35 percent thinner and lighter than other laminated glass, including those made with traditional PVB. While thinner and lighter, it still perseveres through Toronto's harsh climate of freezing winter temperatures that often fall below negative 20 degrees centigrade, and continuous months of thick, heavy ice and snow.

The snow load specification was 65 lbs. per square foot. The structural interlayer demonstrated excellent edge stability, which helps the glass construction to bear heavier loads at the sides, where the barrel-vaulted roof meets the walls, and where the glass construction needs to be strongest. In addition, the structural interlayer offers better long-term edge performance. The overall glass construction is thinner, more affordable and more transparent.

A bridge of strength

The three-year, $120 million Chattanooga waterfront redevelopment project was an ambitious one [Figure 5]. The plan called for a joining together of the Hunter Museum of Art, the Tennessee Aquarium and a new spacious riverside park, creating a desirable and functional *recreational area*. Although the Hunter Museum is only three blocks from the Aquarium, steep steps and narrow streets had made the area inaccessible to many and daunting to most.

What was needed was clearly an elegant pedestrian bridge to link the different areas. The result was Holmberg Pedestrian Bridge, a 200-foot-long glass structure that incorporates the themes of both art and the waterside location, all 50 feet above traffic.
"We were challenged to create a bridge that complemented the existing Walnut Street Bridge—a historic steel truss walkway that led pedestrians to the river—but also one that was a sculpture on its own," said Ray Boaz, partner in the Chattanooga firm Derthick Henley & Wilkerson Architects. "Therefore, we needed to make the bridge as thin and open as possible to maximize views and that's where glass came into play." According to Boaz, the material was eagerly accepted by the client, the City of Chattanooga. The added challenge—a glass bridge—was a first for the firm and the city.

In order to determine the proper structural tolerances, the design team worked closely with interlayer specialists to effectively provide the proper support without over-designing the project. The final product supports more than 300 people and features two distinct finishes that allow pedestrians to chose their path—either a translucent one that obscures the traffic below or a transparent path that provides an experience of walking on air. The walking surface has been treated with a textured traction layer to assure that it is skid-proof and safe.

"It was a lot easier than I thought it would be," said Boaz, who used a new strength calculator (below) to determine the maximum glass stress under load, laminate deflection, effective laminate thickness and time and temperature behavior for the bridge.

Yorkdale Mall, Toronto, Canada
The structural interlayer promotes good edge stability, enabling the laminated glass to bear heavier loads. Architect: MMC International Architects Ltd., Toronto

Boaz advises other architects to work closely with both their structural engineer and interlayer manufacturers. "Once you understand the tolerances and characteristics, working with the glass isn't a whole lot different than working with any other material. Jump into it—it has a lot of exciting possibilities," he said.

Clearly, laminated glass has come a long way since that French chemist knocked over a bottle and saw the cohesive benefits of the substance that would become known as the interlayer—first PVB, and now advanced polymer interlayers that extend and enhance performance. Laminated glass can now be stronger, thinner, and more transparent than, scientists could have imagined only a few decades ago. As more design professionals investigate the uses of laminated glass with advanced polymer interlayers or structural interlayers, innovation and new applications are certain to follow. ■


Photo Joe Hailey, Ross Glass

Holmberg Pedestrian Bridge, Chattanooga, Tennessee
The use of laminated glass with advanced polymer interlayers allowed strength and transparency in this key waterfront redevelopment project.
Architect: Derthick Henley & Wilkerson Architects, Chattanooga

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AIA/ARCHITECTURAL RECORD CONTINUING EDUCATION Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Understand the development and strength performance of laminated glass*
- *Identify the advantages of advanced polymer interlayers in laminated glass*
- *Gain a perspective on the varied applications where laminated glass with advanced polymer interlayers can be used, for protection against natural and man-made disasters*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 349. Follow the reporting instructions, answer the test questions and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. The most common interlayer in laminated glass, polyvinyl butyral (PVB), serves as a:
a. thin sheet of film that bonds window panels together
b. plastic coating on the outside of glass
c. sealant at the edge of panes
d. polish

2. What are the benefits of PVB-based laminated glass?
a. Safety through glass retention
b. UV protection
c. Noise reduction
d. all of the above

3. The use of an advanced polymer or structural interlayer in laminated glass leads to all but which of these outcomes?
a. added strength and resistance to tearing
b. improved post-breakage performance
c. reductions in necessary glass thickness
d. four-sided supports

4. Structural interlayers are less sensitive to moisture intrusion on the edges of the laminate.
a. True
b. False

5. Existing building code requirements in the Florida Building Code require impact resistant protection in wind zones of 110-150 miles per hour.
a. True
b. False

6. Product certification of impact resistant windows may involve:
a. large missile impact test
b. small missile impact test
c. pressure cycling
d. all of the above

7. The use of laminated glass with a structured or advanced polymer interlayer is increasing due to all of which of the following?
a. changing requirements for hurricane resistance
b. new standards for security
c. new uses of glass in design
d. all of the above

8. Why is an advanced polymer interlayer effective in a skylight in a cold climate such as Toronto?
a. It may allow for thinner laminated glass
b. Good glass retention
c. Exceptional cold-temperature performance
d. all of the above

9. Structural interlayers provide an effective ultraviolet (UV) barrier that prevents the aging and discoloration of fabrics and fibers.
a. True
b. False

10. Calculating the effective thickness for laminated glass requires information including:
a. type of load
b. laminate dimensions
c. upper use temperature
d. all of the above.

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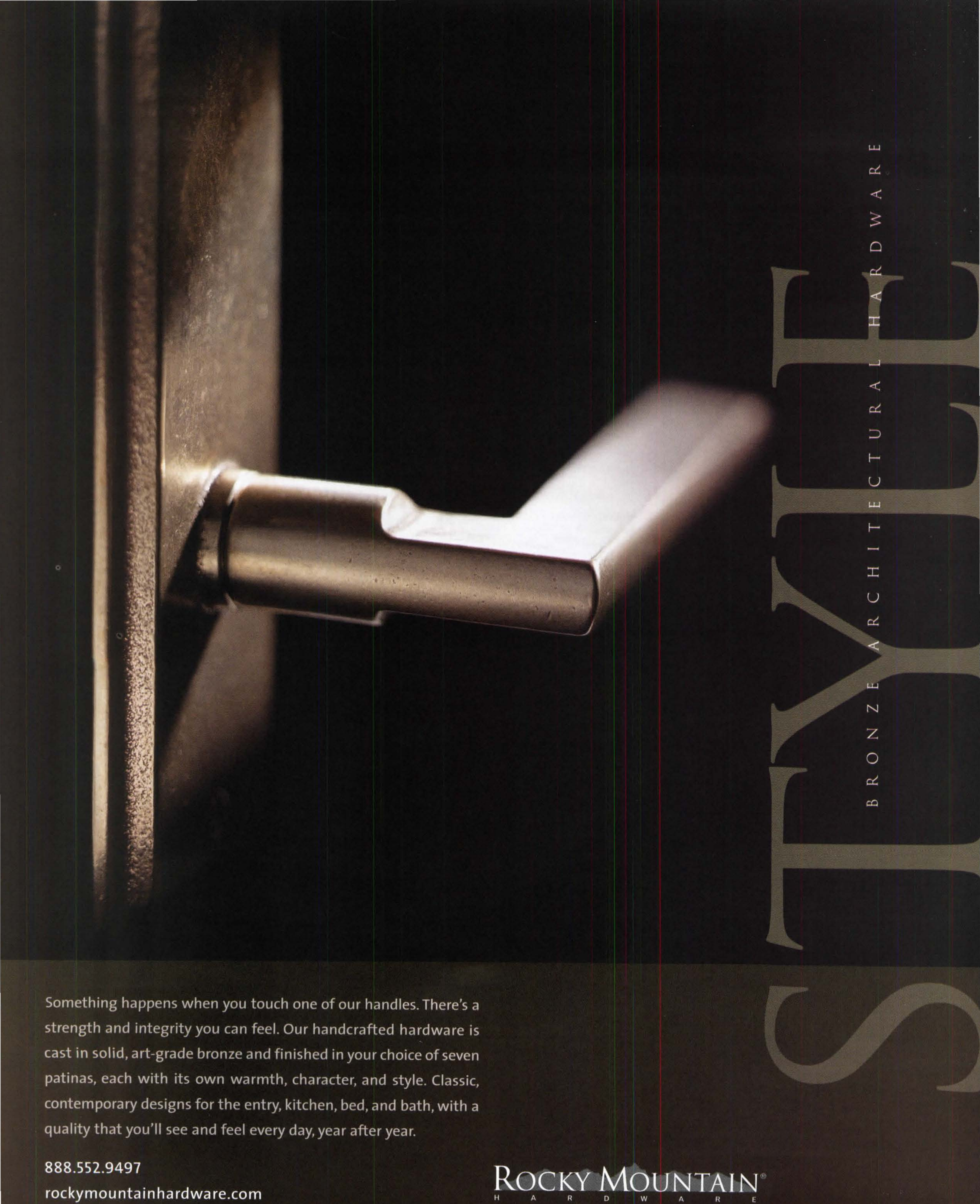

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Selecting High-End Hardware for Residential, Commercial, and Hospitality Locations

Provided by Rocky Mountain Hardware

By Stanley Stark, FAIA

Door hardware is a critical element that provides passage, access, and security but whose operations we take for granted. The aesthetics of hardware design have strong influence on our perceptions of the space we are in or the building we are entering. The architect and designer's selection, application, and specification of door hardware will make a strong contribution to the project's success.

Hardware has evolved from crude, handmade attachments and closure pieces to machine-made, industrialized mechanisms of great precision and design distinctiveness. Most recently, there is a trend in high-end hardware toward distinctive design, which combines highlighting the natural properties of the brass or bronze from which hardware is cast, with its sculpture sense and precision-engineered properties. Hardware, which typically consumes approximately five percent of a building's construction budget, represents an annual construction value of \$10 billion to \$12 billion.

This article concentrates on high-end hardware for residential, commercial, and hospitality locations. It will familiarize you with the trends, the criteria, and the design decisions that enable the correct selection and specification of hardware for these locations.

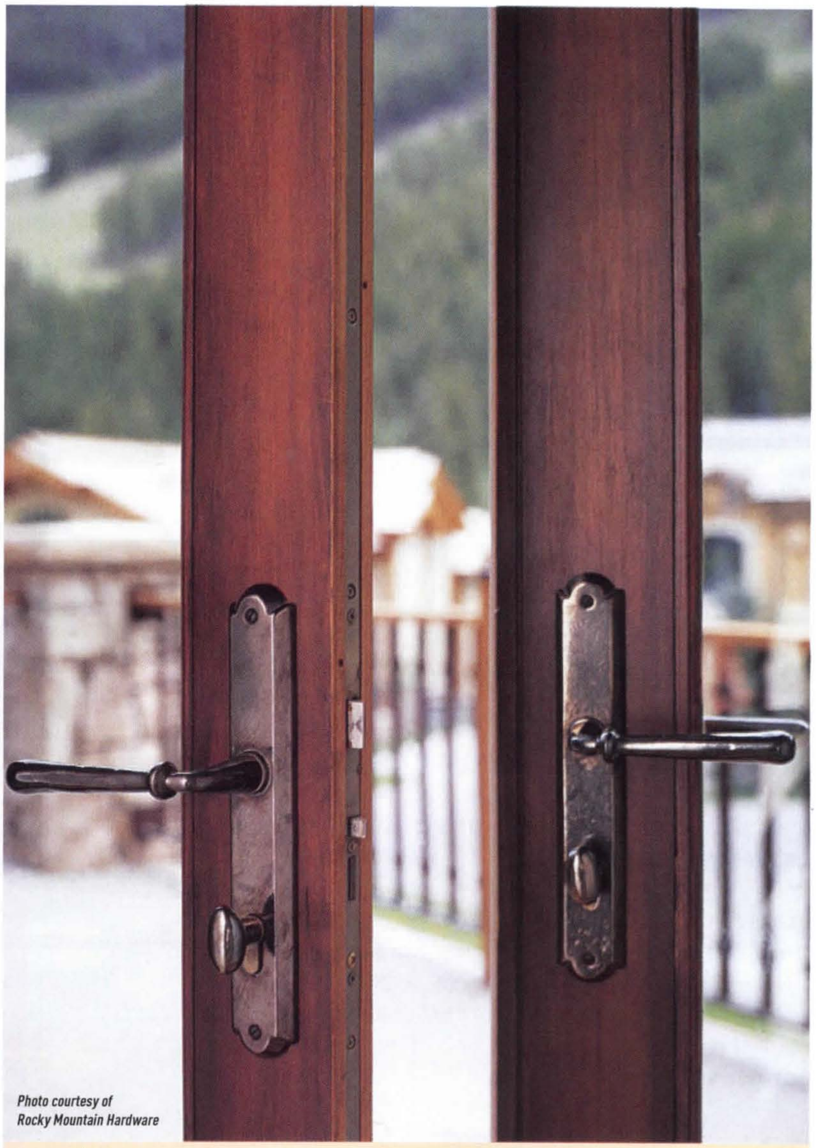


Photo courtesy of Rocky Mountain Hardware

Patio doors with lever handles and thumb-sets. Cast bronze with patina.

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Selecting High-End Hardware for Residential, Commercial, and Hospitality Locations.** To earn one AIA/CES Learning Unit, including one hour of health, safety, welfare credit, answer the questions on page 297, then follow the reporting instructions on page 350 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Understand hardware trends.*
- *Identify appropriate design options, functions and mechanisms for hardware applications.*
- *Define the correct hardware for various door applications.*
- *Understand the advantages of bronze hardware.*
- *Understand some differences between U.S. and European hardware practice and application.*

Trends in Hardware

Hardware as a definer of residential design status has become a deeply entrenched value. Over the past 20 years, people have begun to devote more time and money to transforming their home into showplaces of their design and style. Propelled by this increasing demand, hardware manufacturers began producing door hardware and accessories to meet the needs of architects, designers, and sophisticated homeowners to complement the aesthetics of their design choices. Some manufacturers have responded by combining traditional techniques, such as investment (also known as lost wax casting), and sand casting, with state-of-the-art manufacturing equipment to produce the detail and quality of precisely engineered hardware with a traditional and natural look and feel.

The architectural style choices available today cover a broad spectrum, spanning from modern and post-modern to period, rustic, and traditional. Each style and design vocabulary requires details that work together to provide a harmonious appearance. Unlike the 19th century, when knobs were routine, lever handles have assumed greater prominence. Ease of use, adaptability to meet the Americans with Disabilities Act (ADA) requirements, and a sleek appearance are among the reasons contributing to their popularity.

More natural and organic products, like wood and stone, are being incorporated as major design elements into residential, commercial, and hospitality projects. Hardware, in turn, needs to reflect the natural properties of these materials. This design sympathy with natural products has trended hardware away from manufactured, finished appearances toward living finishes like bronze and patinas, which change naturally over time.

"Designers have embraced newer hybrid styles, such as 'mountain modern' and 'coastal contemporary'," notes Patsy Nickum, owner of Rocky Mountain Hardware. These styles combine the clean lines of modern design while integrating the warmth and character of organic materials and colors such as stone, wood, and structural steel. All are materials used in a raw state, were frequently covered with more finished materials, and now they are exposed and aged with time. Designers have begun to reflect the living and changing aspects of materials in their designs.

"Designers have embraced hybrid styles..."

Increasingly, security hardware and devices are being adapted to many different applications. This high technology trend, combining traditional latch and lock mechanisms with IT systems, represents a design and coordination challenge for both architects and manufacturers.

Basic Issues Guiding Hardware Design and Selection Choices

Typically, the driving force behind selecting different hardware is based on the necessary function, and the basic distinction is between indoor and outdoor applications. Most exterior doors lock, and in many cases the doors are larger in scale (taller, wider, heavier, and carry more hardware) than interior doors. This is especially true of entry doors. In order to hold larger and sturdier locking mechanisms, such as a mortise lock, selecting doors with larger stiles, which provide more room for the trim, is fundamental to having more options in hardware selection. The mortise lock, which integrates the locking and latching mechanisms into a single cartridge style lock, is inset within the width of the door and is set within the stile, the vertical structural member of the door.

"The basic distinction is between indoor and outdoor..."

Many interior doors contain a locking mechanism, but these tend to be smaller than those that secure homes. This varies based on residential and commercial applications. Another broad assumption is that interior doors are not required to meet all of the stringent impact codes, especially relating to hurricanes and high wind conditions that exterior doors are often subject to. This also varies with application, particularly for interior doors in commercial and hospitality settings.

Intensity of Use

High-traffic areas demand lock mechanisms with high tolerance for use. If doors require locking mechanisms, mortise locks are generally recommended. Fewer working parts will assure better operation if it fits the need. For example, in a busy location, a push/pull device, instead of a lever or knob lockset, is preferable. This is typical for doors that do not require latches.

Low-use doors can employ many different mechanisms because the function will not be tested as much as on high use doors. Nevertheless, design professionals should determine the potential use and regulations of the door before specifying hardware. Available options depend on whether the door will be used primarily for security or passage.

Basic Materials

The most common metals used in hardware trim are brass, stainless steel, aluminum, and bronze. Selecting the proper hardware material for a project depends on aesthetics, durability, and availability in all necessary lock functions and sizes for the project.

Photo courtesy of Rocky Mountain Hardware

The bronze sand casting process.

Brass, which is most commonly drop or hot forged, has been popular for many years. This metal begins in a rod form, is heated until it is malleable, and is then pressed with extreme pressure into a mold. This technique forges a product free of blemishes or pockmarks. Brass is often highly polished and then lacquered as a protective coat. Sometimes manufactures plate brass to look like other finishes such as nichel then lacquer coat again for protection. These lacquered finishes, like anything that is touched and used on a regular basis, can crack, chip or peel, thus allowing the base metal to tarnish with time.

Forging tends to result in more highly finished, polished, blemish-free surfaces. Reverting to casting techniques yields finer detail products with a warm texture. Many products can be poured using the sand casting process but the lost wax process can be used to make products that have finer details, while still retaining the desired texture of casting.

Iron, which is still very common in Europe, is also a forged metal. If untreated, iron will bleed or rust, depending on the environment. In most cases, iron is powder coated to retard this natural occurrence. The black finish for which iron is often associated is popular for a rustic or barn-like appearance.

Stainless steel is typically a high-end, modern, or contemporary choice for door hardware. Like forged brass, it has a very smooth, clean-lined surface, and has been a popular material used by Italian- and German-based companies. This metal is often used in coastal environments, where salt-water air tarnishes most metals quickly. When selecting stainless-steel hardware, it is important to research products to be sure the lock mechanisms will not corrode. Not all stainless-steel hardware is appropriate for coastal conditions. Price typically dictates quality of finish.

Selecting & Specifying Hardware

Hardware choices and selections are governed by the function of the door, the style and type of hardware that most suitably meets the door's operating requirements, and both the appearance and the tacit signals the designer wishes to convey, such as push, pull and turn.

Hardware selection begins with lock functions. Important conditions and considerations include the following:

Entry–This refers to an exterior door with keyed access, which can be provided in single cylinder or double cylinder functions.

- Mortise Lock–Recommended for use with heavy or high-use doors. Specific trim selections require this type of lock. It is an integrated lock (see Glossary). Technical attributes of a mortise lock include saw proof inserts in the deadbolts, push button locking capacity, and emergency egress function (single operation exit). Highly recommended for use with grip handle and thumb latch application.
- Deadbolts–Usually combined with a lever or knob function or a push/pull plate.

Patio–This is an exterior door that does not require key access, but requires lock function, and is typically used on doors that access a balcony or patio. The same lock choices as entries apply, mortise lock or deadbolt. In most cases, exterior doors have keyed access from the outside in, to overcome potential redundancy-of-locking situations. This occurs when several doors are in close proximity to each other or when external access is directed towards a single door.

Privacy–This function has three locking options, all with varying levels of security and use.

- Mortise lock–The most secure locking feature for high-use areas.
- Mortise bolt–Although this locking mechanism is not substantially stronger than the push-button locking spring latch, it offers a more identifiable locking feature. For example, this may be used for a bathroom door so that it is more obvious that the door is locked, as opposed to a push button mechanism.
- Spring latch (locking)–This is the most affordable locking mechanism. It is not necessarily weaker than the mortise bolt, but it is less obvious that the mechanism is actually locked.

Passage–This is a non-locking mechanism with operable handles. It is used on doors that do not need to be secured.

- Spring latch–This is a latch operated by a handle.
- Mortise lock box–While there is no locking capacity, it has the same mortise box as a locking mechanism, and functions as a latch.

Dummy–This refers to a set of inoperable handles on one or both sides of a door. This could also be the inoperable side of a double door condition. Dummies are often used with a roller catch or another latching mechanism.

Multi-point–Originally developed in Europe, this mechanism latches the doorframe in three or more places. Many American window companies have adopted this system.

Miscellaneous Functions:

- Corridor–This function allows the inside handles on both sides of the door to be open and functioning. One side has a locking turn piece or push button, such as a mortise lock or locking spring latch. This is typically used to lock an office or room that is not in a public area.
- Classroom–This function allows the inside handle to always be free while the outside handle can either be free or be lockable with a key via a mortise lock or a locking knob or lever. This restricts the locking function to the key holder.
- Store room–The inside handle is always open or free and the exterior handle is always locked. The locking mechanism is keyed from the exterior side.
- Hotel entry–Similar to the storeroom, except that there is an emergency egress deadbolt on the interior, allowing guests the ability to secure their room from the inside.


Photo courtesy of Rocky Mountain Hardware

Residential entry doors with mortise lock-set, thumb piece, and pull. Cast bronze with patina.

Roof decks offer additional space to town house dwellers.
Project: Canton Mills, Canton, Maryland. Architecture Collaborative, Inc.

The ABCs of Pedestrian Roof Decks

Pedestrian roof decks are surfaces that are subjected to pedestrian traffic. They can be constructed with a wood or concrete substrate, and can be waterproofed using a variety of materials. Waterproofing systems for wood or concrete decks are typically classified as protected membrane assemblies or as exposed membrane assemblies. In protected assemblies, the waterproofed membranes are protected by another surface, such as concrete pavers, tiles or wood deck boards. In exposed assemblies, the waterproof membrane, which is either a liquid-applied coating or a PVC membrane, is exposed to the elements.

Traditional waterproofing methods in protected assemblies can result in a number of common problems. Wood can rot. Coatings can delaminate. Concrete deteriorates. Over time, costly maintenance and expensive repairs are required to correct these problems.

Liquid coatings can also be problematic. Because concrete substrates tend to shift in response to daily temperature fluctuations, unattractive and potential dangerous cracks can occur. This kind of constant movement can put enormous stress on epoxy, urethane, and acrylic liquid-applied coatings. As a result, pinholes, blisters or surface cracks often occur, allowing moisture to penetrate the membrane and cause further deterioration of the concrete. In addition, incorrect or inadequate surface preparation is a huge reason for failure of liquid coatings.

While outdoor carpet may be an attractive option, installed on its own, it is not waterproof. When it does get wet, carpet tends to hold water and dry very slowly. If the carpet is laid without a waterproof membrane underneath, it will allow water to permeate the concrete or wood substrate below, causing it to rot and deteriorate. Furthermore, carpet holds the water close to the deck and doesn't allow it to dry, therefore increasing the potential damage. Beyond that, outdoor carpet fibers tend to deteriorate rapidly through exposure to the sun. Frequently, frayed and unsightly outdoor carpets need to be replaced.

Wood decks have a unique aesthetic appeal. But even treated wood will deteriorate when exposed to the elements. Over time, exposure to moisture will cause wood decking to split, warp, twist, shrink, splinter, crack, and rot. Wood decks, which are also highly combustible and can be slippery when wet, require constant maintenance, regular repainting, and re-staining.

There are difficulties with paver overlays, too. To begin with, the structure has to be designed to accept the additional weight and clearance requirements of the paver system. In addition, drainage is critical to the waterproof membrane underneath the paver system, which is difficult to get at should maintenance, repair or replacement become necessary. Even PVC membranes are not problem-free. While normal traffic will not damage the vinyl, removing snow, moving furniture, dropping sharp objects, skidding a bicycle tire, a roller blade or the edge of a running shoe across the vinyl creates friction, and the extreme heat and abrasion may possibly remove the print. Consequently, solid-color membranes are advisable for high traffic areas.

PVC membranes may also be affected by the sun. "All products designed for exterior use will eventually be affected by Mother Nature," says John Ogilvie, President, Duradek, Ltd. "PVC is the best attempt at prolonging the life cycle of various building products and performs an admirable job in delaying the inevitable."

The Benefits of PVC Membranes

The optimum walkable PVC membrane can have significant advantages over other types of waterproofed flooring materials. PVC membranes are extremely durable—even when exposed to heavy traffic and severe weather conditions. They won't peel, chip, delaminate or crack, and will outlast painted surfaces by years. PVC membranes offer varying degrees of slip resistance as required for the particular project and consequently are considered "safer" than wood or concrete surfaces that become slippery when wet. They also excel in terms of ease of installation. In contrast to coated systems that require frequent recoating and maintenance, PVC membranes need only regular cleaning. "The main considerations we look at when selecting a product like this are durability and affordability. We need something that will be reliable and lasting," says Dave Robbins, RA, president, Architecture Collaborative, Inc., Ellicott City, Maryland, who has used PVC membranes on many projects. "We also need it to be relatively easy to install, and PVC membranes are much easier to install and less expensive than most walking surfaces. And since the entire surface is

PVC membranes come in a wide variety of patterns, textures, and colors.

Consideration should also be paid to sequencing of building components—failure to do so can lead to severe moisture intrusion.

walkable, access is not limited as it is in paver-type roofs." Waterproof outdoor roof deck and flooring systems consist of pre-manufactured PVC sheet membranes that are applied to wood or concrete deck surfaces. Because they're pre-manufactured, they can be fabric-reinforced to provide added stability and multi-directional strength.

While waterproofing is the most important attribute of a PVC membrane and appearance is a secondary consideration, membranes come in a wide variety of patterns, colors, and textures geared to diverse needs and budgets. (Figure 3) Because roof deck and flooring membranes are manufactured in an array of contemporary colors, textures, and patterns, they offer the potential to create complimentary or contrasting borders, and even custom design work. Says Robbins, "The availability of finish colors provides a design opportunity not found in other roofing products."

If a walkable membrane is to be specified for a project, there are several determining characteristics to look for in order to ensure high quality, durability, and long-term performance. The membrane should be fabric reinforced. It should also have slip-resistant texture. An effective PVC membrane will also have UV and heat stabilizers. "Warnings against the effects of UV rays on the skin are common," says Ogilvie. "After a period of years these same rays will affect outdoor products too. To minimize this, manufacturers add UV screens and stabilizers to prolong the life of PVC materials. These screens are designed to resist the potential of cracking, embrittlement, and discoloration of the vinyl." In addition, the membrane should incorporate mildew inhibitors, be fire-retardant, resistant to chemicals, and meet all building code standards.

