ARCHITECTURAL RECORD

INNOVATION

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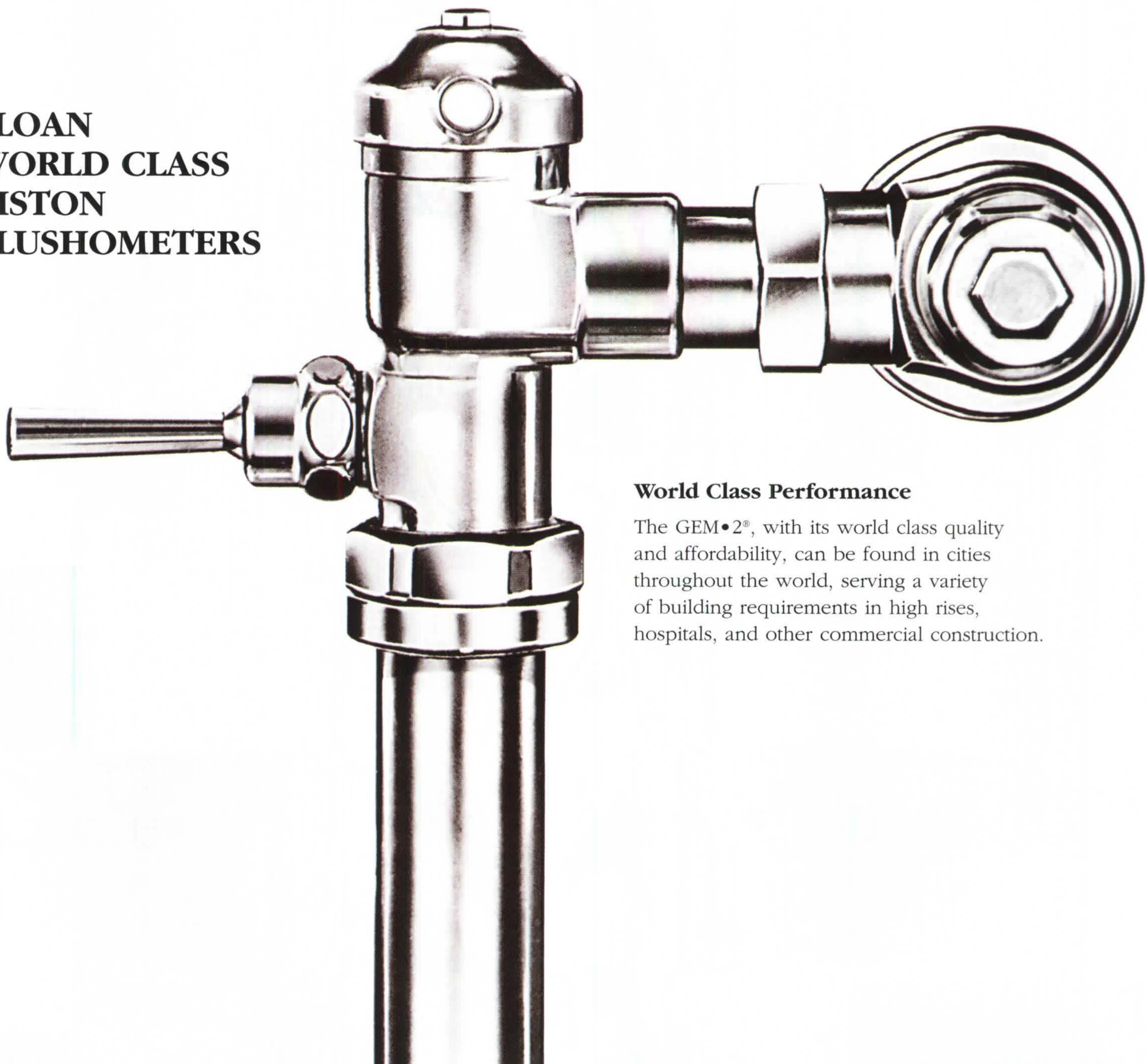

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ARCHITECTURAL RECORD INNOVATION

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ARCHITECTURAL
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INNOVATION

OCTOBER 2003

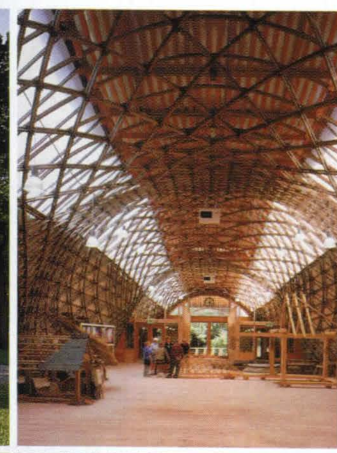
On the Cover: *Peter Testa and Devyn Weiser used Weaver by Simon Greenwold to develop the Carbon Tower (page 36). The generative software allows exploration of industrial braiding and weaving and supports the study of material properties, performance, and manufacturing parameters associated with composites. Weaver is written in C++ and Open GL.*

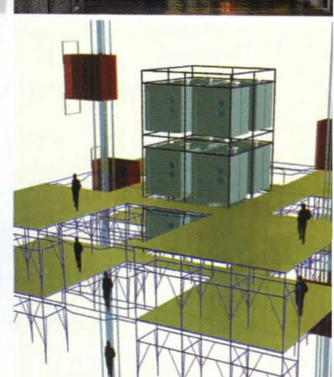
Technology Briefs

Features

Building Technology

Products





Above (clockwise from top left): *SmartWrap, photographed by Elliott Kaufman; the Downland Gridshell, photographed by Adam Wilson; the Melvin J. and Claire Levine Hall, photographed by Barry Halkin; portable skyscraper, graphic by FTL Design Engineering Studio; the Carbon Skyscraper, graphic by Peter Testa Architects.*

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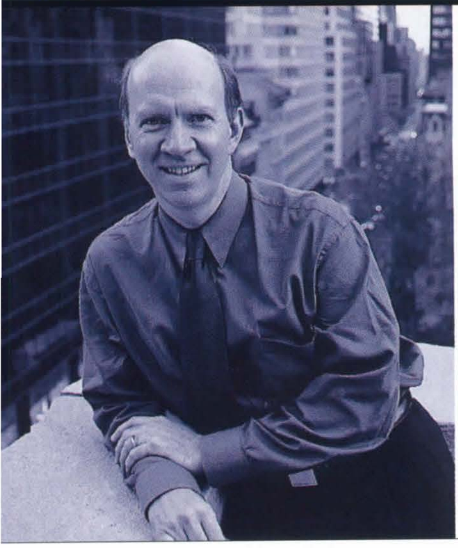


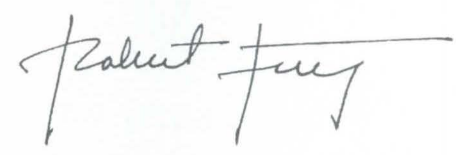
Get yourself plugged in to innovation

Editorial

By Robert Ivy, FAIA

Architects thrive on innovation. Our abilities to combine new materials and ways of making things to solve problems old and new is a kick for us. It gives us energy and gets us up in the morning. It's where we get our juice. Although we have been experiencing an economic slowdown for the past couple of years, this has been a remarkably fertile time for our profession. The pages of ARCHITECTURAL RECORD *bear this out: bold new forms continually confront us. Meanwhile, two architects, Stephen Kieran, FAIA, and James Timberlake, FAIA, used their Latrobe Fellowship to create a model of how the ways we design and build could be transformed to utilize the new materials and methods of making things that are being used in the automotive, aerospace, and electronics industries. Their work is convincing, and if innovation gets you charged up, you will find it compelling.*

It's still a new century. The time is right for revising paradigms. We put together this supplement about innovation because we were excited by the ways these architects, as well as professionals from other fields, are remaking their trades. And we wanted to get you in on that enthusiasm. On October 8 and 9, we're hosting RECORD*'s first Innovation Conference at the Westin Hotel in New York City. We will learn how other people in other industries design, manufacture, and create the economic support necessary to make innovation flourish. The cast of characters is stellar. Join Nobel laureates, celebrated inventors and designers, and several hundred of your peers for two days of controlled exploration. Get inspired. Be innovative. Get plugged in.*



PHOTOGRAPHY: © ANDRÉ SOUROUJON

Technology Briefs

New Gehry Technologies will enable many to boldly go where only Frank has gone before

Frank O. Gehry, FAIA, is taking his expertise to the masses. This fall marks the launch of the sidekick to his architectural practice, Gehry Technologies (GT)—a business venture he hopes will raise the level of technological fluency within architectural practice, as well as cement his legacy as one of the field's foremost innovators.

Heading the new company as chief executive officer is senior partner James Glymph, who has worked alongside Gehry for more than a decade. Dennis Shelden, Gehry Partners' director of computing, will serve as GT's chief technical officer.

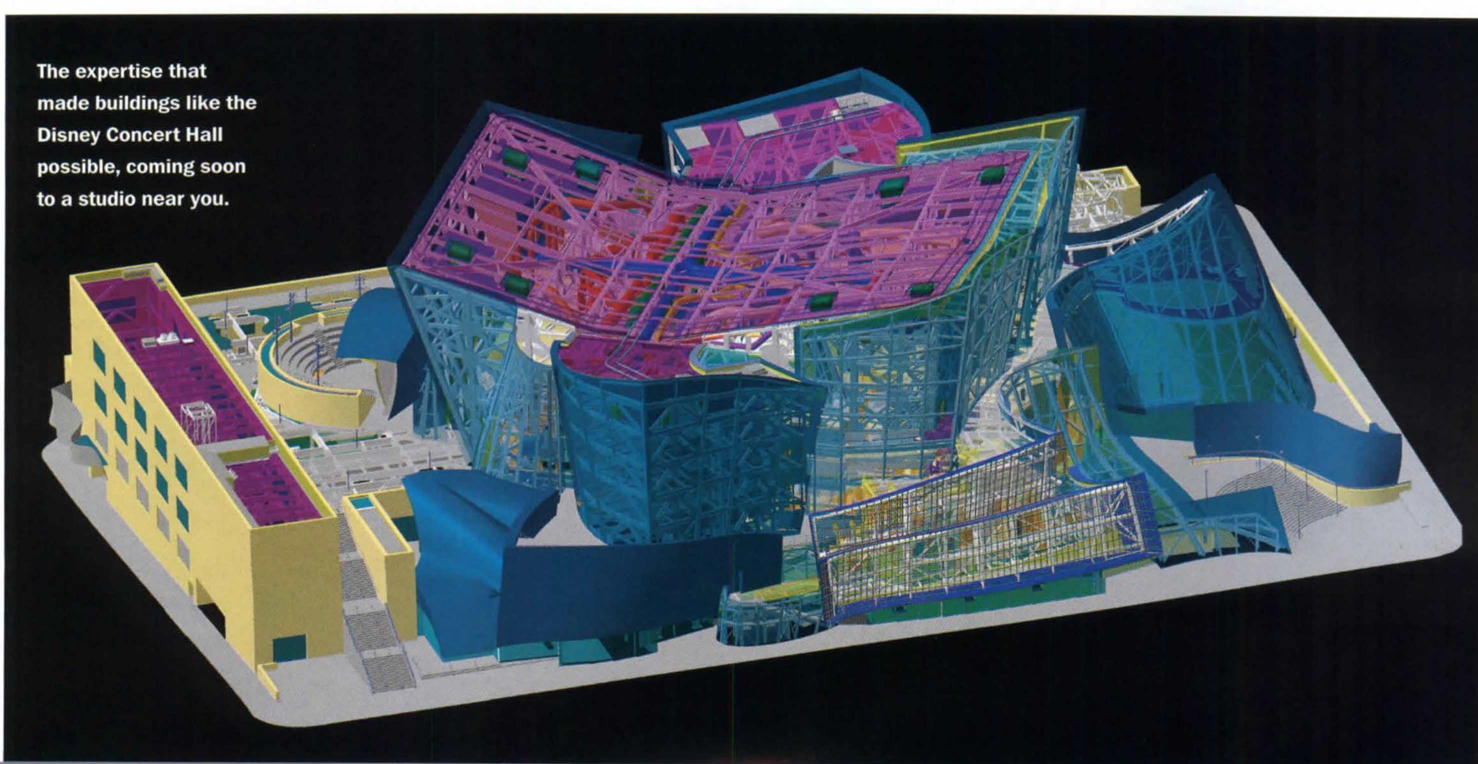
The vision for GT is to create a " 'building ecosystem' tackling innovations in construction practices and associated technologies," according to a press release. Essentially, it will be a consulting practice, providing technologies and expertise to teams who are building specific projects as well as to the industry at large. "Manufacturing industries have completely transformed the way products are designed, built, and delivered," says Glymph, "but the building industry remains entrenched in a paper-based, two-dimensional world. We realized that substantial opportunities existed in bringing advances in practice that we have discovered to the rest of the industry." He adds that faster, cheaper computers make it feasible for firms of all sizes to use the digitally driven process that Gehry follows in his practice, and that the process is suitable for a variety of project types, not just the high-end cultural buildings for which Gehry is renowned.

GT may also serve as a software developer, creating specialized interfaces or additional capabilities for existing design software such as CATIA, the aerospace program the firm has used on many projects. Such tools could be developed on a project-specific basis—a common practice in manufacturing and other industries—and then licensed for a fee to the software maker for widespread use, or sold to the company paying for the project work.

The AIA, the Civil Engineering Research Foundation (CERF), and the Massachusetts Institute of Technology's Media Laboratory have already agreed to collaborate with GT; the projects they will take on together have yet to be fully scoped. In time, the company hopes to create partnerships with the entire range of organizations that have a stake in the design and construction of the built environment.

What Glymph wants to achieve is "a fundamental reshuffling of the roles, responsibilities, and compensation structures for participants across the industry as a consequence of the digital revolution," he says. This could mean, for instance, that all participants in a construction project share the liability for its completion on time and within budget, or that project deliverables be submitted in digital rather than paper form. Many technology enthusiasts believe that requiring architects and their collaborators to rely on digital design information is a necessary step toward reestablishing the architect as a master builder, as well as shortening the time needed to design and construct buildings.

Whether the business model for GT can succeed in a down-market for design and construction services has yet to be determined—firms aren't spending on training and technology like they once were. But like many innovators, Glymph and his staff aren't cowed. "We've been pretty lonely pioneers," he says. *Deborah Snoonian, P.E.*



The expertise that made buildings like the Disney Concert Hall possible, coming soon to a studio near you.

IMAGE COURTESY OF GEHRY TECHNOLOGIES

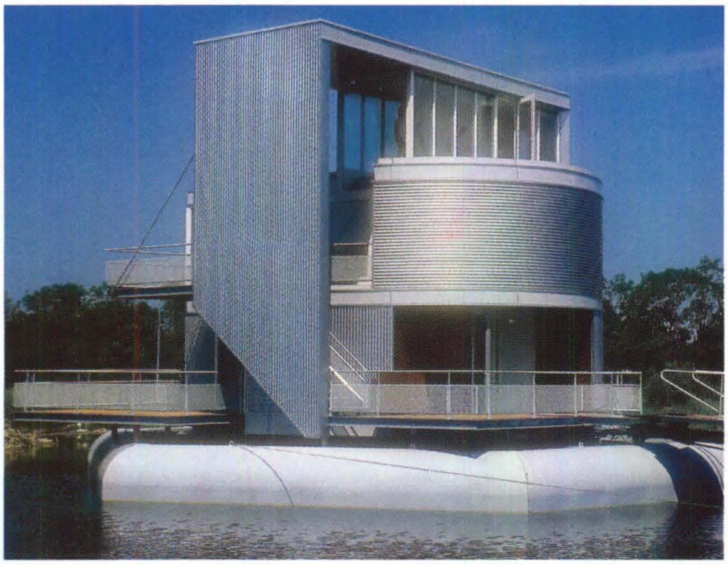
Hertzberger's Watervilla prototype pushes Dutch houseboat design to new levels

The Watervilla, a prototype floating house designed by architect Herman Hertzberger, is supported like an oil rig, on a frame of hollow steel tubes. Inhabitants can reorient the house to optimize its solar orientation.

For centuries, the Dutch have shown great ingenuity in keeping the water that surrounds their low-lying country at bay. That's allowed them to preserve land on which to build housing for the dense population of the Randstad, the crescent that runs from Amsterdam to Rotterdam. Dutch architect Herman Hertzberger has turned the idea on its head by putting houses *in* the water. Of course, there have always been houseboats in Holland. The architect says traditional Dutch houseboats were his inspiration, but notes that as places to live these quaint, colorful anachronisms look better than they work. They're uncomfortable—too much boat and not enough house, he says.

Hertzberger's Amsterdam-based Architectuurstudio designed its first "watervilla" back in 1986. It floated on foam-filled concrete—not exactly a traditional material. Since then, the studio changed the floating foundations from foam-filled concrete to buoyant steel tubes, inspired by off-shore oil rigs. "It was necessary to change the structural system because we wanted the house to float freely in the water and be able to change orientation," explains project architect Patrick Franzen. The design also nearly doubled in size from 80 square meters to 156 square meters, or about 1,680 square feet. (The updated model can be expanded up to 200 square meters, while the original design was fixed.) Most important, the firm was able to build a prototype of the revised house in De Veersche Poort, located in Middelburg in southwestern Holland, which will eventually be home to six Watervillas. The developer of De Veersche Poort commissioned the prototype's construction.

Like oil rigs, the Watervilla floats on a hexagonal frame of six 10-millimeter-thick hollow steel tubes roughly 2 meters in diameter. The D-shaped pipes create enough buoyancy to support 135 tons and are engineered to keep the aquatic houses stable even in choppy waters or high winds. The floating base supports a three-story steel structural frame with steel-plate and concrete floors. The cladding is a prefabricated, low-maintenance skin of made of lightweight steel plates over the 60-centimeter-deep steel frame with foam insulation. The interior can be finished in a number of materials; Hertzberger's studio clad the interior walls in 18 centimeter-thick plywood. Prefab materials allow the house to be built on a quick four-month construction schedule.



The first floor of the prototype currently bobbing in the waters of De Veersche Poort contains two bedrooms, a bathroom, and storage space. Upstairs, via a spiral staircase, is the open living/dining room and a kitchen, all surrounded by walls of floor-to-ceiling glass. On the third level is a large open space that can be used as an office or spare bedroom. Each level has outdoor terraces. An 8-meter-long gangway provides access from shore.

The prototype includes standard (for Holland) heating and cooling systems, but future options include underfloor or wall systems; photovoltaics are another energy-saving possibility, although Franzen explains that the Middelburg villa doesn't have many high-tech bells and whistles in order to keep costs down.

Obviously, it's possible to navigate the Watervilla to a number of different locations, as much for a change of scenery as for energy conservation: Hertzberger designed the villa to rotate 90 degrees by means of two steering wheels. The Watervilla can be moved to capture the best solar orientation, facing the warming sun in winter and away from the sun in summer to minimize heat gain. Franzen says he would recommend a small onboard motor if the owner wanted to change the home's position weekly or even daily.

So far, Watervilla is an information center—consider it a floating "model home"—but Franzen anticipates occupancy by the beginning of 2004. Franzen says the studio can't calculate the exact building cost, given the high engineering expense involved in getting a prototype off the ground (or into the water), but he anticipates that the flotation system will be costlier than earthbound foundations. He estimates future houses will cost between 2,000 and 2,500 euros per square meter—currently $218 to $273 per square foot. *Raul Barreneche*

PHOTOGRAPHY: © PATRICK FRANSEN

Once efficiency and cost issues are resolved, LEDs will be the next big thing in lighting

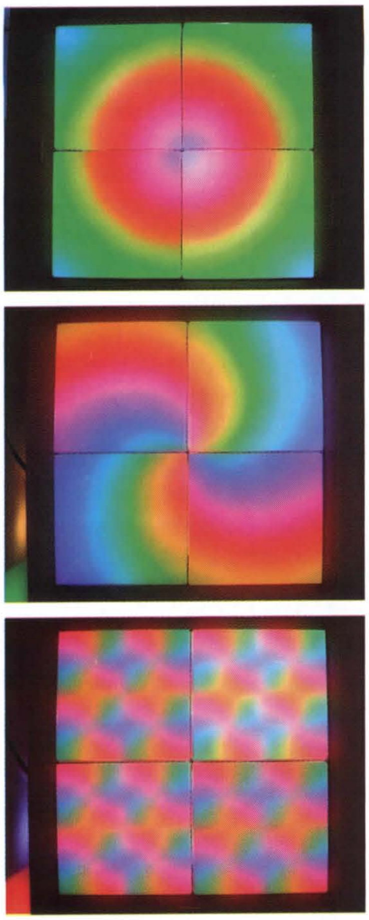
Some say it's just a matter of time before light-emitting diodes (LEDs) eclipse traditional light sources, although the sun isn't going to set on them tomorrow. Right now, cost is the most obvious barrier to the acceptance of LEDs, except in maintenance-intensive applications like traffic lights. The other is their low efficiency, which today stands at a maximum of about 20 lumens per watt. "If output can go up by 10 times, and the price can come down 10 times, then it will start penetrating into lighting applications," says the Lighting Research Center's Dr. Nadarajah Narendran, who envisions that these developments will take five to 10 years.