Design Considerations—the Six Ds

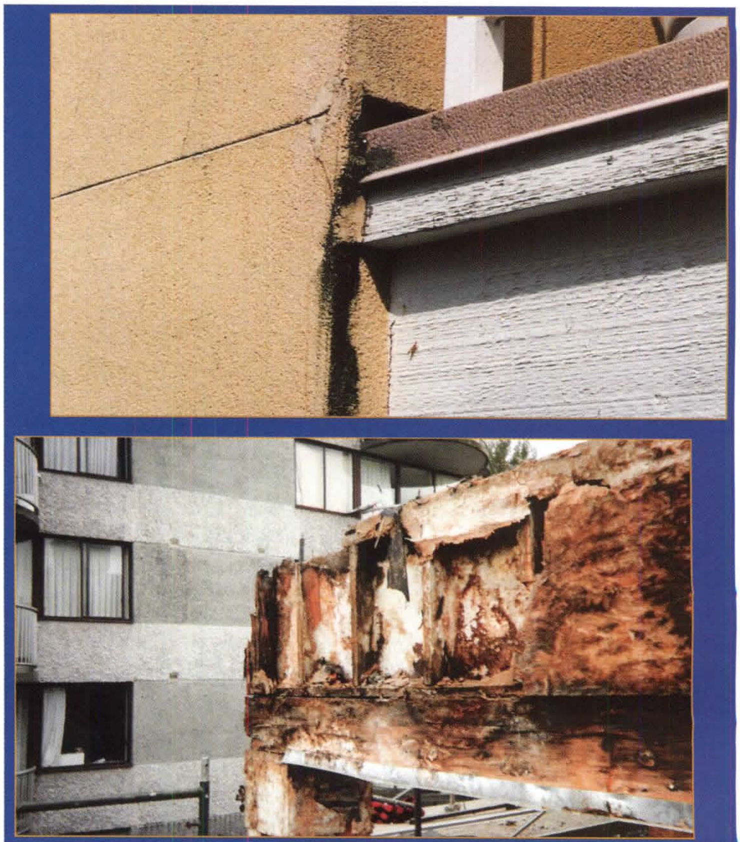
For illustrative purposes, consider a project to waterproof, such as a walkable roof deck. Key design considerations can be thought of as the six Ds—deflection, drainage, drying, durability, detailing, and deconstruction. Each plays an important role in the performance of both the deck and the waterproofing system.

Deflection refers to a deck's ability to control surface water and is affected by several factors, including slope, drip edges, and diverters. For the best product performance and customer enjoyment of the deck surface, the structure should be sloped to eliminate ponding water, while accounting for building shrinkage or settlement. If the deck is designed with the correct slope, water will flow away from the building into a gutter system or over a drip edge away from the exterior wall system. Slope is vitally important. On new construction, wood frame buildings can shrink as much as 1/2 inch per floor, which can result in the balcony sloping in the wrong direction—a situation that can have adverse consequences for controlling surface water. Furthermore, building settling can make things worse if enough slope hasn't been built in. But given the proper slope—approximately two percent or 1/4 inch in 12 inches—a simple drip edge detail is usually the most expedient way of removing surface water from the deck surface; false fascia detailing can be used to hide the gutter, fascia, railing mounts, and deck slope. Severe structural damage can occur if the waterproofing detail is not correctly done. "If most of the water is diverted away from critical areas, it's less likely that problems will occur," says Ogilvie. (Figure 4) To address this situation, simple pre-manufactured diverters can be installed and waterproofed to steer water away from adjoining walls and other critical junctions.

Drainage refers to the ability of the building assembly to redirect any liquid water that enters the system and allow it to drain to the outside. Drainage is dependent on two factors: flashing and proper sequencing of moisture barriers and detailing of wall openings. Flashings are metal components that are placed at strategic spots to either direct water to an appropriate location or to keep it out of a structure. A wall flashing, for example, is attached to the outside wall several inches above the deck surface, and overlapped by tar paper which, in turn, sheds the water onto the PVC roof membrane. In this case, the PVC membrane would tuck up under the flashing so that no water—from snow, splashback, wind-driven rain or from hosing off the deck—can get into the wall system.

Special attention to flashing is important, as incorrect detailing of flashing elements will invariably lead to leaks and water damage. For example, curbs or knee walls higher than three inches or higher than a wall opening will result in a "trapped" deck system that requires special drainage. Should a trapped deck occur, the top plate of the curb or knee wall must slope back toward the deck surface. In addition, the PVC membrane should extend to the line of the outside drip edge, which, in turn, should extend well out from the building wall surface.

Consideration should also be paid to sequencing of building components; failure to do so can lead to severe moisture intrusion. Proper sequencing of moisture barriers is critical, and installing the PVC membrane after the wall assembly has been completed will almost always lead to failure. In the first step, the vinyl is installed on the floor and extended up the wall a minimum of six inches (the actual height is dictated by the local building code). Vertical surfaces are then covered by a tar paper which overlaps the vinyl by at least two inches; some builders use two layers of tar paper for added waterproofing protection. Horizontal surfaces such as the top of stub walls or solid railings should be covered with a peel-and-stick membrane. Special attention should always be paid to the "saddle," where horizontal and vertical surfaces meet.



Severe structural damage can occur when water is not properly diverted.

Many decks have posts and columns that require proper construction and sequencing of moisture barriers to prevent water from seeping under the PVC membrane. Water may find an entry point in the post itself and get in behind the waterproof membrane. As wood posts or columns will crack and allow water to get into the subsurface, they should be covered with a moisture barrier and then finished with siding. Where the dramatic effect of a rough-hewn wood post is required, special consideration must be made for post attachment. When fastening metal rails or posts to the deck surface, all pilot holes should be filled with a sealant before screws are inserted. Curbs, knee walls, posts, and wall openings must be constructed and detailed properly to ensure the performance of the membrane. In constructing or modifying door openings, door sills should be sloped toward the deck surface for optimum drainage. In addition, the waterproof membrane should continue into and waterproof the rough door opening saddle in order to deflect any moisture intrusion.

Well before the product hits the deck, a thorough examination of the space that will be covered is in order. The better the surface, the better the finished floor.

Building authorities may require overflow drains or scupper boxes on trapped decks to provide a path for water to drain from the deck. Drains and scuppers should be sloped toward the outside, and scuppers should be inserted into the deck surface so as to prevent ponding. In general, scuppers are very difficult to detail in such a way as to make them truly impervious to wind, rain, snow, and structural deflection. ABS-shower drains are only approved for showers and are not suitable for any roof deck or multi-family building applications. Drains should be approved roof drains. PVC-coated drains or drains with a positive clamping system are suitable to allow water to drain into the building's storm water system. With PVC-coated overflow devices, the PVC decking membrane can be welded directly to the PVC-coated surface, with no caulking required.

Drying refers to any features of the building assembly that speed the drying of materials that have been exposed to moisture. Drying can be aided by the use of a rain screen wall assembly or by the venting of trapped air spaces. Proper ventilation is critical and insufficient ventilation of the deck space can lead to mold, mildew, and rot. Venting of the air space underneath decks, balconies, and walkways with a closed soffit or ceiling is especially important for adequate drying. If the underside of a roof deck, balcony or walkway has a closed soffit or ceiling, venting is required in order to reduce moisture buildup. To be effective, the vent area should be a minimum of 1/150th of the insulated ceiling area. If equal venting can't be provided at both ends of the joist runs, then purlins should be installed above the joists in order to allow for cross ventilation.

To facilitate ventilation, some manufacturers offer deck ventilation systems that allow for venting of the roof space joists in new and retrofit construction. "These deck ventilation systems work by allowing air from the roof space to circulate up and through a type of snorkel vent which includes a perforated mesh bug screen," says Ogilvie. "And they can be installed without altering the elevation of the deck, door openings, railings or through-wall flashing details."

Durability refers to assemblies and materials that stand up to foot traffic, moisture, mildew, chemicals, and environmental conditions. The durability of the assembly will be affected by the quality of the waterproofing membrane, and by its overall maintenance. While two waterproofing membranes may have a similar appearance, the quality of their ingredients can give the product a price differential of up to 25 percent, and a difference in life expectancy of as much as 75 percent. Model building codes that dictate the requirements for roof and walking deck membranes should be consulted. Roof membranes, for example, are tested in accordance with nationally recognized standards, such as the American Society of Testing and Materials (ASTM) E-108 (International Codes), ULC-S107 (NBC), for Class "A", "B" or "C" Fire Endurance Rating. PVC roof and walking deck membranes must conform to the same material standards as PVC Roofing and Waterproofing Membranes.

Any alternative material, type or method of construction can be accepted as long as it demonstrates compliance with the performance features of the applicable code. In the United States, the International Code Council Evaluation Service (ICC-ES) evaluates Roof and Walking Deck Membranes in accordance with the ICC-ES interim Criteria for Walking decks (AC39), dated March 2000.

In addition, waterproofing membrane products must be manufactured under an approved quality-control program with inspections by an inspection agency accredited by the International Accreditation Service (IAS).

Also key to the durability of a PVC membrane is to ensure that all components of the waterproofing system are compatible and will not adversely affect performance. This includes the membrane, along with any tapes, sealants, adhesives, drains, scupper boxes, flashings, or perimeter fastening devices.

Waterproof PVC roof deck and flooring systems are highly durable and maintainable with periodic washing to remove surface dirt. Rougher membranes may require washing with a scrub brush and mild detergent or pressure washing. Regular inspection of caulking and immediate attention to any loose seaming will ensure that the PVC membrane lasts for years to come.

Detailing refers to the workmanship involved in installing materials and assemblies such that they are watertight and aesthetically appealing. Permanent secure waterproofing depends upon proper detailing at perimeters and penetrations. "A good or bad detail can often mean the difference between a good and a bad installation," says Ogilvie, noting that use of pre-manufactured flashing details for outside corners, posts, and railing attachments can help ensure a neat and waterproof detail. Good workmanship and proper detailing are critical to the long-term performance of a waterproof outdoor flooring system, and should always be installed by manufacturer-approved and/or trained technicians. PVC membranes can be hot-air welded to provide a completely waterproof seam, making them well-suited to fine detailing. Poor workmanship and improper detailing will compromise deck aesthetics, and will result in poor deck performance. "The manufacturer provides a lot of good details to ensure a watertight installation as well as providing the required fasteners and accessories," says Robbins.

Deconstruction refers to the use of waterproofing solutions that offer long-term life expectancy as well as ease of replacement. Deconstruction is a relatively new concern that has become increasingly important for "green" construction. In terms of durability, with proper care and cleaning, today's waterproof *PVC membranes can* be expected to last for 10 to 15 years or more—and 20-25 years is not unusual. Demountable flashing systems are one way to reduce the amount of deconstruction required to repair or replace a waterproofing membrane. These systems are easy to remove, and allow the PVC membrane to be repaired or replaced quickly and easily with minimum destruction. Membrane and trim panels can be replaced without disrupting the existing wall system and doors, which means that to replace the waterproofing membrane, one doesn't have to take off the siding or stucco or compromise the second waterproofing job.

Installation Considerations

Like all products, the PVC membrane will function more effectively with proper installation. Well before the product hits the deck, a thorough examination of the space that will be covered is in order. The better the surface, the better the finished floor. In a typical installation, the vinyl is installed over the top of the structural plywood flooring. Code requires 5/8 inch plywood, but 3/4 inch provides a stronger surface with less bounce and less warping. If the plywood is of poor quality, pressure-treated or it is oriented strand board, it must be overlayed with a plywood or cement board skin. Since 1/4 or 3/8 inch plywood usually warps, an overlay of no less than 1/2 inch is recommended.

Sanded plywood or cement board will give the best-finished surface possible. As a rule, 1/4 inch or 3/8 inch plywood will warp due to absorption of moisture from the atmosphere. For the flattest possible surface, it's recommended to overlay with minimum 5/8 inch and preferably 3/4 inch plywood. In any case, the deck must be secure, well supported, clean, smooth, free of depressions, waves and projections, properly sloped to drains, valleys, or eaves. ■

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***http://archrecord.construction.com/resources/conteduc/archives/0512duradek-1.asp.***

To receive AIA/CES credit, you are required to read this additional text. For a faxed copy of the material, call Jennifer Ogilvie toll free at 877-387-2724.

AIA/ARCHITECTURAL RECORD CONTINUING EDUCATION Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Examine the types of walkable roof decks, waterproofing options, and common problems.*
- *Analyze the characteristics, advantages and applications of walkable roof deck, and outdoor flooring systems.*
- *Explore design and installation considerations for walkable roof decks, balconies, and outdoor flooring systems.*
- *Understand key issues in specifying waterproof PVC-based roof deck and flooring membranes.*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 352. Follow the reporting instructions, answer the test questions and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. PVC membranes are superior to traditional waterproofing materials in that:
a. They will never be affected by the elements
b. They are able to move with the subsurface
c. They do not require cleaning
d. They do not require professional installers

2. Deflection is affected by:
a. Slope
b. Diverters
c. Drip edges
d. All of the above

3. Drainage is dependent on:
a. Drip edges
b. Flashing
c. Ventilation
d. Sealants

4. Installing the PVC membrane after the wall assembly has been completed:
a. Is critical to ensuring a watertight floor
b. Will almost always lead to failure
c. Is an advantage over traditional waterproofing mechanisms
d. Should be done only if the deck has posts

5. Drying can be aided by:
a. Slope of the deck surface
b. Scuppers
c. Venting of trapped air spaces
d. A closed soffit

6. Neat and waterproof details can be assured by:
a. A hot-welded PVC membrane
b. Periodic maintenance
c. Pre-manufactured flashing
d. Overlapping two layers of building paper

7. When installing a PVC membrane over an existing system that has failed, it is necessary to:
a. Inspect for spalling concrete
b. Sand plywood or cement board
c. Use a heavier PVC membrane
d. Fill in joints

8. The most critical element of a PVC waterproofing system is:
a. Detailing
b. Ventilation
c. Preparing the substrate
d. Seaming

9. In "fully wrapped" roof deck membrane installation:
a. A metal "L" trim can be used to secure the PVC membrane to the bottom of the fascia
b. The PVC membrane is heat-welded to a PVC-coated flashing that provides a drip edge
c. Galvanized flashing with a PVC clip holds the PVC membrane in place
d. The PVC membrane is heat-welded to a PVC-coated scupper box, which provides drainage

10. Typically, a membrane manufacturer *will not* supply:
a. Overflow drains
b. Roof drains
c. Flashing
d. Perimeter fasteners

duradek™

Duradek is a multinational company that has installed over 100 Million Square Feet of 100% waterproof, vinyl membranes since 1974. This decking system was developed in the Pacific Northwest, a place that relies on superior waterproofing products for its harsh climates. Not only does Duradek perform well in all kinds of weather, it also comes in over 20 colors and patterns to enhance the exterior of any home. It is a non-slip, mildew resistant, outdoor flooring, with a life span of approximately 20 years. Besides being an exceptional decking membrane, Duradek Ultra products may be used over living space to provide a dry, watertight area below. It is ICC approved for use over habitable areas and also carries Class A and C fire ratings.

CIRCLE 101 ON READER SERVICE CARD OR GO TO ARCHRECORD.CONSTRUCTION.COM/PRODUCTS/

Concrete Tiles: Durable, Sustainable Roofing Materials Integrate Design and Performance

Versatile colors, shapes, and sizes enhance aesthetics while addressing energy efficiency.

Provided by MonierLifetile

By Brian Libby

Concrete roof tile, used for centuries, is a dependable, durable, and sustainable material that enhances energy efficient design, while exhibiting a distinct architectural character. In recent years, the material has grown in popularity because of its superior strength compared to other traditional roofing materials, like wood or asphalt.

Because of concrete tile's long history, a large number of roof tile shapes have been developed. There are flat tiles, Roman tiles with a concave curve at one end and a convex curve at the other (to allow interlocking), S-shaped pan tiles, and semi-cylindrical Mission or barrel tiles. It is red-hued tile that most often comes to mind with concrete tile, but the material is actually available in a variety of shapes, designs, and colors. Whether for a Craftsman bungalow, Spanish colonial, Cape Cod, or Queen Anne home, this material is suitable for many types of residential styles. Concrete roof tile is also appropriate for commercial structures, schools, churches, and other building types, because of its durability and aesthetic design qualities.

Photo courtesy of MonierLifetile

This home was roofed with concrete tile designed to resemble traditional split shake shingles.

Concrete roof tiles better insulate a building against summer heat than comparable roofing products, such as asphalt or wood shingles, and have a lifespan that's often two or even three times longer. During project budgeting, life cycle costs are often evaluated against initial costs.

A multi-year span of historically low interest rates during the late 1990's through 2005 has generated a boom in residential design and construction. Homebuilders have found by using quality materials, such as concrete tile, they can add to value to their projects, and distinguish them from other countless subdivisions. "Tile roofs have such a rich heritage, appreciated by today's homeowner who is interested in craftsmanship and permanence," says Donald A. Gardner, AIA, founder, Donald A. Gardner Architects, Greenville, South Carolina. "Concrete tile meets these objectives by providing a durable roofing solution that emulates natural materials."

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Concrete Tiles: Durable, Sustainable Roofing Materials Integrate Design and Performance.** To earn one AIA/CES Learning Unit, including one hour of health safety welfare credit, answer the questions on page 329, then follow the reporting instructions on page 353 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Understand the qualities and design criteria for use of concrete tiles.*
- *Identify how climate conditions and code requirements impact the use of concrete tile roofs.*
- *Learn why concrete tile is considered an energy efficient and sustainable material.*
- *Analyze the structural issues relating to concrete tile applications.*
- *Explain how coloring and efflorescence affect use of concrete tile.*

Architects and design professionals should be aware of the required conditions sometimes resulting from the additional weight of concrete roof tiles, and the potential structural loads to be accommodated on each project. Although in many cases a roof can accommodate concrete tile without any corresponding structural adjustment, it is important that proper weight measurements be made before proceeding with installation.


Photo courtesy of MonierLifetile

The concrete tile topping this home resembles classic wood shingles but will last far longer.

Concrete Tile Design Issues

Concrete roof tile is suitable for use in a variety of climates, and reflects tradition, function, and technology. "The roof changes the whole appearance of the outside of a house," says Mac McKinney, president, McKinney Builders, Newnan, Georgia. There are, however, certain design criteria that merit consideration.

Weight: While concrete tile is unequivocally heavier than other roofing materials like asphalt and wood, rarely in single-family home construction does it require special structural accommodation. In new home construction, trusses are pre-designed to support the load of standard weight concrete tiles. When re-roofing an existing home in the West, a lightweight concrete tile is an option at less than six pounds per square foot, which in most municipalities is below the weight necessary for an extra structural engineer's report.

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Colder climates: The material has in the past enjoyed greater popularity in the southern United States and South Pacific than it has in northern portions of the Western Hemisphere. But concrete tile roofs actually have been mainstays for hundreds of years in the coldest climates in Europe.

Variety of shapes and colors: Concrete tile is often associated with rounded shapes and red tones, as frequently seen in churches and homes in Spain, Mexico, and Southern California. But concrete roof tiles are available in a variety of shapes and colors appropriate for most architectural styles. Concrete tile can be made to look like many other natural materials, such as slate, clay and wood in various shapes and profiles.

Fiber-cement products: Fiber-cement roofing products are made from cement and wood fiber cellulose. Cellulose is an organic material that is susceptible to moisture and resultant deterioration if the cellulose product is not formulated and manufactured properly. Many fiber-cement roofing products have failed or deteriorated more quickly than expected.

Seismic properties: A study commissioned by the National Tile Roofing Manufacturers Association suggests that concrete and clay roof tiles withstand seismic forces far greater than the 0.8g (gravity acceleration) that the Uniform Building Code requires for other building components.

Costs: With the rising cost of petroleum-based products, such as asphalt shingles, concrete tile has become more comparatively priced. When life cycle costs and sustainability are considered, concrete tile is an economical choice. According to the nonprofit Committee for Firesafe Roofing, measured by life cycle costs in 2005, concrete tile averaged approximately six dollars per 100 square feet, compared to 22 dollars for wood shake roofing material, eight dollars for metal, or a comparable six dollars for asphalt or fiberglass heavy laminate shingles.

Design Considerations

Concrete tiles incorporate many design features for optimal performance. Special tile head lugs are used to engage the battens to which roof tiles are affixed, *assuring a seamless* fit among components. Weather checks are performed at the nose to reduce water intrusion. Interlocking side laps channel water off the roof and protect the underlayment.

An elevated batten system allows unrestricted water runoff that may occur due to condensation, broken tiles, or an unusually severe weather event, such as high winds or heavy rains. The batten system also promotes increased airflow under the tile and reduced penetration into the underlayment. Flashing maintains water flow on top of the tile, while containing and maintaining unrestricted water flow under the tile. Eave closures support the eave course in proper plane to the field tile. Weep holes are drilled to supplement proper drainage, and vents promote increased airflow.

In coastal areas with more severe weather, standard flashings are upgraded in strength with self-adhered or multi-ply underlayment, along with a two-component adhesive that expands to establish contact with both the underlayment and the bottom of the roof tile.

Structural Issues

Although concrete tile weighs two to three times as much as asphalt and fiberglass shingles, and about twice as much as wood shakes, most roofs are designed to allow for two layers of asphalt shingles, which is not necessary with concrete tile. As a result, depending on the project conditions, additional structural engineering to compensate for the weight of the roofing material may be minimal.

Basic design principles allow aesthetic and structural advantages of concrete tile and maximize efficiency. A wood frame load path for receiving concrete roof tile is built with a foundation, sill plate, stud wall, headers, a top plate, ceiling joists, and rafters. For a rafter span chart, the maximum weight a rafter span can withstand, possible required adjustments include purlins (horizontal members fastened perpendicularly to the underside of a rafter and braced to the bearing wall) and ties, all as part of system joining relevant components. Rafter span charts deal only with gravity loads and the support capabilities of the rafters to control deflection. When measured spans exceed the chart criteria, additional bracing is required.

After the rafters have been reinforced to prevent deflection of the load, attention must be shifted to the design aspect of load transfer. The easiest way to understand this concept is to picture a simple triangle and realize that the top two diagonal chords are the rafters holding the weight of the roof and the bottom point is the tie that keeps them from spreading apart. Ties can be standard ceiling joists or T-ties when ceiling joists are not possible. Ultimately, concrete roof tile can be installed on virtually any roof configuration.

Concrete tile, such as the Chestnut Brown Villa style topping this home has become a mainstay of larger high-end luxury homes.

Although concrete tiles can be made to work on steep roof slopes, more moderate roof slopes can achieve the same design effect while saving both construction materials and installation costs. For example, a 12:12 roof slope (or 45 degrees) compared to a 9:12 (75 degrees) roof slope achieves the same architectural intent, while saving approximately 15 percent in materials and 20 percent in installation costs. Proportionate savings would accompany lower roof slopes.

Although concrete tiles can be made to work on steep roof slopes, more moderate roof slopes can achieve the same design effect while saving both construction materials and installation costs.

Excessive use of multiple hips, valleys and offset eaves are effective when using roofing materials with limited depth and dimension. But they are not as necessary when using concrete roof tile. Cut-up roofs, those which are of unique shapes differing from standard rectangular forms, are more expensive because they require more cuts on field tiles and trim at transition points where a portion of tile ends, such as the edge or the top of a pitched room. Trim tile along the edges of these transition points is also more expensive to install than standard field tile.

Larger roof sections increase roofer efficiency. Designing roof sections to accommodate even tile coursing reduces cutting and lowers installation costs without compromising desired architectural elements.

Durability of Standard-Weight Tile

Concrete tile is a noncombustible roofing material; it's proven to be fire resistant. Additionally, the Universal Building Code requires that concrete tiles be able to withstand 50 cycles of freeze thaw and still maintain break strength (the amount of weight it can withstand upon initial testing). Concrete tile passes the freeze and thaws tests for clay, brick and structural material, as conducted by the American Society for Testing Materials (ASTM). This is an important quality not just in cold climates, where the tiles must withstand temperatures well below freezing for weeks on end, but also in regions or climates with wide swings between daily low and high temperatures.

Concrete tiles are also wind resistant. The material is wind tunnel tested by the ASTM to withstand winds of up to 125 miles per hour, an important feature for regions subject to tornadoes and hurricanes. Fastening options for concrete tile, such as nails, wind clips, screws, and adhesive foam, are tested to resist winds up to 140 miles per hour.

A study commissioned by the Tile Roof Institute suggests concrete and clay roof tiles withstand seismic forces far greater than the figure of 0.8 gravity acceleration the Uniform Building Code requires for other building components.

Concrete tile is also hail resistant. In 2005, the State of Texas Department of Insurance approved a new testing method for concrete roof tile developed in accordance with the Roof Tile Institute. In Texas and the greater Midwestern United States subject to annual hail season, the new Factory Manual 4473 will allow for reduced insurance rates for buildings with concrete tile.

In earthquakes, a study commissioned by the Tile Roof Institute suggests concrete and clay roof tiles withstand seismic forces far greater than the figure of 0.8 gravity acceleration the Uniform Building Code requires for other building components.

Beyond meeting the demands of certain extreme weather and climate conditions, concrete roof tiles must also meet several code requirements. According to the Uniform Building Code, the tiles must have enough transverse break strength, for example, to be able to withstand a load of at least 300 pounds placed on the center of the tile. In many areas of the country, concrete tile's durability will not only help protect the building physically, but can also contribute to lower insurance rates.

Moisture passing through the tile body must also be monitored on a regular basis. Code requires that the density of the concrete must be such that water cannot pass through the tile during a 24-hour test. Water absorption for standard weight tile should average between eight and 12 percent.

Concrete possesses ideal thermal and radiant properties, making it an attractive sustainable building choice. According to a 2000 study by the Florida Solar Energy Center, a concrete tile roof reduced the transfer of solar heat, or ceiling flux, by 48 percent compared to a black shingle roof. Much like a basement, it experiences more narrow temperature fluctuations.

Sustainability and durability are additional advantages of concrete tile. Since concrete tiles can last as long as 100 years, the material indirectly reduces construction waste because it has to be replaced less often than other roofing materials. Construction waste accounts for a sizable portion of total landfill space. Concrete tile also is not made with petroleum-based products, as asphalt shingles are, and therefore its cost may not be as vulnerable to oil price fluctuations.

Manufacturing Process

There are four basic ingredients for making tiles: sand or aggregates, cement, color or pigment for aesthetics, and water. These are mixed together to form a solid concrete material.

Not just any sand can be used for making concrete or concrete roof tiles. First, the sand must form to the correct grading specification. Grade refers to the size of different grains of sand. When sand is too coarse, the cement cannot fill the void space between sand grains. The effect on the final product is an open or coarse surface texture leading to increased permeability and higher potential for efflorescence. Sands that are too fine tend to produce tiles that are less strong and less durable than expected. These mixes require a high water ratio, increasing the chances of the grains' interlock not being straight (lock splay) or of surface bubbling, the presence of small bubbles or rings on the surface.

Sand must be chemically, mineralogically, and physically suitable. It must be free of contaminants such as chloride, which is present in marine sand, can interfere with the cement hydration, and may reduce long-term strength and durability performance. Physical properties of the sand, including shape, may also affect its suitability. Finally, the sand must be of consistent quality. When selecting aggregates, adequate reserves of sand must be available.

Once the raw materials have been selected, they are broken, crushed, sampled, and fed to a rotary kiln. The kiln typically operates at 2600 degrees Fahrenheit for the production of Portland cement. Heating to this temperature results in decomposition of the clay minerals and de-carbonation of the calcite, enabling the production of calcium silicates. This process makes the concrete stronger. Finally, the powdered cement from the kiln is cooled before milling to the required fineness. Gypsum is added to control its setting rate, producing cements for different purposes. These are referred to as Type I, II, III, IV, and V.

Type I Portland cement is known as common cement. It is generally assumed unless another type is specified. It is commonly used for general construction especially when making precast and precast, pre-stressed concrete that is not to be in contact with soils or ground water. Type II is known to have moderate sulfate resistance with or without moderate heat of hydration. This type of cement costs about the same as Type I. Cement is increasingly sold as a blend of Type I/II on the world market. Type III is known for its high early strength. Type IV Portland cement is generally known for its low heat of hydration. Type V is known for its extreme sulfate resistance.

Coloring and Curing

Coloring concrete can be done in two basic ways. Natural coloring consists of iron oxides, while synthetic metal oxides can be made from iron to make red, yellow or black pigments, from cobalt chrome aluminates to generate blue tones, or chrome oxides for green.

The concrete mix is fed into a tile-making machine, where it is extruded under high pressure into molds (to make various shapes and sizes of tile) that continuously pass through the machine, and immediately proceed down a conveyor belt to receive nail holes and surface treatments. The tiles are transported and collected into curing racks that are then moved into curing chambers for the initial cure prior to packaging.

The curing process accelerates the rate of cement hydration so that the tiles made are strong enough to be de-palleted (separated from the mold). The curing process also impacts other product quality factors affected by cement hydration, such as color variation, efflorescence, and moisture resistance.

It may look like slate, but this building's tiles are made of concrete too.

There are two types of cures: ambient and heated. After six days of curing, the results of these two processes are the same. The heated cure reaches a stable point much faster, sometimes in one day. For this reason, a controlled heating process is most prudent while tiles are in the curing chambers. This eliminates weather as a factor in curing in order to better assure consistency.

Curing also represents the difference (aside from basic raw materials) between concrete, clay, and natural slate roof tile. Chambers producing cured concrete roof tile reach controlled temperatures of 150 degrees Fahrenheit. Clay tile kilns produce peak heat levels between 2000 and 2200 degrees Fahrenheit. The lesser curing time indicates concrete's greater inherent strength. Natural slate is not manufactured and therefore subject to natural structural inconsistencies which may result in reduced durability. Concrete tile, on the other hand, is manufactured to help ensure a consistent product.

In some areas, particularly warmer regions not subject to severe cold temperatures, a slurry coating, consisting of cement, pigment, sand, and water, may be applied to the tile in the factory. The slurry coating must be mixed to specifications, and is then applied evenly over the tile to a thickness of 400 microns while the tile is traveling on its palette mold at a speed of 1.6 tiles per second.

Efflorescence

For a few months after their manufacturing, concrete tile may exhibit efflorescence, a natural process of water penetrating the capillary structure on the surface and extracting soluble salts from the tile body. Efflorescence is a temporary condition and does not impact the functional qualities of the tile. Deposits from the efflorescence process on the tile surface will wash away in rain or by cleaning once the supply of salts accessible to water is exhausted. The duration depends on the amount and cycle of rain the tile is exposed to.


Photo courtesy of MonierLifetile
Concrete tile can invigorate commercial buildings as well as homes.

Efflorescence can be reduced or eliminated by applying an acrylic sealer to form a continuous film over the tile surface. The sealer blocks the *migration of calcium* hydroxide to the concrete's surface, while allowing carbon dioxide to pass through to form a plug of calcium carbonate in the capillaries.

In addition to efflorescence, the appearance of the tiles may at first be affected by slight mismatches in color from different palettes during curing. When the roofing contractor assembles a roof load, tiles should be gathered from two or more palettes in order to blend shades and reduce grouping of shades.

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***archrecord.construction.com/resources/conteduc/archives/0512monier-1.asp***. To receive AIA/CES credit, you are required to read this additional text. The quiz questions below include information from this online reading. To receive a faxed copy of the material, e-mail info@rockymountainhardware.com.

AIA/ARCHITECTURAL RECORD CONTINUING EDUCATION Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Understand the qualities and design criteria for use of concrete tiles.*
- *Identify how climate conditions and code requirements impact the use of concrete tile roofs.*
- *Learn why concrete tile is considered an energy efficient and sustainable material.*
- *Analyze the structural issues relating to concrete tile applications.*
- *Explain how coloring and efflorescence affect use of concrete tile.*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below.
Go to the self report form on page 353. Follow the reporting instructions, answer the test questions and submit the form. Or use the Continuing Education self report form on *Record's* website—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. Natural coloring of the concrete tiles is done with:
a. Iron oxide
b. Cobalt chrome
c. Chrome oxides
d. Sulphur dioxide

2. The Uniform Building Code stipulates concrete tiles must be able to withstand a load placed on the center of the tile of at least how much?
a. 450 pounds
b. 32 ounces
c. 300 pounds
d. 500 kilograms

3. A study commissioned by the Tile Roof Institute suggests that concrete and clay roof tiles withstand seismic forces far greater than the 0.8 gravity acceleration that the Uniform Building Code requires for other building components.
a. False
b. True

4. To assure a seamless fit among components, tile head lugs are designed to:
a. Elevate the tile from the deck
b. Engage battens
c. Provide additional strength
d. Direct water away from the nail holes

5. Which of the following are features and benefits of concrete roof tiles?
a. Aesthetics
b. Durability
c. Energy efficiency
d. All of the above

6. A two-component adhesive expands to establish contact between the bottom of the roof tile and the:
a. Elevated batten
b. Underlayment
c. Undergarment
d. Shingle

7. A purlin is:
a. A framing member in a system that joins relevant components
b. A horizontal ridge beam
c. A horizontal member fastened perpendicularly to the underside of a rafter and braced to the bearing wall
d. Additional bracing required when measured spans exceed span chart criteria

8. When calculating roofing weights, how much does concrete roof tile generally weigh compared to asphalt shingles?
a. One third
b. Eight and a half times
c. Three sixteenths
d. Two times

9. A temporary surface condition affecting all concrete products, in which soluble salts rise to the surface, is known as:
a. Efflorescence
b. Effervescence
c. Permeability
d. Curing

10. Concrete roof tiles should undergo an annual visual inspection for maintenance, in addition to which of the following?
a. Defore a hail storm
b. During a high wind event
c. After an earthquake
d. After a period of high humidity

MonierLifetile
Changing the way people think about roofs.

Builders, architects, contractors and homeowners rely on the industry leader, MonierLifetile, for time-tested concrete tile roof solutions that add beauty and distinction to their properties. MonierLifetile roof tiles are available in a wide variety of colors and profiles to complement any architectural style or building application. Offering beauty and unmatched longevity, a MonierLifetile roof could possibly be the last roof your project will ever need. For information on MonierLifetile's innovative products and systems, please visit www.monierlifetile.com or call (800) 571-TILE (8453).

CIRCLE 102 ON READER SERVICE CARD OR GO TO ARCHRECORD.CONSTRUCTION.COM/PRODUCTS/

Designing Public Rest Rooms: Privacy is in the Details

Planning criteria address aesthetics, safety, maintenance, and sustainability

Provided by Hadrian

By Virginia A. Greene, AIA

The design of public rest rooms is essential to the success and function of all building projects. Among the most important design criteria are public health, privacy, safety, and welfare issues governing these spaces. Good planning, combined with lighting and ventilation, creates safe, clean, and comfortable public environments.

Large, high-traffic venues, such as airports, sports arenas, and theatres, rely upon efficient and functional public restroom design to accommodate significant numbers of people on tight schedules. Plumbing fixture counts for men and women, whether determined by codes, ratios, building owners, or design professionals, are critical factors that can result in effective traffic and circulation flow, or long lines of patrons at peak hours. Regardless of the project building type, location, size or scale, the success of public rest room design is in the details. When appropriately planned and specified, toilet partitions provide solutions for public health, safety, and accessibility.

Maintenance and Safety

Design criteria for public rest rooms must include practical maintenance solutions. All public rest room facilities are subjected to health department inspections to maintain health standards. Architects can specify internal central floor drains to collect water used in cleaning and maintaining "wet" spaces in public buildings, such as multi-plex theaters, where large numbers of people gather.

Most public facilities use toilet partitions in rooms with ceramic tile on floors and walls, and less frequently, on ceilings, thereby creating a continuous impervious surface to withstand frequent cleaning. Ceramic provides the best water resistance for all wall and floor surfaces in bathroom design. Specifying ceramic tile in wet zones also allows flexibility for introducing color, texture, and light to interior spaces. Tile borders, edge treatments, and color bands further enhance aesthetics and design options. The overall effect is a uniform surface for efficient cleaning and maintenance.

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Designing Public Rest Rooms: Privacy is in the Details** To earn one AIA/CES Learning Unit, including one hour of health safety welfare credit, answer the questions on page 334, then follow the reporting instructions on page 353 or go to the Continuing Education section on *archrecord.construction.com* and *follow* the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Discuss the aesthetic and functional elements of public bathroom design*
- *Analyze code requirements for handicapped bathroom design and accessibility*
- *Specify toilet partitions, hardware, and materials for public rest rooms*
- *Understand planning criteria when calculating the number of plumbing fixtures for men and women in public buildings*

Public safety is the primary design consideration in public rest rooms. Partitions protect the public from undue exposure, theft, and injury. Toilet partitions are usually found in public rest rooms, but can also be used as shower compartments in public facilities, such as gyms and health clubs. These partitions are subject to accessibility design standards for handicapped or challenged patrons, and to vandalism, graffiti, and surface-damage criteria.

Toilet Partition Panel Systems

Toilet partitions are made to be permanently affixed to a building. They are wall systems used primarily as privacy enclosures, which can be mounted or anchored to the floors and ceilings of public bathrooms. Standard toilet partitions subdivide public bathroom spaces in accordance with code requirements for safe exiting and handicapped accessibility, and are made of fire-resistant materials to meet fire code ratings. Most standard partitions made of metal have a one-hour fire rating. Although they are not defining fire separation walls, partitions create subdivisions, or individual compartments, within public rest rooms. The structural requirements for some toilet partitions demand free-standing, self-supporting wall supports, called pilasters or stanchions.

Fixture Counts

Determining the total number of fixture compartments per rest room depends upon the number of patrons and relevant code requirements. Plumbing fixture count for public toilet rooms is determined by the total number of seats in an assembly building, such as a building with auditorium seating. For design purposes, total seat count is distributed as 50 percent male occupants and 50 percent female occupants. Based on the numbers calculated for each gender, the architect follows governing codes, which often use a ratio basis for factoring the minimum number of toilet-room fixtures required.

Determining the total number of fixture compartments per rest room depends upon the number of patrons and relevant code requirements.

Typically, twice as many water closets, or toilets, are provided for females than for males. In addition, a urinal can be substituted for water closets for up to one half the total required number of fixtures for males. Panels surrounding urinals are typically either wall or floor mounted systems, and are available in washable materials, such as metal, plastic, or composites. Specifications may also address the lateral stability to withstand 40 pounds of pressure per square foot, and frequent use.

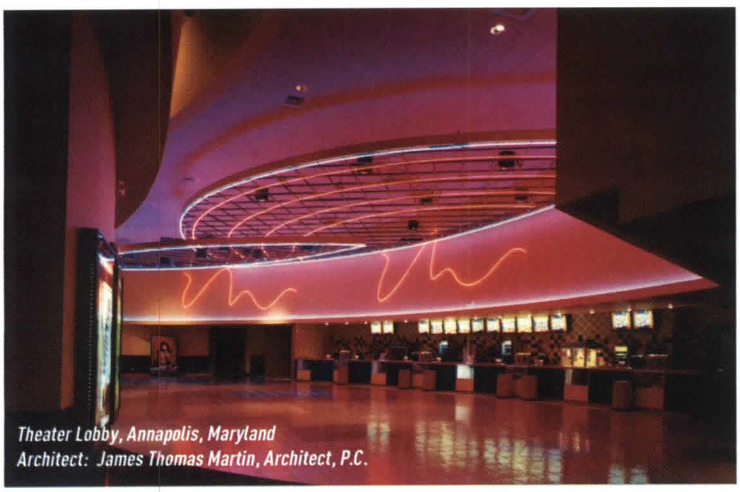
Privacy, Health, and Safety

Public rest rooms should be clean, safe environments. Designing private bathroom spaces with partitioned toilets requires attention to privacy, security, health, and sanitary conditions. Public and private areas may be clearly defined by the location of toilet partitioning systems. Aligning the toilet and sink areas opposite one another using toilet partitions as space dividers separates public and private zones. Successful public spaces prioritize user comfort, ease of movement through the space, cleanliness, and the brevity of time required to use the facility.

Public rest rooms should be clean, safe environments.

Theater design is a case in point. "In the movie theater and exhibition industry, the ability to move people is very similar to the approach applied at Disney properties. Movie show times are staggered to control and mitigate ingress and egress of hundreds of moviegoers, or patrons. Convenient location, disbursement of facilities throughout the theater complex, and the number of rest room facilities for men and women follow the same theory," said James T. Martino, AIA, principal of James Thomas Martino Architect, P.C., in Port Washington, New York.

The use of toilet partitions to sub-divide a bathroom facility can affect air circulation. If not properly planned, poor air circulation in a bathroom space with toilet partitions can cause moisture pockets and air circulation barriers. The building design must provide appropriate mechanical systems, which require careful review and coordination of architectural, mechanical, electrical, and plumbing systems to ensure proper ventilation. The architect reviews toilet partition shop drawings from the manufacturer and coordinates the design with mechanical systems for air and moisture control in wet zones. Architects should review the location of fresh air and return air ducts in conditioned bathroom facilities, as these systems may impact the location of toilet partitions, panel



Theater Lobby, Annapolis, Maryland
Architect: James Thomas Martin, Architect, P.C.

heights, quantities of toilet partitions, frequency of use, and proximity to heating, ventilation, and air conditioning (HVAC) systems. When these design factors are well orchestrated, bathroom areas in public facilities provide comfort and optimal airflow.
Public rest rooms should be safe spaces. When planning high-traffic public areas, architects must consider the possibility that individuals may try to damage, destroy, or vandalize the finishes, furnishings, and equipment in a space. Toilet partition design must address minimizing damage from vandalism, theft, and defacement.

These factors impact the design for secure closing mechanisms, variable partition heights, finish surfaces, and panel spacing. Various surfaces may be specified to provide durability, such as a washable, stain-resistant, painted-on finish for metal panels that addresses ease of maintenance due to vandalism. Continuous hinge-side fillers enhance privacy by visually sealing the gap between the compartment door and the vertical support, or stanchion. A full height continuous stop and keeper eliminates the sight gap on the stop side of the door, and protects against vandalism because doors cannot be "racked," or bent, by pulling on the top corner of the door, as can occur with a single-point stop and keeper.

Toilet partition design must address minimizing damage from vandalism, theft, and defacement.

Design of High Traffic Areas

Toilet partitions must be strong and durable, to withstand daily abuse caused by normal traffic, including dents to scratches. When specifying toilet partitions, architects should consider materials that are compatible with peak demands of high traffic and frequency of use.

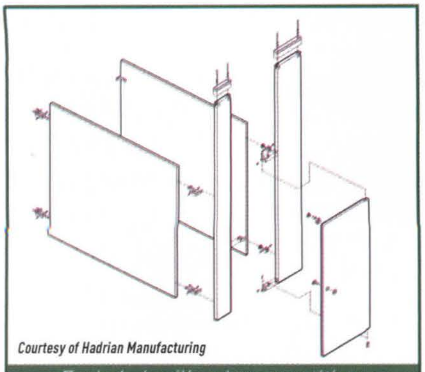
The huge volume of people using public bathroom facilities at a sports stadium can be as many as one quarter of the seating capacity during a timed break in the action. Building owners expect architects to consider these volumes, along with cost-effective facility maintenance. Public rest room facilities are subject to daily maintenance procedures to meet health department standards. Employees are required to wash their hands after using the facilities, and standards govern daily sanitization and bathroom cleaning. Toilet partitions, which are ceiling mounted or hung from the structure above, allow open floor space, better accessibility, and maintenance flexibility for mopping and cleaning each partitioned toilet area. Ideally, toilets are wall mounted for the same reasons, to save time and money, and to provide clean environments.

Hardware

During a concert performance intermission, especially at older theaters, it is not unusual to see lines of women waiting to use the rest rooms. Appropriate rest room design results in better fixtures, spatial relationships, and more individually partitioned toilet compartments. In older public rest rooms, the owner often must hire a monitor to expedite the flow of people. While not ideal, this step can ease the pressure of partition use and provide a measure of safety.

Some toilet partitions contain special color-coded indicator latches that signal if the stall is occupied, as used on commercial aircraft. These indicators consist of slide hardware in the latch mechanism exposing a red bar when the stall is occupied, and a green bar when unoccupied.

The simple style and lines of toilet partitions can be emphasized or streamlined through hardware details. Zinc, steel, and aluminum are materials used in hardware for toilet partitions. Heavy traffic can cause undue wear and tear on the toilet partition anchors. Panels should be durable enough to function well and withstand daily use in all public facilities, such as airports, which have high traffic volumes, and require frequent hardware checks and adjustments. Even though these areas must accommodate space for packages, luggage, and carry-on baggage, rest rooms are often designed with limited space to access these items.



Courtesy of Hadrian Manufacturing

Exploded ceiling-hung partition.

Higher panels and appropriate hardware details contribute to safe toilet compartments, thereby preventing theft or the ability of an individual to reach underneath or overhead. This type of protection is often used within public rest rooms at train stations, airports, and bus terminals, where passengers are laden with packages and may be easily distracted. Most toilet partitions have internal latches and locking mechanisms, which are easy to use and prevent getting locked into a stall. Longer panels are mounted for more coverage and protection. Some building owners have posted signage in rest rooms, indicating that the public is

The Numbers Game

Hadrian Manufacturing

First door on left: Out-swinging handicapped toilet partition doors.

Designing public rest rooms to accommodate a large volume of people in a short period of time is challenging. The user time frame is estimated at a minimum of two to three minutes per person, or more. The traffic involved in off loading people from buses, airplanes, trains or other forms of public assembly exiting, such as that experienced at a movie theater, when one movie ends and another begins, raises issues about whether rest room design varies significantly for men and women. Either way, toilet partition material standards are gauged to meet the highest traffic needs. Wherever partitioned toilet panels are used, whether in an airport terminal, train station, hotel or sports facility, panel systems should be specified to best fit the design criteria and space program.

At major-league sports facilities, with seating capacities for thousands of fans, this issue is critical. "Project design teams will meet or exceed the code-required numbers of plumbing fixtures. Priorities include plans for numbers that do not cause long waits at the toilet rooms for either gender," states Gina Leo, media relations representative at The HOK Sport Companies, in Kansas City, Missouri. Even while there are design pressures on some venues for increasing revenues, architects must consider how rest room configurations in premium seating areas, and luxury boxes, increase the level of amenities. The experience architects have had in successful venues suggests that the 2 to 1 ratio is not always the best tool to apply, as it tends to result in too few men's fixtures being provided in order to make room for the very large number of women's fixtures required to meet the ratio.

In some stadium and arena projects where the 2 to 1 ratio has been applied, the unreasonably long lines at men's rooms, rather than at the women's rooms, have resulted in many upset men. "Planning the appropriate fixture ratios for each plumbing fixture, men's and women's, to minimize waiting, has proven more successful than simply applying a ratio between the number of fixtures for men to the number of fixtures for women," Leo adds.

Rest Room Design: Code Ratios and Timing are Key Factors

Architect J.K. Roller Architects

Hoyts Cinemas, Philadelphia, PA. Exterior view at night.

Architect J.K. Roller Architects.

Hoyts Cinemas, Philadelphia, PA, Bathroom Interior. Toilet partitions separate public sink areas and private toilet areas in theater rest rooms.

Public rest room design must interpret code restrictions, as they relate to creating the ideal layout for men's and women' facilities. In theaters, which are classified as assembly use, architects must meet codes for all public spaces. Design factors drive the numbers of toilet partitions required. The code, rather than the client or the architect, determines the number of individual enclosed water closets in rest room design.

"Rest room use occurs primarily upon arriving at the theater or leaving after a movie is over. With this in mind, toilet rooms are located adjacent to the lobby, and in the most likely path of travel when exiting the building. Time factors into rest room use, as women often require more time than men. The number of water closets provided should address these peak demands," said Paul Georges, AIA, of J.K. Roller Architects, Philadelphia, Pennsylvania.

While some designers may believe that water closet ratios should be higher, such as twice as many water closets for women than for men, the code establishes criteria to calculate these requirements. In the design for assembly occupancies A-1, the International Building Code (IBC) states that for every 125 male occupants, one water closet, or enclosed partitioned toilet fixture, should be provided. The requirement is increased to one water closet for every 65 female occupants.

For example, consider a movie theater designed with a total of 2,000 seats. When divided equally, 1,000 occupants count for the men's room calculations and 1,000 for women. In the men's category, for every 125 of 1,000 occupants, one water closet is required, for a total of eight toilet fixtures. For women, every 65 of 1,000 occupants requires one water closet, for a total of 16 fixtures. The IBC allows up to two-thirds of the required water closets for men to be substituted with urinals, which are typically screened.

When designing for the numbers, the 2 to 1 ratio method isn't the rule. "Prior to the adoption of IBC, the Pennsylvania Code recognized the delays women faced with the use of rest room facilities in public places," said Georges. The Rest Room Equity Act of 1990 required that the toilet fixture count for women be a minimum of twice the amount of fixtures for men. This requirement was commonly referred to as "potty parity." With the adoption of IBC, depending on the actual occupant count, the fixture ratio can be less strict.

responsible for their own property. This signage is often integrated into the design.

Handicapped Accessible Design

The Americans with Disabilities Act (ADA) is a federal civil rights law that ensures people with disabilities have equal access to goods and services. The law applies to most types of facilities and public rest rooms, regardless of local building codes. (Figure 4) While wheelchair accessible bathrooms are required in new facilities, not all accessible toilet partitions are designed for the required five-foot wheelchair turning radius.

All new public *bathroom details* must plan fixtures and partitions to accommodate the wheelchair-turning radius within a partitioned space. Some designs provide large accessible stalls, and standard access compartments with out-swinging doors clearing 32 inches, for direct wheelchair access to wall-mounted toilet compartments without turning space. These designs have accordingly increased the depth of each stall from 48 inches to 56 inches in depth. By comparison, floor mounted toilets require 59 inches for accessible design.

First door on left: Out-swinging handicapped toilet partition doors.

It is important to note that handicapped-accessible partitions and stalls are not interchangeable with standard partition stalls because they accommodate specific accessibility needs. These unique stalls therefore have specific design criteria with a separate set of standards within the toilet partition system. For example, toilet partition door hinges are out-swinging to meet code standards for 32 inches clear when open at 90 degrees. Handicapped accessible partitions must provide mounted grab bars at 33-inches to 36-inches above the finished floor material. Horizontal grab bars are to be mounted on the nearest sidewall and behind the toilet.

Architects specify hardware designed for accessibility, but should always adhere to the latest ADA specifications. Requirements can vary by region and state. Accessible hardware includes lever-type door handles, which must be operable without a twist or turning movement. Additionally, standard ADA-compliant hardware, with safety release latches in case of an emergency, should also be considered. According to Martino, theater design is increasingly including the convenience of an additional, separate ADA rest room facility, with one toilet and one sink, thus allowing the wheelchair user to be accompanied by someone for assistance. "This concept allows ease of moving the patrons within the theater complex," Martino observes.

The use of multiple handicapped accessible direct access partitions in a bathroom provides everyone a more accessible experience. When the same accessible hardware is used uniformly throughout the design, such as lever-type handles, users may experience greater ease in using the rest room, such as opening and closing a partition door if their arms are full of packages, or if they are carrying a child into the bathroom. Also, providing access and orientation for a person entering a rest room facility is an important design objective, which can be achieved by the layout of the space, and by use of accessory elements for each application. Toilet partitions can typically be customized from a selection of options.

Standard Toilet Partitions and Urinal Screens

The type of metal toilet partition that architects generally specify has 58-inch-high doors and panels and is "headrail braced," which is also referred to as 'floor mounted-overhead braced.' This standard height for metal toilet partitions is *also available in ceiling*-hung, floor-mounted, and floor-to-ceiling styles. Floor-to-ceiling mounted partitions and screens are the strongest and are specified where extra durability is required. There are several choices affecting cost, such as mounting and material expense.

Toilet partitions should be designed and specified for privacy, security, design flexibility, use of quality materials, and ease of installation. The same design standards apply to urinal screens, which are used as visual barriers only, and are not required to enclose the urinal space. The installation and alignment of these screens is key to their successful use.

Toilet partitions should be designed and specified for privacy, security, design flexibility, use of quality materials, and ease of installation.

A honeycombed core, or corrugated internal panel structural design, improves the strength and impact resistance of metal toilet partitions. Some industry standards have developed over time, such as concealed hinge mounting for better appearance, and higher-quality hardware. Continuous hinge partition doors and flange mounting of screens are simpler in their design and easier to clean. Hinges designed for high use are able to take asymmetrical loading situations, such as packages hung on coat hooks on the backs of stall doors. The metal plates at the foot of partition stanchions or pilasters, which are referred to as shoes, protect and conceal the floor and ceiling mounting hardware. This can give a clean line to the design and increase washable surfaces, which do not collect dirt and debris.

Variety of Styles

There are many different types of partitions, including square edge and arched, or curved designs. Toilet partitions are offered in several styles, including enclosures where the standard partition height is 58 inches high, with doors and panels mounted 12 inches above the finished floor material, and 14 inches above the finished floor material for standard plastic doors and panels. Partitions are also designed full height for the most privacy and security, as vandalism includes using the toilet fixture as a stepping platform to gain access to another partition from overhead. These secure systems are 64 inches-high material with a six-inch gap from the bottom of the door to the finished floor material. These are also available with 72-inch doors and 76-inch panels. Some highly reflective panel and ceiling finishes are not desirable, as they may compromise privacy.

Standard toilet partition systems are manufactured to save time and money because they can be efficiently shipped and installed relatively quickly. In high-traffic areas, long-term use of these systems demands that toilet partitions be interchanged and upgraded over time. Facility managers often renovate highly used or outdated public rest rooms with a new design, material change, or panel replacement. The flexibility and workability of metal toilet partitions enables replacement of damaged components, providing significant cost savings, compared to purchasing and installing all new toilet partitions.