Color rendering capabilities must also continue to improve to make the technology practical for general illumination purposes. "We don't feel the white LEDs are quite ready for prime time," says Kevin Dowling of Color Kinetics, a Boston-based manufacturer of LED products. "But two years from now, I believe you'll be seeing massive improvements in efficiency and color."

But the advantages of LEDs are indisputable. One is long life. "If an LED has 100,000 or 200,000 hours of lifetime, it becomes equivalent to a building material," Narendran continues. "All of a sudden the way we light our spaces is different."

Another benefit of LEDs is that because they operate on just a few volts and draw milliamps of current, they produce no heat and can be directly controlled by a digital inter-

Icrave Design Studio used Color Kinetics' LED cove lighting fixtures to illuminate this Lucite catwalk at the Dorsia Lounge in New York City.



face. Lamps running on line voltage are usually controlled by rheostats, mechanical relays, or large transistors. A number of Color Kinetics's products take advantage of the ease with which LEDs can be digitally controlled. The company has just introduced the Chromasic microchip, which combines digital LED control and communications technology into a single silicon chip. "This is a very big step in making systems viable for large-scale implementation," says Dowling. "It means you can control a single LED or a large panel of LEDs."

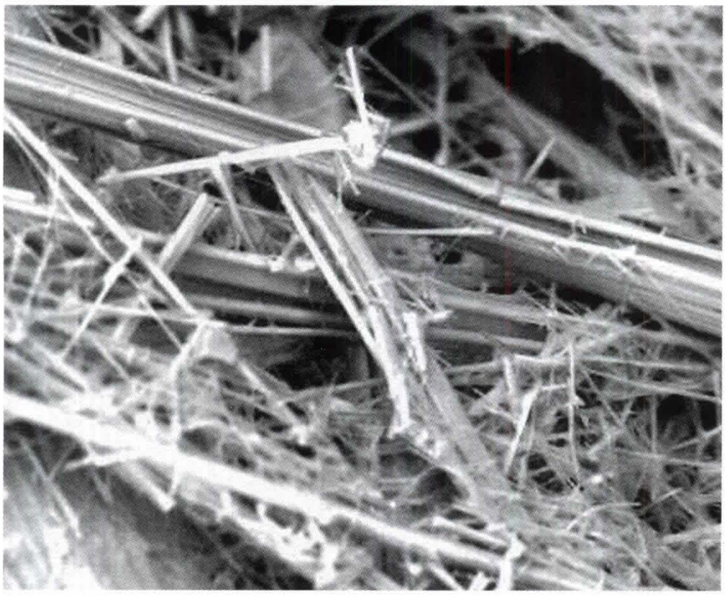
The Chromasic chip is used to control Color Kinetics' IColor Tile FX, pictured at left. Each tile is a 2-foot-by-2-foot panel that contains 144 "nodes," each comprising a red, green, and blue LED. Each node is about the size of a pencil eraser. The brightness of each LED can be individually addressed so that it is possible to create vibrant, moving displays of color. Up to 64 billion color combinations can be created.

In a similar vein, electronic controls could be developed to adjust solid-state lighting to an unprecedented degree to create different color temperatures. Bill Ryan, of Philips Lighting, says, "In the morning, you could get 3,000 degrees Kelvin, and in the afternoon, you could change that to 4,000 K." Offices could adjust based not only on time of day and occupancy, but on precisely where the occupants are in the space.

New: LEDs in a sheet

Organic light-emitting diodes are beginning to make their way into prototype architectural applications, such as those supplied by DuPont for KieranTimberlake's SmartWrap exhibit (see Timeline, page 24), and are also being developed by Philips, General Electric, and other companies. OLEDs comprise thin layers of organic electroluminescent material sandwiched between layers of electrodes, all embedded in a base material. Light is emitted when voltage is applied to the electrodes. The assembly may be no thicker than a coin. Although the most sophisticated OLEDs can display information exactly like the color liquid-crystal displays found in laptop computers, they can also be quite simple, displaying one color alone. They have many advantages over LEDs that make them much more suitable for architectural applications: They require no backlighting; they work in cold temperatures; they are cheaper and easier to manufacture, and they're more energy efficient. They are also more stable when applied over large areas. DuPont's Olight Web site, www.olight.com, promises that the day will come when OLEDs will be manufactured in rolls. As with LEDs, cost and efficiency issues must still be overcome. "Our ultimate goal is to get OLEDs more efficient than fluorescents," says Anil Duggal of General Electric's Global Research Center. She says that goal remains at least 10 years down the line. *John Calhoun*

Asbestos: It seemed like a good idea at the time. And it was. And it still is...or could be



Asbestos is made of long, thin fibers, which are very strong and resistant to heat and chemicals.

The story of asbestos is a cautionary tale for tomorrow's materials scientists and innovators. Asbestos has been used in thousands of products in innovative ways for a long time, because of its strength, durability, and resistance to heat and fire. In the construction industry, it has been used extensively in ceiling and floor tile, pipe insulation, firebrick, window caulking, duct connections, and spray-on fireproof insulation.

Today, however, the mere mention of the word can cause panic—for good reason. Since the early 1940s, millions of people have been unknowingly exposed to asbestos fibers, causing thousands to develop lung cancer, mesothelioma, and asbestosis, which, in turn, has spawned new legal and removal specialties.

There's a cruel irony in asbestos: When it's contained and controlled (the fibers remain bonded and do not become airborne), it protects people and property better than any other material. But when it's out of control, it's an invisible killer. The same can be said of many products and most chemicals.

Now that the risks regarding asbestos are known and safety measures prescribed, why isn't anyone looking for new applications? The material hasn't been banned. It continues to be used in many products, and the benefits of asbestos are many—high tensile strength, chemical and thermal stability, high flexibility, as well as low conductivity. To date, there are no comparable substitutes. Organic fibers, plastics, and glass wool fibers are used, but these materials may turn out to be as hazardous as asbestos, and they do not work as well.

Innovation is stymied by many factors—fear of eternal litigation should a new product fail or be improperly used, and the weight of stringent regulation. It seems unlikely that tomorrow's scientists will be able to remove all risk for universal asbestos application, but they're going to try. *Jill Melamed*

PHOTOGRAPHY COURTESY OF THE ASBESTOS INSTITUTE

GenerativeComponents software gives "bending the rules" a whole new meaning

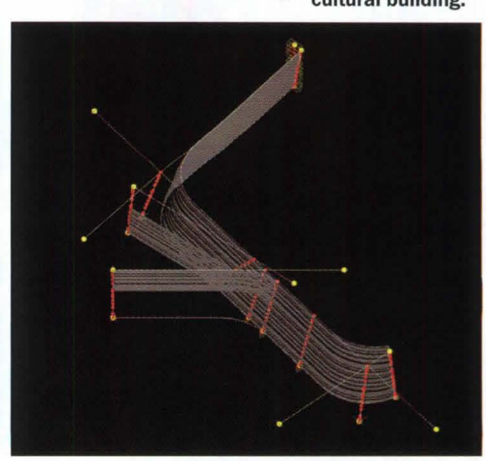
Some architects can program computers, some programmers are architects—but having the one skill shouldn't mean having to have the other, says CAD pioneer Robert Aish, Bentley Systems' director of research. New parametric design software he has developed, GenerativeComponents (formerly CustomObjects) is poised to allow even technophobes to harness computing power for customized designs.

GenerativeComponents lets designers create rules for a project—for example, a complex stadium roof of known dimensions and curvature—and form specialized components to be used to construct it. These components then "populate" a design that's generated automatically according to the rule. If the rule changes—if the designer modifies the roof's span or curvature—so too do the shape, orientation, and behavior of all its component parts, much like changing a formula in a spreadsheet affects all the values on which that formula is based.

"This process enables architects to explore design alternatives more quickly and capture geometric relationships," says Aish. This is not the case with traditional CAD, in which elements such as walls and windows are merely graphical representations of building parts. It also differs significantly from parametric programs like Autodesk's Revit, whose chief benefit is production efficiency achieved by embedding non-design information like cost and manufacturer into well-understood building components like doors. Aish has been vetting his tool for two years with a collective he helped found, the SmartGeometry Group, whose tagline—"Architectural design with computational design tools"—elegantly articulates a fundamental challenge of the CAD era. Last summer the group convened in Cambridge, England to put the tool through its paces and to educate a larger audience of early adopters. Bentley plans to integrate Generative Components into their signature CAD program, MicroStation, in 2004.

Above all, Aish wants to introduce freedom of expression in an era of digital fabrication and mass customization. Users who want to create complex sculptural forms can still do custom programming within the software, although, "if exploring modifications to a design takes too long," he says, "you just exhaust people." *DS*

The California firm Morphosis is experimenting with GenerativeComponents software to design a new cultural building.



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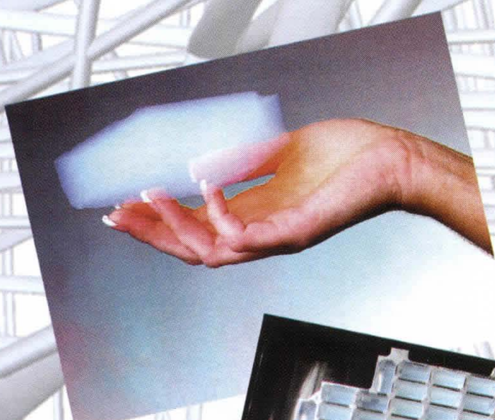
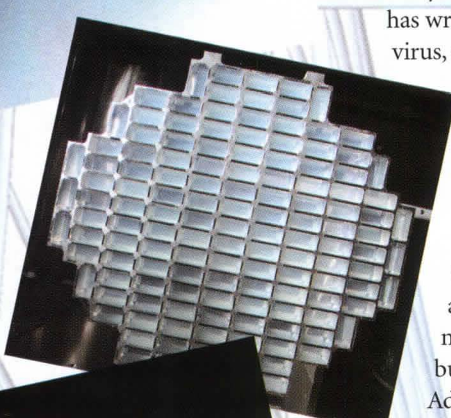
INNOVATION

The methods and materials of design and construction will change dramatically in the 21st century as architects, engineers, scientists, and manufacturers join in intense and creative collaborations.

By Sara Hart





At 99.8 percent air, aerogel (top) is the lightest solid in the word; it will be used as a particle collector (middle) on NASA's Stardust mission; Cabot Corporation developed Nanogel, a translucent form of the material, which doubles the insulation in Kalwall day lighting panels (bottom).

PHOTOGRAPHY COURTESY OF NASA/JET PROPULSION LABORATORY (TOP AND MIDDLE); KALWALL (BOTTOM)

"Innovation [the successful implementation of a new idea] has taken place, and continues to take place every day … and most of it goes unnoticed," says architect and engineer Chris Luebkeman, who, as director for Global Foresight and Innovation at the international engineering firm Arup, should know. And, because exposing the unnoticed and evaluating potential for major change is the purpose of this supplement, we know that predicting actual innovations that will make it to the marketplace requires a crystal ball.

Without one, we look for a rational strategy, such as the one in Malcolm Gladwell's *The Tipping Point*. Gladwell defines a tipping point as "one dramatic moment in an epidemic when everything can change all at once." Gladwell's strategy is based on the behavior of epidemics. He has written that ideas, behaviors, and new products move through the population much like a virus, creating a tipping point only after they reach a critical mass.

In the multidisciplined, economically vulnerable, intransigent world of building design and construction, epidemics are hard to start, and even harder to spread to critical mass. Conventional wisdom contends that the construction industry is not receptive to change, because innovation is too fraught with risk and unpredictability, and the industry is too diverse and, therefore, immune to radical transformation. That's a 20th-century truism. Today, evidence of a sea change can be found in the current wave of neologisms creeping into the vocabulary of architecture and construction, many of which seem to be oxymorons—mass customization, permanent flexibility, deployable structures, zero-net consumption, and even clean-coal burning. Both new materials and news ways of combining old ones are in development. Advances in materials science, increased private and public alliances, and the infiltration of digital technology into everything have conspired to create pockets of experimentation and unusual collaborations among architects, engineers, and manufacturers. Isolated pursuits do not a revolution make, but, as Gladwell emphasizes, "people are the natural pollinators of new ideas and trends." People figure prominently in this issue for that reason.

For the sake of clarity, it's important to distinguish between the three "I's"—improvement, innovation, and invention. Improvement is the ongoing, incremental enhancement of an existing product. Innovation, on the other hand, *depends on collaboration*, often between unlikely partners, and often involves the adaptation and application of technologies from other industries. Inventions are more complicated and can take decades to find commercial application. Aerogel (left) was invented in the 1930s, didn't find an application until NASA used it as insulation on its spaceships, and wasn't commercialized until last year when Cabot Corporation developed Nanogel for Kalwall's light panels. Now there are an estimated 800 new applications in development.

Improvement, innovation, and invention mingle and merge in all of the work shown, and in scores of laboratories, universities, factories, and garages. Some efforts won't gain momentum until they reach the critical mass necessary for tipping. We invite our readers to continue their own investigation. This content can be accessed from our Web site, www.archrecord.com, which contains a resource area with contact information for the architects, engineers, universities, federal agencies, and manufacturers who are presented. ■

Quickening Pace: Innovations accelerate over time

As an industry, building design and construction doesn't have a cutting-edge reputation. Yet.

1665 Following the Great Fire in London, which destroyed hundreds of timber-framed structures, some of the first building codes are established, requiring certain buildings to be made of brick and stone.

1836 The Germans develop a way to test concrete for tensile and compressive strength.

1854 A crude system for reinforcing concrete with steel bars to increase tensile strength is patented in England.

1891 The Monadnock Building was completed in Chicago. At 16 stories tall, it was the last load-bearing high-rise brick building in the U.S., with walls six feet thick at its base.

1940s The German company Mero manufactures the first space frames, 3D gridwork that makes the construction of long-span roofs economically feasible. These are still commonly used, although the collapse of the Hartford Civic Center's roof in 1978 caused many to question the integrity of this method.

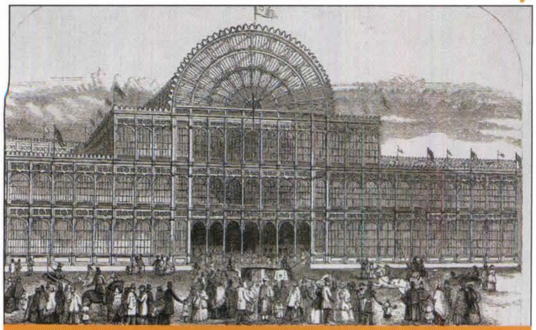
1952 The metal-and-glass curtainwall of Gordon Bunshaft's Lever House is the first of its kind in New York. The skyscraper becomes an icon of International-Style Modernism.

1959 Claude Louis-Navier's cable-stayed bridge over the Loire River in France presents a new alternative to suspension bridges for long spans. Cable-stayed structures have lighter, smaller anchors and deflect less at midspan.

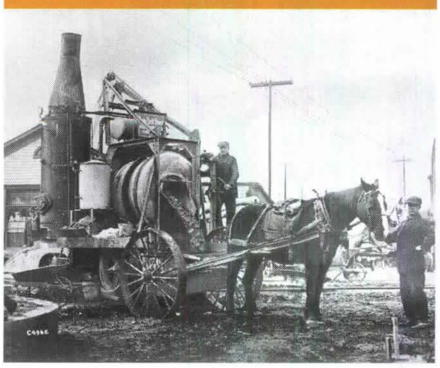
METHODS

1600s 1800s 1900s

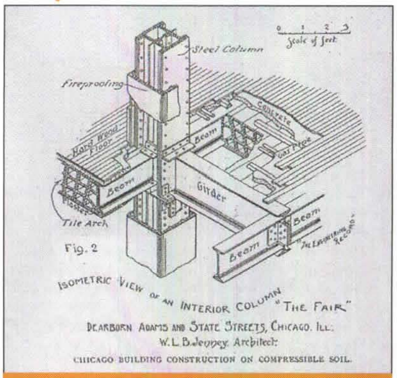
Manual labor and simple machines—levers, pulleys, wheels—were once sufficient tools for putting up buildings. Then along came internal combustion engines, cheap fuels, mass-production techniques, and the power grid, which changed forever the way materials are made and how buildings are constructed. Today's mantra of "better, faster, cheaper" has sharpened the focus on making design and construction ever more efficient. Sophisticated computer-modelling techniques will help designers create energy-efficient buildings that can be erected quickly and safely. Rapid prototyping and digital fabrication will allow mass customization of the built environment, with complex geometric components made in factories and shipped to a construction site ready for assembly. Architects and engineers will work together more and more closely as design and technical prowess become inseparable.



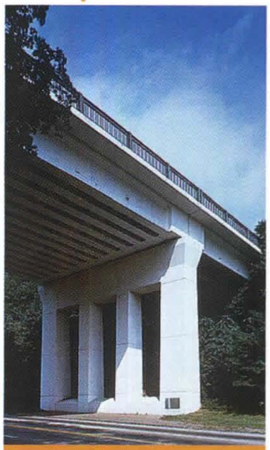
1851 London's Crystal Palace is an example of one of the first buildings made of prefabricated cast-iron parts.



1860s Horse-driven, steam-powered concrete mixers replace mixing by hand and make construction more efficient.

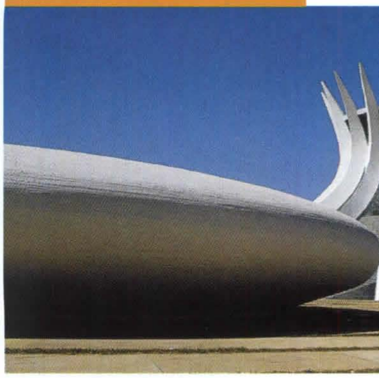


1880s High-rises built with steel framing are shown to be feasible. The first one in the U.S. is Chicago's Home Insurance Building.



1949 The Walnut Lane Bridge in Pennsylvania is the first precast, prestressed concrete bridge.

1960 Though he's not the first to use thin-shell concrete, Oscar Niemeyer takes advantage of its lightness to achieve mathematically-determined shapes in his designs in Brazil.



1965 Finite element analysis is used to assess structures. This method, which requires simultaneous equations to be solved via computer, involves looking at structural members in small subdivisions to predict the behavior of the entire system. This breakthrough eventually allows highly-complex, nonorthogonal forms to be feasible.

1967 The Assembly Hall at the University of Illinois is the first concrete-domed sports facility.

1969 Dampers are used in tall structures for the first time in the twin towers of the World Trade Center in New York. They let the towers deflect slightly while resisting wind and overturning loads, a critical safety feature for high-rise buildings. They are now commonly used in high-rises and buildings in earthquake-prone areas.

1985 The U.S., lagging behind Germany and Japan in the construction of base-isolated tall structures, finally finishes the first building of this kind in Rancho Cucamonga, California. Base isolation allows buildings to move slightly on their foundations without toppling over, which helps prevent damage during earthquakes.

1988 U.S. company 3D Systems sells the first stereolithography machine, marking the advent of rapid prototyping, which allows designers to create 3D models of proposed designs quickly and directly from CAD files.

1994 Researchers at Stanford and the Walt Disney Company begin toying with 4D CAD programs (the fourth element is time) to predict construction sequencing with an eye toward avoiding problems in the field.

1990s Research begins on embedded systems—small computing devices implanted in structural systems that are capable of detecting and even fixing abnormal loads during natural or manmade disasters to avoid collapses. Other uses identified for embedded systems include improved safety and security features.

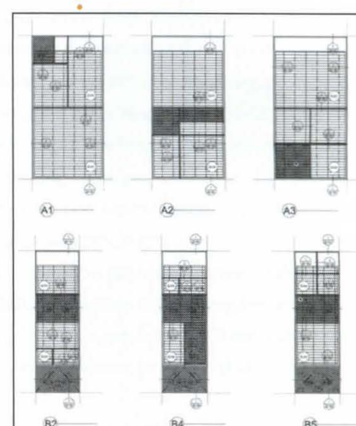
1995 Internet-based project-management tools make their debut. In the next five years, hundreds of dot-com startups offering this service crop up. Most do not survive the tech-bubble burst of 2001.

2000s

STOLLER/ESTO; TILT-UP CONCRETE ASSOCIATION; KIERANTIMBERLAKE ASSOCIATES; JOHN BURLAND

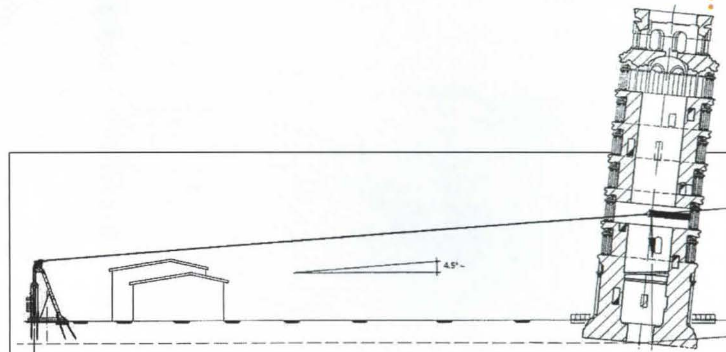
1960s Basic oxygen furnaces replace open-hearth furnaces in the steelmaking process. The finished product has fewer impurities and is easier to form.