Material Strength and Durability

Heavy use can cause partitions to rack and doors to pinch when opening and closing. Proper mounting and hardware is key to preventing this type of damage. Headrail bracing is recommended in heavy-use areas, such as schools and industrial settings. The top rail is designed with an anti-grip feature to deter climbing.

Most partitions are adjustable with floor mounting hardware, able to accommodate sloping floors to floor drains. As concrete sub-floors are most often involved in these installations, architects should look for adaptable product designs. Architects also periodically review available alternate panels for replacement and alternate color selections. Generally, panels are developed to withstand impacts and offer dent resistance, depending upon the panel construction. Standard metal panels are typically one inch thick and constructed with an internal cell structure for added strength, while others are constructed of solid material. ■

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***http://archrecord.construction.com/resources/conteduc/archives/0512hadrian-1.asp.*** To receive AIA/CES credit, you are required to read this additional text. The quiz questions below include information from this online reading. To receive a faxed copy of the material, call Technical Glass Products at 1-888-397-FIRE (3473).

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CONTINUING EDUCATION Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Discuss the aesthetic and functional elements of public bathroom design*
- *Analyze code requirements for handicapped bathroom design and accessibility*
- *Specify toilet partitions, hardware, and materials for public rest rooms*
- *Understand planning criteria when calculating the number of plumbing fixtures for men and women in public buildings*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 353. Follow the reporting instructions, answer the test questions, and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. What toilet partition mounting standard provides the best maintenance flexibility?
a. Floor mounted
b. Ceiling mounted
c. A combination floor and ceiling mounted
d. Unmounted

2. What are the most important issues for the architect in the design of toilet partitions for public rest rooms?
a. Using extruded steel tubing
b. Strength, durability, and low maintenance
c. Health, safety, welfare issues
d. Maintenance schedule

3. What is the best material for water resistance in bathroom design?
a. Plastic or composite panels
b. Perforated steel panels
c. Ceramic tile
d. Insulation

4. What part of the toilet partition panel system is not interchangeable?
a. Handicapped-accessible stall
b. Panel door heights
c. Door latches
d. Hinges

5. What organization represents the industry on environmental building matters and advocates change in the way buildings are designed, built, and maintained?
a. Leadership in Energy and Environmental Design
b. American Medical Association
c. International Building Code
d. United States Green Building Council

6. Toilet partitions are usually found in public rest rooms, but can also be used as shower compartments at gyms and health clubs.
a. True
b. False

7. Materials chosen for panel durability, like solid plastics, provide the best sound absorption.
a. True
b. False

8. Public rest rooms should be designed only for privacy.
a. True
b. False

9. Toilet partition types include square edge, arched, or curved designs.
a. True
b. False

10. Brushed metal surfaces for toilet-partition panels is preferred where scuffing or marking the surface is a concern in high-traffic areas.
a. True
b. False

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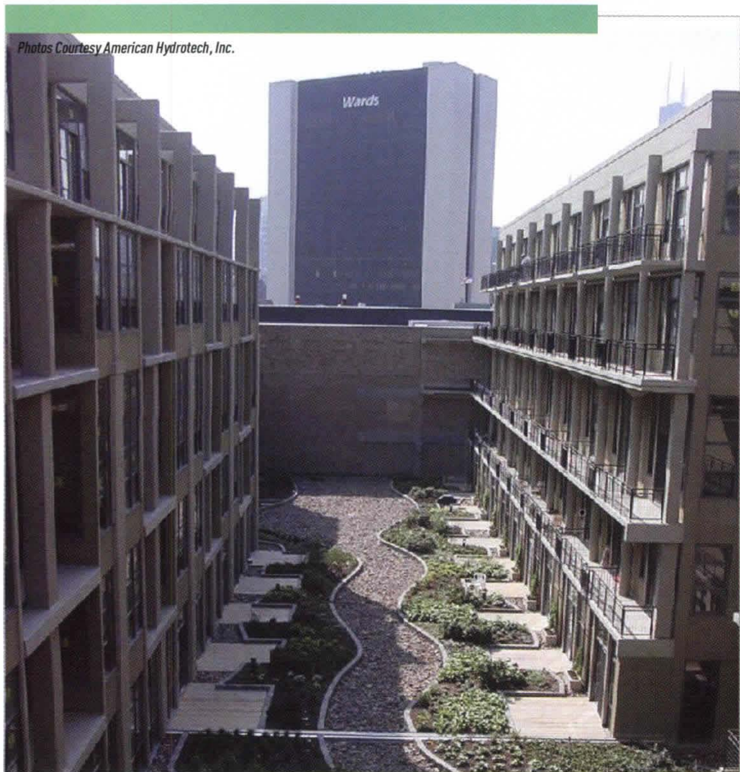
Designing with Green Roofs: Maximizing Sustainability and Stormwater Management

Photos Courtesy American Hydrotech, Inc.



900 N. Kingsbury (Domain Lofts at eport) Chicago, Illinois
Architect: Pappageorge Haymes Limited
Images of the installation of this green roof on the top on an existing roof deck between two interior bays. The roof was retrofitted by the architects and provided with insulation and a seamless membrane. The garden and walking paths create a secret garden for residents who live above busy Chicago streets.

New urban roof top gardens lower energy costs and increase environmental benefits

Provided by American Hydrotech, Inc.

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Designing with Green Roofs: Maximizing Sustainability and Stormwater Management.** To earn one AIA/CES Learning Unit, including one hour of health, safety, welfare credit, answer the questions on page 339, then follow the reporting instructions on page 354 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify the components of a green roof.*
- *Describe how green roofs help with stormwater management.*
- *Analyze green roofs as part of your environmental strategy.*

By Celeste Allen Novak, AIA, LEED AP

Ten stories above the Lake Michigan campus, atop Loyola University's newest learning lab in Chicago, is a rooftop prairie garden, planted on eight-inch soil beds. This urban oasis of tranquility provides a place where birds nest, amid a green outdoor environment. The Michael R. and Marilyn Quinlan Life Sciences Education and Research Center, designed by architects, SCB - Solomon Cordwell Buenz, provides stormwater detention, improves water quality, reduces the heat island effect of the city, and increases the life of the roof. Renee Euler, ASLA, landscape architect and designer of this green roof says, "It's a great view. It's a unique place for a prairie to be living and it has the potential to spread the seeds of native plants across Chicago."

These secret gardens, hidden from general view, and some very public green roofs, are a growing new trend in sustainable design and stormwater management. Green roofs maximize the buildable area of a project site and provide new places for people to go outdoors in an urban environment. Owners receive value from architects and design professionals who understand how to design, plant, specify, and construct green roofs.

Roofs are designed to keep rain and snow out of and away from a building, and support mechanical equipment. Roofs keep buildings dry and prevent heat loss. Traditional flat roofs are often unsightly, add little to building aesthetics, and represent a landscape of potential opportunities for designers. They add to the hard surfaces of the urban landscape or building site, and require stormwater mitigation.

A green roof or garden roof is a high-performance, environmental statement. Green roofs include many of the same components as conventional roofs, including insulation, waterproofing membrane, ballast, and flashing, but also contain components to provide moisture retention/drainage as well as a growing media to support the plants. building performance standards.

Types of Gardens on Roofs Require Programming Decisions

Programming a building requires knowledge of how it will be used. Green roofs can support the weight of soil, rain, snow, and in many cases, pedestrians, on top of an engineered roofing system. Manufacturers typically provide two categories of garden roofs: intensive roofs and extensive roofs. Each type of roof has different maintenance, structural, and performance criteria that must be evaluated.

Intensive Green Roof Benefits

Intensive garden roofs can be pedestrian-friendly, with walking paths, plants, shrubs, and even trees. Soil depth is determined by the programmed activity to occur on the roof. The cost of supporting pedestrians, and saturated soils, is countered by the benefits of adding additional usable tenant areas. In addition, intensive roof gardens provide new areas for infiltration and storage of stormwater.

In 2004, according to the City of Chicago Department of the Environment, more than 80 municipal and private green roofs, totaling over one million square feet, were in various stages of construction. In November 2005, spokesperson Connie Buscemi of the Chicago Department of Planning and Development said that Chicago had over two million square feet of green roofs in the city. "Chicago has become the model for meshing green roofs with development and the environment." The city encourages green roofs to be added to industrial buildings as well as single family houses by providing grants and assistance programs to developers.

Chicago initiated a program based on the principal that adding plants and trees to the urban fabric reduces Urban Heat Island effect. Cities are hot, full of heat-storing pavement. More trees and plants in a city can change the temperature and decrease the cost of air conditioning. The City of Chicago claims that it saves almost $3,600 annually from its green roof on City Hall roof through energy savings. The associate architect on this Chicago landmark is William Worn Architects and the rooftop design, completed in 2001 by Conservation Design Forum. The city is monitoring the green roof on the Chicago City Hall and tests show that when the air temperature is ninety degrees Fahrenheit, the green roof temperature is also ninety degrees, whereas the asphalt roof on the adjacent building is one-hundred and sixty degrees. Continued studies of green roof projects in the city are proving the case for green roof installations.

The City of Chicago's Department of the Environment began to promote green roofs in the mid-1990s. They provided grants for roofs, such as one for Schwab Rehabilitation Hospital, designed by Stephen Rankin Associates, to reduce the heat island effect. In July 2004, U.S. News & World Report named Schwab as one of the top U.S. hospitals, citing the therapeutic environment of the unique rooftop garden as one of the reasons.

Photo Courtesy American Hydrotech, Inc.

Assembly of Intensive Garden Roof.

David Rahija, Schwab's Director of Inpatient Therapy, is excited by this thriving garden, completed in 2003. He says "The garden is not only a place for patients but also a place for staff to relax." Master Gardeners, a volunteer gardening program, has volunteered to assist with plant maintenance. Above the roof membrane system, some of this roof is paved with a highly reflective concrete paver on pedestal walkway. The roof has deep planting beds, trees, and a flowing stream built up above the roof deck, accessible from the therapy rooms. Patients in wheelchairs can plant flowers in wheelchair accessible flowerbeds. Planting, weeding, and watering improve motor coordination, and manual dexterity. Therapists have designed programs for sensory stimulation and for learning relaxation techniques. Staff and patients appreciate the ability to go outside. Patients are provided with a safe outdoor space, where therapists use horticulture therapy to heal and restore well-being. This verdant garden grows benefits beyond initial costs, through spiritual healing and environmental benefits for patients and caregivers.

Extensive Garden Roofs are Worth the Effort

An extensive garden roof is usually much lighter and thinner than the intensive roof. Since it is typically not intended for additional usable space, developers question whether it is worth the effort. As land values rise, developers need to maximize building footprints. Small sites and large parking requirements leave little room for stormwater storage. The usual solution is to bury large storage tanks under the pavement for storage and filtration or to direct all stormwater to city storm systems. Shrinking stormwater infrastructures have placed more fees on developers, thereby encouraging green roofs as viable solutions.
"The more green roof you put on, the less stormwater you have to put somewhere else,"

explained landscape architect Cheryl Zuellig, ASLA, of JJR, in Ann Arbor, Michigan. Research studies at the Russell E. Larson Agricultural Research Center by Penn State University quantified a 50 percent reduction in runoff from a three-and-one-half-inch green roof. Continued studies are proving the stormwater retention of green roofs in many climates, different soil thicknesses and the type of plants. Green roof providers will help design professionals calculate the amount of storage available by design on a roof, based on climate data and required local stormwater codes.

Municipalities determine rainfall in many ways. The quantity of rain is calculated by quantifying the average rainfall, as well as the frequency and magnitude of a storm event. The most common criteria for rainfall are the amount recorded in a 100-year storm. This is defined as the amount of rainfall that has a one percent chance in any given year of being equaled or exceeded. Building codes require that developed properties should minimize stormwater run-off onto other properties, or into storm sewers. Washtenaw County, Michigan is one of many municipalities to research new stormwater infiltration systems. They are waiting for the research data to confirm what many Europeans already know: green roofs are an effective stormwater mechanism and will lead to a decrease in the cost of municipal infrastructure.

Green roofs can solve this problem, if designers understand the trade-offs involved for stormwater detention. Rainy Portland, Oregon is statistically only slightly wetter than Michigan. The difference in Portland, which allows designers a one-to-one trade-off for green roofs as stormwater detention, is that the typical storm event consists of light rainfall that falls over a longer period of time. In Michigan, a storm will flood the storm sewers quickly, requiring a larger storage capacity to accommodate potentially larger flood storage. A typical roof system in Portland can be more shallow than a roof system in Michigan.

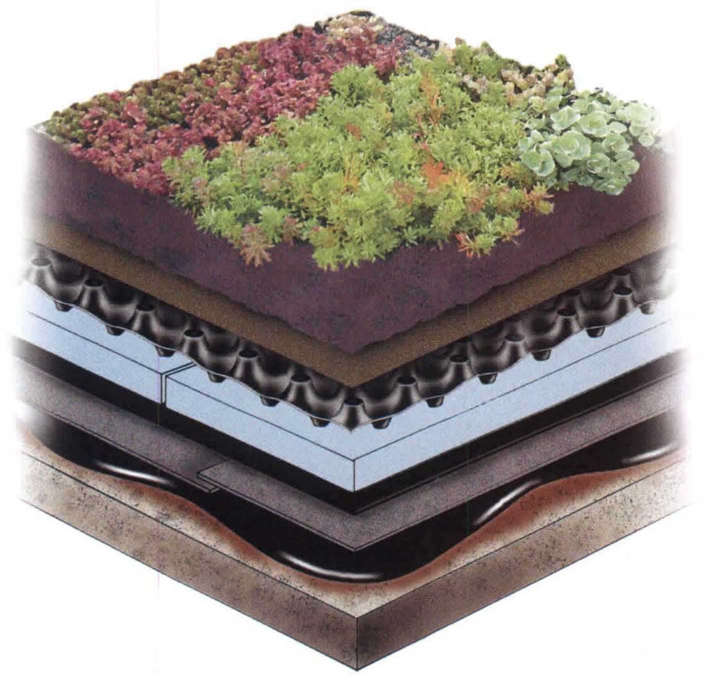
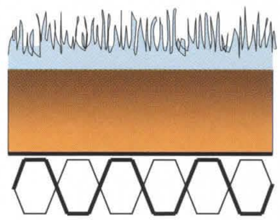


Photo Courtesy American Hydrotech, Inc.

Assembly of Extensive Garden Roof.

Green Roofs

Extensive - Green Roof Assembly (min. thickness)



	Weight (lb/sq.ft.) Dry	Wet
Extensive Soil (3")	14.0	18.0
Drainage/Retention	0.3	0.9
	14.3	18.9

Courtesy American Hydrotech, Inc.

The rooftop garden at JBG Companies in suburban Maryland is an example of an extensive roof garden designed for storm water management. The site was in a community concerned with impervious surfaces and rising taxes. One of a cluster of buildings, Woodland Park One, was built on a site that had been completely paved. Jef Fuller, AIA, managing principal of DNC Architects, Inc., realized he had an opportunity to solve a stormwater problem and increase the value of the property to the developer.

In Maryland, if an architect can increase the area that can absorb rainwater by 20 percent beyond the existing development footprint, then there is a waiver of one-to-one per area for stormwater requirements. For Fuller, this meant that the building area would be increased if he could place the stormwater detention above ground, instead of burying it under the parking area. Calculations proved that the costs were identical if he put a green roof on the building, instead of burying the stormwater in an underground tank. Additionally, the green roof had the advantage of being part of the viewscape for office workers in the higher buildings, which were in the next phase. The roof was completed in 2003 and requires no irrigation, and maintenance is minimal.

Fuller demonstrated to his client, JBG, and to Montgomery County authorities that the green roof would decrease the site's impervious area from 88 percent to 40 percent. Through his calculations, the owner saved permit time, reduced underground storm storage tanks, and complied with Maryland's Smart Growth initiative for green roofs.

The Pieces Must Fit Together

The Hanging Gardens in ancient Babylon, New York City's Rockefeller Center Plaza, and earth-bermed houses of the 1970s, are built-up roof gardens using conventional heavyweight soils. New technologies provide architects with interrelated roof components, creating a lightweight viable living roof by design.

The most common deterrent to adding a green roof is the cost of the additional structure required to support the roof load. Jeremy S. Edmunds, Assoc. AIA, P.E., LEED-AP, project manager at Brownfield redeveloper Cherokee Northeast, in East Rutherford, New Jersey states, "We haven't built a green roof yet, but are studying them for several projects in the Northeast. If waterproofing and structural loading concerns are addressed, we feel green roofs will turn heat island eyesores into welcoming gardens."

Green roofs add weight, or dead load, to the roof of a structure and must be factored into its design. Besides the weight of the roof membrane and insulation, the weight of the green

Staten Island Ferry Terminal—St. George Terminal, Staten Island, NY • Architect: New York office of Hellmuth Obata + Kassabaum
This one-quarter acre extensive green roof provides rainwater collection for irrigation and stormwater retention.

roof components, growing media (soil), and plants must be taken into consideration. Of these, the soil weight is typically expressed as a saturated or wet weight. Some extensive green roofs can weigh little more than a traditional roof with ballast; however this weight can increase substantially as the thickness of the soil is increased to accommodate the wider variety of plants that can be placed in an Intensive green roof. The soil for a green roof can weigh between 5.5 to 7.5 pounds per square foot per inch of depth (wet or saturated weight), so on a typical extensive green roof, a three-inch depth of soil would add 16.5 to 22.5 pounds per square foot. This spread in weight is largely dependent on the composition of the soil, and can vary between green roof providers.

The Guidelines for the Planning, Execution and Upkeep of Green Roof Sites, also known in Germany as the FLL standards, is the international standard for green roofs. For 35 years, Germany has been greening its roofs, and this technology is now being used in the U.S. New building codes are being developed for green roofs and testing standards are being written by the ASTM International Green Roof Task Group.

Green Roof Resources

Green Roof Resources
U. S. Green Building Council. http://usgbc.com

PENN State Center for Green Roof Research.
http://hortweb.cas.psu.edu/research/greenroofcenter/

City of Chicago. http://egov.cityofchicago.org/city/

Green Roofs for Healthy Cities:
Your Green Roof Infrastructure Industry Association
http://www.greenroofs.net/index.php?option=com_content&task=view&id=18&Itemid=30

ASTM.
http://www.astm.org/cgibin/SoftCart.exe/DATABASE.CART/WORKITEMS/WK575.htm?L+mystore+kpnj0867+1085198469

The Greenroof Directory.
http://www.greenroofs.com/resources.htm

A client once phoned Frank Lloyd Wright to complain about a leaking roof over their dining room table. "Move the table," he said. Some owners may initially balk at the idea of a green roof because of a past unfortunate roof experience. Most owners want to see a roof drain completely and as quickly as possible, and the idea of actually retaining water within a green roof assembly is a foreign concept to most. Of the various components that make up a green roof, there is none more important than the roof membrane. No matter how great a green roof looks, if it leaks, the owner will not be happy. There are a number of roof membranes and assemblies available, including: built-up, single-ply, *asphalt prefabricated* sheet, and fluid applied, just to name a few. Not every roof membrane or assembly is designed to be buried beneath a green roof assembly, in a continuously wet environment, so it is critical that the membrane manufacturer be consulted to insure their product is up to the task.

The ideal membrane for a green roof assembly should have several attributes. The membrane must be capable of performing in a wet environment, long lasting, bonded to the substrate (making it easy to locate and repair damage if it occurs), monolithic or seamless, easy to detail, installed by an authorized trained applicator, and fully warranted. One type of roofing membrane which has performed well, with a successful 40 year track record in buried wet applications is a fluid applied rubberized asphalt membrane. This type of membrane is applied in a fabric reinforced assembly 215 mil thick, directly to the substrate, and is monolithic, and ideal for green roof applications.

Vegetation-free zones are typically incorporated around a building's perimeter edge, at drains and at other penetrations through the roof. These areas typically consist of a 12- to 18-inch-wide path of stone or concrete pavers, and protect the roof flashings from the plants roots, as well as provide ease of access to the flashings (if ever needed), a fire break, and wind uplift protection. Green roofs installed in high wind areas and on taller buildings need to be designed to accommodate the specific wind uplift forces on these roofs, especially at the corners and perimeter edges. The vegetation-free zone in these cases must be enhanced in order to accommodate these forces.

Roots are Contained by Barriers

Whether planting smaller grasses or larger shrubs, all plants have roots. The balance between protecting the membrane from damage and promoting healthy root growth and spread (not confining or killing roots) is the primary goal of a root barrier. Root barriers can vary depending on the type of plants. For species with aggressive root systems, contractors can lay asphaltic sheets with an embedded repelling agent or heavy duty plastic sheets with taped or overlapping seams to prevent root penetrations. For smaller plants with less aggressive root systems, thin polyethylene sheets are installed, again overlapped with seams. ■

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***http://archrecord.construction.com/resources/conteduc/archives/0512american-1.asp***

To receive AIA/CES credit, you are required to read this additional text. For a faxed copy of the material, e-mail American Hydrotech at info@hydrotechusa.com

AIA/ARCHITECTURAL RECORD
CONTINUING EDUCATION Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify the components of a green roof.*
- *Describe how green roofs help with stormwater management.*
- *Analyze green roofs as part of your environmental strategy.*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 354. Follow the reporting instructions, answer the test questions and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. What is the most important element of a green roof?
a. A quality membrane designed for a wet environment
b. Inspection chambers
c. 18-inch vegetation free zone
d. Insulation

2. Plants should be selected based on which criteria:
a. Size
b. Root system
c. Drought resistance
d. All of the above

3. Intensive green roofs are:
a. Always 3-inches thick
b. Low maintenance
c. Require no irrigation
d. Pedestrian friendly

4. The weight of an extensive green roof is calculated by:
a. Thickness of the membrane
b. Type of plants
c. Thickness of the growing medium, type of plants, and the weight of the components
d. None of the above

5. The benefits of green roofs are:
a. Improved water quality
b. Reduced impervious surfaces
c. Reduce the heat island effect
d. All of the above

6 Growing medium for a green roof may contain all but which of these materials:
a. sand
b. mica
c. slate
d. scoria

7. Vegetation-free zones, typically consisting of pavers at the building's perimeter edge, serve all of the following purposes except which?
a. Create a fire break
b. Provide ease of access to flashing
c. Replace the need for drains
d. Offer wind uplift protection

8. An essential part of rainwater storage on a green roof:
a. Waterproofing
b. Drainage assembly
c. Flashing
d. Ballast

9. Green roof manufacturers should:
a. Provide only the roof components, not the plants
b. Provide and warranty all components including the growing medium
c. Provide certifications from English testing agencies
d. Provide netting for geese

10. Roof pitch for an extensive green roof can be up to:
a. 0 degrees
b. Less than five percent slope
c. Less than 45 percent slope
d. Planted the same way on each side of the slope

HYDROTECH

American Hydrotech's Garden Roof® Assembly has helped to focus the building industry on the potential of "sustainable" design with respect to the rooftop. Additional usable space, mitigation of the urban heat island effect, stormwater management, as well as numerous other environmental, technical and owner benefits are achieved. The foundation upon which this assembly is built is Hydrotech's Monolithic Membrane 6125® roof membrane with over 40 years of successful applications in the U.S. Hydrotech can provide every component of the Garden Roof Assembly (the roof membrane, insulation, garden roof components and even the soil), to assure single source responsibility.

CIRCLE 104 ON READER SERVICE CARD OR GO TO ARCHRECORD.CONSTRUCTION.COM/PRODUCTS/

At Bosch, we're committed to protecting the environment. From low-impact manufacturing to the way our products are designed. Innovative sensor technology helps Bosch dishwashers save water. Bosch front-loading washing machines use 66% less energy and 60% less water than conventional units. All while offering state-of-the-art features and unrivalled functionality. Because we believe you should never have to sacrifice excellence to embrace the planet we live on. For more information call 1.877.588.2417 or visit **www.boschappliances.com/report.**

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Bosch home appliances

Bosch presents

Specifying Residential Appliances: Green Update

Energy-saving appliances reduce water use and enhance sustainability

By Peter J. Arsenault, AIA, NCARB, LEED-AP

Residential design and construction, whether single family or multifamily, is increasingly becoming the focus of sustainable, or green building around the country. In early 2005, the National Association of Home Builders (NAHB) released voluntary Model Green Home Building Guidelines (available online at www.nahb.org/gbg). While they are developed for single-family homes, the guidelines also apply to multifamily and custom homes, as well as remodeling projects for existing homes.

At the same time, the U.S. Green Building Council (USGBC) has undertaken the pilot testing of the Leadership in Energy and Environmental Design (LEED®) rating system for homes. They describe it as "a voluntary initiative promoting the transformation of the mainstream home building industry towards more sustainable practices." Affordable housing is a big part of this trend too, with the organizations above and with the Enterprise Foundation. This not-for-profit organization helps America's low-income families with their struggle out of poverty by providing decent homes and safer streets. They have teamed up with other national organizations to create "The Green Communities Initiative," a partnership of The Enterprise Foundation/Enterprise Social Investment Corporation (ESIC) and the Natural Resources Defense Council (NRDC), along with the American Institute of Architects, American Planning Association, and major corporate, financial, and philanthropic organizations. These efforts are aimed at helping architects, builders, owners, subcontractors, suppliers, and others, to incorporate the latest and best approaches to environmentally sound, energy-efficient practices in residential buildings.

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Specifying Residential Appliances: Green Update.** To earn one AIA/CES Learning Unit, including one hour of health safety welfare credit, answer the questions on page 345, then follow the reporting instructions on page 354 or go to the Continuing Education section on *archrecord.construction.com* and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

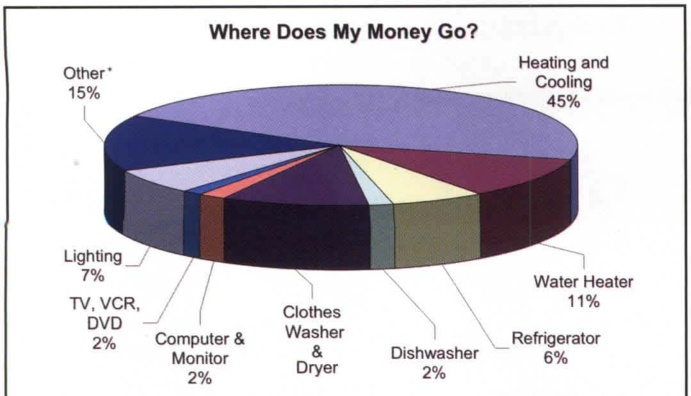
- *Identify the factors that make residential appliances environmentally sound and energy efficient.*
- *Understand the criteria and options for specifying "green" appliances.*
- *Identify organizations and resources that provide information about sustainability.*

Green Factors

Within this residential green design work, architects can look at several areas to help make their buildings comply with these new and emerging green standards. One area that should not be overlooked is the specifications of residential appliances for several significant reasons:

According to the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® program, heating and cooling represents only 45 percent of a typical home energy bill. The remaining 55 percent is attributed to fixtures and appliances of all types and sizes.

Energy Use. Often, most of the architectural focus related to residential energy use is on the building envelope and the heating and cooling systems. However, according to the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® program, heating and cooling represents only 45 percent of a typical home energy bill. The remaining 55 percent is attributed to fixtures and appliances of all types and sizes.



*"Other" represents an array of household products, including stoves, ovens, microwaves, and small appliances. Individually, these products account for no more than about 2% of a household's energy bills.

ENERGY STAR® chart showing typical breakdown of a residential energy bill

The Rocky Mountain Institute (RMI) observes that "Americans spend $43 billion annually to run household appliances, which is an average of $560 per year per family. If every household in the U.S replaced old appliances with efficient models, they'd collectively save at least $15 billion per year." While heating and cooling efficiency are important, it is at least equally important to pay attention to the energy efficiency of appliances that are specified into homes.

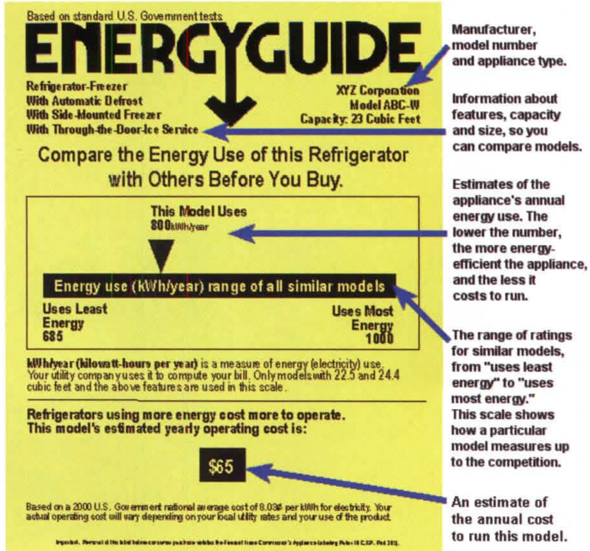
The significance of energy use goes beyond the monthly utility bill, however. Most of the electricity generated in the United States still relies on the burning of fossil fuels, which dumps carbon dioxide into the atmosphere. The current calculation is that one kilowatt-hour (kWh) consumed (or saved) equals 1.43 lb of carbon dioxide emitted (or saved) at the power plant. At an average of eight cents per kWh, the projected impact of $15 billion in energy savings referenced above would prevent the emission of 175 million tons of carbon dioxide annually. This is significant since carbon dioxide is one of the leading gases attributed to the "greenhouse effect" and global warming. RMI notes that the average American household produces approximately 9,900 pounds of carbon dioxide a year, which means that the energy used in homes generates more greenhouse gas emissions than cars. Hence, specifying energy efficient appliances is good for the homeowner or renter who pays the energy bill, the atmosphere, and the environment.

The ENERGY STAR® Program sets standards for different types of appliances. Specifications qualify each type of residential appliance for the program.

APPLIANCES	SPECIFICATIONS FOR ENERGY STAR LABEL
Clothes Washers	* Minimum Modified Energy Factor (MEF) of 1.42.
Dishwashers	* At least 25% more efficient than minimum federal government standards.
Full Size Refrigerators, 7.75 cubic feet or greater	* At least 15% more energy efficient than the minimum federal government standard (NAECA).
Full Size Freezers, 7.75 cubic feet or greater	* At least 10% more energy efficient than the minimum federal government standard (NAECA).
Compact Refrigerators and Freezers Less than 7.75 cubic feet and 36 inches or less in height	* At least 20% more energy efficient than the minimum federal government standard (NAECA).

Source: US EPA Energy Star Program web site www.energystar.gov

Energy Labeling Criteria. When selecting energy-efficient appliances, observe the appliance labeling. Most appliances sold in the United States are required to display a yellow ENERGY GUIDE label (similar to mileage rating labels on cars), with a line scale in the center showing how each appliance *model rates* in energy use compared with similar models.



Sample ENERGY GUIDE label for a refrigerator

The estimated annual operating cost is listed below the scale, and the label gives factual, comparative information.

According to their literature, "ENERGY STAR® is a government-backed program helping businesses and individuals protect the environment through superior energy efficiency." ENERGY STAR® labels and logos are only awarded and displayed on appliance models that are tested and proven to consume 10 to 50 percent less energy than minimum federal efficiency standards.

ENERGY STAR® labels apply to specific models, not just a manufacturer, so care should be taken to seek out labeled models. To learn which makes and models merit the ENERGY STAR® label, call 1-800-STAR-YES, or see www.energystar.gov.

ENERGY STAR® logo and label.

Water Use. Many recent standards with an emphasis on energy use also include requirements to reduce water use. In 2001, the Associated Press indicated that by 2030, the implementation of the water saving provisions of recent environmental legislation will show that water use will be cut by 10.5 trillion gallons, and $15.3 billion will be saved in electricity costs. According to the Green Guide, a GreenBiz News affiliate, "Residential water use accounts for about 10 percent of the water used in this country. This in no way diminishes the responsibility of every household to streamline use habits and invest in water-saving technology, though the consequence of doing so must be kept in perspective. In some regions, like the western U.S., where fresh water can be scarce, household consumption has a significant impact on the watershed, which affects salmon runs and the more poorly developed areas when water is diverted to supply new communities, resort areas, and agriculture." Responsible use of water is a serious and growing issue that can be addressed in plumbing fixtures, and electrical appliances that require water to operate, such as washing machines and dishwashers.

The U.S. Department of Energy states that, "Based on our estimates, a typical family with a home more than a decade old could save $200 per year in electricity and water bills, and 18,600 gallons of water, by switching to highly energy- and water-efficient appliances. If every American household installed these products, the annual water savings would equal the average flow of the Mississippi River into the Gulf of Mexico for five entire days." Water use in appliances is enough of an issue that the EPA is reportedly working on a water efficiency labeling program, similar to the ENERGY STAR® labeling program.

Recyclable Content: If a residential project involves remodeling and selective demolition of existing appliances, full consideration should be given to recycling those appliances. Currently, discarded appliances are second only to old automobiles as a source of recycled metals, particularly steel. Using recycled steel has a positive impact on the environment, since it takes four times as much energy to manufacture steel from ore as it does to make the same steel from recycled scrap. While steel is the most abundant recyclable component in appliances, other recyclables include metals like aluminum and copper, as well as plastics and the safe recycling or disposal of Chlorofluorocarbon (CFC) refrigerants. When specifying new appliances, architects should consider whether they are fully recyclable at the end of their useful lives. Some manufacturers indicate that up to 99 percent of their product can be fully recycled, becoming the raw material for the next generation of products and preserving other environmental resources in the process.

Currently, discarded appliances are second only to old automobiles as a source of recycled metals, particularly steel.

Appliance recycling has become so significant that, since 1993, the Association of Home Appliance Manufacturers (AHAM) has facilitated the Appliance Recycling Information Center (ARIC). The mission of this center is "to serve as the authoritative source of information on the environmentally responsible disposal and recycling of appliances and to undertake research into the recycling of major household appliances." According to their web site (www.aham.org/aric), ARIC focuses its activities on "industry coordination and information and education." ARIC has initiated joint meetings of representatives from the major appliance industry, the steel recycling industry, plastics council, and scrap recycling companies. In September 1994, the Major Appliance Resource Management Alliance (MARMA) was founded to expand on the ARIC mission of increasing the recycling rate of major home appliances. Additionally, ARIC develops and makes available the most accurate technical data about appliance disposal and recycling, including advances in appliance recycling technology.

AHAM is also a co-sponsor with the Steel Recycling Institute of the Recycling Information Center. If owners or contractors have questions on recycling, they can call 1-800-YES-1-CAN to reach recorded messages and ask questions of live operators.

Cost Implications

Every appliance has two price tags: a purchasing price and an operating cost. That's not counting the environmental and health costs of burning coal and other fossil fuels in power plants. Instead of comparing purchase prices with one another, the costs to operate the appliance over its useful life (usually 10 to 18 years) should be considered. Most, but not necessarily all, appliances designed for increased efficiency carry slightly higher initial purchase costs. However, the long-term savings are significant. For example, total water usage alone in efficient appliances might be reduced by one third, saving $95 or more in a year, based on 2005 costs. Energy savings can be even more dramatic and create a quick payback for the small initial premium of a superior appliance.

Specification Guidelines for Appliances

Based on the significance of appliances in green buildings, the following guidelines are suggested when preparing specifications for residential appliances.

Refrigerators

Refrigerators are often the largest single energy-using appliance in a typical household and, consequently, are the most carbon dioxide-emitting appliances. A typical energy bill reflects almost as much energy use for a refrigerator (six percent) as lighting the entire house (seven percent). A new, more efficient refrigerator can typically save $70 to $80 per year, and will pay for itself in about nine years. The good news is that new energy efficiency standards for refrigerators went into effect in July 2001, requiring models to use 30 percent less energy than previous 1993 standards. Specifying a model that qualifies for the EPA's ENERGY STAR® label will save the user even more. On January 1, 2004, the ENERGY STAR® criteria for refrigerators changed, requiring that all refrigerators greater than 7.75 cubic feet must be at least 15 percent more efficient than the federal minimum standard.

When specifying energy-efficient refrigerators, Green Guide and Greenbuilder.com recommend the following:

- Specify an ENERGY STAR® rated, or better, refrigerator or freezer. Note that there are some models that just meet the requirements, and some that far exceed them. It is possible to specify more than just minimum ENERGY STAR® (i.e. 15 percent above federal standards) requirements and accept only models that exceed requirements (20 percent or greater than federal standards).
- Top freezer models are generally more efficient than side-by-side models. Side-by-side refrigerator/freezers are not only less energy efficient (particularly if they include water or ice dispensers), but also are more likely to need repair. RMI determined that these models use seven to 13 percent more energy than similar top freezer models.
- Manual defrost models use half the energy of automatic defrost models, but must be defrosted periodically to remain energy-efficient.
- Automatic icemakers and through-the-door dispensers will increase energy use by 14 to 20 percent. Given that these features also add to the sticker price, consumers would be better off using ice trays and skipping such models altogether, to conserve energy.
- The most energy-efficient models are the 16 to 20 cubic foot sizes.
- It is usually less costly to run one larger refrigerator rather than two smaller ones. Avoid the temptation to plan for separate units running in different locations. It's much more economical and ecological to ensure a single model is properly sized to meet user needs.

Clothes Washers

Heating water generates up to 86 percent of the energy consumed by a clothes washer. Hence, specifications for washers should address both energy and water usage. Most sources agree that consideration should be given to horizontal axis (H-axis) front-loading machines. According to RMI, "These use about half to a third of the energy of conventional vertical-axis top-loaders because they need less water to get the same load just as clean. They also have a faster spin speed than vertical axis machines, meaning that clothes will require less drying energy as a result. The energy, water, and detergent saved will cut annual washing costs by about $65, and pay back the higher up-front cost in three to nine years."

Specifications for washers should address both energy and water usage.

Greenbuilder.com has identified the following specification features and options that affect the amount of hot water used and the overall efficiency of a clothes washer:

- Wash and rinse cycles: Select a model with many choices. Warm wash cycles clean very well. Only oily stains may require hot washes. Cold-water washing is adequate with proper detergents and pre-soaking and cold rinses are effective. "Suds-saver" (reusing slightly soiled wash water) and pre-soaking are energy conserving options.
- Water level controls: Generally, washing a full load is most efficient, however, a small load should have the option of using a smaller amount of water.
- Water extraction: Higher spin speeds will reduce drying times.
- ENERGY STAR® rating: In addition to all the above, specify a model that meets or exceeds the ENERGY STAR® rating requirement for energy and water usage.

Bosch home appliances

Clothes Dryers

The fundamental specification choice is between electric and gas-fired models. In terms of comparative energy use, gas dryers are generally less expensive to operate. However, since there is no requirement to display the Energy Guide label on clothes dryers, it is not easy to compare the energy use of various dryer models. Most sources agree that there is not a lot of variation in overall energy use between models. Typically, usage and running time dictate the amount of energy used.

Beyond fuel type, controls for turning off dryers become the major specification consideration for energy consumption. The first choice is whether or not the dryer uses sensors to automatically turn off the dryer once clothes are dry. The alternative is timed drying, leaving the running time, and corresponding energy use, to guesswork of the user. The best dryers have moisture sensors inside the drum for sensing dryness and turning off the machine. Most others only infer dryness by using temperature sensors in the exhaust air portion of the dryer, which may result in running the dryer longer than needed. Compared with timed drying, savings of about 10 percent with temperature-sensing controls, and 15 percent with moisture-sensing controls, are possible.

The ENERGY STAR® program currently does not rate clothes dryers, so the specifications should not reference it, but instead, stand alone.

Dishwashers

As with clothes washers, there are two related issues for dishwashers, overall energy use and water use. A significant portion of the energy used by dishwashers is actually the energy required for heating the water they consume, since almost all dishwashers on the *market use internal* booster heaters. That is actually a good thing, because it allows domestic hot water heater temperatures to be turned down to around 120 degrees, instead of the higher temperatures usually desired for dish washing. The lower water heater temperatures mean less energy is used on an ongoing basis with the higher temperature created only for the intermittent needs of the dishwasher. Specifying a dishwasher that *requires less water* to be heated and used by a dishwasher will result in more efficient operation. Many newer models have been documented to actually use half the water that conventional hand washing would require.

The ENERGY STAR® program currently does not rate clothes dryers, so the specifications should not reference it.

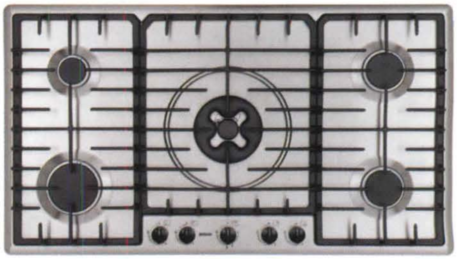
A significant specification detail is to call for a dishwasher that incorporates soil-sensors, since they adjust water use depending on how dirty the dishes are in each load. Recent improvements in test procedures better estimate the energy consumption of soil-sensing dishwasher models, allowing more accurate comparisons on the yellow Energy Guide labels.

Bosch home appliances

Cooking Appliances

As with clothes dryers, the fundamental specification choice for cooktops, ovens, and ranges is for either electricity or natural gas as the energy source. In most cases, the level of energy use for any single cooking appliance is small enough, and modern efficiencies are high enough, that no appreciable difference may exist between specifying gas over electric. Collectively, all cooking appliances together in a home could add up to 6.5 percent or 750 kWh per year of a typical home's energy bill, so providing highly efficient units over less efficient ones will make a difference overall.

The ENERGY STAR® program currently does not rate cooking appliances, so specifications should not reference it. There are many other resources available, however, (see sidebar) so architects can readily find information to specify energy efficient and environmentally responsible appliances of all types.



Bosch home appliances

ENERGY AND SUSTAINABILITY RESOURCES FOR RESIDENTIAL APPLIANCES

- ENERGY STAR® is a government-backed program helping businesses and individuals protect the environment through superior energy efficiency. ENERGY STAR® program information and rated appliances models are found at www.energystar.gov
- U.S. Green Building Council (USGBC) and Leadership in Energy and Environmental Design (LEED) Standards are found at www.usgbc.org
- National Association of Homebuilders (NAHB) represents residential builders nationwide. www.nahb.org
- Enterprise Foundation and information on the Green Communities Initiative. www.enterprisefoundation.org
- American Council for an Energy-Efficient Economy (ACEEE) is a nonprofit organization dedicated to advancing energy efficiency and promoting economic prosperity and environmental protection. www.aceee.org
- Association of Home Appliance Manufacturers (AHAM) provides market industry trends on appliances. www.aham.org.
- Appliance Recycling Information Center (ARIC) provides information on recycling appliances. www.aham.org/aric
- Consumer Reports rates appliances. www.ConsumerReports.org
- Rocky Mountain Institute addresses energy and consumer issues. www.rmi.org
- The Green Guide is a GreenBiz news affiliate. http://www.thegreenguide.com
- Greenbuilder.com is an online resource with information about building and appliances. www.greenbuilder.com

CLICK FOR ADDITIONAL REQUIRED READING

The article continues online at ***archrecord.construction.com/resources/conteduc/archives/0512bosch-1.asp***. To receive AIA/CES credit, you are required to read this additional text. The quiz questions below include information from this online reading. To receive a faxed copy of the material, call 1-800-921-9622.

AIA/ARCHITECTURAL RECORD **CONTINUING EDUCATION** Series

LEARNING OBJECTIVES

After reading this article, you should be able to:

- *Identify the factors that make residential appliances environmentally sound and energy efficient.*
- *Understand the criteria and options for specifying "green" appliances.*
- *Identify organizations and resources that provide information about sustainability.*

INSTRUCTIONS

Refer to the learning objectives above. Complete the questions below. Go to the self report form on page 354. Follow the reporting instructions, answer the test questions and submit the form. Or use the Continuing Education self report form on *Record's* web site—*archrecord.construction.com*—to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS

1. The typical American residential energy bill attributed to appliances and other items not associated with heating and cooling is:
- **a.** 45 percent
- **b.** 11 percent
- **c.** 55 percent
- **d.** 35 percent

2. The use of residential appliances that require less energy to operate have the potential to reduce greenhouse gas concentrations and global warming.
- **a.** True
- **b.** False

3. The yellow ENERGY GUIDE label on an appliance indicates:
- **a.** Energy saving potential above federal minimum standards.
- **b.** Comparative performance and operating cost compared to other similar models.
- **c.** Government endorsement of the appliance.
- **d.** Performance of a manufacturer.

4. An ENERGY STAR® label on an appliance indicates:
- **a.** Overall performance of a manufacturer.
- **b.** Annual cost to operate the appliance.
- **c.** Compliance with federal minimum standards.
- **d.** Test proven ability of appliance models to consume 10 to 50 percent less energy than federal minimum standards.

5. ENERGY STAR® labels can be found on many types of residential appliances except:
- **a.** Dishwashers
- **b.** Refrigerators
- **c.** Clothes dryers
- **d.** Clothes washers

6. Most appliances can be specified with recyclable materials of all except the following:
- **a.** Steel
- **b.** Plastic
- **c.** Wood
- **d.** Refrigerants

7. When designing and specifying refrigerator units, it is usually more energy efficient to design in one larger unit rather than two or more smaller ones.
- **a.** True
- **b.** False

8. In specifying clothes washing appliances, the single biggest factor for energy efficiency is:
- **a.** The type of control.
- **b.** The size of the machine.
- **c.** The amount of water used per load.
- **d.** The choice of manufacturer.

9. In specifying clothes dryers, the most significant factor in energy use is:
- **a.** Type of energy source.
- **b.** Moisture sensors to turn off the dryer when a load is dry.
- **c.** The ENERGY STAR® label.
- **d.** The size of the machine.

10. In specifying dishwashers, a significant factor in energy use is:
- **a.** The presence of a "soil sensor" to adjust the amount of water used.
- **b.** The type of hot water heater in the residence.
- **c.** The amount of hand washed dishes.
- **d.** The controls on the appliance.

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Bosch home appliances is part of BSH Home Appliances Corporation, a fully-owned subsidiary of Bosch and Siemens Hausgeräte GmbH, the third largest appliance manufacturer in the world. Inspired by the lifestyles of today's discerning consumers, all Bosch products combine superior performance and excellent quality with unrivalled ease of use. Extending its care philosophy beyond the immediate home, Bosch is the leader in environmentally friendly home appliances. Just one more sign of Bosch's commitment to improving quality of life through the relentless pursuit of perfection. For more information, please call 1.800.921.9622 or visit www.boschappliances.com.

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AIA/ARCHITECTURAL RECORD CONTINUING EDUCATION

Program title: ***"Daylighting in Schools, Grades K-12,"*** **(12/05, page 247)** 125SPONK

AIA/CES Credit: This article will earn you one AIA/CES LU hour of health, safety, and welfare credit. (Valid for credit through December 2007.)

Directions: Select one answer for each question in the exam and completely circle appropriate letter. A minimum score of 70% is required to earn credit.
Take this test online at http://archrecord.construction.com/continuinged/default.asp

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2.	a	b	c	d	e	**7.**	a	b	c	d	e
3.	a	b	c	d	e	**8.**	a	b	c	d	e
4.	a	b	c	d	e	**9.**	a	b	c	d	e
5.	a	b	c	d	e	**10.**	a	b	c	d	e

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AIA/ARCHITECTURAL RECORD CONTINUING EDUCATION

Program title: **"Exploring the High-Performance Benefits of Laminated Glass: Versatile Building Material Provides Multiple Advantages," (12/05, page 252)** 125SPONN

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AIA/ARCHITECTURAL RECORD CONTINUING EDUCATION

Program title: "Products Madw of "Eco-Effective" Components," Architectural Record (12/05, page 159). 125EDITZ

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Dates & Events

New & Upcoming Exhibitions

Anarchy to Affluence: Design in New York, 1974–1984
New York City
January 10–April 2, 2006
This exhibition examines the important interiors, furniture, graphics, fashion, and illustration produced in New York between 1974 and 1984, a period in which downtown New York artists, musicians, playwrights, and designers created some of the most avant-garde work produced in America during the last century. In conjunction with New York University's Grey Art Gallery exhibition *The Downtown Show: The New York Art Scene 1974–1984*. At Parsons The New School for Design. Call 212/229-8919 or visit www.parsons.edu.

The HOME House Project: The Future of Affordable Housing
Atlanta
January 26–March 28, 2006
A multiyear traveling initiative created by the Southeastern Center for Contemporary Art (SECCA) in Winston-Salem, North Carolina. The first component of the project was a national design competition and exhibition that showcased innovative solutions for sustainable low- to moderate-income-family housing proposed by more than 440 contest entrants form around the world. At the Museum of Design Atlanta. Call 404/688-2467 or visit www.museumofdesign.org.

Symmetry
Los Angeles
January 26–May 7, 2006
In the world of space and time, symmetry derives its meaning from a center, a repetition of forms on mirroring sides of an axis. This exhibition features works by Los Angeles–based contemporary artists that use or relate to this concept. At the MAK Center for Art & Architecture L.A., at the Schindler House. Call 323/651-1510 or visit www.makcenter.org.

Tokyo–Berlin/Berlin–Tokyo
Tokyo
January 28–May 7, 2006
An exhibition exploring the cultural contracts between Tokyo and Berlin, and the development, from the end of the 19th century through the present, of these two cities as avant-garde centers of art and literature. At the Mori Art Museum. Visit www.mori.art.museum.

The Edge of Europe: New Architecture in Spain
New York City
February 12–May 1, 2006
The exhibition will feature approximately 45 architectural projects designed and/or built since 2000. The quality and innovation of these recent projects reflect several important developments: the ongoing liberalization of civil culture in democratic Spain, the economic and cultural growth of the nation within a unified European context, and the continued importance of cities and urban culture in Spanish identity. These factors have drawn a native response from the architectural profession as well as from other countries in Europe, Asia, and the United States. At the Museum of Modern Art. Call 212/708-9400 or visit www.moma.org.

Suburban Escape: The Art of California Sprawl
San Jose, Calif.
May 28, 2006–September 10, 2006
Artists have documented the forward march of California's suburban sprawl since the very first tract home subdivisions were developed in the 1940s. This exhibition surveys work by over 30 artists who have devoted a significant portion of their careers to California's suburban landscape and culture. At the San Jose Museum of Art. For more information, call 408/294-2787 or visit www.sanjosemuseumofart.org.

Ongoing Exhibitions

Jean Prouvé Drawings and Photographs of A Tropical House
Los Angeles
Through December 9, 2005
Responsible for innovative prefab housing ideas from the 1930s, Prouvé's prototypes are key antecedents to the current renewal of interest in industrialized architecture. Drawings, photographs, and building elements are on display. At Small Space Gallery, UCLA Department of Architecture and Urban Design. Call 310/443-7020 or visit www.aud.ucla.edu.

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The Prism Awards acknowledge and reward the most creative and amazing uses of natural stone in building and design. This year's award will be presented on Tuesday, April 4, at Coverings, the Ultimate Tile & Stone Experience, in Orlando, Florida.

Sponsored by the Marble Institute of America and judged by editors from *Architectural Record*, the Prism Awards have become the stone industry's leading recognition of the ultimate in stone craftsmanship and creativity.

Winning the $10,000 Grand Prize or any of the five small cash prizes is just the start. A Prism Award also brings winners more press, more notoriety among peers and more clients.

INTERESTED?

Go to www.coverings.com/prism for prize information, rules and an entry form. You'll also find more photos of winning entries from last year.

The deadline for entries is **February 3, 2006**. If you're up for the challenge, we'll have a check waiting.

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Dates & Events

Projective Crossings
Syracuse, N.Y.
Through December 16, 2005
A "digital exhibition" in Slocum Hall at Syracuse University School of Architecture. Call 315/443-2255 or visit www.soa.syr.edu for more information.

Paul Laszlo: 35 Years of Design 1930–1965
New York City
Through December 17, 2005
A show displaying over 50 masterworks of California architect and designer Paul Laszlo. His work conveys a sophisticated and light sensibility, coupling color, craft, and texture with forms on a grand and luxurious scale. At Gallery Donzella Ltd. Call 212/965-8919 or visit www.Donzella.com.

The Design Workshop: Seven Years of Design Build at Parsons
New York City
Through December 19, 2005
This exhibition showcases seven years of The Design Workshop, an annual program in which graduate architecture students at Parsons collaborate with nonprofit organizations in New York City to design and build a project over a period of eight months. At Parsons The New School for Design. Call 212/229-8919 or visit www.parsons.edu.

Kumamoto Artpolis: Architecture Through Communication
Los Angeles
Through December 23, 2005
An exhibition of 70 projects by contemporary Japanese architects to improve the architectural culture of Kumamoto, Japan, includes work by Hitoshi Abe, Tadao Ando, Jun Aoki, Toyo Ito, and Kazuyo Sejima. At Perloff Gallery, UCLA Department of Architecture and Urban Design. Call 310/267-4704 or visit www.aud.ucla.edu for more information.

Quonset: Metal Living for a Modern Age
Anchorage
Through December 24, 2005
This exhibition explores the impact of the Quonset hut on American culture. At the Anchorage Museum of History and Art. For more information, call 907/343-4326 or visit www.anchoragemuseum.org.

Tea and Coffee Towers
Scottsdale, Ariz.
Through December 31, 2005
This exhibition features tea and coffee sets designed by 20 of the most innovative international architects. At Scottsdale Museum of Contemporary Art. Call 480/874-4682 or visit www.smoca.org.

The Initiated Eye: Secrets, Symbols, Freemasonry, and the Architecture of Washington, D.C.
Washington, D.C.
Through December 31, 2005
An original exhibition focusing specifically on the significant contributions of Freemasons to the design and architecture of Washington, D.C. At the Octagon. Call 202/638-3221 or visit www.theoctagon.org.