1990s It goes in pieces: Tilt-up construction allows low-rise concrete structures to be built without formwork, often in less than a month.



1990s Permasteelisa's factory-built curtain walls point up a trend: building components that are pre-made and assembled in the field, rather than brought to the site and cut to fit.

1970 Cross-bracing is an innovative exoskeleton for the tube structure of Chicago's John Hancock building. The x-shaped bracing creates strength while saving material.



2003 After 10 years of investigation, architects and engineers find a solution for arresting the tilt of the leaning Tower of Pisa, which involves shoring up the ground beneath the tower, as well as building structural reinforcements.

MATERIALS

1600s | 1700s | 1800s | 1900s | 2000s

1633 The Dutch West India Company builds the first brick building in the U.S. in Manhattan.

1781 The relationship between carbon content and steel strength is discovered, enabling the development of different types and strengths of steel.

1824 Englishman Joseph Aspdin burned finely-ground chalk with clay in a lime kiln until carbon dioxide was driven off, then ground up the mixture. He called his invention Portland cement, after the building stones quarried in Portland, England.

1856 Sir Henry Bessemer discovers that steel can be made by blasting compressed air through molten iron to burn out excess carbon and impurities. The process was named after him, and his discovery lowered the price of steel dramatically, making it more feasible for use in buildings.

1880s Friedrich Siemens invents the tank furnace for glassmaking, which allowed molten glass to be continuously produced in greater quantities than was previously possible.

1910 Frenchman Edouard Benedictus pioneered lamination by inserting a celluloid material layer between two sheets of glass to strengthen it. He patented his creation under the name "Triplex."

1928 PPG establishes the Pittsburgh glassmaking process, which combined and improved upon a few earlier methods for manufacturing sheet glass. It is still widely in use today.

1930 Air-entraining agents were first used in concrete to help the material resist freeze-thaw damage.

1938 Dupont invents nylon, the first man-made organic textile fiber. Its strength and elasticity make it suitable for interior building products such as carpets and wallcoverings.

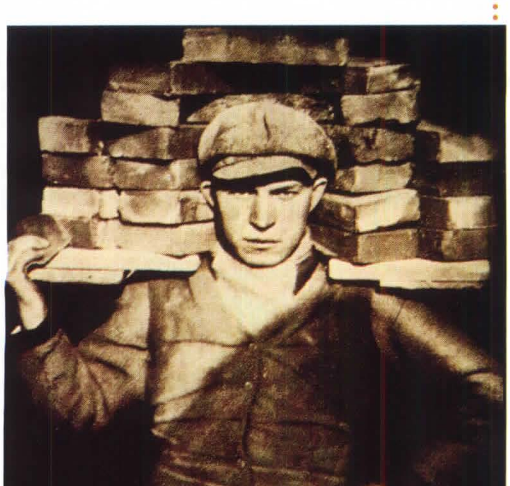
1957 Monsanto and architects from MIT build the House of of the Future at Disneyland in Anaheim, California. The four-winged house is made of 30,000 pounds of plastic, including walls, rugs, and furnishings.

1960s Polyvinyl chloride (PVC), invented in the 1920s, begins to have application in buildings in the form of piping and waterproofing materials.

1970s Fiber reinforcement was introduced to improve the strength and performance of concrete.

2001 PPG's SunClean glass, coated with titanium dioxide, repel oils and lets the sun break down dirt naturally.

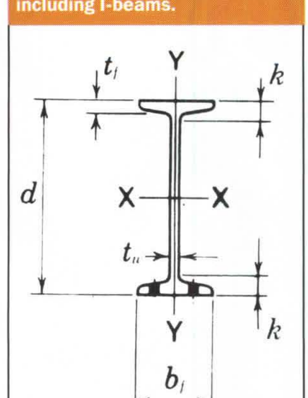
Brick, concrete, steel, glass: The language of the built environment has remained pretty consistent, but the age of chemistry and the digital revolution are converging to usher in an era of new materials. High-strength composites have the potential to be used in applications where steel and concrete now reign, but the building industry hangs back due to doubts about their long-term performance—questions that research and testing will solve in due course. Smart materials, which can alter their form and physical properties depending on how they're used, will find a home in health-care facilities, offices, and many other buildings. Environmental-protection laws will require the use of recycled, recyclable, or reusable components, including new materials like bioplastics made from natural sources like sugarcane instead of petroleum products.



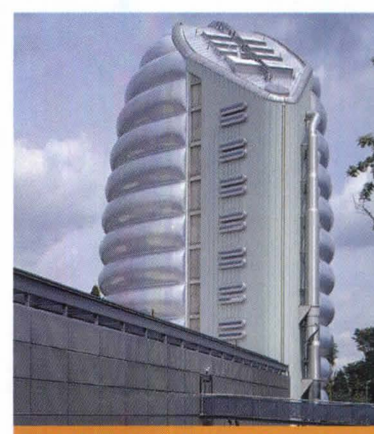
1850s Machines for pressing bricks first appeared in Europe, allowing them to be manufactured more quickly.

1940s A new man-made material, vinyl, becomes ubiquitous in commercial flooring products.

1879 Germany establishes standard shapes for rolled steel, including I-beams.



1990s Titanium, rust-free and corrosion-resistant, makes an architectural statement on buildings around the world.



2001 Grimshaw's National Space Centre uses lightweight composites in its skin.

2002 Safety glass lightens up a traffic tunnel in Munich.

IMAGES (CHRONOLOGICALLY): © INTERNATIONAL MASONRY INSTITUTE; MANUAL OF STEEL CONSTRUCTION; ARCHITECTURAL RECORD ARCHIVES; RIDDER METALEN; NATHAN WILLOCK/VIEW;

1685 The ventilating fireplaces in the Louvre in Paris are described and published in a paper representing the first crude central heating system.

1775 Alexander Cumming invents the precursor to the modern one-piece toilet.

1829 Boston's Tremont Hotel is the first known American building with indoor plumbing, using water drawn from a rooftop storage tank fed by another new invention, the steam pump.

1848 Dr. John Gorrie of Florida invents a compressed-air refrigeration system for cooling the air in a local hospital ward, the predecessor to modern air conditioning.

1874 To reduce the insurance premiums on his piano factory, Englishman Henry Parmelee designed and patented the first widely-accepted automatic sprinkler head.

1880s Thermostatic controls first appeared, but were rarely used until electricity was widely available in the early 20th century.

1948 J.D. Krocker, an engineer in Portland, Oregon, pioneers the first commercial building use of a ground-water heat pump.

1958 Research on fuel cells by Francis Thomas Bacon is licensed by Pratt & Whitney for use on the Apollo spacecraft.

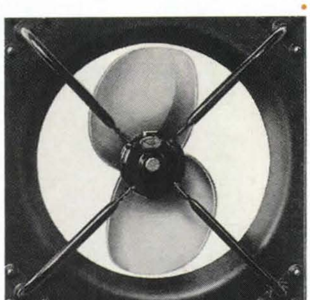
1970s Setback thermostats allow building operators to change indoor air temperatures according to a timed schedule, so that heating or cooling requirements are reduced when buildings are unoccupied.

1980s Electro-chromic glass is developed, which transforms from clear to opaque when a voltage is applied. It can be used to keep out excessive sunlight from daylit areas.

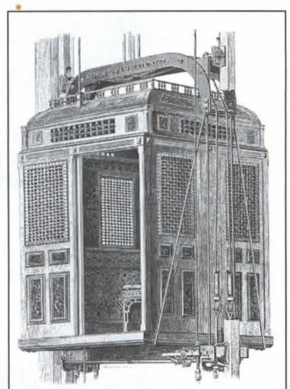
SYSTEMS

1600s 1700s 1800s 1900s 2000's

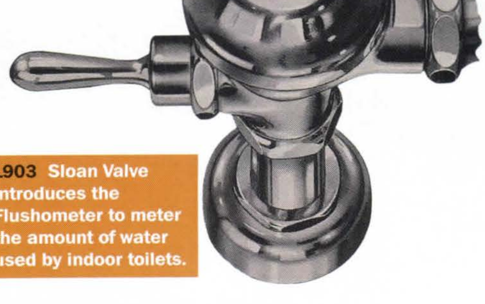
Energy savings, security, and air-quality concerns are driving the advances in building systems today. Photovoltaics are becoming cheaper and more efficient, and fuel cells are being investigated for use in major infrastructure projects like mass transit systems. All of a building's systems—HVAC, lighting, security, communications—will share data seamlessly to maintain healthy indoor environments and protect occupants much like the body's immune system fights off disease. Advanced materials will become integral to a building's energy efficiency and safety.



1902 Willis Carrier builds the first air conditioner to combat humidity inside a printing plant.

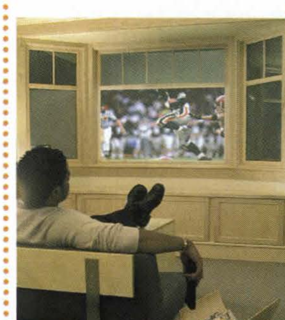


1903 Otis Elevator introduces the gearless traction elevator. Today, elevators move the equivalent of the world's population every 72 hours.



1903 Sloan Valve introduces the Flushometer to meter the amount of water used by indoor toilets.

1970s Federal and state incentives are established to promote the use of solar energy during the oil shocks.



2002 Andersen's Project Odyssey puts transparent resistors in windows to transform them into digital displays.

2002 Phase-changing materials, capable of storing more heat than water, begin to have application in wallboard and other materials that help buildings achieve energy efficiency.

2003 Web-based control of HVAC and other building systems, pioneered by Johnson Controls, makes operation as easy as a mobile phone call.

OTIS ELEVATOR; NEW MEXICO SOLAR ENERGY ASSOCIATION; ANDERSEN CORPORATION; KIERANTIMBERLAKE ASSOCIATES; JOHNSON CONTROLS

1814 Coal gas is used to light London's streets. Ten years later, nearly 40,000 lamps are installed in 215 miles of London's thoroughfares.

1857 Alexandre Becquerel experiments with electric discharge lamps coated with luminescent materials, the forerunner of modern fluorescent lamps.

1879 On New Year's Eve, Thomas Edison demonstrates his cardboard-filament incandescent lamps to throngs of visitors in Menlo Park, New Jersey. The lamps averaged 16 candlepower, consumed about 100 watts of power, and lasted for about 100 hours.

1886 The gas mantle is introduced. It helps keep fossil fuel lights competitive with electric lights for the next 30 years.

1915 First patent issued for a neon sign: Times Square would never be the same.

1936 Electro-luminescence is observed for the first time by Georges Destriau, which would lead to the development of light-emitting diodes (LEDs).

1954 Abraham Van Heel puts a coating of glass over bare glass fiber, dramatically increasing the distance the fiber can carry light.

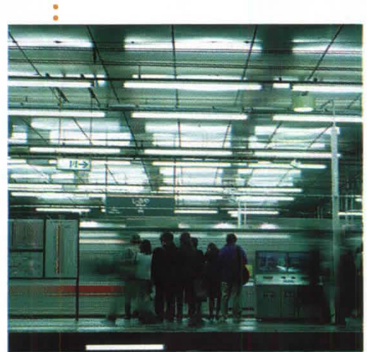
1962 The first LEDs become commercially available.

LIGHTING

1800s 1900s 2000s

For centuries, people burned naturally formed combustible materials to make light. Marginal improvements came with the invention of processes that concentrated these natural fuels and made them either more efficient, such as the rendering of fats into tallow for candles, or cleaner to burn, such as the refining of oil into kerosene. In the 19th century, ways to generate and store electricity were discovered and the race was on to figure out how this new source of energy could be converted into light. Today's light fixtures are variations on the ones that evolved during that era. Since the energy crisis of the 1970s, efficiency has been a major goal, and manufacturers have sought light sources that can convert more energy into light, and less into heat.

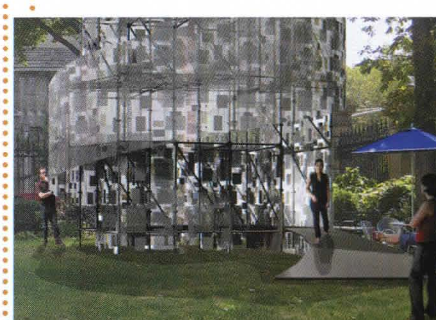
1901 A prototype of a low-pressure mercury vapor arc lamp is patented by Peter Cooper Hewitt. This work will lead eventually to discharge lamps that use sodium vapor, or mercury vapor tinted by metal halides.



1937 General Electric patents the first practical fluorescent lamp, and introduces them a year later at the World's Fair. Today they're a staple in many office and infrastructure interiors.

1970 Corning produces the first economical glass fiber-optic cable, which transmits light to about a third of a mile away. Today a single fiber-optic cable can carry light for more than 20 miles.

2001 Don't just wish on a star: Create your own nightlight experience with Nebula, by Philips Design, a projection system linked to the World Wide Web with images that change continually.



2003 Architects KieranTimberlake and Dupont introduce SmartWrap, a material onto which microscopic-sized organic light emitting diodes (OLEDs) are printed for displaying images in the same manner as a computer screen.

IMAGES (CHRONOLOGICALLY): © SCHENECTADY MUSEUM; GETTY IMAGES/RYAN MCVAY; FIBERSTARS;

1800 Joseph Marie Jacquard creates a loom that weaves patterns guided by punched cards. The cards store binary instructions in much the same manner as IBM punch cards do over 100 years later.

1821 Charles Babbage builds the Difference Engine, a calculator that used mechanical parts. Nine years later he creates the Analytic Engine to store information and run sequences of equations.

1880 Herman Hollereth adapts Jacquard's ideas to compile data for the 1890 U.S. Census.

1930 Vannevar Bush creates the Differential Analyzer, the most sophisticated computer available.

1945 ENIAC, the first electronic computer, is built at the University of Pennsylvania.

1963 A code called ASCII assigns a string of ones and zeroes to each of 128 different upper and lower case letters, numbers, and punctuation marks. In the future, most software will use the code to represent text.

1969 ARPANET, the precursor to the Internet, is put in place by the Department of Defense. The system connected several universities and research centers.

1976 Steve Wozniak and Steve Jobs form Apple Computer.

1981 Partners for life: Microsoft's Disk Operating System (DOS) is accepted as the basic software for IBM's new personal computer.

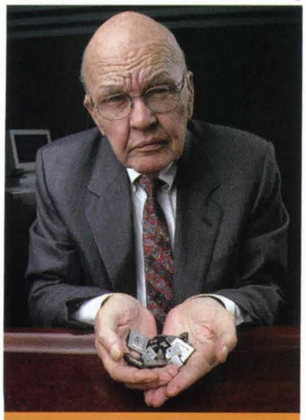
1982 AutoCAD is released. It becomes the first major successful software program for automating hand drafting.

1994 Netscape begins giving away its Navigator browser software for viewing information on the World Wide Web.

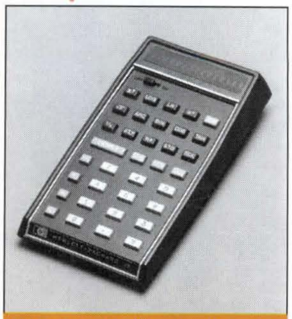
COMPUTING

1800s 1900s 2000s

In just over 50 years, computers have revolutionized the design, construction, and operation of buildings. The focus has shifted from software that automates once-manual processes, such as drafting, to tools that free designers to work as they please, as well as technologies that help buildings become self-regulating. Parametric CAD programs will be used to design complex geometric forms manufactured with computer-driven methods. The holy grail of design computing—the single building information model, in which geometric and non-design information such as cost are captured in the same database—has proved an elusive nut to crack, but software companies and practitioners are still trying to crack it. Sensors and activators implanted throughout buildings will enable advanced security features and improved indoor environments.

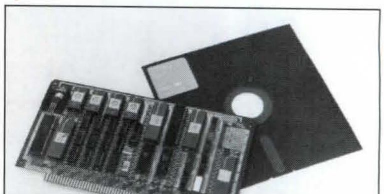


1958 Jack Kilby of Texas Instruments palms his brainchild of that year, the integrated circuit, a small electronic device that made computers smaller and more powerful.



1972 The HP-35 scientific calculator, billed by the company as "an extremely accurate electronic slide rule."

1976 Seymour Cray shows off his namesake supercomputer, which is sold to Los Alamos National Laboratory for $8.8 million.



1978 The war over storage devices began when the 5-1/4-inch floppy disk made its debut. This disk will cede to 3-1/2-inch diskettes, which have largely given way to CDs and other media.

1981 Adam Osborne built the first portable computer, the Osborne I. It cost $1,795 and weighed 24 pounds.

2002 Tablet PCs let designers doodle right on their monitors, making way for software that captures digital penstrokes instead of keyboard-and-mouse input.

Imagining the future

How will we make buildings in 2030?

By Sara Hart

Imagine thirty years from now. Will urban areas in 2030 look like Ridley Scott's Los Angeles in the sci-fi movie *Blade Runner*—a prelude to Armageddon where the affluent reside in the tops of 400-story skyscrapers, and the less fortunate scratch out an unsavory existence in the seamy, polluted, and lawless regions on the surface? Or will Americans live the utopian dream in self-sufficient, fossil-fuel free communities?

Both industry analysts and savvy practitioners insist that it's not the best use of time to predict farther out than 10 years. At this moment, however, the future is already taking form. On one hand, materials scientists are locked in laboratories inventing new, smart, and sustainable materials and composites, which are touted elsewhere in this issue as the beginning of a revolution in design and construction. At the same time, building materials that dominated the 20th century still dominate in the new millennium.

The projects presented here, while contemporary, are daring in ways that hint at future trends. In each case, the architect and engineer seem to strain to get more performance from familiar materials—smaller structural members, less environmental impact, greater spans. Success often depends on technological innovation, the side effect of which is increased complexity. This desire to stretch the limits signals another trend that promises to change the relationship between architect and engineer, regardless of materials.

Twentieth-century Modernism prescribed that all buildings be made of three materials—concrete, steel, and glass. The glass

industry is constantly innovating and inventing, giving rise to specialties such as facade engineering. Glass research has moved beyond traditional melting processes into coating techniques, solar control technology, and the integration of microelectronic circuitry.

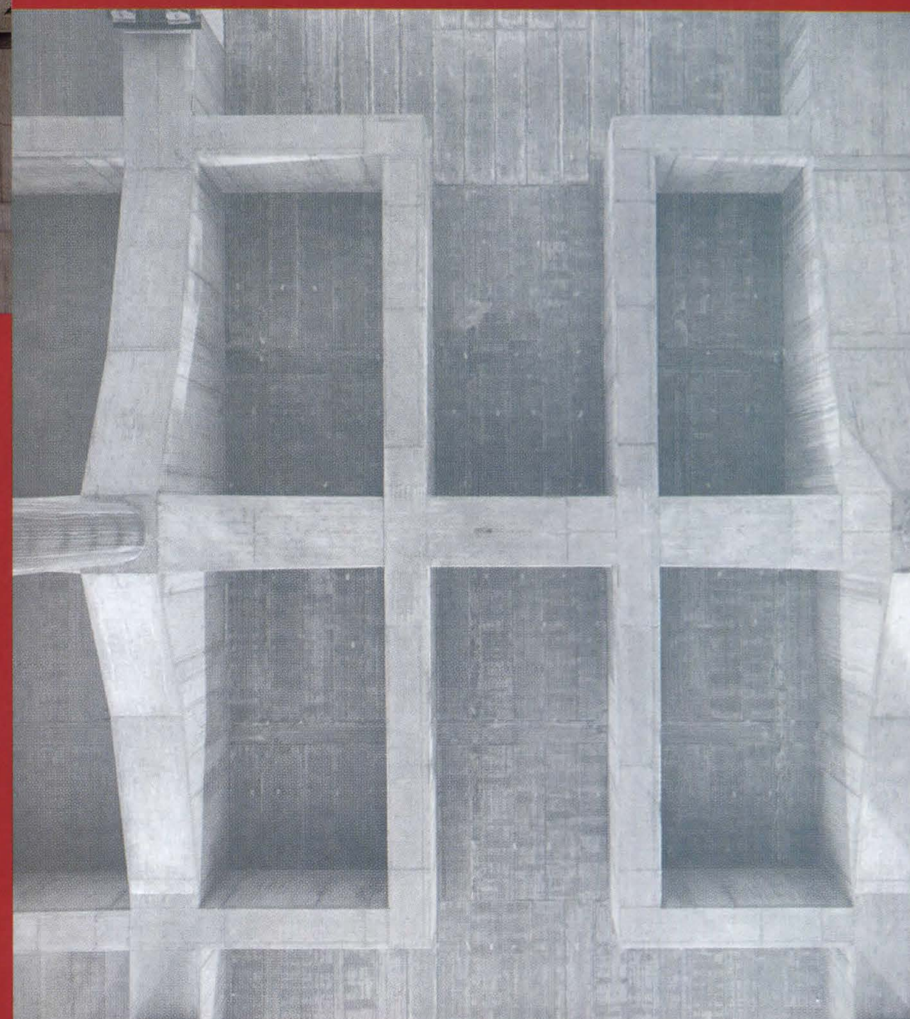
But what role will the so-called smokestack industries play 30 years from now? What will happen to the steel industry, mired as it is in the politics of import tariffs and the economics of overcapacity? Will new materials surpass the "technical audacities" that Henry-Russell Hitchcock and Philip Johnson attributed to concrete and steel in their 1932 manifesto, *The International Style*?

"Buildings will still be made of steel in 30 years—and in 300 years. Forever, unless someone figures out how to build a 100-story building with a material as strong and as economical as steel," says Bill Heenan of the Steel Recycling Institute, clearly confident that steel will continue to dominate well into this century.

Innovation happens at a glacial pace in industries dependent on multiple suppliers and cheap energy. In this century, the steel industry predicts several important trends, most of them having to do with complex manufacturing innovations. Architects will be more concerned with the environmental issues affecting steel and concrete, traditionally dirty businesses, as pressure mounts to conserve energy and make sustainable buildings.

Reduction in the amount of carbon needed to make quality steel has been dramatic, but eliminating it altogether is decades away, assuming that it will ever be possible. In the short term, recycling is an effective strategy. Heenan asserts that steel is the only material that is almost totally recyclable. In fact, 95 per-

PHOTOGRAPHY: © ROLAND HORN



STEEL & CONCRETE

Berlin Central Station
Architect: *von Gerkan, Marg und Partner, Hamburg, Germany*
Structural components were designed to maximize daylight and views throughout the railway station. Compact concrete decks float on slender steel columns, forming one complex structural system and minimizing the size of each element. All the joints between the steel tubes, foundation, and decks are cast steel. The durability and weldability are far superior to conventionally welded tubular and composite structures. The fork capitals embedded in the decks transfer the loads onto the columns. Barrel vaults support the ceiling in the station tunnel. The columns of these "vault tables" are located on the platforms between the railroad tracks. The concrete will remain unfinished.

cent of steel salvaged from demolition sites can be reused without degradation. "When melted at 3,000 degrees, steel loses memory of what it was before and can be made into something completely different," says Heenan. "As a matter of fact, 200,000 tons of steel removed from the wreckage of the World Trade Center has been recycled to provide the armor plate for a new submarine." By 2030, the industry predicts that buildings, automobiles, and a wide assortment of products will be made of recycled steel.

Concrete is arguably the oldest building material, in use for thousands of years. Although stronger, lighter, and better reinforced, the recipe has remained much the same—cement, sand, water, and aggregates. It's cheap, durable, and—in creative hands—a material of considerable beauty. Even more important is the fact that the entire infrastructure of the U.S. is supported by concrete. According to industry statistics, it is the world's most widely used man-made material and is second only to water as the most utilized substance. Slightly more than a ton of concrete is produced annually per each person on earth—six billion tons. The U.S. produces more than 2.5 tons per citizen each year.

One would reasonably assume then that the future of the concrete industry is as solid and secure as its product. To make sure it maintains its ubiquity, however, the concrete industry has created an ambitious plan for the

SUSTAINABILITY

Wessex Water Operations Center, Bath, England
Architect: *Bennetts Associates*
Engineer: *Buro Happold*
Heralded as the greenest office building in the United Kingdom, the design team carefully considered the environmental impact of all materials. Recycled concrete railway sleepers made up 40 percent of the coarse aggregate required for the *in situ* concrete. The precast concrete coffering is supported on a light steel frame rather than the standard concrete structure. Construction waste was segregated on the site so that 70 percent could be recycled.

METHODS & MATERIALS

The Downland Gridshell at the Weald and Downland Open Air Museum, Chichester, England
Architect: *Edward Cullinan*
Engineer: *Buro Happold*
The loosely clad clear-span timber gridshell (left) is set over a sealed and sunken archive space of earth-protected masonry. The organic form is due primarily to the stiffness required for the shape of a gridshell, composed of a series of continuous curves. The complete form is a triple bulb hourglass shape, 40-to-50 feet wide.

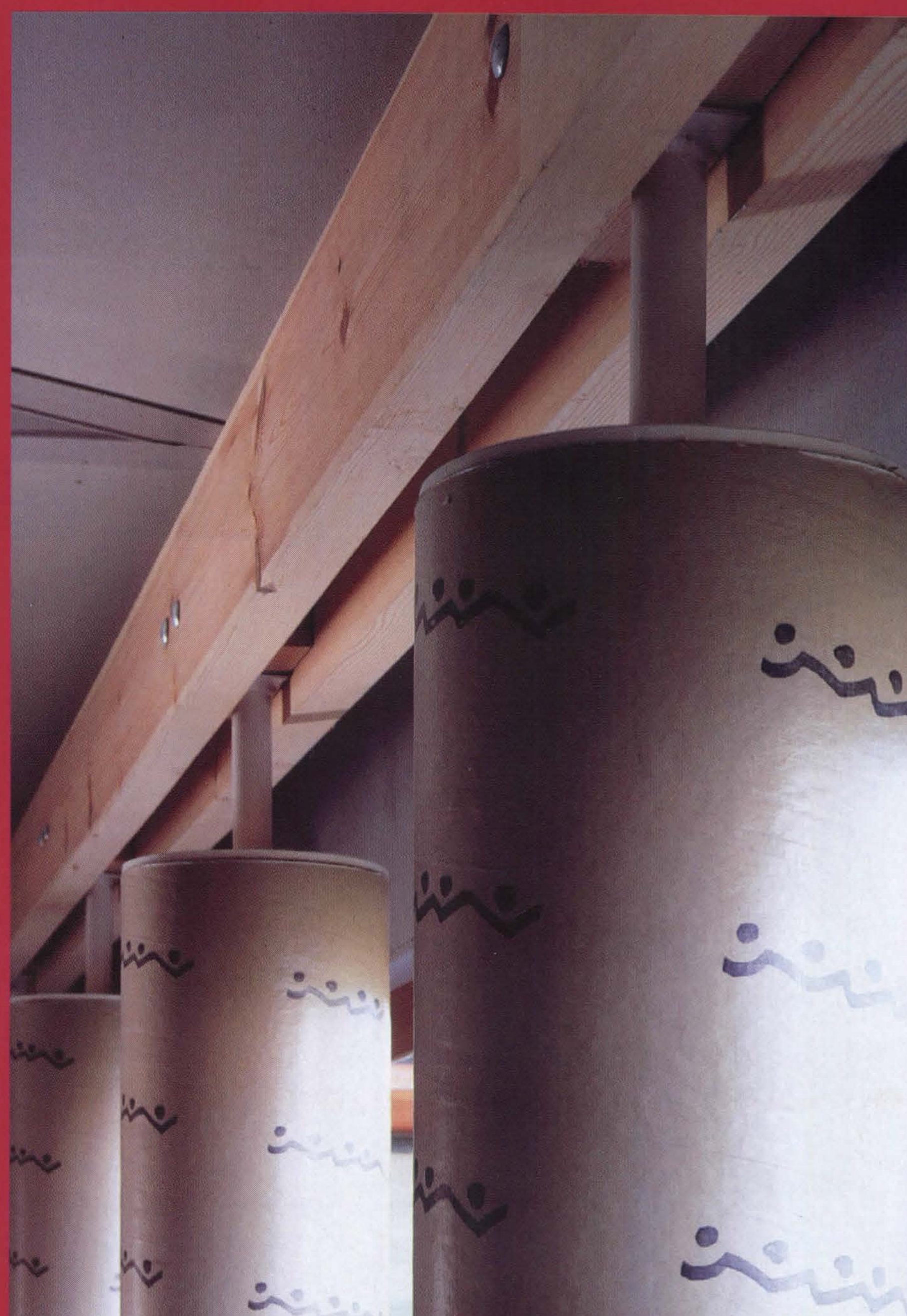
Westborough School, Westcliff-on-Sea, England
Architect: *Cottrell and Vermeulen*
Engineer: *Buro Happold*
Cardboard tubes (below) support the timber trusses of the roof of this building prototype. The tubes are 180 or 230mm in diameter and the edges are 15mm of solid card. Funded in part by government, the project is part of research and documentation aimed at developing the material as a viable construction product.

future called Vision 2030, which defines areas in which research is needed, as well as where partnerships with other industries, government, and academia are required.

To realize its vision, the American Concrete Institute, in cooperation with the U.S. Department of Energy's Office of Industrial Technologies and other independent organizations, has created a guide called *Roadmap 2030: The U.S. Concrete Industry Technology Roadmap*. *Roadmap* acknowledges future liabilities, many of them energy- and environment related, and details the industry's strenuous effort to mitigate them through research and innovation. For example, the cement and concrete product manufacturing industry consumes a lot of energy, spending approximately $1.5 billion on purchased fuel and electricity in 2000.

Improved High-Performance Concrete (HPC) will make production, delivery, and placement more efficient. Fiber-reinforced HPC components will become an attractive material for rapidly built, low-cost housing. In addition, systems for designing both residential and commercial structures with a low risk of fire, blast, and earthquake damage are a high priority in *Roadmap*. Acceptance of new technologies and their availability in the marketplace will be reduced from an innovation-stifling 15 years to a competitive two.

The industry is looking for new materials, which it has outlined as research initiatives. Nonmetallic alternatives to reinforcement are a high priority. In 2003, there is increasing world-wide interest in fiber-reinforced plastics (FRP) and carbon fibers to prevent damage caused by corrosion. The search is also on to find lightweight local sources of aggregates in order to reduce the



PHOTOGRAPHY: © BURO HAPPOLD/ADAM WILSON; BURO HAPPOLD/MANDY REYNOLDS (OPPOSITE)

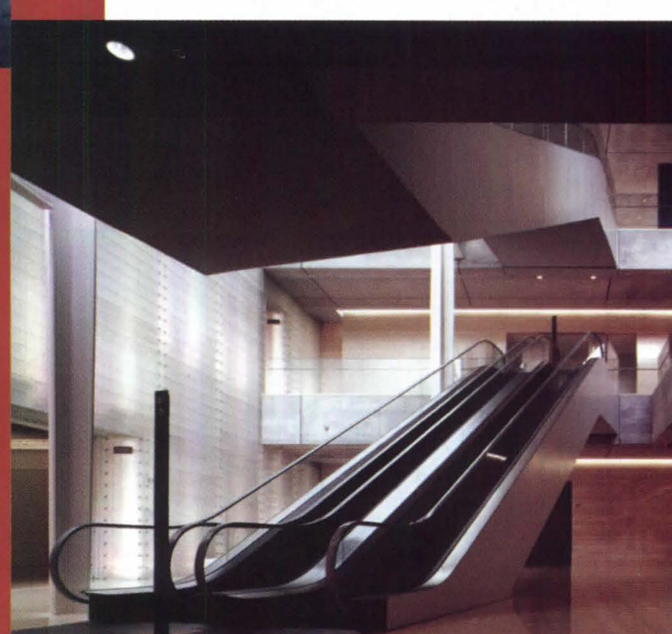
energy required to transport them to building sites. Efforts are presently underway to make concrete an environmentally benign material by reusing high-alkali wastewater, recycling aggregates, and reusing cementitious waste products. By 2030, smart materials ranging from sensor-laced concrete to hybrid products will respond to environmental conditions and warn of failures. As they emerge, embedded technologies and new materials will require more expertise within the industry, as well as among architects and engineers.

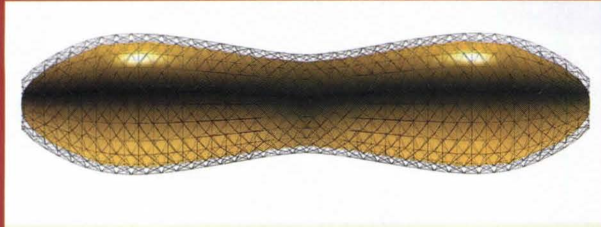
Given the rise in material and systems complexity, the role of the engineer, especially the fields of structural and facade engineering, is already expanding. In the last century, the engineer was largely a silent partner—the consultant who invisibly realized the architect's vision in concrete, steel, and glass. The relationship was cooperative. Now it appears to becoming genuinely collaborative. And by 2030, there is evidence that engineering will be the new architecture, as advanced technical skills draw the engineer deeper into the design process. Cecil Balmond, chairman of Arup's European Division, emerged from the shadows long ago and is renowned as the *über* engineer for complex projects. He leads the firm's Advanced Geometry Unit, which has designed structures for Toyo Ito, Daniel Libeskind, and Shigeru Ban.

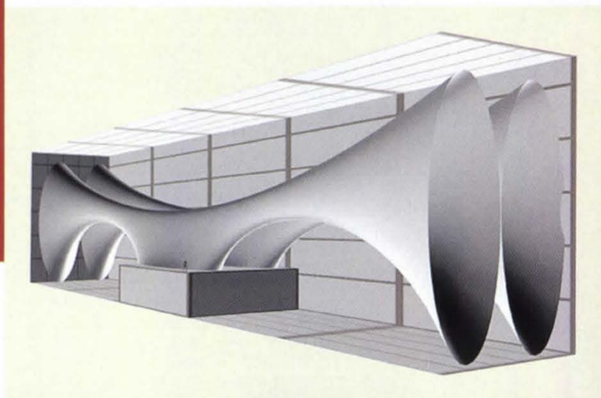
The Advanced Geometry Unit builds complex 3D analytical models with its proprietary software, FABWIN, a nonlinear, form-finding program, which can be reprogrammed to meet the needs of different projects. Computer models can be so complex that communicating the design ideas requires both virtual and physical simulations. Arup created wax prototypes of Marsyas (opposite page) with a Thermojet 3D printer. But to simulate

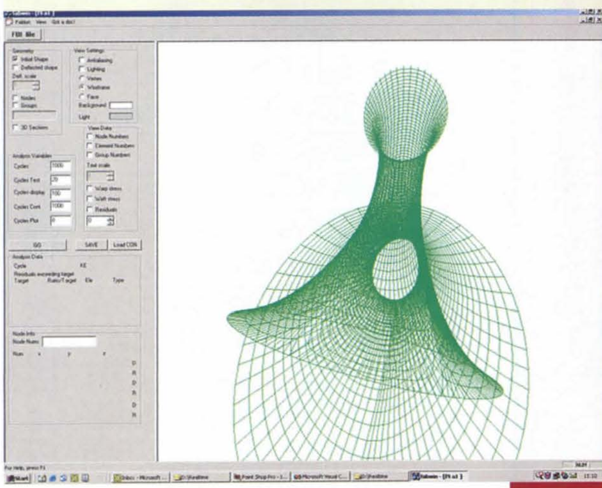
GLASS

Pola Museum of Art, Kanagawa, Japan
Architect: *Nikken Sekkei*
Laminator: *ASAHI Glass*
Winner of the 2003 DuPont Benedictus Award, this museum houses a private collection of Impressionist art in a lush forest. Laminated glass is ubiquitous throughout. A sloped skylight of clear laminated glass forms a "light spine" the length of the museum. Glass is also used for the structural ribs, which support the sloped skylight. The extensive use of glass floods the five-story museum, most of which is underground. The glass atrium allows panoramic views to the floor below, making the overall plan obvious to the visitor.









ADVANCED GEOMETRY

Marsyas, Tate Modern, London
Artist: *Anish Kapoor*
Engineer: *Arup*
Arup's Advanced Geometry Unit developed a complex, organic, curved concept using its in-house form-finding program FABWIN. After months of iterations (left), the final design is a prestressed, PVC-coated polyester membrane stretched over steel rings spanning 460 feet. The tensile structure is based on soap film stretched between boundaries. By treating the membrane surface as a net of node points connected by triangles and achieving an equal amount of curvature in all directions, Arup moved into new engineering territory.

the experience of something so unusual and enormous, the engineers created a virtual reality machine using the latest 3D gaming technology. This allowed both the artist and engineers to study lighting, texture, and color in great detail.

Like Arup, most multidisciplinary engineering firms today develop their own software or adapt other products, such as gaming software, which, of course, adds another degree of complexity to the process. These firms also reinvest some percentage of their profits into ongoing research and development, such as Buro Happold's development of cardboard as a construction material (page 33). Architects who want to maintain parity with engineers and create the next generation of "technical audacities" from an ever-deepening reservoir of methods and materials will follow the trend, as KieranTimberlake (page 42), Kennedy Violich (page 36), FTL Design Engineering Studio (page 47), and others have done. Still, in an era of engineering virtuosity and genuine collaboration and teamwork, who will own the architecture? ■

PHOTOGRAPHY: © ARUP/DENNIS GILBERT/VIEW; MAMORU ISHIGURO (OPPOSITE)

Brave new solid-state, carbon-fiber world

FEATURES

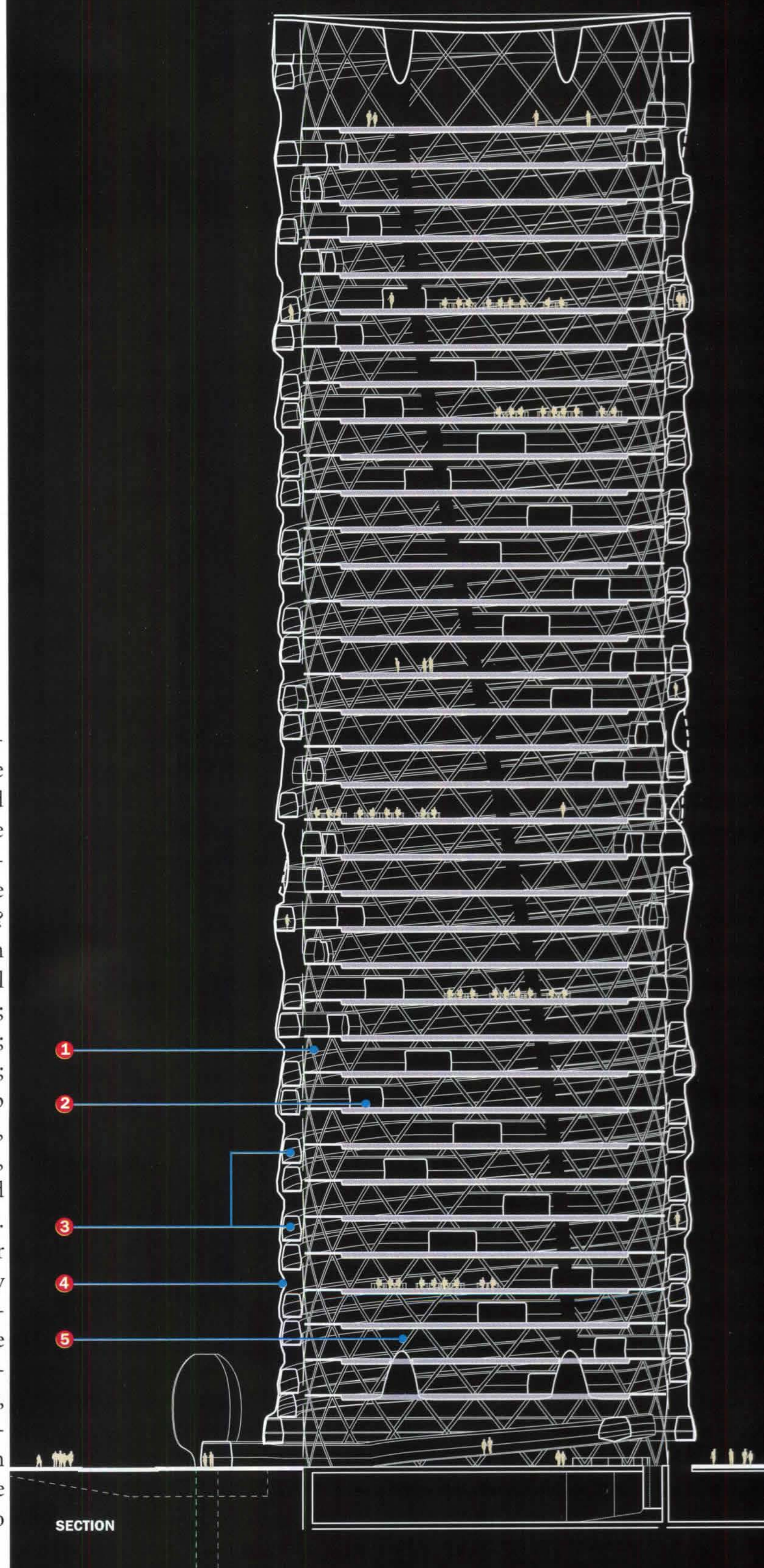
By Barbara Knecht

Architects may come to know their buildings, but what connection do they have to the ingredients used to make them? Most buildings are constructed from a tried and true, albeit huge, repository of materials that is listed in the McGraw-Hill Construction Sweets Catalog File, advertised in magazines, and unveiled at trade shows, but how often do architects have the opportunity to experiment with new materials or untested processes?