Two Columbus Circle: Museum of Arts & Design and Allied Works Architecture
New York City
Through December 31, 2005
The first public viewing of the design for Museum of Arts & Design. This exhibition traces the conceptual development of the design by Brad Cloepfil of Allied Works Architecture and will include a detailed preview of the new facilities, which will anchor the southwestern corner of Central Park. At the Center for Architecture. Call 212/683-0023 or visit www.aiany.org.

Field Experiments in Art, Architecture, Landscape: Hombroich Spaceplacelab
New York City
Through December 31, 2005
Fourteen renowned architects and artists from around the world are currently creating an experimental development called Hombroich Spaceplacelab, a unique and daring merger of art, architecture, and landscape near Cologne, Germany. Each designer is individually responsible for one of the project's 40-acre lots. Each lot must have a ratio of 90 percent landscape to 10 percent building. Models, drawings, plans, and photographs of the projects are on view at the Center for Architecture. Call 212/683-0023 or visit www.aiany.org.

Excavating Design: 18th-Century Drawings and Prints
New York City
Through January 8, 2006
Visitors can trace the origins of Western architec-

tural design through drawings, prints, and sketches that evoke the majesty of the Roman ruins. In the Cooper-Hewitt's new 700-square-foot, ground-floor gallery. For more information, call 212/849-8400 or visit www.ndm.si.edu.

Jewish Washington: Scrapbook of an American Community
Washington, D.C.
Through January 8, 2006
Scrapbooks, historical photographs, business ephemera, architectural artifacts, and other items convey the story of the local Jewish community as it grew along 7th Street into neighborhoods across the city. At the National Building Museum. Call 202/272-2448 or visit www.nbm.org.

1945 Creativity and Crisis: Architecture and Design of the World War II Era
Chicago
Through January 8, 2006
Chicago architecture and design, and their contributions to everyday life during the 1940s, are subjects of this exhibition. Well-known architects and designers, such as Ludwig Mies van der Rohe, L. Morgan Yost, Bertrand Goldberg, Bruce Goff, Henry P. Glass, and Richard Ten Eyck, are featured in the exhibition. At the Art Institute of Chicago. Visit www.artic.edu/aic.

Prairie Skyscraper: Frank Lloyd Wright's Price Tower
Bartlesville, Okla.
Through January 15, 2006
An exhibition of approximately 108 drawings, models, photographs, documents, building components, and furnishings to mark the building's 50th anniversary. At the Price Tower Arts Center. For more information, call 918/336-4949 or visit www.pricetower.org.

Renewing Wright
Pittsburgh
Through January 15, 2006
This exhibition brings together two iconic buildings by Frank Lloyd Wright with, in each case, an associated project by a leading visionary architect of today. At the Heinz Architectural Center, Carnegie Museum of Art. Call 412/622-3131 or visit www.cmoa.org.

Design Innovations in Manufactured Housing
Chicago
Through January 15, 2006
Commissioned for this exhibition, the featured designs present creative solutions to fill the demand for affordable, high-quality housing. Eight nationally recognized architects and industrial designers—David Baker, Bryan Bell, Carol Brown, Teddy Cruz, Yolande Daniels, Doug Garofalo, David Khoury, and Ali Tayar—have contributed original models and drawings that consider innovation in the design, materials, and manufacturing techniques of low-cost, factory-built housing. At the Field Museum. For more information, call 312/922-9410 or visit www.fieldmuseum.org.

Designing the Taxi
New York City
Through January 15, 2006
This exhibition presents new concepts for New York's most iconic mode of transportation, the taxicab, as it approaches its centennial in 2007. Included are design firms Pentagram, Antenna Design, Birsel + Seck, IDEO, Ken Smith Landscape Architect, TRUCK, Imagination, Hybrid Product Design, and Blue Marlin. At Parsons The New School for Design. Call 212/229-8919 or visit www.parsons.edu/events.

Extreme Textiles: Designing for High Performance
New York City
Through January 16, 2006
Devoted to the subject of technical textiles—highly engineered materials designed for ultimate performance in extreme conditions—this exhibition presents more than 150 extreme textile applications from a wide range of areas, including architecture, apparel, medicine, transportation, aerospace, and the environment. At the Smithsonian's Cooper-Hewitt National Design Museum. For more information, call 212/849-8400 or visit www.cooperhewitt.org.

Contemporary Chinese Architecture: Part One
London
Through January 17, 2006
China is currently undergoing rapid building and development and is fast becoming a dominant force in the future of architecture. This first display, in a two-part series, depicts these processes through a collection of spontaneous photographic impressions. At the Royal Academy. For additional information, call 020/7300-5839 or visit www.royalacademy.org.uk.

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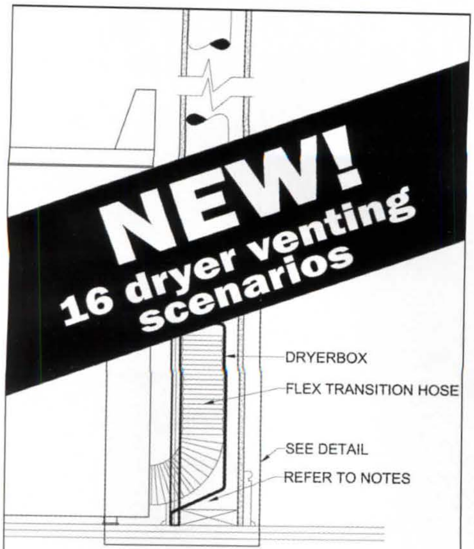

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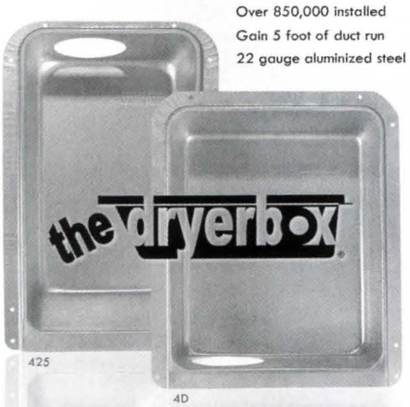

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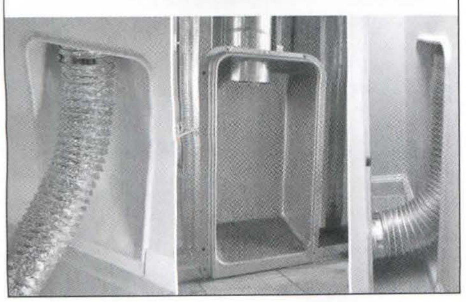

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Dates & Events

Liquid Stone:
New Architecture in Concrete
Washington, D.C.
Through January 29, 2006
This exhibition has been extended, presenting nearly 30 very recent or current projects that use concrete in exciting ways. Some featured works include the Longitudinal House(s), by Vincent James Associates Architects; a Technical School Library in Eberswalde, Germany, by the Swiss firm Herzog & de Meuron; and the new Auditorio de Tenerife, in the Canary Islands, by Santiago Calatrava. At the National Building Museum. Call 202/272-2448 or visit www.nbm.org.

ReThink ReDesign ReCycle
Chicago
Through January 31, 2006
The ongoing exhibition *Competition: Public Process for Public Architecture Gallery* will be updated with the display of more than 100 entries for the competition to design on-street recycling bins created by members of the City of Chicago and the AIA Chicago Young Architects Forum. In CAF's CitySpace. Call 312-942-3432 or visit www.architecture.org.

International Arts and Crafts
Indianapolis
Through January 2006
Organized by the Victoria and Albert Museum in London, this exhibition features more than 300 objects from Great Britain, where the Arts and Crafts movement began, as well as America, Europe, and Japan. At the Indianapolis Museum of Art. For more information, visit www.ima-art.org or call 317/923-1331.

Transcending Type
New Haven
Through February 3, 2006
This exhibition was curated by the editors of ARCHITECTURAL RECORD for the 9th International Venice Architecture Biennale held in September 2004. To fit the Biennale's theme, *Metamorph*, alluding to landmark changes in architecture largely fueled by the digital revolution, the curators invited six inventive young architects to share their unique visions of characteristically American building types. At Yale School of Architecture gallery. Call 203/432-2288 or visit www.architecture.yale.edu.

Wine Architecture: The Winery Boom
Vienna
Through February 6, 2006
This exhibition presents the background and developments that led to the unique Austrian cultural phenomenon (which emerged in the 1980s) of combining wine with architecture. At Architekturzentrum Wien. Call 431/ 522-3115 or visit www.azw.at.

Holabird & Root: 125 Years
Chicago
Through February 12, 2006
Celebrating the 125th anniversary of one of Chicago's most distinguished architecture firms, Holabird & Root, through the lens of famed architectural photographer Hedrich Blessing. The exhibition examines the firm's diverse work and reveals the evolution of American architecture. At the CAF's ArchiCenter. For more information, call 312/922-3432 or visit www.architecture.org.

Design.be: Design in Belgium after 2000
Hornu, Belgium
Through February 16, 2006
This exhibition shows the talents of more than 100 Belgium creators and design teams within companies. At Grand-Hornu Images. Call 32(0)65/65-21-21 or visit www.grand-hornu.be or www.label-design.be.

Investigating Where We Live
Washington, D.C.
Through February 19, 2006
This exhibition showcases the results of the Museum's five-week summer outreach program, where teens used photography as a tool to document and interpret three Washington, D.C. neighborhoods—Anacostia, the Navy Yard, and the New York Avenue corridor. At the National Building Museum. Call 202/272-2448 or visit www.nbm.org.

The Mythic City: New York Photographs by Samuel H. Gottscho, 1925–1940
New York City
Through February 20, 2006
This exhibition surveys New York City at a pivotal moment in its development, presenting a dreamlike landscape of Modernist towers chiseled by sun and shadow and devoid of Depression-era ravages. At the Museum of the City of New York. Call 212/534-1672 or visit www.mcny.org.

Santiago Calatrava:
Sculpture into Architecture
New York City
Through March 5, 2006
Many forms of Calatrava's celebrated buildings

originated in his independent works of art. This exhibition showcases his sculptures in marble and bronze, drawings, and architectural models, including work related to the new transportation hub he has designed for the World Trade Center site. This is the first exhibition in the U.S. to feature such a large selection of Calatrava's independent work and to examine it in conjunction with his architecture. At the Metropolitan Museum of Art. Call 212/535-7710 or visit www.metmuseum.org.

In-Depth: The House of Spiritual Retreat by Emilio Ambasz
New York City
Through March 6, 2006
Emilio Ambasz originally designed the House of Spiritual Retreat in 1979 for an imaginary site near Cordoba, Spain. It was constructed only last year, on a hilly, arid landscape outside of Seville. In-Depth explores Ambasz's project through seven drawings, a pair of models, and a selection of recent photographs. At the Museum of Modern Art. Call 212/708-9400 or visit www.moma.org.

Chicago Architecture Foundation Tours
Chicago
Through March 2006
Led by trained volunteer docents, these acclaimed tours explore the architecture of the Chicagoland area via bus, boat, train, by walking, or Segway. For descriptions of all tours, visit www.architecture.org/tours.

In Pursuit of Pleasure: Schultze and Weaver and the American Hotel
Miami Beach, Fla.
Through May 28, 2006
Leonard Schultze and S. Fullerton Weaver were the preeminent architects/designers of American hotels in the 1920s and 1930s. The exhibition focuses on the firm's hotels. which include the Waldorf Astoria, Sherry-Netherland, Pierre, Breakers, Biltmore Chain, Nautilus, and Roney Plaza. At the Wolfsonian-FIU Museum, which owns the entire Schultze and Weaver archive. Visit www.wolfsonian.org.

Cityscapes Revealed: Highlights from the Collection
Washington, D.C.
Long Term
This first-ever retrospective of the permanent collection explores America's architectural heritage through exquisitely detailed drawings; rare, early 20th-century photographs; and original building fragments from national historic landmarks, including the former U.S. Pension Building, the Museum's extraordinary home. At the National Building Museum. Call 202/272-2448 or visit www.nbm.org.

Worldview
Long-term
Worldview was started by the Architectural League in 2001 as a way of using the Web to create a forum for the presentation of new work in architecture and urbanism in cities around the world that are often overlooked in the mainstream architectural press. *Worldview: Oslo* is the third in an ongoing series of Web reports on architecture and urbanism in cities around the world. Other cities in the series are Dhaka and Caracas, all of which can be accessed at www.worldviewcities.org.

454 Projects for Paris 2012
Paris
Long-term
Fixed or mobile structures, inflatable architectures, monoliths, monumental sculptures, observation towers, scaffoldings, giant stairways, ramps and stairs, nacelles, fluorescent ring compositions, stretched canvas towers, diversion of cranes, forest of urban periscopes, and more: They are 454 projects from over 80 countries, for the realization of the Olympic Landmark in Paris, to be exhibited at the Pavillon de l'Arsenal, the center for information, documentation, and exhibition for urban planning and architecture of the City of Paris. For more information, call 01/42-76-33-97 or visit www.pavillon-arsenal.com.

ReThink/ReDesign/ReCycle
Chicago
The ongoing exhibition *Competition: Public Process for Public Architecture* will be updated with the display of more than 100 entries for the competition to design on-street recycling bins created by members of the City of Chicago and the AIA Chicago Young Architects Forum. At the CAF's CitySpace Gallery. Call 312/922-3432 or visit www.architecture.org for more information.

Lectures, Conferences, and Symposia

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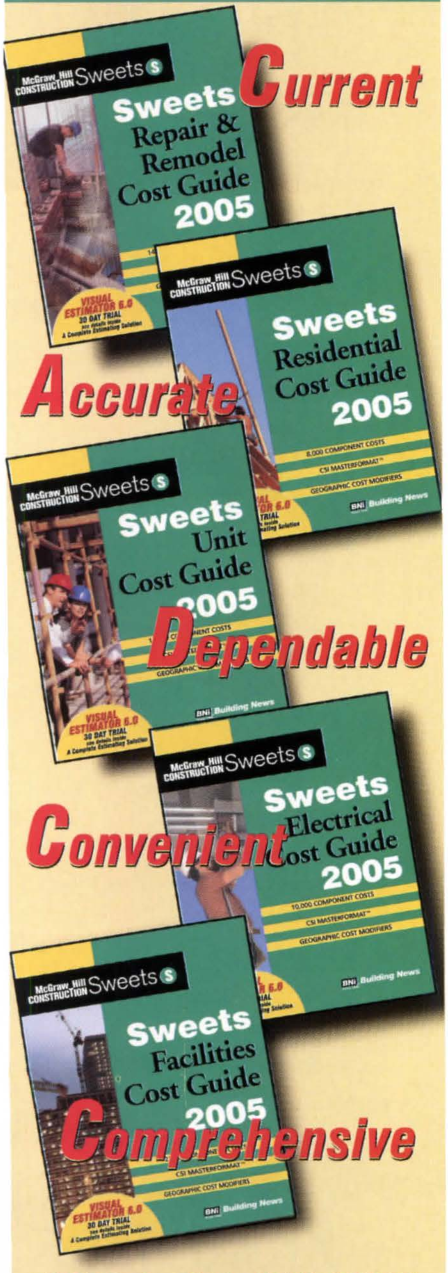

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the world's most significant postwar to contemporary furniture galleries, will run concurrently with Art Basel Miami Beach. These museum-quality galleries will bring together the best collectors, connoisseurs, and designers from around the world in one of the premier destinations for art and design. One of the hallmarks of Design.05 Miami will be the annual selection of the Designer of the Year. For the inaugural Design.05 Miami, the designer will be Pritzker Prize–winner Zaha Hadid, who will do a site-specific installation that will be the focal point of the event and will serve as the centerpiece of the gallery spaces. In the Miami Design District. For additional information, visit www.design05miami.com.

Smart Growth: LEED for Neighborhood Development
Washington, D.C.
December 1, 2005
Nigel Howard, chief technology officer for the U.S. Green Building Council, will discuss the proposed LEED (Leadership in Energy and Environmental Design) standards for neighborhood development (LEED-ND). These standards will measure the environmental performance of entire neighborhoods, based on how their design reduces vehicle travel, energy use, urban water runoff, and other impacts. At the National Building Museum. Call 202/272-2448 or visit www.nbm.org.

Building in the Aftermath Symposium: Housing in the Wake of Katrina and Other Disasters
Washington, D.C.
December 2, 2005
A half-day symposium exploring the short- and long-term housing issues that governments, planners, and residents of the hurricane-devastated region face. What are the postdisaster planning issues, and what steps should be taken to better prepare for future disasters? This symposium features experts fresh from inspection of the ravaged areas and with experience in disasters overseas. At the National Building Museum. Call 202/272-2448 or visit www.nbm.org.

Hugh Hardy
New York City
December 6, 2005
Hugh Hardy, 2005 National Design Award Finalist in Interior Design, is internationally known for projects such as the New York Botanical Garden Visitor Center, the restoration of Radio City Music Hall, and the refurbishment of Bryant Park, all in New York. Go behind the scenes as Hardy presents some of his current projects and discusses the processes behind his work. At Cooper-Hewitt National Design Museum. Call 212/849-8349 or visit www.cooperhewitt.org.

Victoria Embankment: Sir Richard MacCormac RA
London
December 8, 2005
Sir Richard MacCormac is chairman of MacCormac Jamieson Prichard (MJP), whose work is derived from an understanding of the physical, cultural, and historic context of a site. MJP are preparing a "Vision" for Victoria Embankment—the North bank of the Thames between Westminster and the City. The lecture will take place at the Royal Academy. Call 020/7300-5830 or visit www.royalacademy.org.uk.

AEC World Expo and Conferences
Mumbai, India
December 14–18, 2005
Jasubhai Media and Indian Architect & Builder in coordination with Vision Partners are producing India's first-ever Architecture, Engineering and Construction (AEC) world expo. At the MMRDA grounds. Visit www.aecworldexpo.com.

Bruce Mau
New York City
December 15, 2005
A one-on-one conversation led by Parsons dean and Pulitzer prize–winning architecture critic Paul Goldberger and featuring Bruce Mau, whose work includes a collaboration with Rem Koolhaas on the publication *X, M, L, XL*; work with Frank Gehry on signage for a biodiversity museum in Panama; and the exhibition and publication *Massive Change*, which investigates the intersection of design, technology, culture, science, and civilization. At Parsons The New School for Design, Tishman Auditorium. Call 212/229-5488 or visit www.parsons.edu/events for more information.

L'Enfant Lecture on City Planning and Design
Washington, D.C.
December 15, 2005
The lecture, established to draw attention to critical issues in city and regional planning in the United States, will feature leading figures in plan-

ning, architecture, urban design, governance, and other fields. Named for Pierre Charles L'Enfant, who created the acclaimed plan for Washington, D.C., the inaugural lecture in the series will be delivered by Sir Peter Hall. At the National Building Museum. Call 202/272-2448 or visit www.nbm.org.

DFI 31st Annual Conference on Deep Foundations Call for Abstracts
Washington, D.C.
Abstracts Due: January 6, 2006
The broad range of topics include Historic Perspective, New Design, Innovative Installation, and Quality Control. The conference will take place October 4–6, 2006. For more information, visit www.deepfoundations06.org.

2006 International Builders' Show
Orlando
January 11–14, 2006
Attracting attendees from around the world, the International Builders' Show is the largest annual light-construction show in the world. The show will feature a timely exhibition: *The NextGen "Peace of Mind" Demonstration Home*, a 2,500-square-foot home, showcasing the latest innovations in storm-resistant construction. At the Orange County Convention Center. For more information, visit www.nextgenhome.com.

Light Resource 2005–2006 Lecture Series on Architecture + Design
Vancouver
January 12–April 6, 2006
Produced by the Vancouver League for Studies in Architecture and the Environment, this lecture series will include Yoshiharu Tsukamoto, Rick Joy, Jeppe Aagaard Andersen, Paul Lewis, Dan Menchions, and Keith Rushbrook. In the C 300 Theatre, UBC at Robson Square. For further information, call 604/683-8588 or visit www.lecturesonarchitecture.net.

Portland Cement Association Education and Training
Skokie, Ill.
February 6–March 22, 2006
The Portland Cement Association's (PCA) spring course continues to offer seminars that address current industry concerns and changes. Courses use a combination of practicing professionals with solid experience and the latest in simulations to enable participants to master the skills they need. PCA is a registered provider for the American Institute of Architects, Learning Education Units. At the PCA Headquarters. Call 847/972-9032 or visit www.cement.org.

Saving Places 2006: Building on the Past
Denver
February 8–10, 2006
Colorado Preservation, Inc.'s 9th annual historic preservation conference will feature 200 national and regional preservation experts discussing current preservation programs, projects, trends, and technology. At the historic 1770 Sherman Street Event Complex. Call 303/893-4260 or visit www.coloradopreservation.org.

Interior Design Show
Toronto
February 23–25, 2006
The 8th Annual Interior Design Show features thousands of products and services for the residential market from hundreds of manufacturers, distributors, retailers, and designers. The show is open to both trade and consumers. At the National Trade Centre. Call 416/599-3222 or visit www.interiordesignshow.com.

Architectural Digest Home Design Show
New York City
March 9–12, 2006
Design professionals and consumers are invited to experience the latest in home design from nearly 300 high-end exhibitors at the fifth Architectural Digest Home Show. At New York City's Pier 94. Call 800/677-6728 or visit www.archdigesthomeshow.com.

The World of Asphalt Show and Conference
Orlando
March 13–16, 2006
Targeted toward a broad range of asphalt industry professionals, the World of Asphalt 2006 education program will feature two prestigious conferences, the Asphalt Pavement Alliance (APA) Asphalt Pavement Conference and the People, Plants, and Paving Training Program. At the Orange County Convention Center. Call 800/867-6060 or visit www.worldofasphalt.com.

CA Boom 3
Santa Monica, Calif.
March 23–March 26, 2006
In its third year of success, CA Boom 3 expects to double the exhibitor base by creating several new

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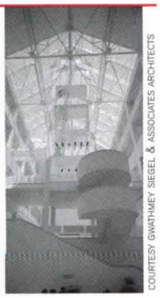
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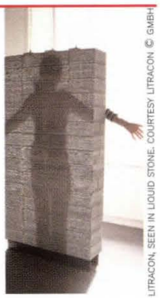
exhibitions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areas of the show, including an area reserved exclusively for designers and manufacturers of prefabricated dwellings. A new "First-Timers Section" exclusively for independent contemporary designers and manufacturers who will show a limited line for the first time will also be featured. At the Santa Monica Civic Auditorium. Call 310/306-6677 or visit www.caboomshow.com.

Coverings
Orlando
April 4–7, 2006
Coverings provides the opportunity for more than 32,000 industry professionals to meet with 1,200 exhibitors from around the world representing the entire spectrum of tile and stone products, tools, and machinery. The show spotlights thousands of new products and hundreds of new suppliers. At the Orange County Convention Center. Call 877/868-5293 or visit www.coverings.com.

44th International Making Cities Livable Conference "True Urbanism & Healthy Communities"
Santa Fe
May 18–22, 2006
Proposal Submission Deadline: December 20, 2005
Topics include: principles of true urbanism; the built environment and the healthy community; community participation in architecture and planning; walkable neighborhoods and physical health; transit-based neighborhood development; reviving America's town squares; making places for civic engagement; teaching urban sustainability; new designs for mixed-use urban fabric; respecting regional and local character; contextual architecture; Classical architecture yesterday and today; child- and family-friendly community design; village-style development; infill v. greenfield development; transforming commuter suburb into mixed-use neighborhood; and redesigning suburban malls as neighborhood centers. For more information, visit www.livablecities.org.

AIA 2006 National Convention and Design Exposition
Los Angeles
June 8–10, 2006
Titled "Architecture on the Edge: Innovation, Engagement, Inspiration," this national convention will bring more than 25,000 visitors to Los Angeles. Call 213/630-0777 or visit www.aialosangeles.org.

Competitions

Innovative Design in Engineering and Architecture with Structural Steel Awards (IDEAS) Awards Competition
Deadline: December 15, 2005
This program recognizes those projects where structural steel has been utilized in an innovative manner and recognizes the entire building team: architectural firm, structural engineer firm of record, general contractor, detailer, fabricator, and erector, as well as the project owner. Visit www.aisc.org/ideas2form.

Designare Dramaticus 2005
Submission Deadline: December 30, 2005
Intaglio Composites has invented a new process that permanently impresses photographs and images into concrete. Possibilities for applying this technology to design entries are boundless. The winning designer will get to pick between \$10,000 cash or \$50,000 worth of photo-engraved concrete. More information is available at www.intagliocomposites.com.

Chan Chan 2006
Registration Deadline: December 31, 2005
Submission Deadline: January 15, 2006
Design a Beach Lodge for the Peruvian Coast. The nearby archaeological monuments, the Citadels of Chan Chan, should inspire and inform your creation. Visit www.arquitectum.com.

06 Skyscraper Architectural Competition
Registration Deadline: January 5, 2006
Submission Deadline: January 15, 2006
Explore new ideas in vertical density by designing a skyscraper in the metropolis of your choice. The competition is run by eVolo, an international architectural organization, which welcomes students and professionals alike to submit. More information is available at www.evolo-arch.com.

4th Annual DFI Student Paper Competition
Washington, D.C.
Abstracts Due: January 6, 2006
Open to graduate and undergraduate students of engineering, construction, and geological sciences. Visit www.dfi.org.

Preserve the Dunes Design Awards Program
Registration Deadline: January 12, 2006

Set up for single-family residences constructed in a critical dune area since these lands were protected in 1989 by the Michigan Sand Dune Protection and Management Act, the awards will recognize excellence in residential and landscape design that is responsive to its setting and protects the dunes. Call 269/208-1711 or visit www.sosdunes.daac.com.

GE Edison Award Competition
Deadline: January 18, 2006
Open to professional designers, architects, engineers, and consultants, entries will be judged on the following criteria: functional excellence; architectural compatibility; effective use of state-of-the-art lighting products and techniques; appropriate color, form, and texture revelation; energy effectiveness; and cost effectiveness. Visit www.geedisonaward.com.

Dedalo Minosse International Award Competition
Registration Deadline: January 27, 2006
In its sixth year, this competition focuses on the client. Work must have been completed by a professional architect or building engineer. Also, a special section has been added—one focusing on Italian architecture and the other on clients who have hired young architects under 40. Visit www.assoarchitetti.it.

A Site Museum for Tulum
Registration Deadline: January 27, 2006
Submission Deadline: March 17, 2006
The 8th International Arquine Competition invites you to design a 1,650-square-foot museum for the third-most visited archaeological site in Mexico. Visit www.arquine.com.

Ceramic Tiles of Italy Design Competition
Deadline: January 30, 2006
This annual awards program recognizes design excellence in projects that feature Italian ceramic tile. North American architects and interior designers are invited to submit residential, commercial, and institutional projects. Entries may be submitted for domestic and international new construction and renovation projects. Visit www.italiantiles.com.

2006 Annual James Beard Foundation Awards
Deadline: January 31, 2006
The James Beard Foundation Awards recognize outstanding achievement within the fine food and beverage industry. Open to architects/designers in North America for restaurant projects since 2003. For further information, visit www.jamesbeard.org.