The obstacles to innovation are tremendous: "Convention gets built; innovation gets published," as the saying goes; commercial developers are risk averse; public agencies have pit bull watchdogs; building codes ask for ASTM certifications; owners need insurance; building inspectors expect uniformity; contractors thrive on repetition; everyone has shallow pockets. Innovation takes time, money, and a leap of faith, but it does happen, and it is happening more, although it can't be called the norm of practice—yet.

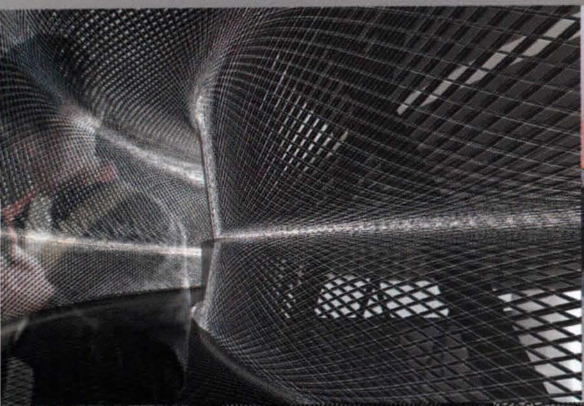
Architects Peter Testa and Sheila Kennedy are reinventing the design process through collaboration with industry.

Architects Peter Testa and Sheila Kennedy have very different practices, but both navigate the uncharted waters of innovative design through collaboration with manufacturers, multidisciplinary interaction, and the adaptation of nascent technologies. "The complexity of contemporary buildings is an enormous achievement, but we need to question how we came to the point of building with such complexity. We believe we need to

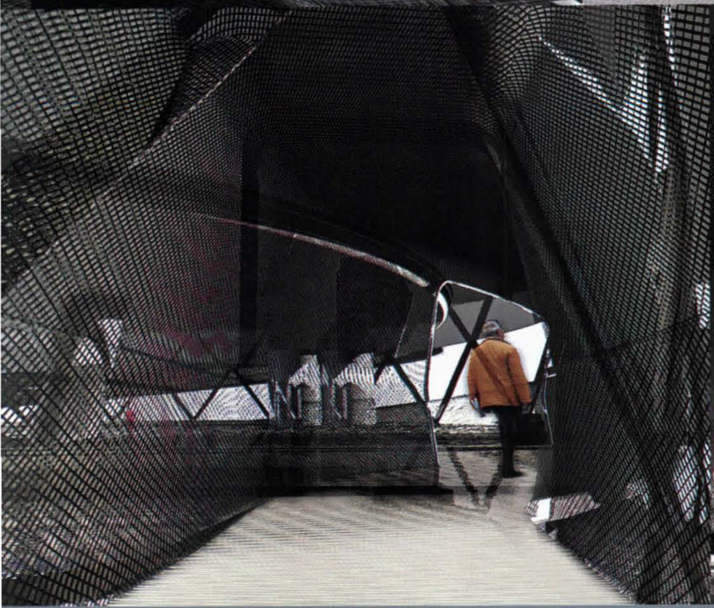


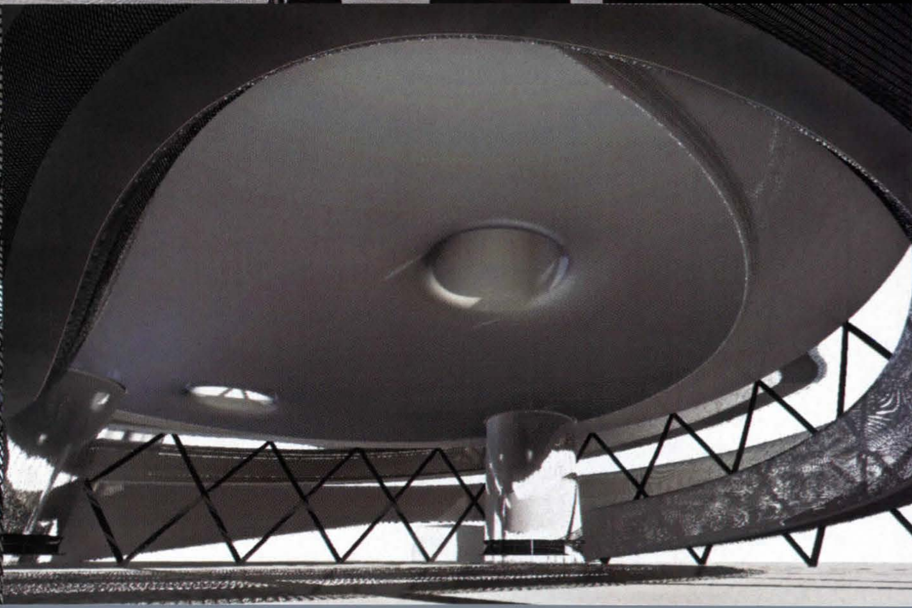
SECTION

Barbara Knecht is a writer in New York and Boston.



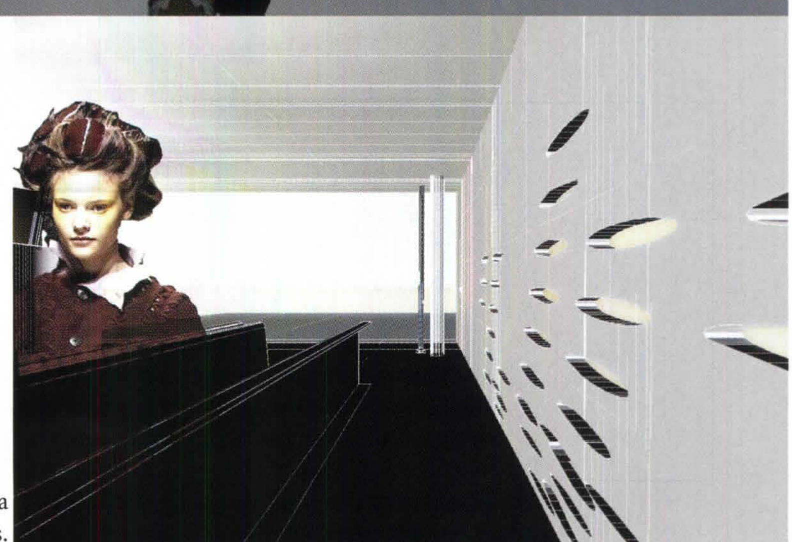
The Carbon Tower Prototype is a 40-story mixed-use high-rise that incorporates five innovative systems (see section). Studies conducted by Arup suggest that, if built, the tower would the lightest and strongest building of its type.



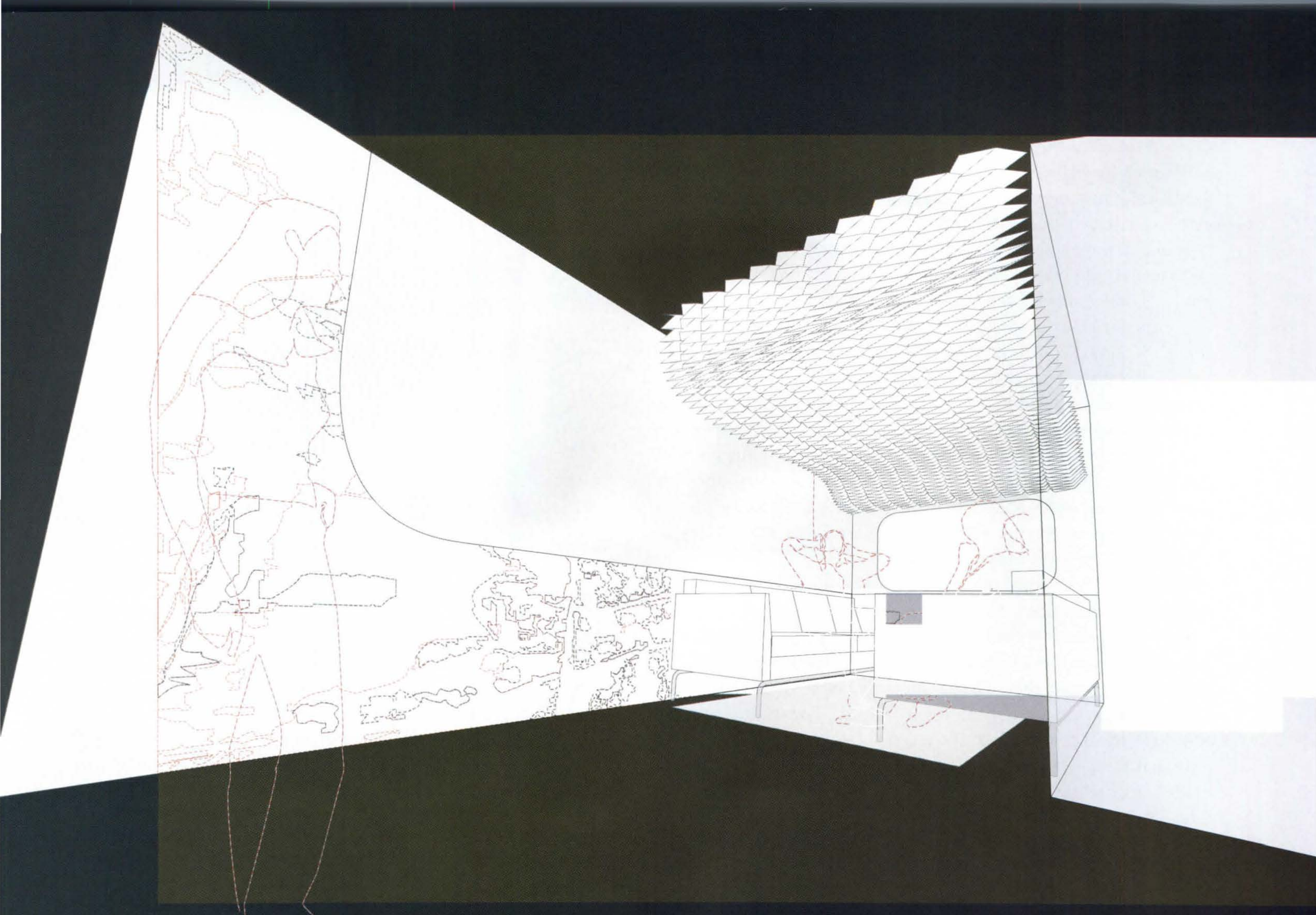


rethink how we assemble buildings." These might seem like strange words coming from architect Peter Testa, who, with his partner, Devyn Weiser, has designed a carbon-fiber tower, a complex undertaking that proposes to build a high-rise tower out of composite materials. According to Testa, whose firm, Peter Testa Architects, is located in Santa Monica, California, the willingness to use complex computer modeling tools will allow the design of new buildings, materials, and products that just might transform the building industry.

For a shop in West Hollywood, Testa's firm designed a structure using textile-based composites. Two carbon-fiber frames support a woven mesh of Kevlar cables spanning 110 feet. A double façade of Kevlar panels is suspended from this framework.



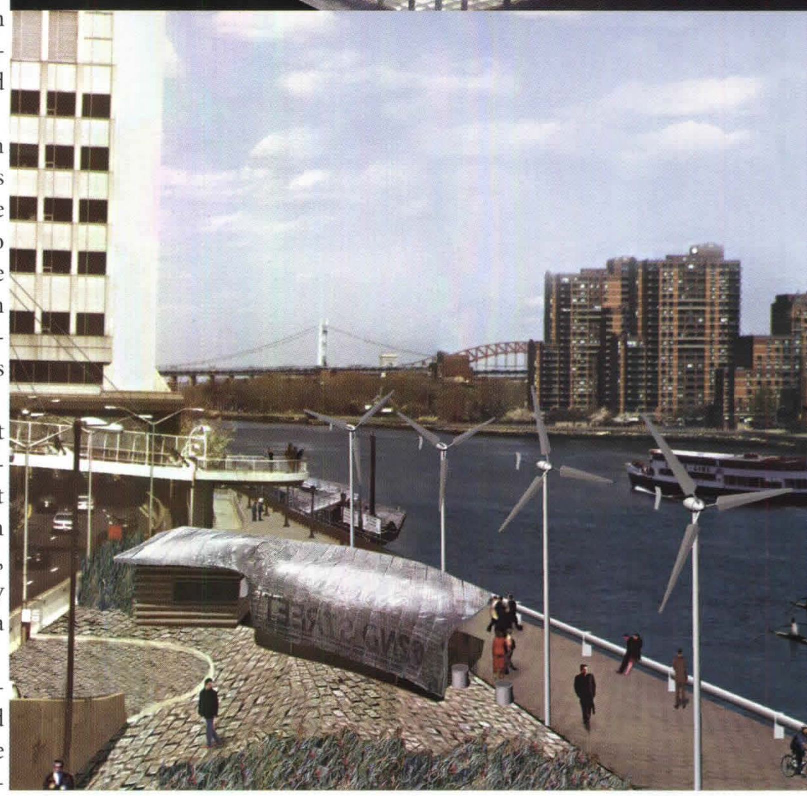
Testa and Weiser are pursuing, in partnership with industry, a systemic examination of intermediate-level building systems. Manufacturers are the most willing to shoulder risk; they stand to profit from reasonable investment. The lure for many manufacturers is scale, an advantage not lost on Testa. The carbon tower project was envisioned with that strategic thinking. "The [construction] industry isn't completely fixed. If one finds applications for materials that are provocative and at a big enough scale, it is possible to engender new divisions of industry," says Testa. "We are interested in things that are realizable. *We are trying* to reach different actors and trying to create something the industry can understand and rally around." The ultimate measure of an innovation is when it becomes a reality.



Testa designed a listening room for furniture retailer Totem's New York showroom. Using Pulp, Testa's product line made of waste-paper products, the firm create a variety of effects. Surfaces are finished with resins, waxes, and thin films. An electrotextile wallpaper provides ambient illumination.

Sheila Kennedy, AIA, principal and founder with partner Frano Violich, AIA, of Kennedy & Violich Architecture (KVA) in Boston believes there is an exciting horizon for architects to return to the design of materials. One of the main missions of KVA and MATx, its materials research unit, is to expand the diminishing role of architects. Its goal is to forge a new relationship with materials, one that will draw on mass customization. "We have always taken existing materials and products and expanded the palette beyond their usual use. Research with new materials is an extension of what we have been doing all along," she says. Kennedy describes two main "design drivers" that she believes are changing how space is made and organized. The first is the advance in solid-state technology; the second is the wireless and hard-wired distribution and integration of information infrastructure.

Innovators look for opportunities and mine for ideas. A seemingly unlikely arena for innovation is work commissioned for public agencies. For New York City, however, KVA is designing seven ferry landings along the Harlem and East River waterfronts in Manhattan. The work includes intermodal passenger shelters, commuter ferry boat docking facilities, site improvements, and community amenities.



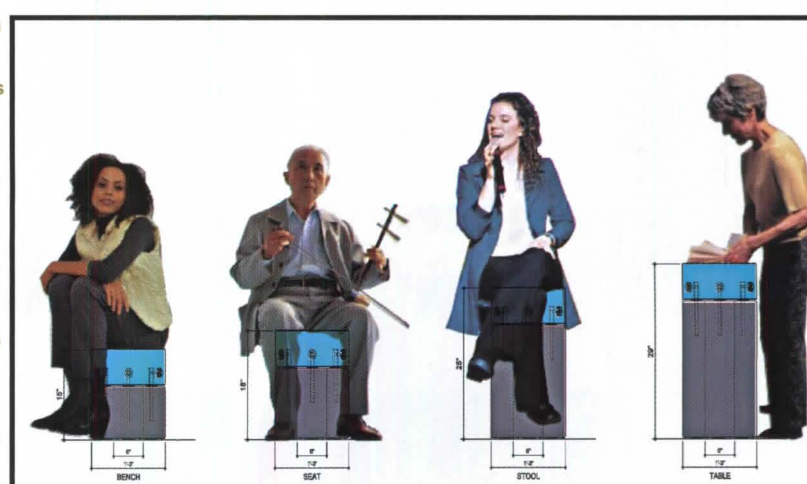
"The ferry project will be the first public project built with substantial components that are digitally fabricated," explains Kennedy. "These are the tools that link directly to industry, since we can project the design right into fabrication." The technology also allows for rapid prototyping, which is especially useful in a multisite project. Although this kind of technology is becoming more common in the construction industry, Kennedy says they have often gone outside of the construction industry to metal fabricators or set builders who are more familiar with it.

In the spring of 2001, Kennedy began to work with DuPont on an initiative to incorporate solid-state technologies with translucent and transparent materials. "Internal and external market research supported the idea of integrating solid-state lighting with surface materials where we had good brands," explains Tom O'Brien, portfolio manager for DuPont Ventures, who had heard Kennedy speak about the subject at a conference. "However, it also called for a prototype that would demonstrate validity."

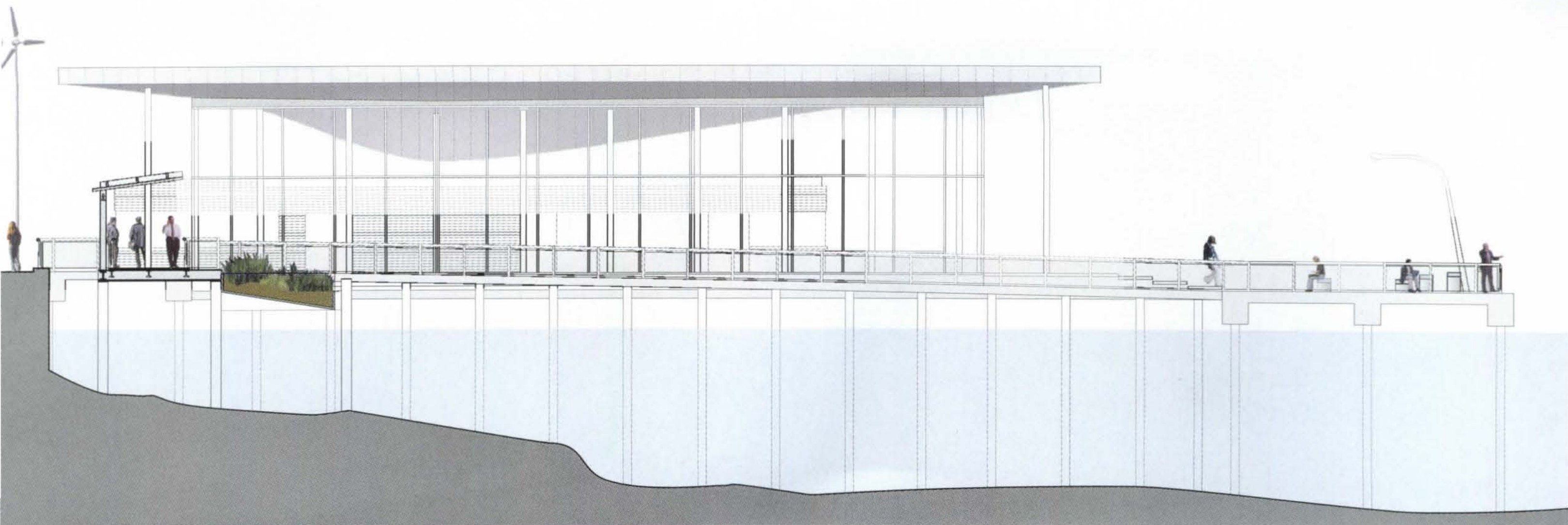
The KVA and DuPont teams focused on two DuPont products: Corian and SentryGlas Plus protective glass. They developed concept demonstrations—a combination of materials, solid-state lighting, and product information to stimulate discussion about applications. Although he can't talk too specifically about the results, O'Brien says the goal was to make the DuPont products smarter by integrating technology without compromising the integrity or features that have made them successful. O'Brien is now working with three DuPont businesses to turn these concept demonstrations into possible offerings.

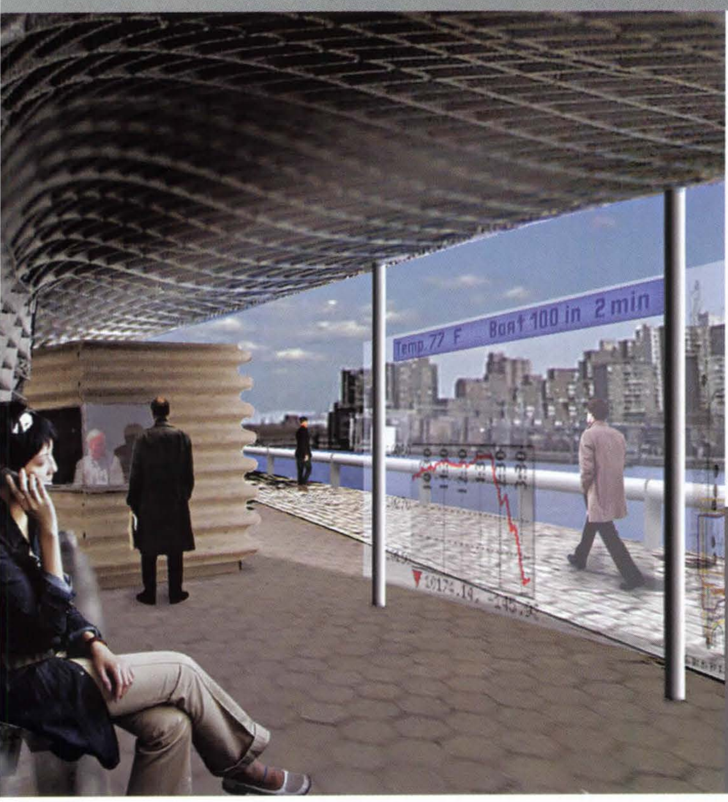
The nature and methods of KVA's work involves risk, but Sheila Kennedy considers herself one of the architects who wouldn't enjoy her work if she couldn't affect cultural production. "But you can't proselytize the beauty of risk-taking," she acknowledges. "Still, as the technology and machines we use become more common, risk will diminish." ■

KVA is designing seven ferry landings (opposite) along Manhattan's Harlem and East River waterfronts. The 34th Street Commuter Ferry Terminal is the first to go into construction. The architects adapted marine-buoy lighting technology, which uses energy-conserving LEDs, photo-sensors, and photovoltaic cells, into the street furniture (right).

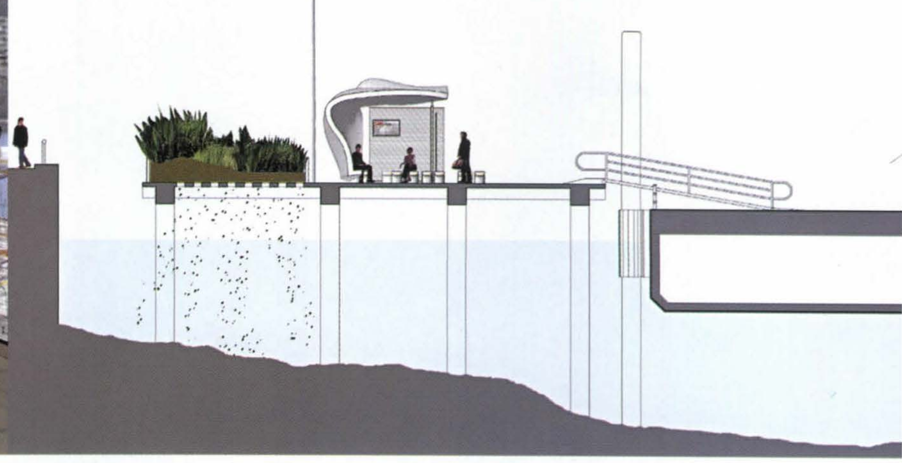


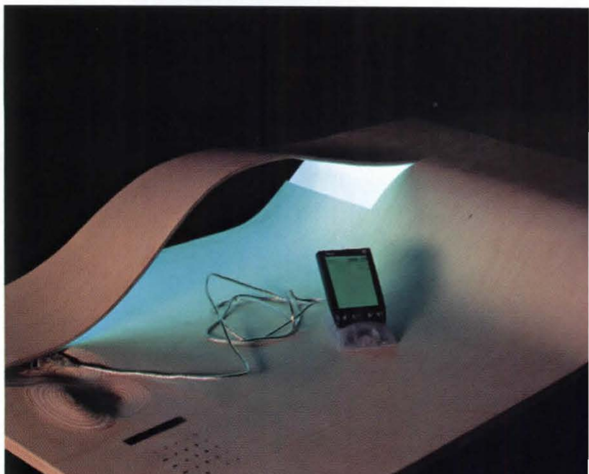
IMAGES COURTESY OF KENNEDY & VIOLICH ARCHITECTURE





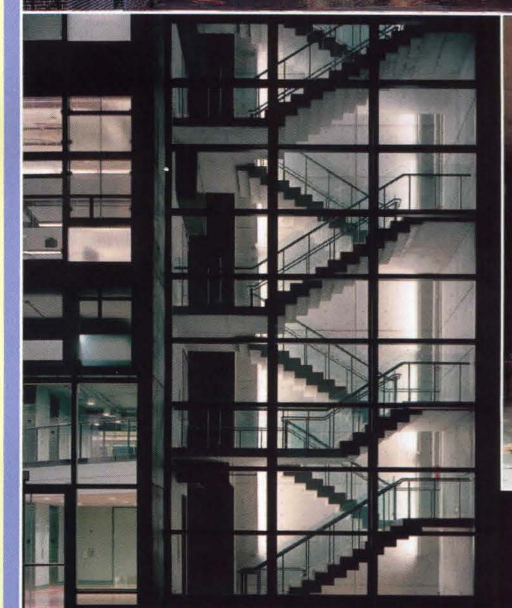
KVA, with a grant from the DOE's "Research That Works!" program, developed the second generation of its Electroluminescent Plywood Desk (bottom, right). It uses electroluminescent (EL), thin-film technology to provide integrated lighting that is energy efficient. Plywood is layered with a flexible polymer that is sprayed with a coating of phosphers and sealed, producing a film thinner than a business card.





The proportions of the glass facades are based on the golden section, and the units incorporate both transparent and translucent glazing. Secondary materials include granite and brick, which relate to adjacent buildings.

Seeking innovative alternatives, **Kieran Timberlake Associates** pumps research into architecture



By Sara Hart

In 2001 the American Institute of Architects (AIA) College of Fellows awarded its first Latrobe Fellowship to Philadelphia architects Stephen Kieran, FAIA, and James Timberlake, FAIA. The grant was established to fund research leading to significant advances in the profession of architecture. Since receiving the award, KieranTimberlake Associates (KTA) has been immersed in the study of building processes, assemblies, products, and new materials. The firm's research is leading to commercial applications, including advanced building-envelope composites, modular bathroom units, and factory-built door assemblies.

This research plays a major role in all of KTA's new projects, which is evident in the Melvin J. and Claire Levine Hall at the University of Pennsylvania's School of Engineering and Applied Science. The 48,000-square-foot facility houses offices, laboratories, meeting spaces, and a 150-seat auditorium. Levine Hall is shoehorned into a thicket of older brick and stone classroom buildings and connected to existing buildings on the north and south. The footprint and massing are calibrated to agree with the fenestration, scale, and parapet height of the adjacent buildings. A newly landscaped pedestrian walk leads to the double-height lobby on the eastern facade, with a view through to a courtyard in the rear.

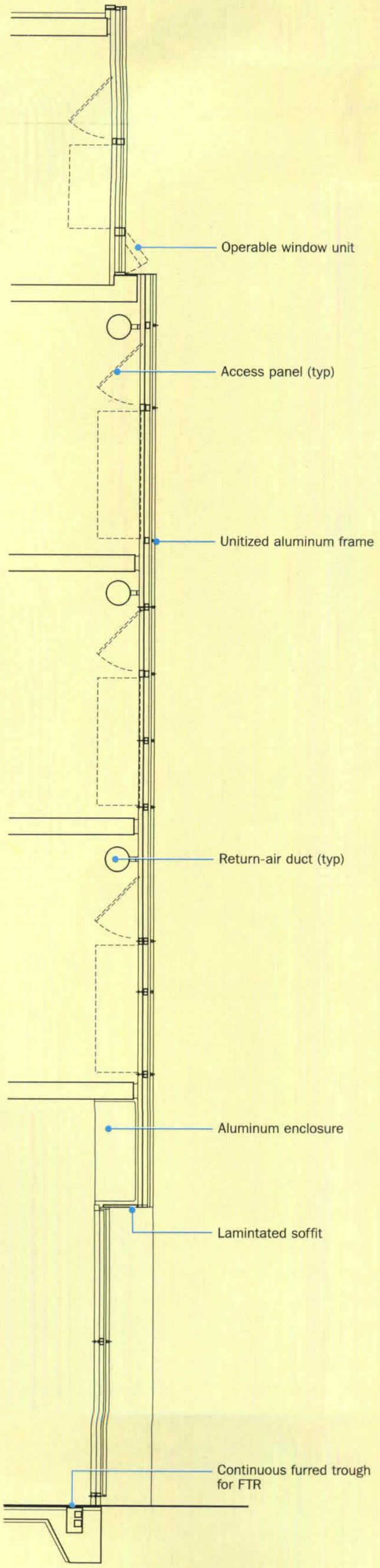
The construction method can be described as a hybrid of sorts. The interiors were conceived as loft spaces with 14-foot ceilings.

Project: *Melvin J. and Claire Levine Hall, School of Engineering and Applied Science, University of Pennsylvania*
Architects: *KieranTimberlake Associates—James Timberlake, partner in charge; Richard Maimon, AIA, associate in charge; Steven Johns, project architect; Stephen Kieran, Albert Garcia, Yves Gauthier, Samuel Robinson, Mark Sanderson, Chris Pfiffner, Richard Snyder, Amanda Sachs, Krisada Surichamorn, Castor Kong, Karl Wallick, Meiko Sato, Justin Doull, Kate Czembor, Matthew Spigelman, project team*
Engineers: *CVM (structural); Vanderweil (MEP, fire); Barton & Martin (civil); Arup (energy)*
Fabricator (curtain wall): *Permasteelisa Cladding Technologies*

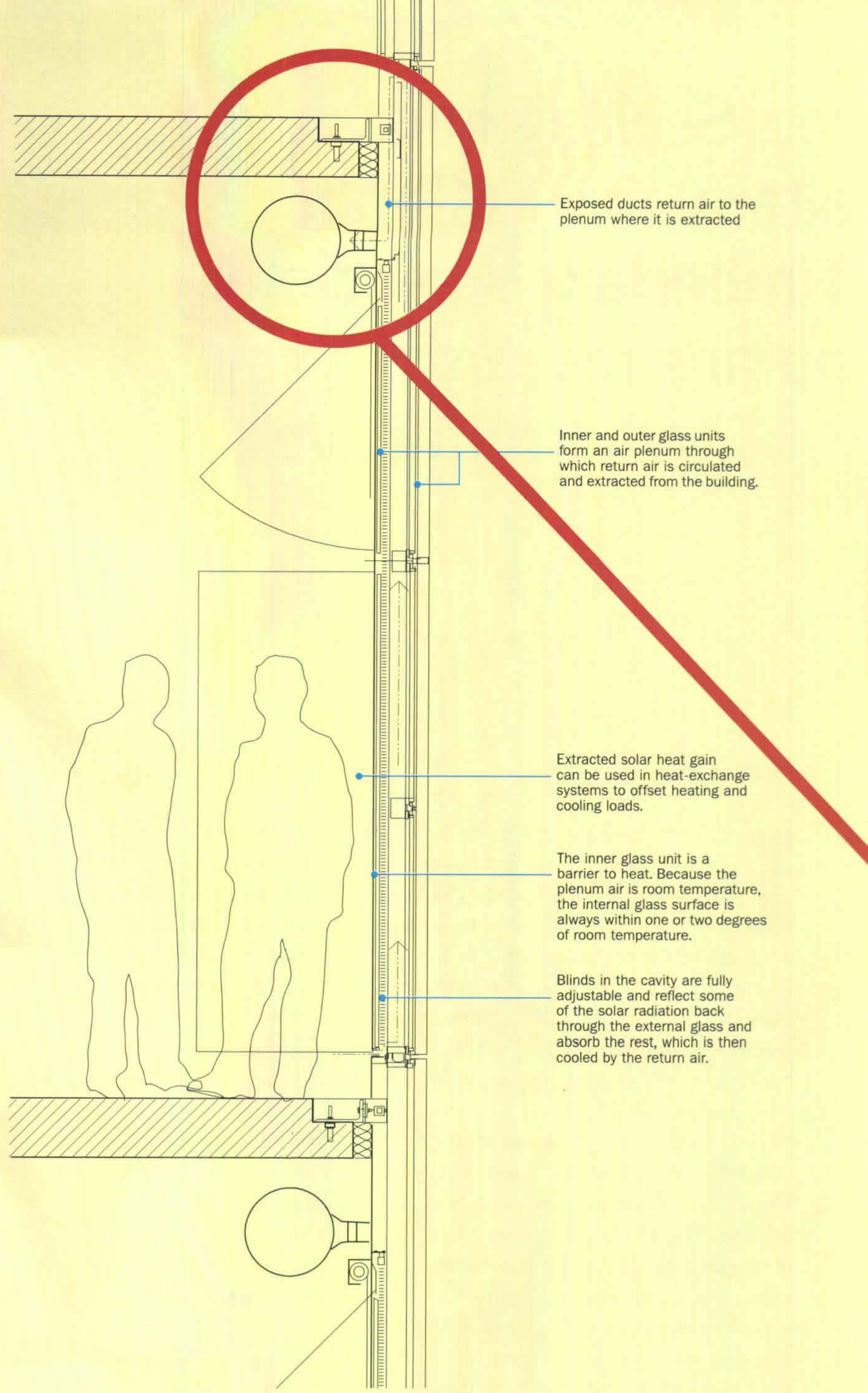
PHOTOGRAPHY: © BARRY HALKIN

Key elements for creating an active, pressure-equalized, ventilated curtain wall

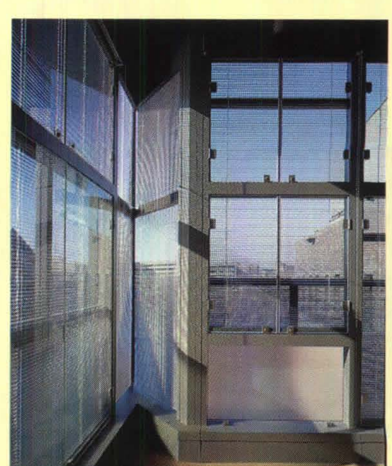
Hypothesis. Create a dynamic image for a new engineering and applied science facility. Emphasize the state of the art by allowing new technologies to drive the design process.
Process. Analyze the wall, its components, and available manufacturers. Retain an independent expert in energy and sustainable design issues to evaluate the energy codes related to the program. Enlist an engineer to develop calculations relative to comfort and energy-code compliance. Commission Permasteelisa Cladding Technologies in Italy to build the components and ship to Philadelphia fully glazed and ready for installation.
Value. Due to the addition of the added layer of glazing, interior blinds, and unitized construction, the curtain wall costs more than a comparable "standard" wall. This premium has been identified to be in the range of 25 to 35 percent over a comparable wall of architectural grade. The increased premium may be amortized over time by reduced energy costs.



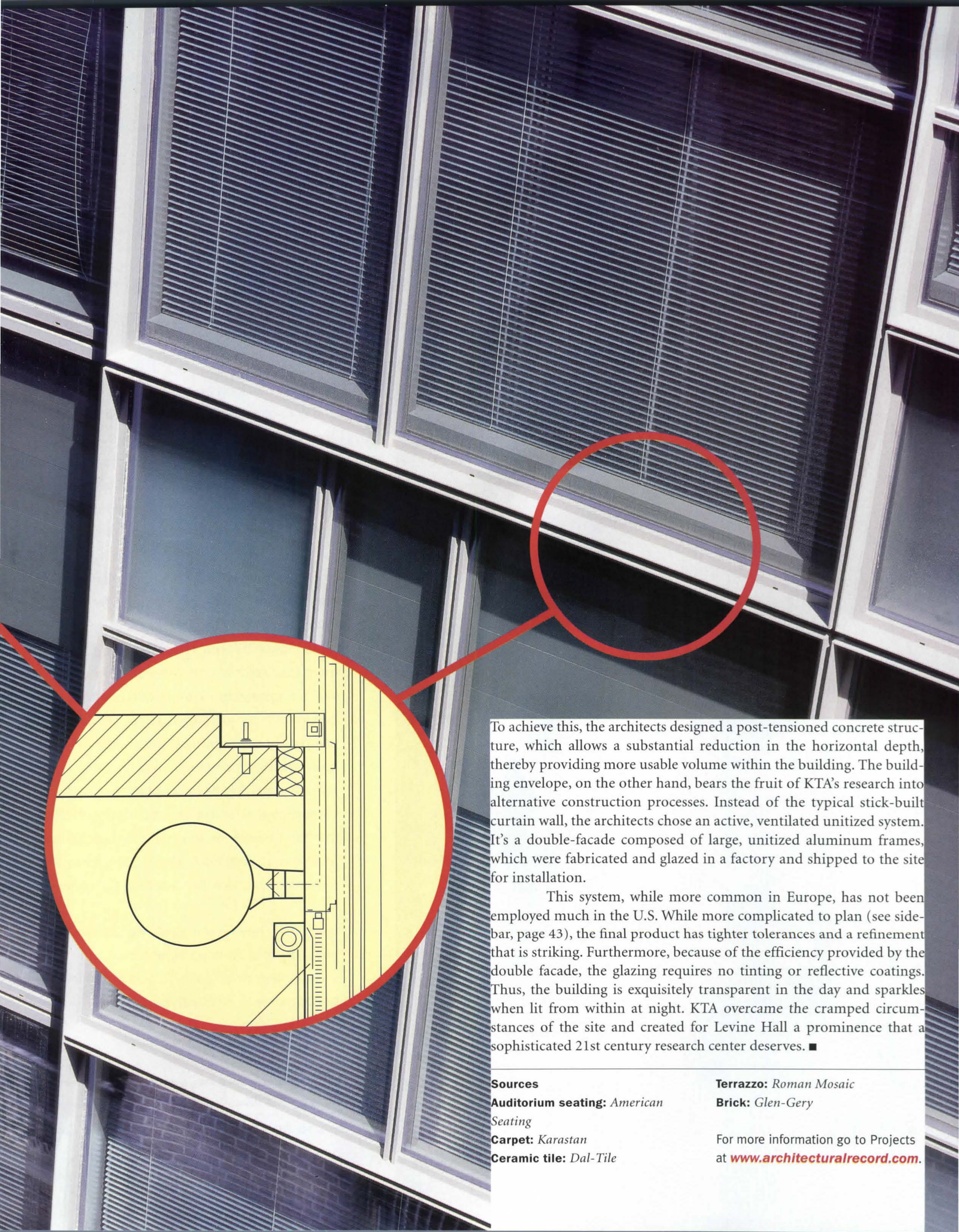
WALL SECTION



FUNCTIONS OF AN ACTIVE, PRESSURE-EQUALIZED, VENTILATED CURTAIN WALL



Faculty offices are located at the perimeter of the building with abundant natural light and views. An energy analysis indicated that an active curtain-wall system with blinds would result in greater comfort within perimeter rooms, thereby addressing the concerns of the potential users.



To achieve this, the architects designed a post-tensioned concrete structure, which allows a substantial reduction in the horizontal depth, thereby providing more usable volume within the building. The building envelope, on the other hand, bears the fruit of KTA's research into alternative construction processes. Instead of the typical stick-built curtain wall, the architects chose an active, ventilated unitized system. It's a double-facade composed of large, unitized aluminum frames, which were fabricated and glazed in a factory and shipped to the site for installation.

This system, while more common in Europe, has not been employed much in the U.S. While more complicated to plan (see sidebar, page 43), the final product has tighter tolerances and a refinement that is striking. Furthermore, because of the efficiency provided by the double facade, the glazing requires no tinting or reflective coatings. Thus, the building is exquisitely transparent in the day and sparkles when lit from within at night. KTA overcame the cramped circumstances of the site and created for Levine Hall a prominence that a sophisticated 21st century research center deserves. ■

Sources
Auditorium seating: *American Seating*
Carpet: *Karastan*
Ceramic tile: *Dal-Tile*
Terrazzo: *Roman Mosaic*
Brick: *Glen-Gery*

For more information go to Projects at **www.architecturalrecord.com**.