The Architectural League of New York 2005–2006 Young Architects Forum
Deadline: February 10, 2006
Open to architects and designers no more than 10 years out of undergraduate or graduate school. Winners will receive a cash prize, exhibit their work, and present lectures during April and May at the League in New York City. Call 212/753-1722 or visit www.archleague.org.

New Life for the Big Easy New Orleans
Deadline: March 1, 2006
An international competition for new housing in New Orleans in the wake of Hurricane Katrina's devastation to the Crescent City. Participants in the competition will design housing for an actual block in the city. Programmatic elements include single-family housing, multifamily housing, and mixed-use urban planning. For further information, visit www.architecturalrecord.com.

International VELUX Award 2006
Registration Deadline: February 10, 2006
Submission Deadline: May 5, 2006
Open to students of architecture, the award celebrates and promotes excellence in completed study works and acknowledges students as well as their tutors. The overall award theme is "Light of Tomorrow," reflecting a wish to explore and discuss the role of daylight in architecture. Daylight and sunlight are important factors in how buildings are perceived and in the daily lives of people, their health and comfort, at home or at work. Visit www.velux.com/a for further information.

4 Corners Design Competition
Registration Deadline: February 24, 2006
Submission Deadline: March 1, 2006
Submit a design for a pedestrian connectivity in downtown Naples, Florida. In addition to the jury's judging process, community members will vote for the "People's Choice Award." More information is available at www.aiaflasw.org.

E-mail event and competition information two months before event or submission deadline to elisabeth_broome@mcgraw-hill.com. Edited by Alexandra Gates.

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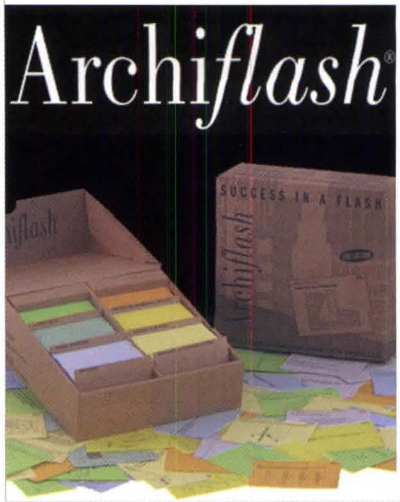

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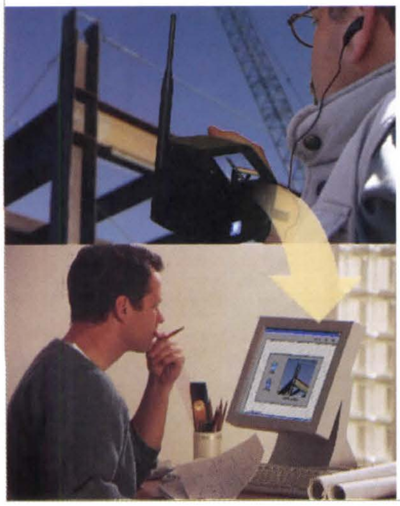

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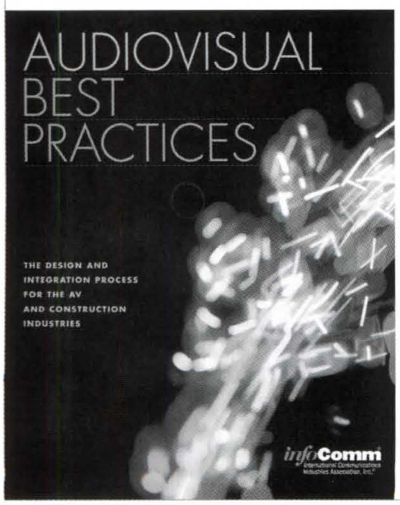

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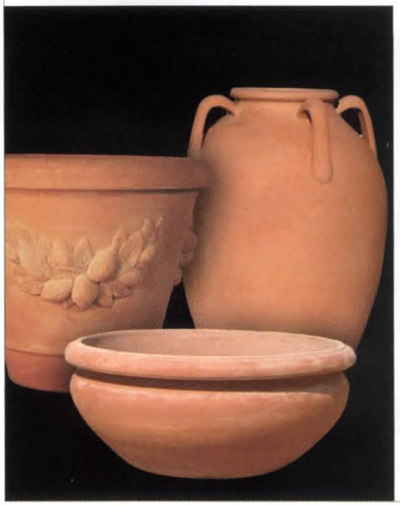

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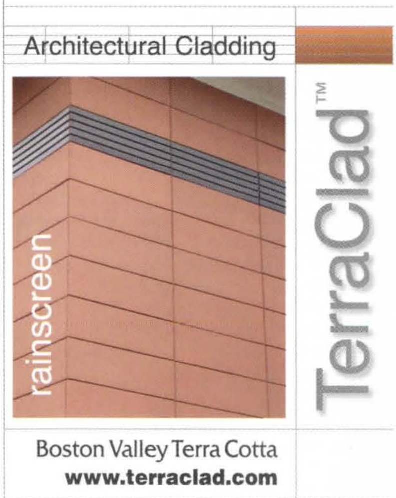


Boston Valley Terra Cotta Inc.

A "green" architectural cladding system delivering the advantages of rain screen performance while retaining the beauty and richness of terra-cotta. Terraclad is a fired ceramic material produced in the U.S.A. in Boston Valley Terra Cotta Company's state of the art facilities in Orchard Park, NY. Available in colors, sizes and patterns to match the designer's imagination.

888-214-3655
www.bostonvalley.com

| Circle Reader Service #160

Commercial Grade Outdoor Furniture

2 Site construction

Modern Outdoor

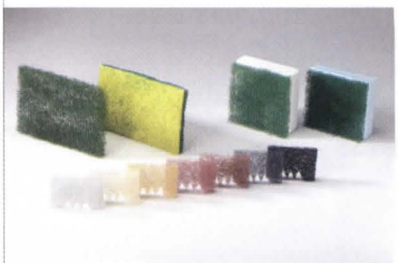
High style, clean-lined simplicity, short lead times, environmentally conscious materials—these are the attributes of Modern Outdoor—a producer of top quality outdoor furniture with a definitive modern aesthetic. The Modern Outdoor Collections are commercial grade products designed for the restaurant, hospitality, and resort industries, with an aesthetic that is perfect for a residential client's backyard setting. The entirety of the Collection is made from Ipe, Electropolished Stainless Steel and Natural Composite materials. Modern Outdoor offers attractive pricing.

818-838-7060
www.modernoutdoor.com

| Circle Reader Service #158

Help Prevent Moisture-Related Masonry Failures

4 Masonry



CavClear

CavClear® helps prevent mold, mildew and other moisture-related failures in masonry walls. CavClear® products offer a comprehensive approach to moisture management and airspace maintenance in your masonry designs. CavClear® products are not installed just at the flashing levels; they are specified and installed throughout the full-height of the airspace. A continuous drainage and ventilation is critical in preventing failures. CavClear® products are the only complete, patented solution to protect weeps and prevent mortar bridges.

888-436-2620
www.cavclear.com

| Circle Reader Service #161

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TO ADVERTISE: Contact Deidre Allen
T: (212) 904-2010 / F: (609) 426-7136
deidre_allen@McGraw-Hill.com

Thin Stone Cladding Systems

4 Masonry

Stone Truss Systems, Inc.

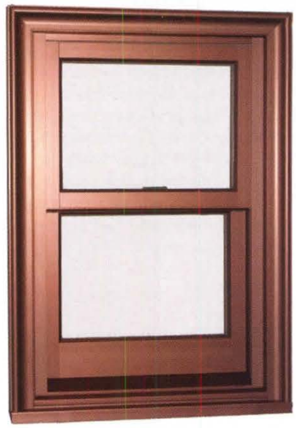
Thin lightweight natural stone wall cladding by THIN STONE SYSTEMS, LLC offers economical solutions for new construction and renovation, for both exterior and interior. Reinforced by a special patented process, the thin veneer panels of natural granite, marble, or limestone are applied to a structural framing system of extruded aluminum. Weighing only 6-lb. psf, the wall system provides many advantages including speed and simplicity of installation.

212-838-7667
www.thinstonesystems.com

| Circle Reader Service #162

Copper Finish

5 Metals



Linetec

Linetec offers a copper anodize finish that maintains its initial copper color and does not patina over time. Architects, owners, and residents no longer need to worry about the design complexities and maintenance issues when choosing the classic look of copper. Contact Linetec for more information or to request samples.

888-717-1472
www.linetec.com

| Circle Reader Service #165

Pre-Engineered Railings

5 Metals

Handrail Design Inc.

inox™ Stainless Railing System: Manufactured of corrosion-resistant stainless steel, inox is ideal for interior or exterior applications in commercial and residential facilities. Infill materials are available in perforated stainless steel, tempered glass, and stainless steel rods. Handrails are available in wood/stainless, stainless, or colored nylon. Curved rails and custom designs are available. Complete supply and installation service are available throughout North America, which includes inox, CIRCUM™, HEWI® Nylon, and d line™ railings. Email info@hdirailings.com

717-285-4088
www.hdirailings.com

| Circle Reader Service #163

Aluminum Flooring

5 Metals

Power Stretch

Aluma Floor™ is manufactured with 3/16-in. solid aluminum. A "Floor of The Future" is now here. Let your creativity run. Call or visit their web site.

630-628-0226
www.aluminumfloors.com

| Circle Reader Service #166

Safety Railings

5 Metals

Kee Industrial Products, Inc.

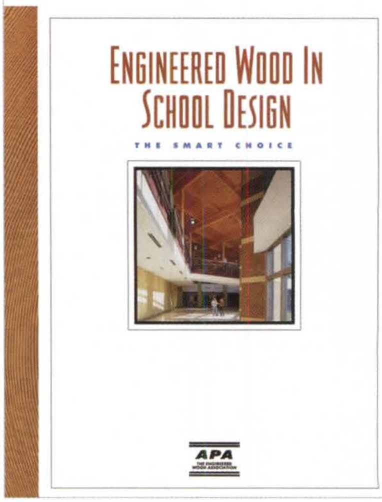
OSHA-compliant Kee Klamp® slip-on, structural pipe fittings for railings, awnings, display fixtures, lighting grids, and other tubular pipe structures provide a strong, lower-cost alternative to installing welded railings. Galvanized for corrosion-resistance, Kee Klamp fittings are available in more than 70 styles in a variety of sizes to fit standard pipe from 1/4-in. to 2-in. diameter. Newer fittings allow for flat panels to be attached to tubular pipe structures. Complete line of fittings includes crossovers, tees, in-line joints, swivel fittings, base fittings, wall flanges, elbows, corners, internal spigots, slopes and angles.

800-851-5181
www.KeeGuard.com

| Circle Reader Service #164

Engineered Wood In School Design

6 Wood & plastics



APA The Engineered Wood Association

School design has come a long way since the "quick and cheap" concrete structures of the 1950s. Today, architects work to create large, open spaces that meet project-oriented teaching styles instead of traditional, classroom-centered "chalk and talk" presentations. This publication from APA—*The Engineered Wood Association* describes key design and construction issues through interviews with architects and school officials. Engineered wood's broad design capabilities are profiled in nine schools from around the country, with photographs of gymnasiums, libraries, cafeterias, common areas and front entries.

www.apawood.org

| Circle Reader Service #167

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deidre_allen@McGraw-Hill.com

Columns & Capitals

6 Wood & plastics

Architectural Products by Outwater, LLC

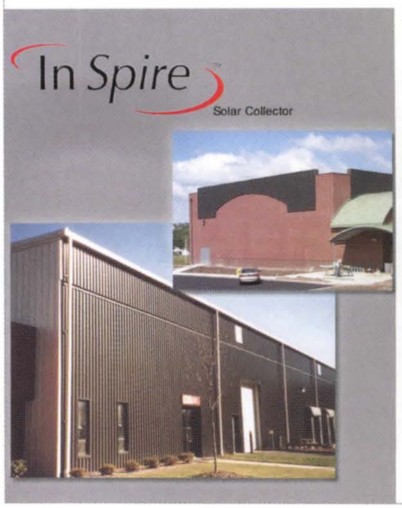
Architectural Products by Outwater stocks a vast assortment of Classical, Colonial, and Non-Tapered, plain/fluted, round/square columns in wood, structural and decorative composites, and aluminum. Available with free traditional caps and bases or optional classically ornate plaster, resin or aluminum capitals, Outwater offers stock columns in heights from 8-ft. to 12-ft. with 6-in. to 12-in. diameters, and custom made-to-order heights up to 26-ft. with 36-in. diameters. Outwater also offers a variety of options for custom column requirements.

800-835-4400
www.outwater.com

| Circle Reader Service #168

Metal Wall Cladding

7 Thermal & moisture protection



ATAS International, Inc.

ATAS International Inc. introduces the INSPIRE Wall System, a new metal wall cladding made from .032 aluminum with tiny perforations in a heat absorbing surface. The premium finish is available in sixteen standard colors. Mounted a few inches from the main wall, on preferably a southern exposure, fresh air is drawn through the perforations and directed into the building with a fan and duct system. Air space between the walls also acts as an insulator. INSPIRE Wall is environmentally friendly, because it uses clean, natural energy.

800-468-1441
www.atas.com

| Circle Reader Service #171

Architectural Columns, Balustrades & Mouldings

6 Wood & plastics

Melton Classics, Inc.

Melton Classics provides the design professional with the most comprehensive selection of quality architectural products in the industry, including architectural columns, balustrades, mouldings, cornices, and a wide array of architectural elements. Architectural columns are available plain or fluted, load-bearing or column covers, round or square in fiberglass, fiberglass/marble composite, synthetic stone, cast stone, GFRC, and wood for paint or stain. Melton Classics offers a maintenance-free balustrade product ideal for any application.

800-963-3060
www.meltonclassics.com

| Circle Reader Service #169

Shake

7 Thermal & moisture protection

CertainTeed Corporation, Roofing Products Group

With a timeless style worthy of its name, the CertainTeed Presidential Shake™ is designed to exceed the industry's toughest performance standards. Constructed of two laminated layers of the most durable roofing materials, the solid 355-pound shingles provide an extra layer of protection and peace of mind.

800-233-8990
www.certainteed.com

| Circle Reader Service #172

Pad-Style Snow Guards

7 Thermal & moisture protection

Alpine SnowGuards

Alpine SnowGuards manufactures over 60 styles of snow retention devices. Pictured are their new SnowCatcher™ traditional pad-style snow guards, available in copper, zinc, lead-coated copper, Kynar-painted aluminum, Galvalume, and other metals. They make snow guards for just about any roof. Fax number 888-766-9994 Email info@alpinesnowguards.com

888-766-4273
www.alpinesnowguards.com

| Circle Reader Service #170

Crimp-Curved Roof, Wall & Decking Panels

7 Thermal & moisture protection

Curveline

Curveline can crimp-curve metal panels in a range of profiles, substrates and finishes for structural or decorative use. Applications: roofs, walls, standard and acoustical decking, canopies, fascias, mansards, etc. Specifiers may source panels from manufacturers in 100+ factory locations and select the desired curving parameters, including simple, complex and multi-radius curves.

www.met-tile.com/curveline

| Circle Reader Service #173

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T: (212) 904-2010 / F: (609) 426-7136
deidre_allen@McGraw-Hill.com

Metal Snow Guards

7 Thermal & moisture protection

East Coast Lightning Equipment

East Coast Roof Specialties, a Division of East Coast Lightning Equipment, introduces Ice-Brakes—metal snow guards for metal roofs. Their cast aluminum pad style snow guards are designed to prevent dangerous and destructive snow and ice avalanches from metal roofs by holding built-up snow in place. Ice-Brakes are low profile—projecting just over 1-in. from the surface of the roof. They cast little shadow and are less conspicuous than taller style snow guards. Ice-Brakes are installed with or without roof penetrations, and are handcrafted and economically priced.

860-379-9072
www.icebrakes.com

| Circle Reader Service #174

Roof Penetration Flashings

7 Thermal & moisture protection

SBC Industries

SBC Industries has developed a complete line of easy-to-install roof penetration flashings that replace pitch pans known to require maintenance and commonly cause roof failure. They are approved and endorsed for use in warranted roofs by a number of system manufacturers. These stainless steel flashings are compatible with most materials and are the answer to problems with flashing of angle irons, I and H beams, pipes, square tubing, channels, conduits, coaxial and lightning cables, and struts. Available in either a split or a slipover design.

800-228-2580
www.sbcflashings.com

| Circle Reader Service #177

Snow & Ice Protection

7 Thermal & moisture protection

M.J. Mullane Co., Inc.

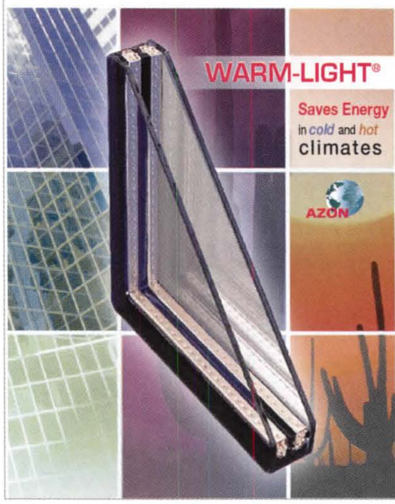
Mullane Snow Guards is now in its 23rd year of manufacturing quality snow and ice retention products. The Bronze Guard® line continues to expand its cast bronze products, which have proven to be among the most durable and attractive in the industry. The three-pipe bronze fence bracket has over 4,000-lb. capacity and its smooth lines are compatible with historic restoration or new construction. Architectural castings do not crack from ice, water, and temperature extremes. Mullane Co. recently acquired the historic Fitrite-David Levow Snow Guard Company.

978-568-0587
www.bronzeguard.com

| Circle Reader Service #175

Extreme Performance Commercial Insulated Glass

8 Doors & windows



AZON USA Inc.

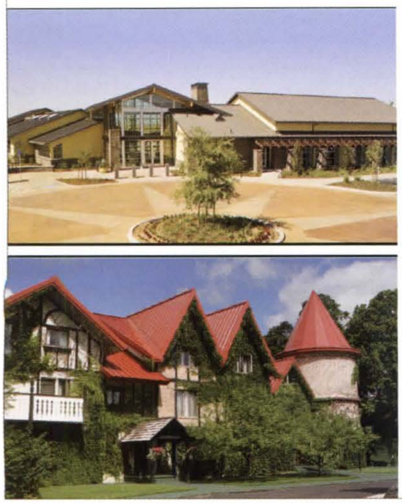
Warm-Light® spacer from Azon creates a warm-edge glass unit that reduces thermal conductivity in any climatic condition. The result is a dramatic reduction in condensation on the glass surface in cool climates and less heat transfer in warm climates, as well as lower utility costs and a more comfortable interior environment. The polyurethane core in Warm-Light spacer is 100 times less conductive than stainless steel or conventional aluminum spacer. Also enables design flexibility for a variety of building types, window sizes and styles, with standard and custom colors.

800-788-5942
www.warmedge.com

| Circle Reader Service #178

Metal Building Components

7 Thermal & moisture protection



Metal Sales Manufacturing Corporation

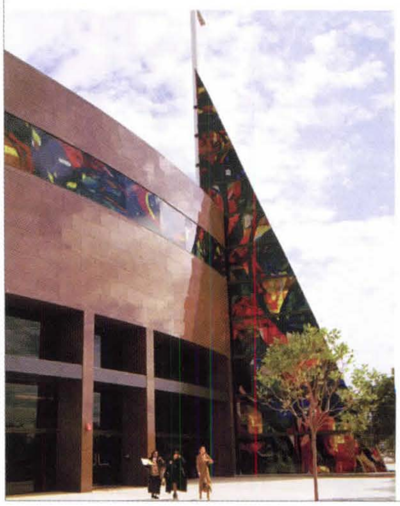
With 19 branches throughout the United States, Metal Sales Manufacturing Corporation is one of the building industry's premier providers of metal building components. They produce metal roofing, siding panels, and accessories for agricultural, commercial, architectural, industrial, and residential building projects of every shape and size—new construction or retro-fit. Metal Sales has a 40-year history of providing cutting-edge products, impeccable service from highly trained professionals, and the largest sales force in the industry.

800-406-7387
www.metalsales.us.com

| Circle Reader Service #176

Stained Glass Meets Codes

8 Doors & windows



Bovard Studio Inc.

Bovard Studio Inc. Stained Glass has developed a proprietary process for laminating stained glass onto large panels of 1/2-in. laminated tempered glass to meet hurricane and earthquake codes. Pictured: West Angeles Cathedral's 108-ft.-high stained glass tower with its 652-ft.-long by 8-ft.-high stained glass clerestory band.

800-452-7796
www.bovardstudio.com

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deidre_allen@McGraw-Hill.com

Swing Doors

8 Doors & windows

Eliason Corp.

Eliason Easy Swing® Doors are manufactured for use in supermarkets, restaurants, drug stores, specialty stores, department stores, food service and walk-in coolers. Choose from a variety of colors and options. The HCP-10 is built to take the punishment from motorized equipment and pallet jacks. Custom manufactured to meet your specifications. Buy direct. Specify with confidence.

800-828-3655
www.eliasoncorp.com

| Circle Reader Service #180

Anti-Reflective Glass

8 Doors & windows

IGT Glass

Luxar anti-reflective glass is perfect for any glass application where glare and reflection are not wanted. Luxar reduces glare and reflection to less than 0.5%. It is perfect for museums, store fronts, stadiums, restaurants, projection rooms and display cases. It is available on low iron float glass for maximum clarity in 2mm to 12mm thicknesses to meet any project requirement.

480-767-2200
www.luxar.com

| Circle Reader Service #183

Walkable Laminated Safety Glass

8 Doors & windows

General Glass International

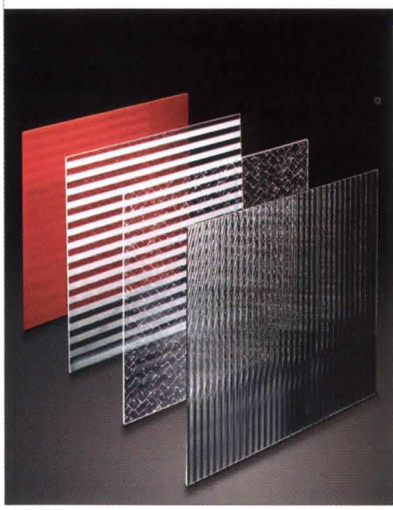
Bi-Step Structural Glass Flooring by BGT offers design freedom for artful expression while meeting the functional needs of any project. It is a walkable laminated safety glass for use in floors, bridges, landings, and stairs. It offers code compliant slip-resistant friction values and proven structural integrity.

800-431-2042
www.generalglass.com

| Circle Reader Service #181

Visual Effects Glass

8 Doors & windows



Oldcastle Glass®

Montage™ Visual Effects Glass by Oldcastle Glass® is a totally new concept in glazing. Montage™ provides architects and designers the ability to create unique custom effects by combining a wide variety of standard designs and technologies. Montage™ allows you to mix and match textured patterned glass, custom colored coatings, designer silk-screened patterns, even unique rice paper designs into your very own vision.

866-653-2278
www.oldcastleglass.com

| Circle Reader Service #184

Ceramic Frit

8 Doors & windows

Goldray

This versatile product can be applied to glass for a cost-effective, low-maintenance solution to many design needs. Goldray glass coated with ceramic frit is available in combinations of solid colors, metallic colors, and translucent colors. Goldray products produced with ceramic frit will be highly durable, with abrasion resistance, a long life, and the ability to withstand a large range of temperatures. This product is available in both laminated and monolithic forms. Visit Goldray's web site for more information on this and other innovative products.

800-640-3709
www.goldrayindustries.com

| Circle Reader Service #182

Glass

8 Doors & windows

PILKINGTON
First in Glass™

Pilkington

Pilkington North America is a total glass solution provider. Pilkington has a solution for every glass requirement, whether that requirement is to control energy usage, protect against fire, insulate against noise, provide safety and security, display decoration and privacy, or build all glass facades. For more information or to order samples and literature, please call 800-221-0444 or e-mail building.products@us.pilkington.com. Visit www.pilkington.com.

800-221-0444
www.pilkington.com

| Circle Reader Service #185

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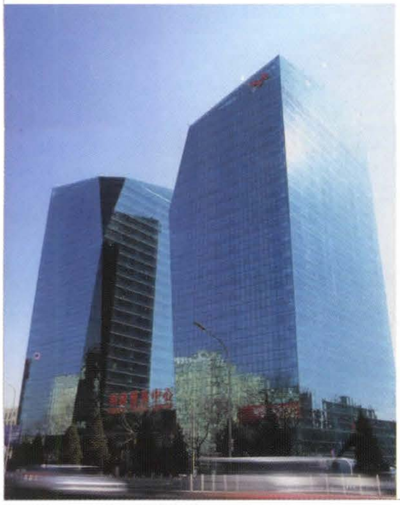
T: (212) 904-2010 / F: (609) 426-7136
deidre_allen@McGraw-Hill.com

Reflective Glass

8 Doors & windows



Pilkington

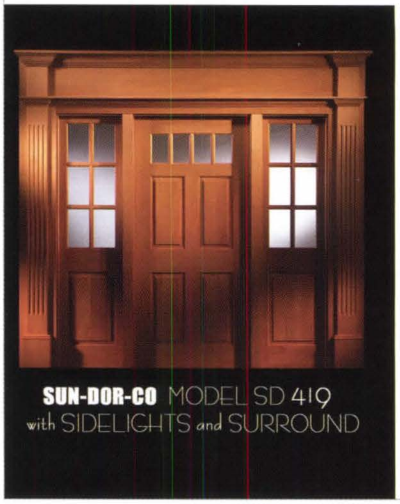
Pilkington Eclipse Advantage™ Reflective Glass outperforms traditional glass solutions with a unique combination of reflectance, high daylight transmittance and low heat absorption, as well as significantly reduced lead times only a pyrolytically coated glass can provide. A durable, easily fabricated product with excellent availability, Pilkington Eclipse Advantage™ Reflective Glass is one of a broad palette of distinctive colors, including Pilkington Arctic Blue™, Blue Green™, EverGreen™, Gold, Bronze, Grey and Clear Eclipse Advantage™.

800-221-0444
www.pilkington.com

| Circle Reader Service #186

Custom Doors

8 Doors & windows



SUN-DOR-CO

SUN-DOR-CO will handcraft any custom door your creativity and client requires. SUN-DOR-CO makes it possible, and practical for you to source your client a beautiful one-of-a-kind door of the highest quality. 50 years of experience assures you an exceptional hand-crafted door, as shown in this photo of a door-surround. SUN-DOR-CO turns your door design and your client's dream into reality in less than 60 days.