Technology transfer remains a nascent movement, but **more architects** take up the challenge

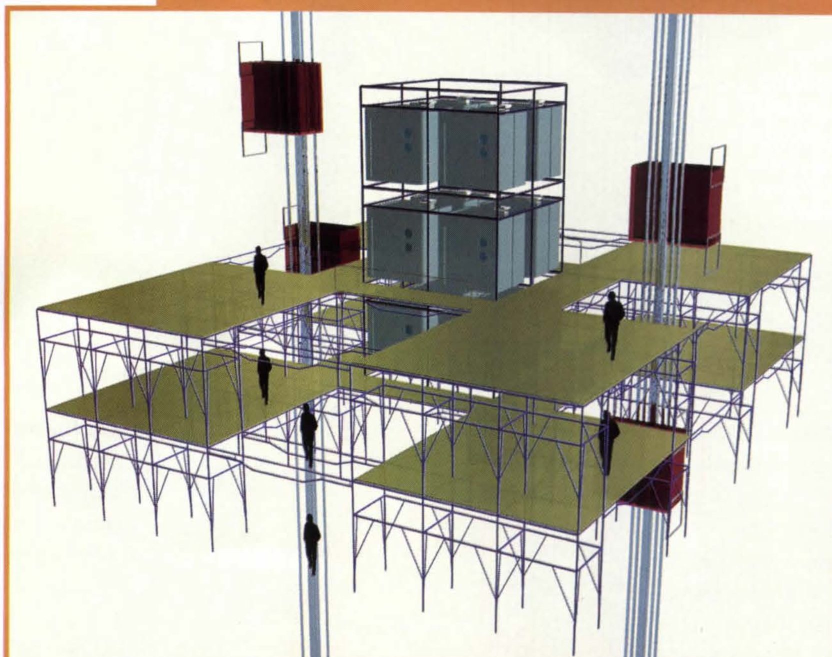
By Lynn Ermann

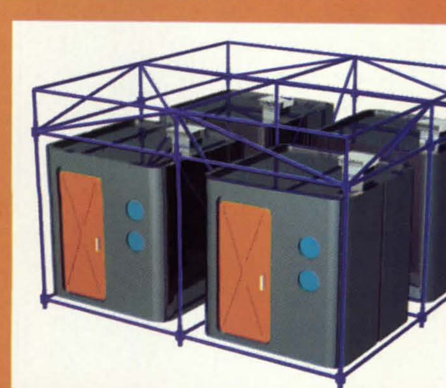
In 1999 Mike Skura, vice president of architectural design at CTEK, a company that specializes in prototype glass for cars and airplanes, was startled by a phone call from architect Frank Gehry. "He said he had searched high and low for someone to do complex, compound curved glass," recalls Skura, "and wanted to know if we could do it." They had to try, of course. Skura broke a lot of glass struggling to bend large sheets into the tight curves of the Gehry-designed, glass-enclosed cafeteria in the Condé Nast headquarters in New York, but the eventual success solidified a partnership between Skura and Gehry and their separate industries. After that, CTEK got so many calls from architects for glass projects that it introduced a separate architectural division to accommodate the huge demand for complex, curved architectural safety glass.

By searching outside the confines of standard construction-industry methods and materials to find a business that supplies the automotive and aerospace industries, Gehry engaged in what is called technology transfer—simply the movement of processes or materials from one industry to another. (Of course, he had already made that leap with his much-publicized adaptation of CATIA—aerospace design software—to help rationalize the exotic geometries of his buildings.)

Technology transfer is not a new phenomenon. In fact, it's increasingly widespread in all industries, facilitated by both the Internet and federal legislation. The Space Act of 1958 required NASA to make its discoveries and inventions available to private industry. Early imports into the consumer marketplace from the aerospace industry included power drills, medical devices, Velcro, and Mylar. Countless other inventions have come from the military, including plastics, titanium, the earliest computers, rockets, and transistor radios, to name a few. Since 1980, when the Bayh-Dole Act allowed universities, not-for-profits, and small businesses to have ownership of inventions created with government funds, technology-transfer facilities have sprung up at universities across the country. Legislation in 1980 and 1986 made all federal laboratory scientists and engineers responsible for technology transfer, while over 700 laboratories were gathered under one umbrella organization, the National Technology Transfer Center.

Lynn Ermann is a New York-based writer.





FTL Design Engineering Studio applied its expertise in lightweight, flexible structures to design (in collaboration with Honeywell and Clemson University) an inflatable airlock for NASA. The two-layer fabric container (right) is made of about 180 pounds of fabric sandwiched on either end by metal hatches that together weigh about 3,200 pounds. On other earthbound fronts, with its eye on the future, the firm has developed a recyclable, portable skyscraper (middle) with the innovative use of standard clip-on construction methods, borrowing event-industry stackable toilets (right), and housing the infrastructure and HVAC systems in truck trailers on the ground.

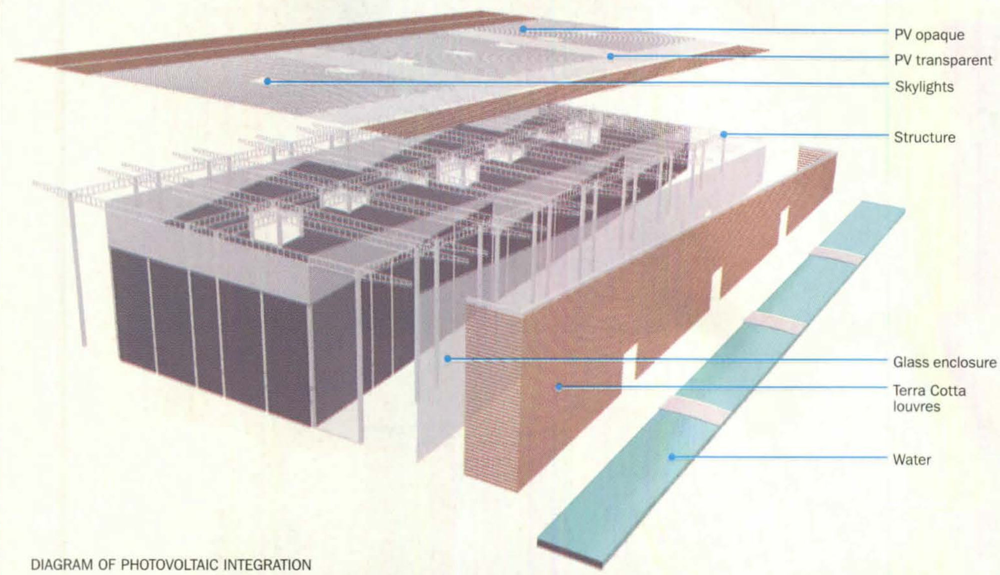
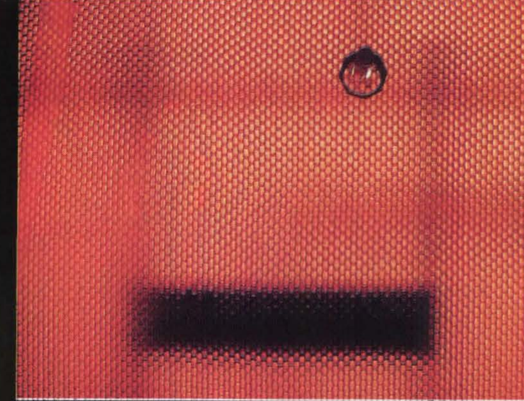


DIAGRAM OF PHOTOVOLTAIC INTEGRATION



At the Illinois Institute of Technology (IIT), students must participate in the Inter-Professional Curriculum (IPRO) program—a semester-long, multidisciplinary research and design studio that emphasizes "real-world" scenarios. The team project shown here focused on integrating energy-saving building components for a new convention center in Phoenix, designed by SOM. The group investigated applying Building Integrated Photovoltaic (BIPV) systems, particularly in the exterior walls.

Studio as laboratory

A renewed interest in materials and processes may also be related to the imaginative, fluid forms made possible by sophisticated software programs, especially in university architecture programs. "We feel we can control materials more now," observes Ron Witte, an associate professor at Harvard's Graduate School of Design (GSD). Osram Sylvania, for example, one of the largest manufacturers of light-emitting diodes (LEDs), has sponsored LED studios at the GSD for research, while scientists at NASA's Jet Propulsion Laboratories have worked with students to produce aerogel tiles from a solid form of the material.

Technology transfer is increasingly widespread in all industries, facilitated by the Internet and federal legislation.

Architecture schools that are closely allied with engineering programs tend to have more financial support for technology-transfer explorations. The Illinois Institute of Technology's (IIT) direction is particularly promising: The architecture program requires all undergraduates to take an Inter-Professional Curriculum (IPRO)—a series of courses that require students from different disciplines to work together on "real-life" projects. One such project for Skidmore Owings and Merrill (SOM) in Chicago had the students focus on the integration of energy-saving elements into SOM's newly designed convention center in Phoenix. The IPRO teams investigated the effect of using a building-integrated photovoltaic (BIPV) system, particularly in the exterior walls. The results were positive and provide an example of how IPRO-generated innova-

IMAGES COURTESY OF ILLINOIS INSTITUTE OF TECHNOLOGY; DESIGN: KIM SAGAMI, MIJEONG FIELD, YUNSEOK OSCAR KANG, ERIKA LAU, VELINA MIRINCHEVA, ABDUL MUHAMMAD tions have spawned a strong relationship with IIT's technology-transfer department.

Slow but steady change

The introduction of unusual materials to architecture is incremental. In the near future, technology transfer will find its way increasingly into the development of more efficient construction methods and processes, such as factory-built components. "For the most part, exteriors are still glass, steel, and concrete. A builder is more likely to use a new lamination process borrowed from the auto industry or a joint from the sailing industry than to incorporate a totally revolutionary material or process," speculates Andrew Dent, director of the New York–based Material Connexion, a library of over 3,000 carefully reviewed innovative materials, including foams, fiberglass weaves, and photovoltaics.

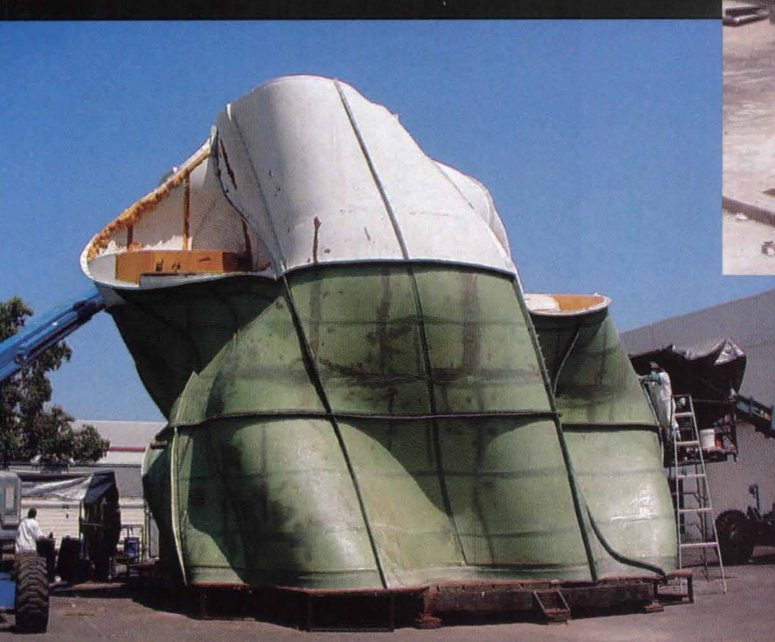
Architecture schools that are closely allied with engineering programs, such as IIT, are better off financially.

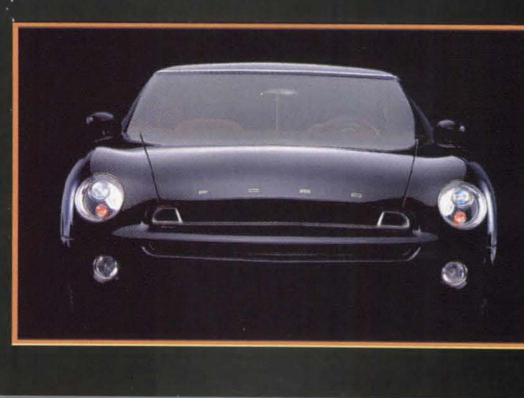
There are other embedded obstacles. According to Mike Skura, part of the problem stems from the fact that insurance policies are not lenient, and there's a chain of liability that can result in expensive litigation if materials or systems fail. There are also issues of regulation. For instance, national testing requirements generally dictate that materials be tested and rated for flammability only, but local testing regulations around the country can be more restrictive.

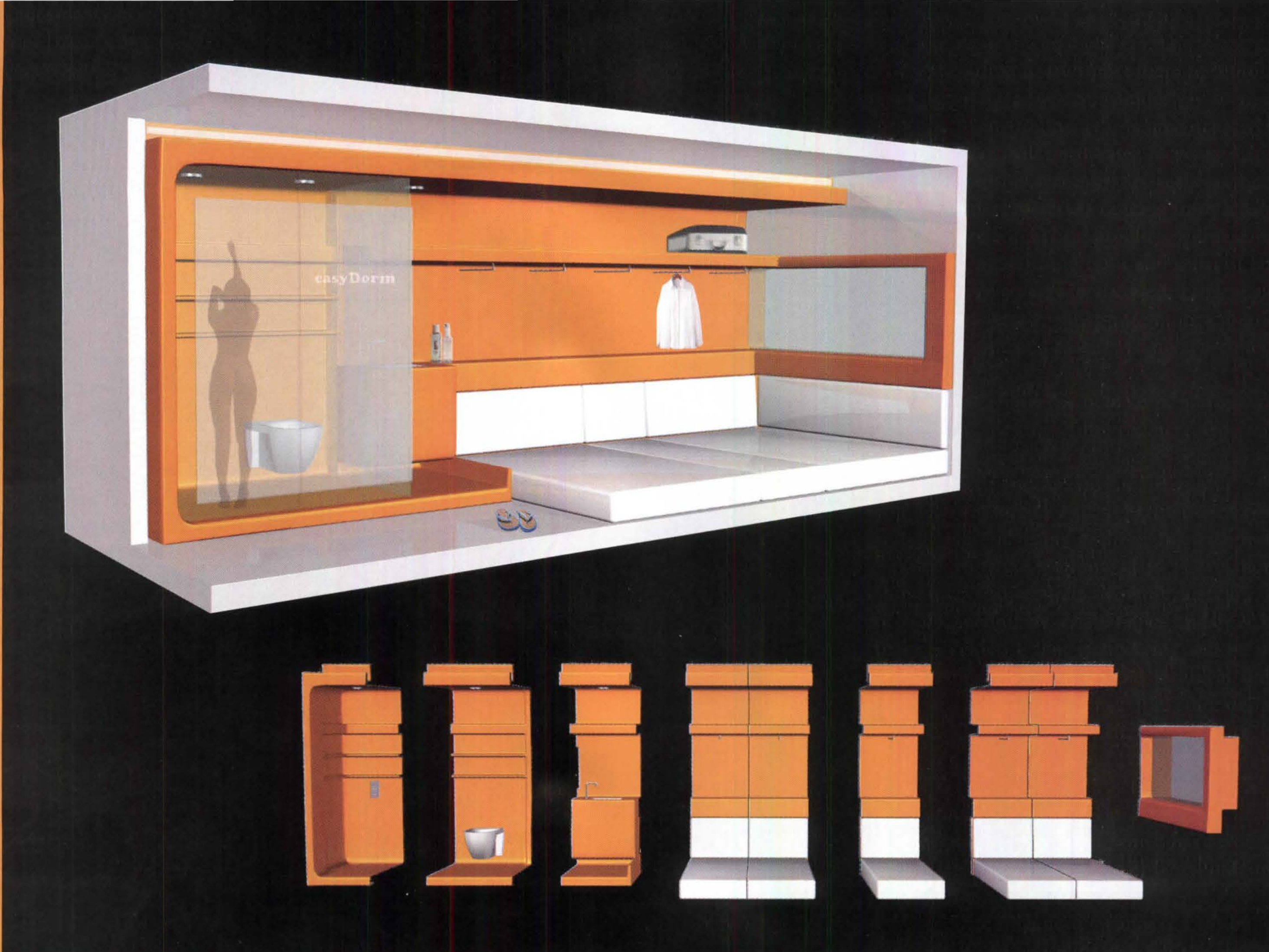
And yet there are success stories. Even before the experimental Gehry found a company to bend glass for him, New York–based FTL

CTEK has extended its capability as a supplier of complex safety glass to the automotive and aerospace industries (see Ford's Forty-Nine Dream, bottom) to create complex contoured forms for innovative architectural applications. Gensler chose CTEK to manufacture glass landscaping boulders (below, right) for a theater and retail complex in Hollywood. CTEK made templates based on real rocks and coated the final pieces with its proprietary weatherproofing resin. CTEK has also done a building system and cladding study for a new Frank Gehry sculpture (below, left), which will eventually be covered in titanium shingles.

IMAGES COURTESY OF CTEK







EasyDorm is fabricated out of prefab modular mix-and-match panels (shower, toilet, sink, bed/storage, and flex-strip) that combine to create two standard room types. This kit-of-parts permits the fabrication of customized units as well. Materials are high-performance and easy-to-clean. Waterproof fiberglass, painted in the company's signature orange, is used in wet and high-traffic areas. Mattresses and cushions are wrapped in durable vinyl. When guests depart the entire room can be wiped clean with only a damp cloth.

IMAGES COURTESY OF JOEL SANDERS ARCHITECTS

Design Engineering Studio was emerging as a hybrid practice—part design, part engineering, part R&D, all innovation. Twenty-five years ago, Nicholas Goldsmith, FAIA, and Todd Dalland, FAIA, founded FTL to pioneer lightweight, tensile-structure design and other fabrication technologies. According to Goldsmith, this pursuit has less to do with inventing technologies than with finding new applications for existing ones, which is another definition of technology transfer. "We didn't invent photovoltaics," says Goldsmith. "But we did figure out a way to embed them into tensile structures." This transfer, of course, is not a simple or risk-free one. FTL conducts extensive analysis with its customized software and uses digital simulations to model the performance of materials and complex fabrication techniques.

Soon, technology transfer will find its way into the development of more efficient construction methods.

More recently, CTEK's Skura and New York architect Joel Sanders designed a prototype for a chain of budget hotels in London called easyDorm. Prefabricated fiberglass units will be installed in the shells of gutted buildings. Mass customization allows the unit costs and maintenance costs of the hotels to be reduced so that the savings can be delivered to the customer. The modular system facilitates ease of installation, allowing the length and width of the rooms to be modified according to the dimensions of a given building or site. In rehab conditions, the system is not constrained by exterior window/wall configurations: A

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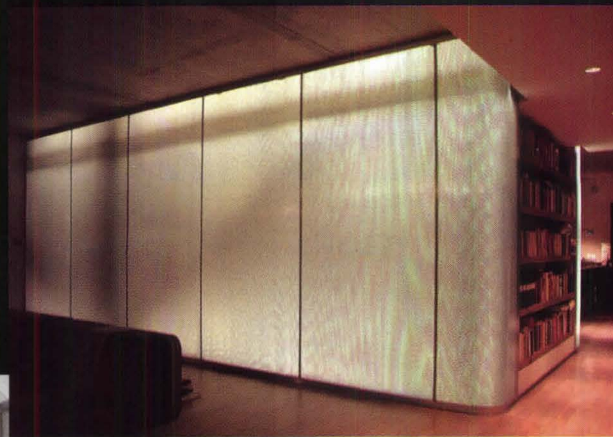

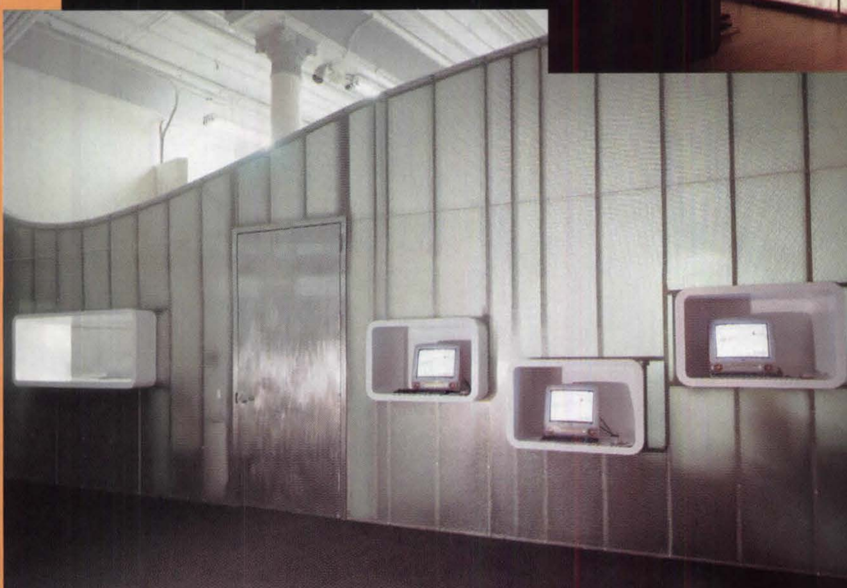

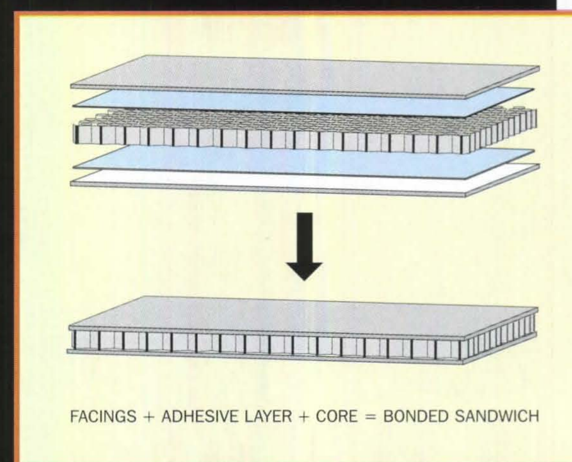

IMAGES COURTESY OF FRAN POLLIT (LEFT); JAMES WILKINS (TOP); PANELITE (DIAGRAM, BOTTOM)

Panelite is a remarkable bonded sandwich construction using aerospace technology. The honeycomb cells act like the web of an I-beam, making the panels resistant to deflection. Panelite's in-house material development division researches, creates, and tests new materials. It also collaborates with *designers to develop* efficient fabrication processes, such as the two New York projects shown here: govWorks (bottom, left) by A + I Design and a loft (top) by Archi-tectonics.

prefab translucent window/wall panel built behind the existing façade allows the transmission of borrowed light. The prefab components can be easily assembled on-site using local, standard construction methods and materials.