800-835-0190
www.sundorco.com

| Circle Reader Service #189

Brochure & Data Sheet

8 Doors & windows

Pilkington Fire Protection Glass North America

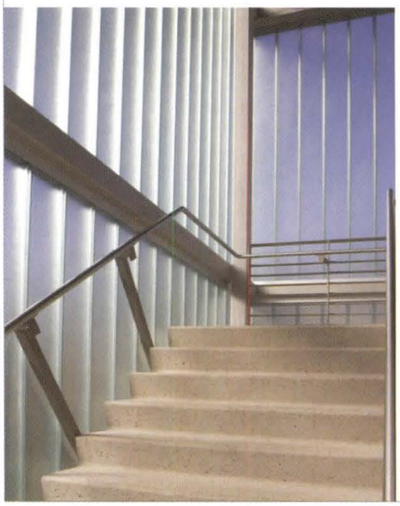
Pilkington introduces a new product brochure and technical data sheet. The brochure includes information on both the Pilkington Pyrostop™ Fire Resistant Glass and Pilkington Pyrodur™ Fire Protection Glass products. You can download a copy of the new brochure and data sheet from their web site or call them. The products are available in the U.S. through Technical Glass Products (TGP).

419-478-0165
www.pilkington.com/fire

| Circle Reader Service #187

Glass Walls, Facades & Partitions

8 Doors & windows



Technical Glass Products

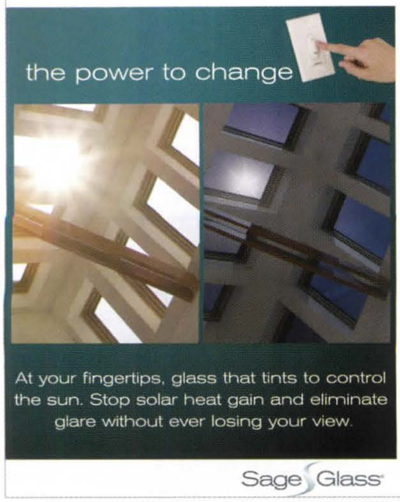
Technical Glass Products offers Pilkington Profilit™—an exciting translucent glass option for commercial and residential applications. Profilit uses self-supporting cast glass channels in aluminum perimeter frames to create glass walls, facades or partitions that are opaque but also transmit light.

888-397-3473
www.tgpamerica.com

| Circle Reader Service #190

Electronically Tintable Glass

8 Doors & windows



SAGE Electrochromics, Inc.

In the making for over a decade; durable, tested glass that tints at the push of a button. SageGlass® electronically tintable glazing eliminates having to choose between a design that maximizes the positive attributes of the sun—daylight, view, connection to the outdoors—and one that attempts to minimize its drawbacks—heat gain, glare, and fading. You get unprecedented solar control without the need for blinds, so the view and your design intent are preserved.

877-724-3321
www.sage-ec.com

| Circle Reader Service #188

Blinds Between Glass

8 Doors & windows

Unicel Architectural Corp.

Unicel Architectural Inc. has developed a unique patented glazing product: Vision Control®. With this custom unit, enjoy total control of light, privacy and sound without worrying about cleaning. Unlike ordinary blinds, Unicel's pivoting blinds made of extruded aluminum are mounted inside a hermetically sealed glass unit offering you 100% dust-free and germ-free louvered glazing. Blinds are operated using a hand crank, thumbwheel, motorized switch or computer; cord-free and string free. Ideally suited in interior partitions, doors, windows, curtain walls, skylights.

800-668-1580
www.visioncontrol.qc.ca

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deidre_allen@McGraw-Hill.com

Wood Interior Windows & Doors

8 Doors & windows

Weather Shield Windows & Doors

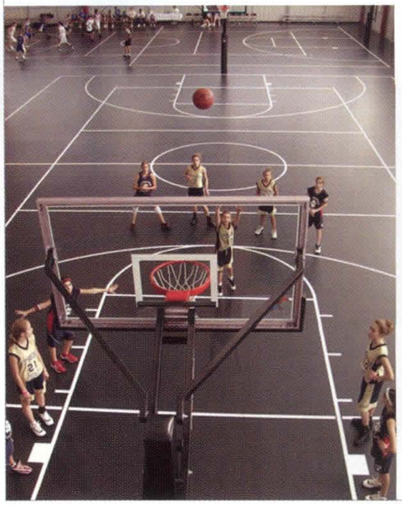
Engineered with unique features and built for unparalleled performance, the Weather Shield Legacy Series is simply one of the best window and door lines available for custom and luxury homes. Available in tilt double-hung, casement, awning, and direct-set windows and French doors, the premium windows feature elegant wood interiors in a variety of wood species from Weather Shield's Custom Wood Interiors Collection™.

800-477-6808
www.weathershield.com

| Circle Reader Service #192

Resilient Athletic Flooring

9 Finishes



Abacus Sports Installations

Abacus Sports Installations is proud to offer PADENPOR. *PADENPOR* resilient flooring is designed for multipurpose use, including all sports activities, dances, meetings, roller blading, etc. PADENPOR is a "dual durometer" multi-purpose floor. Two products (rubber basemat and urethane) are combined to introduce two different hardnesses to the floor. The rubber underlayment (LEED and Green certified) is soft, offering resilience/ergonomics/safety. The urethanes are hard, offering not only performance (ball rebound/playability) but also durability.

800-821-4557
www.abacussports.com

| Circle Reader Service #195

Custom Accordian Doors

8 Doors & windows

Woodfold-Marco Mfg., Inc.

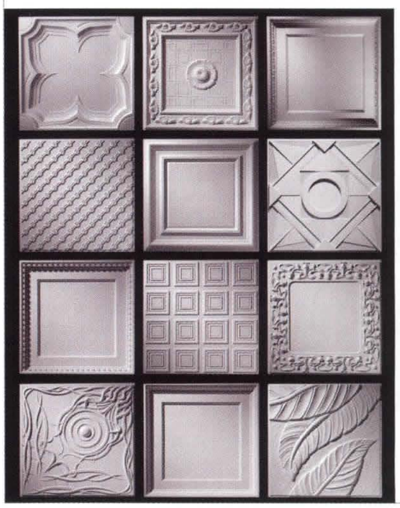
Woodfold custom made accordion folding doors fill a variety of needs in America's schools. Totally suspended from overhead track, with sight, security and acoustic models available, Woodfold can bring the world to your classroom. Their solid hardwood roll-up doors coil conveniently overhead and are ideal for food service areas, bookstores, and reception areas. Woodfold doors are available through an established network of building product specialty distributors. Fax number 503-357-7185.

503-357-7181
www.woodfold.com

| Circle Reader Service #193

Ornamental Plaster Ceiling Tiles

9 Finishes



Above View Mfg., By Tiles, Inc.

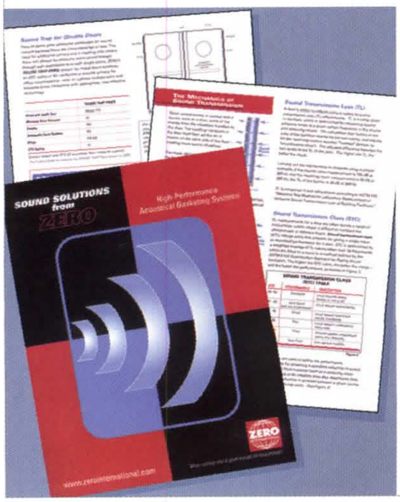
ABOVE VIEW ornamental plaster ceiling tiles are fabricated from a non-toxic, non-combustible, proprietary composition. They drop into any standard 15/16-in. T-Bar grid system. There are more than 50 standard designs, custom design work, and 1300 custom colors and faux finishes available upon request.

414-744-7118
www.aboveview.com

| Circle Reader Service #196

Sound Solutions

8 Doors & windows



Zero International, Inc.

A definitive guide to understanding the science of sound as it applies to doors and door openings. This 20 page brochure discusses the principles of acoustics and noise problems, explains the transmission of sound and how it is measured, provides a good working knowledge of STC ratings for door openings, along with an understanding of the role of gasketing in achieving the needed STC values required. The second half of the brochure discusses the steps for practical application, plus specific gasketing and components available for maximum sound control. Free in printed form or on the Web.

800-635-5335
www.zerointernational.com

| Circle Reader Service #194

Ceiling & Wall Metal Panels

9 Finishes

Chicago Metallic

Traditions™ embossed metal ceiling and wall panels from Chicago Metallic combine the look and feel of finely crafted antique embossed tin and ornate plaster. Over forty panel and cornice design choices. Nail-up, lay-in and concealed snap-in options. Painted and anodized finishes. Perforations are available for acoustical performance up to NRC 0.95. Visit their web site.

800-323-7164
www.chicagometallic.com/traditions

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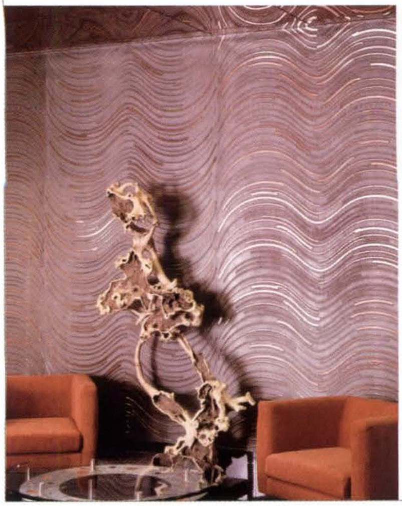
deidre_allen@McGraw-Hill.com

Cast Metal Wall Surfacing Material

9 Finishes



Gage

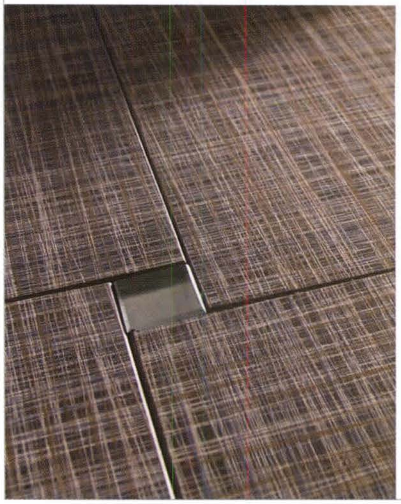
Gagecast® is a cast metal wall surfacing material suitable for a variety of interior architectural applications where patterns that feature high luster, relief, durability, and cost effective installation are a requirement. Twenty-eight designs are standard, however, custom collaboration is encouraged. Gagecast® is one component of Gage Vertical Surfacing. Contact the factory for product literature and selected samples.

800-786-4243
www.gageverticalsurfacing.com

| Circle Reader Service #198

Italian Clay Flooring

9 Finishes



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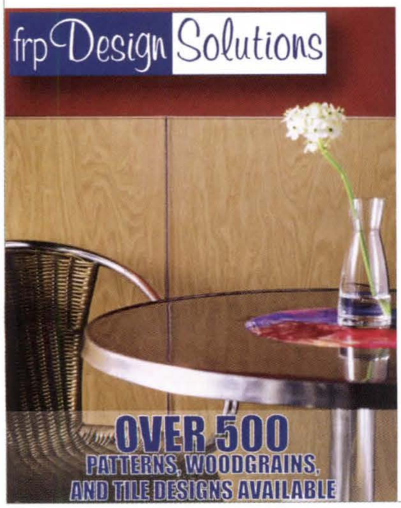

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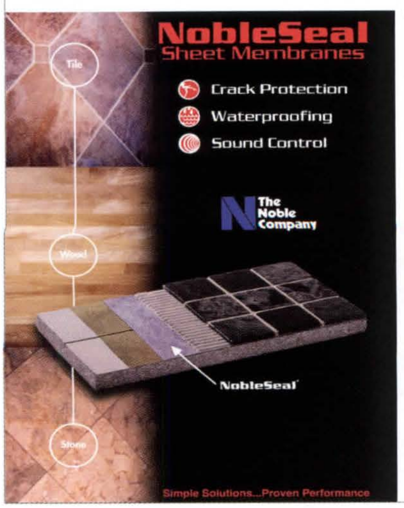

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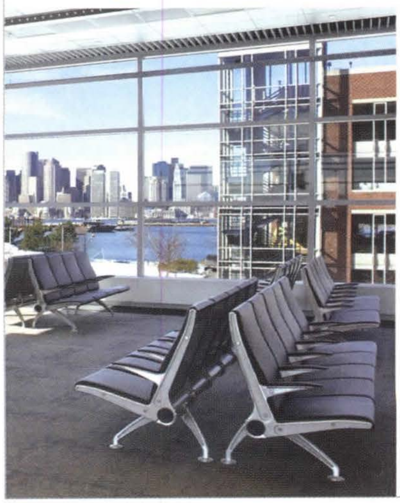

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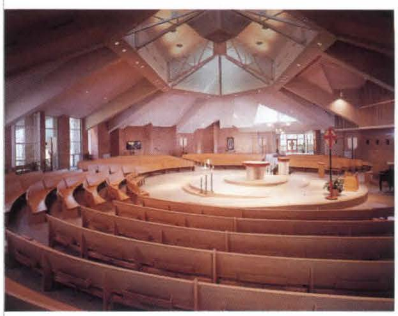

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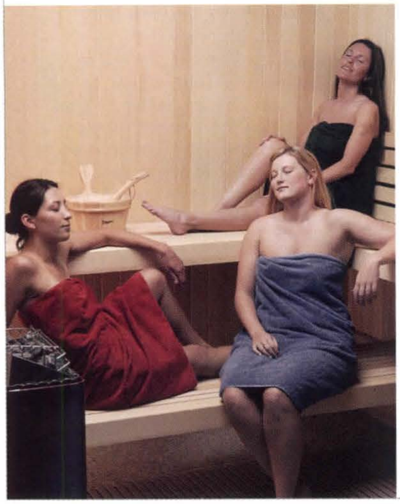

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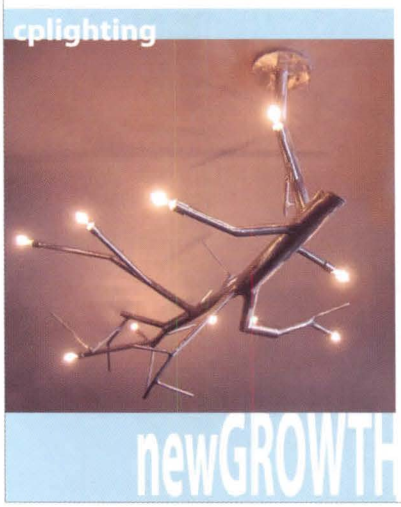

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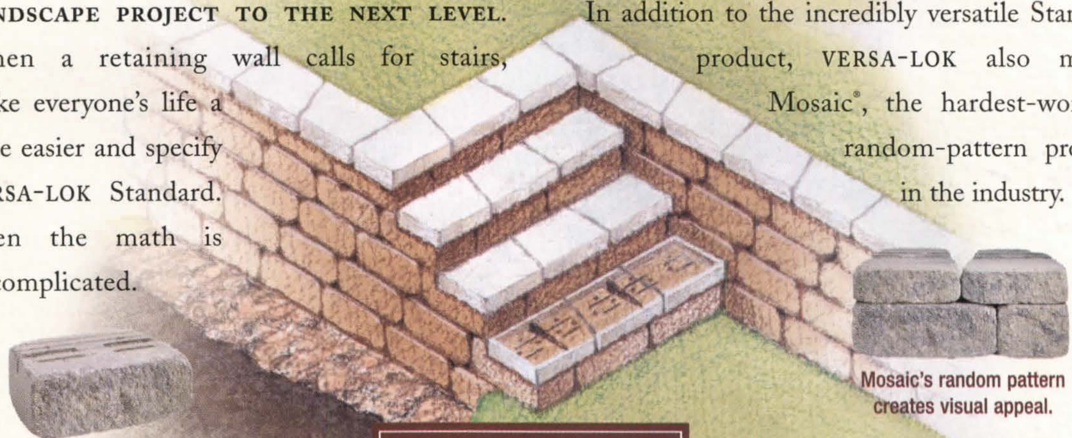

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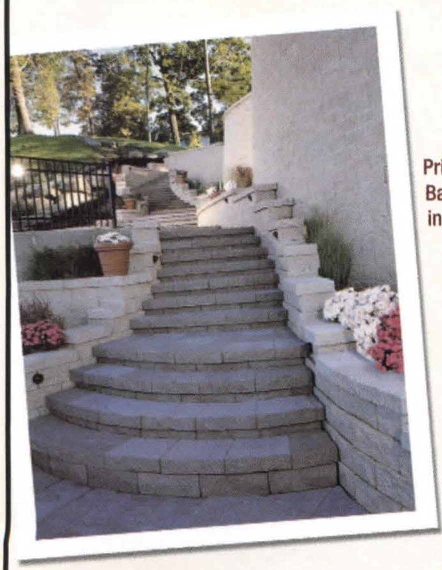

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From the pages of ARCHITECTURAL RECORD 2004

A Record House Twin

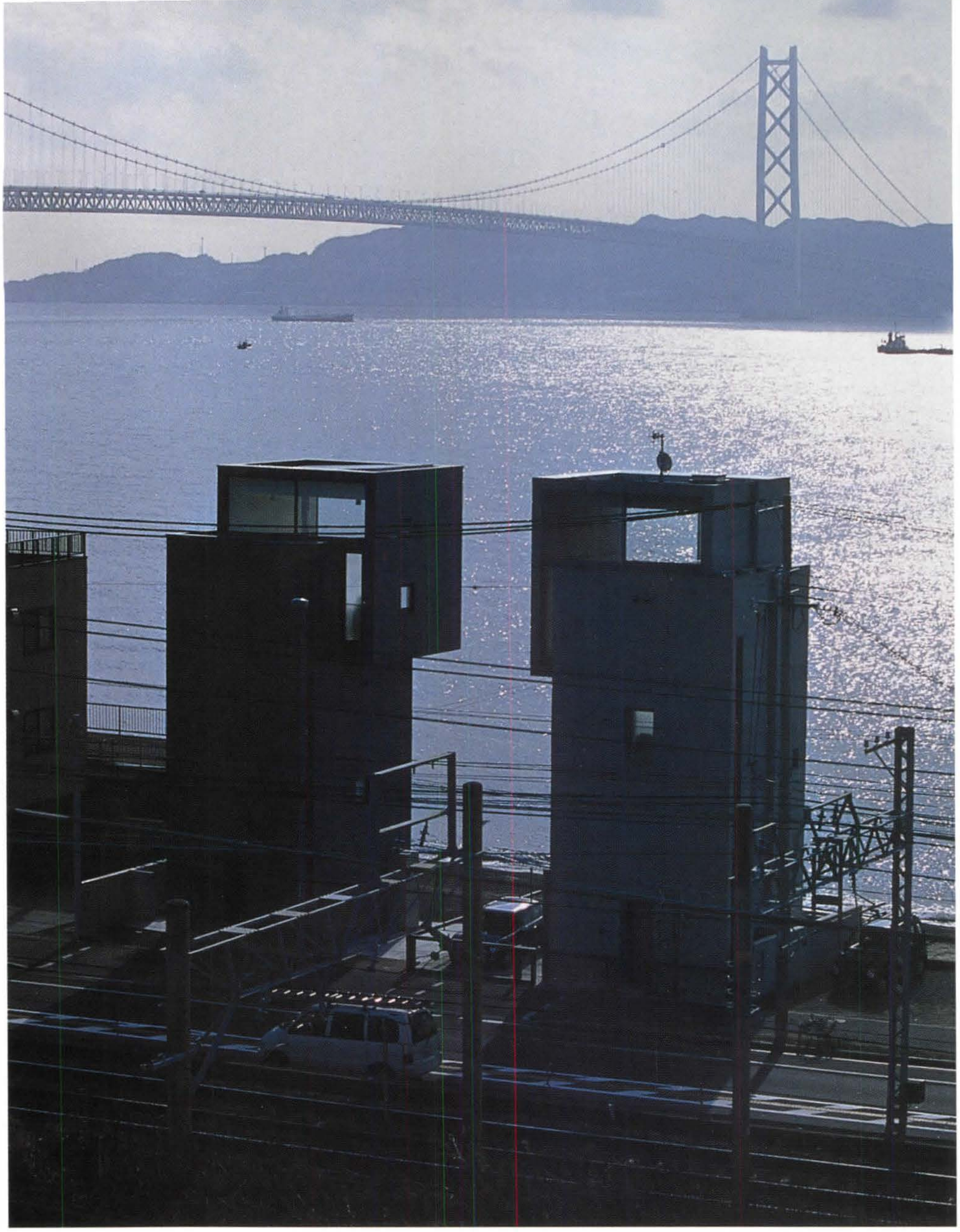
By Naomi Pollock

PHOTOGRAPHY: © FUJITSUKA MITSUMASA (BOTTOM)

On its completion in 2003, Tadao Ando's 4 x 4 House, in Kobe, Japan, stood as a tiny concrete tower that didn't look or act like a house and, bracketed between a busy street and the Inland Sea, didn't even have another home nearby. Equally unorthodox, 4 x 4 was the product of a trendy magazine's mail-in survey that had matched up the client, a concrete contractor, with the world-famous architect.

A clean, direct solution to an owner's needs and a site's constraints, 4 x 4 was also, on a deeper level, an architect's personal response to the shocking devastation wrought by the Great Hanshin Earthquake. Ando purposefully made the house tall enough to provide views of the epicenter's location, on Awaji Island, directly across the water. With a diminutive footprint, measuring 4-by-4-meters, the building stood alone like a lighthouse, exposed and vulnerable to wind and sea.

From the start, the architect dreamed of someday building an addition: a separate but connected structure. But fate intervened. After the first house's completion, another client approached Ando, requesting a 4 x 4 of his own. Despite the uniqueness of the first tower, the designer embraced the idea, even suggesting that the new house stand right beside the



This page: **Along a commercial strip on the outskirts of Kobe, the new tower (left in photo, right) occupies a tiny, previously vacant site (below) next door to the original 4 x 4 House.** **Previous page:** **Ando's original sketch (top) anticipated a separate volume as an addition, but not a second tower as built (bottom).**

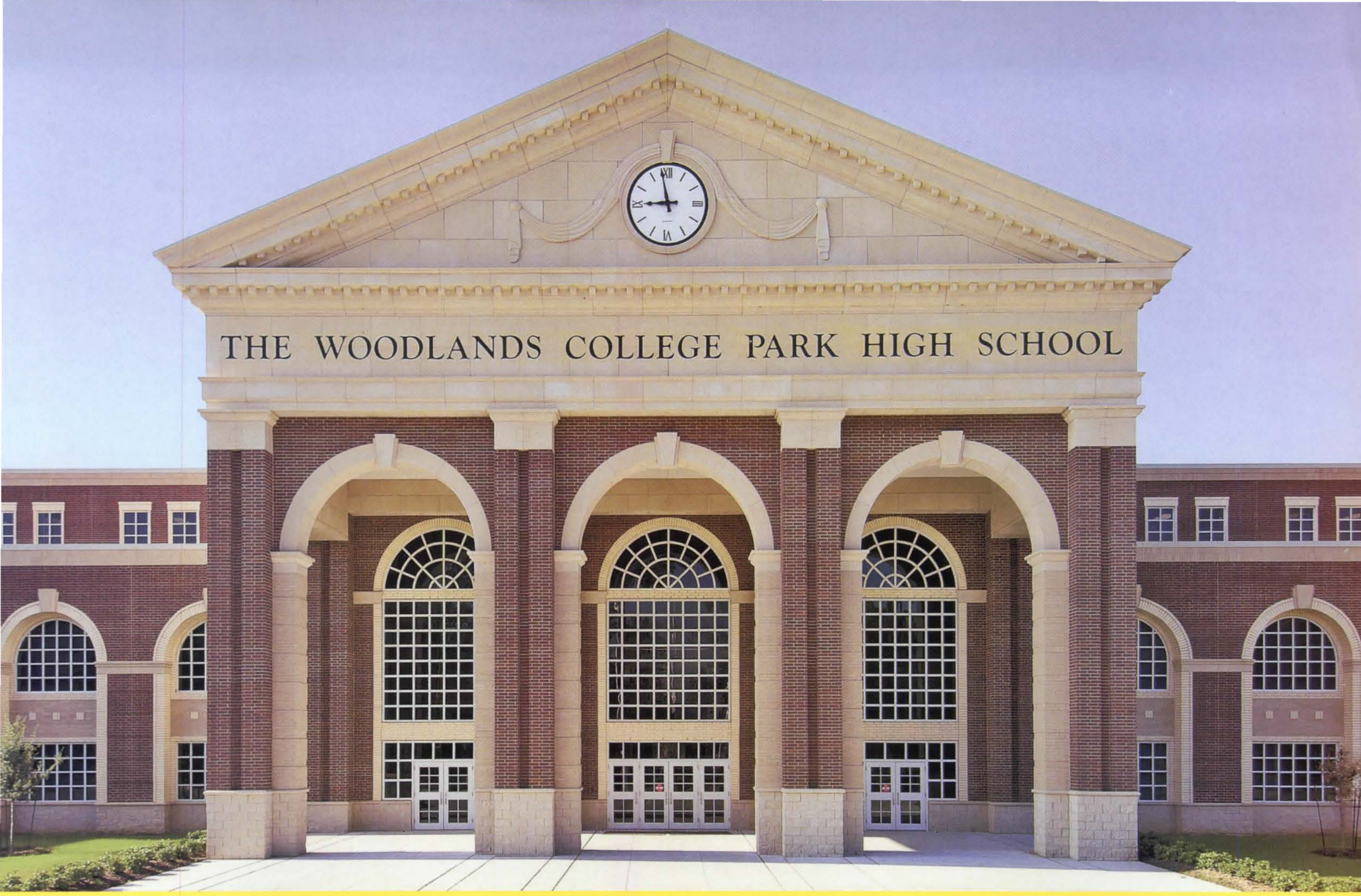
(continued from previous page) old one—on land owned, but now leased out, by the original client. This time, though, the architect agreed to use wood, his new client's preference, instead of concrete.

The concrete-contractor-turned-client (and now next-door neighbor) who had built the 4 x 4 House I also erected "The Sequel," as Ando dubs it. Both buildings have essentially one function per floor. But the use of wood versus concrete only subtly distinguishes the duo. While the new tower has a laminated-pine structural frame and Paulownia wood flooring, its exterior cement-board cladding bears a strong resemblance to the sibling building's exposed concrete. Only at The Sequel's corners, where the architect pulls back the panels, does he reveal timber on the exterior.

While the two houses share practically the same massing and dimensions, they are not identical twins. The most significant difference is in the vertical circulation. Ando gave the newcomer an elevator and, instead of the original space-consuming, standard switchback stairs, L-shaped runs hug the building's edges. By pushing the stairway to the perimeter, Ando could tidy up the top-floor configuration and create a perfect cube for the most important space: the combined kitchen-living-dining room, with Awaji Island views.

As mirror images, the blocky tops of the two buildings jut toward each other. "By creating paired structures, resembling a gate opening out toward the sea, I hope to reinforce the connection of architecture to the place," explains Ando. Together, two towers may make a larger statement than one, but this near replication weakens the profound message conveyed by a solitary, asymmetrical sentinel. ■

PHOTOGRAPHY: © FUJITSUKA MITSUMASA (TOP); MITSUO MATSUOKA (BOTTOM)



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