In another example of applied technology transfer, architect Christian Mitman was experimenting with a metal mesh created by a honeycomb process first used in the aerospace industry when he became so enamored of it that he developed a whole line of panels. Trademarked as Panelite, it was first used in interiors, but is now used in high-profile outdoor commissions, such as Rotterdam-based architect Rem Koolhaas's curtain wall for a new student center on the IIT campus, a panel that lets in natural light while muffling the rumblings of a nearby elevated train. Mitman's company has now progressed from adapting materials from other industries to developing them in-house, including a proprietary panel for the Koolhaas-designed Prada stores, as well as mica laminates and structural fabrics.

Technology-transfer advocates, Philadelphia-based architects Stephen Kieran, FAIA, and James Timberlake, FAIA, (page 34) are convinced that technology transfer will eventually change the way buildings are designed and constructed. "Our hope," says Kieran, "is that there will be regular affiliations and alliances with materials scientists and product engineers, working together as models of collective intelligence, making large parts of buildings in high-quality, controlled settings, using materials they're not using now, purposeful materials, not just collections of neat-looking materials." ■

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Innovative Products

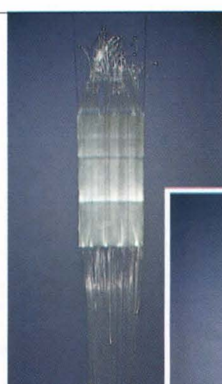
▼ Tough resin and spongelike aluminum

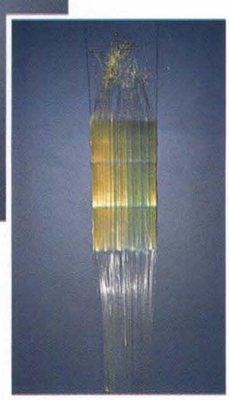
One of the innovative products on display at the Robin Reigi Art & Objects material showroom is a soft resin gel from Charles Hickok Industrial Design that is incapsulated in a flexible urethane resin, making it more resistant to breaking down. Another showroom highlight, Aero Foam Metals' Aluminum Foam, is created when pretreated aluminum rods are placed in a mold with a foaming agent and heat. At the correct temperature, the aluminum breaks down and puffs up with air to become a lightweight, yet highly structural cast object with a consistent skin on the outer surface and a spongelike inner surface. Robin Reigi Art & Objects, New York City. www.robin-reigi.com **CIRCLE 200**

◄ Structural glass cylinders

Highly transparent and resistant to chemical and thermal stresses, Schott's structural glass cylinders provide an alternative to steel or concrete weight-bearing elements in building construction. In order to make the cylinders shatter-resistant and able to withstand high-compression loads, an outer glass shell is laminated around an inner-core glass pipe. For the Tower Place project in London (shown), Norman Foster & Partners stabilized the building's membrane-type stressed glass façade by using 4-meter-long, laminated, prestressed glass cylinders with internal steel wire ropes. Schott Corp., Yonkers, N.Y. www.us.schott.com **CIRCLE 201**

► Woven fiber optic lamps





Merging industrial technology with fiber art, textile designer Suzanne Tick, in collaboration with industrial and interior designer Harry Allen, has created a series of lamps constructed of handwoven fiber optic yarns. Once Tick designed the lamps and wove the fabrics, with the help of Hiroko Maemura, Allen sculpted the shapes and illuminated them. The team designed two lamps: a vertical hanging wall lamp with a spray of yarn ends, and a standing lamp on a wood base, encircling a pole like an illuminated shade. The lamps are currently available on a custom basis. 212/598-0611. Suzanne Tick Design+Consulting, New York City. **CIRCLE 202**

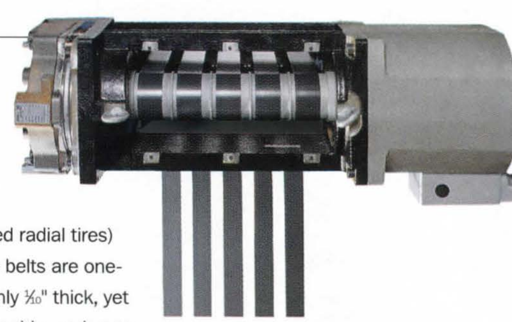
► Pass through a masterpiece

On display in the U.S for the first time at Siggraph 2003, a computer graphic conference held in San Diego, FogScreen is a new method for forming a high-quality walk-through dry-fog display. The new technology projects images onto a laminar, non-turbulent airflow, creating a thin and swiftly flowing fog wall. The fog, made of chemical-free water, dissolves in seconds by itself, leaving no trace behind when switched off. Among its many potential uses, the Finnish inventors anticipate architects will integrate the screen into new buildings. FogScreen, Seinäjoki, Finland. www.fogscreen.com **CIRCLE 203**

◄ Make the perfect cup of Joe

At Toto's "Water Technology for Tomorrow" center at this year's K/BIS, the company tested U.S. customer receptivity to some of their water technologies currently available in Japan. The Alkaline 7 Water Filtration System (shown) allows users to control the pH balance of the water in their residential spaces, so they can vary its acid/base balance to brew the perfect cup of coffee or wash bacteria and toxins from their fruits and vegetables. Toto USA, Morrow, Ga. www.totousa.com **CIRCLE 204**

► Cable-and machine room-free elevator

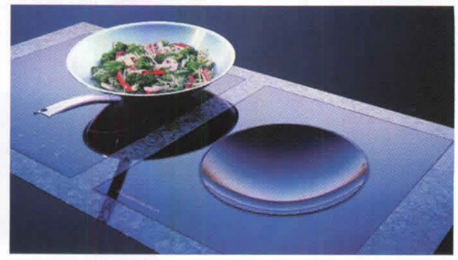


Gen2 is the first elevator to use flat, coated-steel belts (similar to steel-belted radial tires) to lift the elevator car. The belts are one-to-two inches wide, and only 1/10" thick, yet they are stronger, more durable, and more flexible than the heavy woven steel cables that have been the industry standard since the 1800s. The Gen2 system requires a machine that is only one quarter the size of conventional systems, eliminating the need for a separate machine room. Also eliminated is the need for lubrication, making the product more environmentally friendly. Otis Elevator Company, Farmington, Conn. www.otis.com **CIRCLE 205**

Innovative Products

▲ **Antidirt structural membrane**

For over 10 years, composite membranes with Fluotop PVDF (polyvinylidene fluoride) surface treatments have been used in major textile projects all over the world. The next generation, Ferrari's Fluotop T2 membrane, couples PVDF and hardening agents to provide an optimal "graft" of the flouropolymer treatment onto the surface of the vinyl coating. This Fluotop T2 surfacing is an antidirt and antiaging shield that also allows for better quality of light transmission. Ferrari, Cedex, France. www.ferrari-textiles.com **CIRCLE 206**



▲ **Magnetic induction wok**

When a pan is placed on top of the concaved black-glass ceramic surface of the Induction Wok by Küppersbusch, electromagnetic energy heats the surface of the wok until the pan is removed, and the surface instantly becomes cool to the touch. When the unit is turned on, coils produce a high frequency alternating magnetic field, which flows through the cookware quickly to stimulate the molecules to move back and forth rapidly, thus creating friction and heat. Küppersbusch USA, Tampa. www.kuppersbuschusa.com **CIRCLE 208**

► **Automated theater rigging**

According to the rigging experts at Hoffend—their projects include Cirque du Soleil's "O" show in Vegas—the antiquated counterweight rigging system requires stagehands to manipulate rigging at dangerous heights and in unsafe situations. Vortek is an ADA-compliant floor-to-ceiling system that uses intuitive touch-screens and menus to allow a professional or student crew to control the entire technical operation of a show from a single position. www.hoffend.net Hoffend & Sons, Victor, N.Y. **CIRCLE 207**

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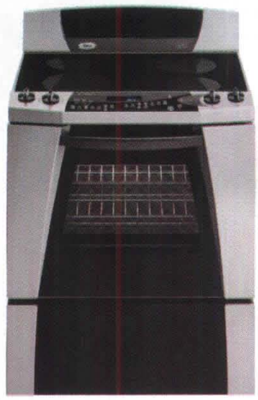
Innovative Products

► Call the oven if you're late

The Internet Home Alliance's Mealtime Pilot is a real-world test that allows customers to use network-enabled appliances to simplify meal preparation. In the pilot, conducted for six months in 20 homes in the Boston area, consumers will manage meal-making from an oven (Whirlpool's Polara range, shown), a Web-enabled fridge tablet and entertainment/command center, and cell phone. Internet Home Alliance, Monterey, Calif. www.internethomealliance.com **CIRCLE 210**



► Download some dinner

Although not yet as mainstream in today's kitchens as the toaster, the "Internet fridge" is now available from several manufacturers, including Samsung, Electrolux, and LG Electronics. The 26-cubic foot LG Internet Refrigerator features a high-quality LCD screen and its own LAN port to enable Internet surfing and shopping. The touch screen display allows users to access the Internet, check e-mail, or watch TV. The standard fridge comes with a remote control for easy operation from any location in the kitchen. LG Electronics U.S.A., Englewood Cliffs, N.J. www.LGappliances.com **CIRCLE 209**

◄ Electric plaid

Created by International Fashion Machines, a company that researches and develops interactive electronic textiles for design, industry, and the military, Electric Plaid is a soft, flexible, handwoven display technology used to create sensuous individual artwork, interior design, and architectural surfaces with colors that can change to give you information or change the decor of the room. IFM, Cambridge, Mass. info@ifmachines.com **CIRCLE 211**

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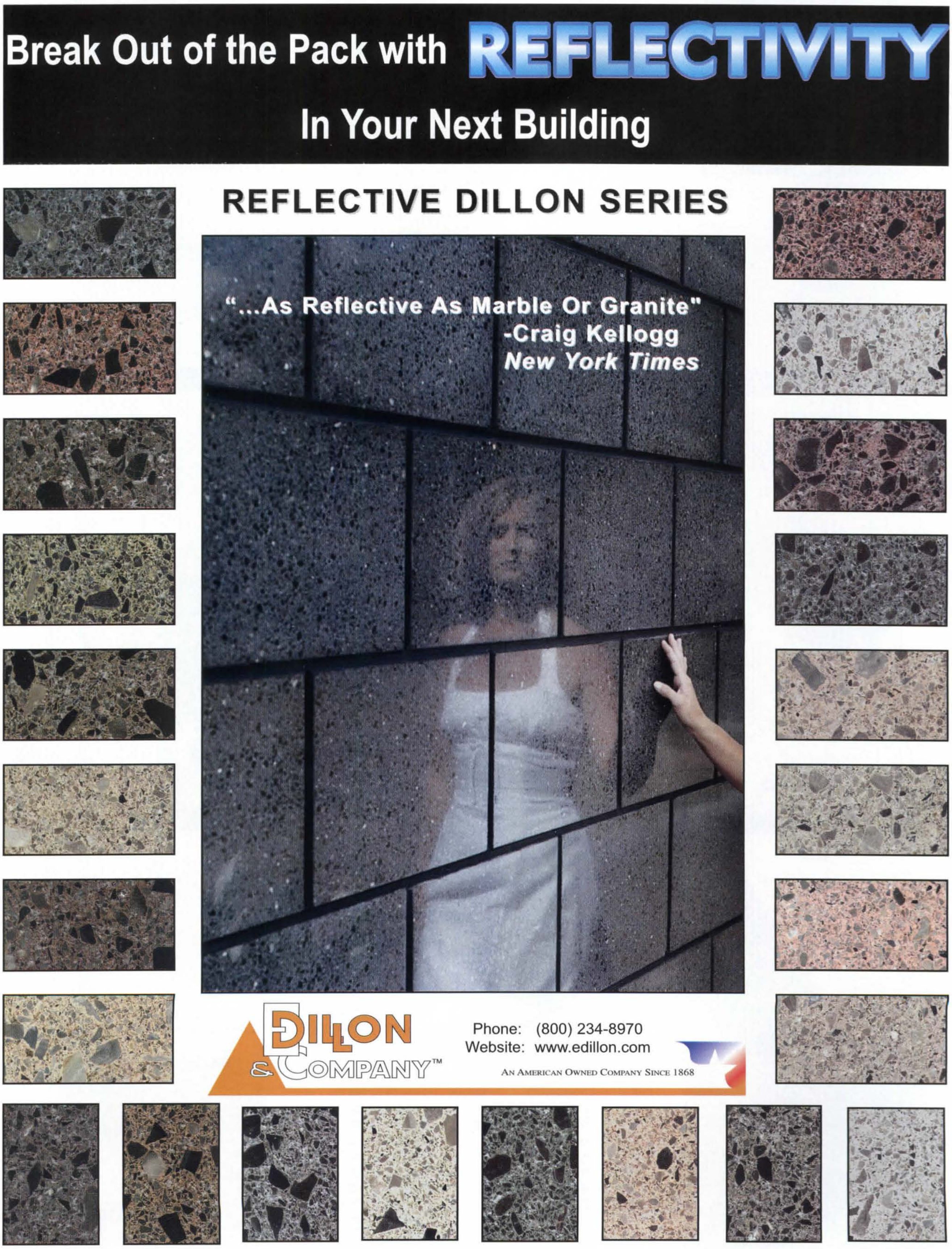
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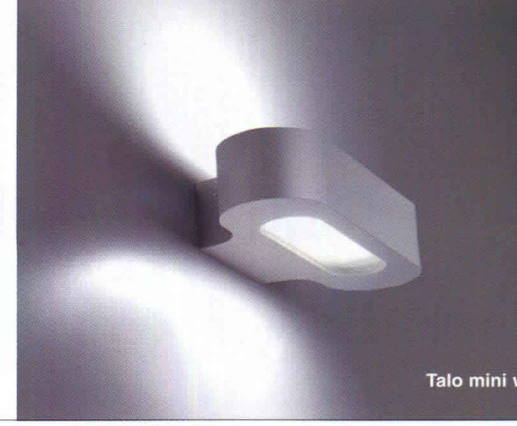

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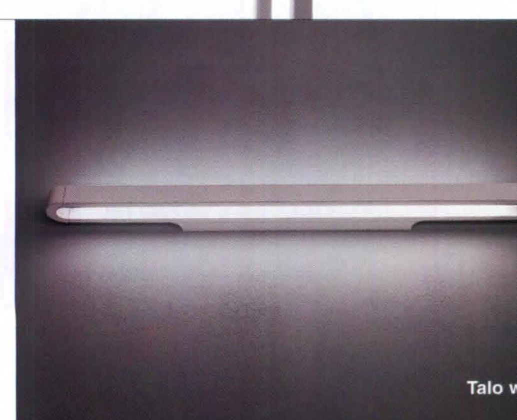

PREPARING CONTRACTS IS ABOUT TO GET A LOT EASIER

The New AIA Contract Documents Software Delivers PDF and Word Convenience, as it Unveils a Fully-Redesigned Application

By Evan Schuman

BOSTON – In August, Edward Tsoi, FAIA, was finalizing a contract on a four-month $35 million architecture project for the Boston Medical Center.

The Tsoi/Kobus & Associates co-founder was fuming about how software problems were making a complex negotiation even more complicated.

"It takes so very much time and energy just to understand what the other side of the table really wants," he said. "And it is so hard to follow when the inserts and changes are essentially 20 pages stapled to the back."

Having to re-key each of these changes into the software in order to draft a workable contract is a paperwork challenge Tsoi's staff would rather do without. But as architects, attorneys, contractors, and building owners know only too well, Tsoi's struggles are hardly unique.

Word, PDF Integration

The American Institute of Architects (AIA) will unveil an entirely new software platform for delivering its industry-standard AIA Contract Documents application in September. In a radical departure from the software's history, the new AIA Contract Documents software is abandoning its internally-developed word processor and announcing a tight integration with Microsoft® Word as well as the ability to create documents securely as PDFs.

The changes are promising to fundamentally change the way documents are crafted, especially when it comes to collaboration and time spent on filling out forms versus helping shape the built environment.

"This new version is so far superior that you can really concentrate on what the work is rather than battle the software."

– Christopher Smith, AIA, Ernst & Young

NEW AIA Contract Documents Software

Product Highlights

CREATING AND EDITING

- Dialog boxes ask questions. Answers automatically fill in blanks in the document, are stored for future use
- Microsoft® Word editing, track changes functionality
- Customized document templates

COLLABORATING

- E-mailed documents as Word or PDF attachments
- Track changes made by the other parties on the project team
- Variance Check that compares draft document against AIA standard language to note any differences
- Collaborate with anyone who can view Word or PDF documents

GENERATING OR PRINTING A FINAL

- "Clean copy" documents without strike-throughs or underlines
- "Additions and Deletions" report reflects variations from standard AIA language and is included at the end of the document
- "Comparative" final document marks variances in place

STORING AND RETRIEVING

- Store, share documents on network
- Call up project data, automatically incorporate into new documents
- Create PDFs of contracts created in EF 3.0 PLUS

Christopher Smith, AIA, is area director of Design/Construction for Ernst & Young and oversees a large volume of outsourced projects for the financial services giant. Compared with the prior industry-standard software, he sees the new package as a vast improvement. "This new one is so far superior that you can really concentrate on what the work is rather than battle the software," Smith said.

Even the downloading of the software will be much easier, with nothing more than a few clicks from www.aia.org required.

The AIA's development efforts have been a major priority for the organization. "Our current software users told us what they wanted and we listened. We're confident that this new software will save time, enhance collaboration, and help streamline contract negotiations," said Norman L. Koonce, FAIA, who serves as the organization's Executive VP and CEO.

Focusing On Substance

The new software offers users several ways to track changes, including an Additions and Deletions Report that logs every change made to the original AIA contract language, regardless of whether the track change option is turned off or not. "Those options offer so much versatility in how you control the process," said beta tester Bill Klorman, president of Klorman Construction in Los Angeles.

The program also boasts a spreadsheet

capability that is similar to Microsoft Excel, but it hides the confusing calculation formulas, said Suzanne Harness, AIA, an attorney who serves as managing director of the AIA Contract Documents program. "The software provides a dialog box that asks the user a series of questions and then does the math invisibly. Also, preparing a payment application is now faster than ever because the two required forms are linked, a timesaver for contractors."

Easier to Use Than Word Itself

Some early users of the product point out that the software doesn't merely support Word, but that its ease-of-use and interoperability features are superior to Word.

"It's Word, but better than Word," Klorman said. "The working interface is very comfortable. The desktop and toolbars were certainly very well thought-out."

Barbara Heller, FAIA, of Washington, D.C. architecture firm Heller & Metzger, said she found the software quite user-friendly. "Using Word on your own and navigating all of the formatting options can be difficult for some people," she said. "This new AIA software does it for you."

Heller said her favorite features were the Additions and Deletions Report and being able to produce a clean copy document. "Because the Additions and Deletions Report will show each change to the original document, we can now make clean copies without strikethroughs and underlines."

One of the new application's features is the ability to track revisions by multiple collaborators in a way that is intuitive and yet doesn't interrupt or distract the reader. Tsoi said his Boston Medical Center project could have really used that feature. "The ability to track the changes by the authors and have that be totally visible to every person who touches it is fantastic," Tsoi said. "With ten people negotiating this deal, you can imagine how difficult it is to keep track of who said what about what portion."

Another business advantage can be found when architects and attorneys are freed from manually tracking minute changes and can focus more on substantive elements, such as defining scope and writing detailed architectural descriptions, said veteran Yale University Lecturer Phillip Bernstein, FAIA.

"Being able to work in a word-processing environment that is familiar and comfortable offers a very comprehensive view, which helps in understanding the pieces" said Bernstein, who has taught students at Yale's School of Architecture for 16 years. "I think a firm that is using the new software is at a distinct competitive advantage."

The strongest element of that advantage is that the software now supports much greater collaboration. The fact that the files can be easily e-mailed to – and opened and edited by – anyone with a version of Microsoft Word is essential to accelerating the negotiation process, Klorman said. This sharply reduces the need for lengthy conference calls and allows for contract changes to be dealt with much more efficiently.

> **"Architects can now knock out a typical owner-architect agreement in one-third the time."**
>
> *– Barbara Heller, FAIA, Heller & Metzger*

Self-Completing Documents

The software provides dialogs that prompt users to enter project and document-specific information, which automatically feeds into any document created for the project.

Tsoi was quite impressed with that feature. "You just pull up a standard form and it's almost completely filled out for you," Tsoi said. "Those who struggle daily when filling out these forms are going to love it."

Heller agreed: "The ability to produce documents is an order of magnitude faster. Architects can now knock out a typical owner-architect agreement in one-third the time."

The dialog information may also be stored for use on future projects. That means that a form can not only complete itself on the current project, but it will do so on each and every subsequent project for that client or others, at the option of the user.

Custom Templates

Robert Middlebrooks, AIA, a beta user and a vice president with Norfolk, Va., -based Clark Nexsen, gave his vote for favorite new feature to the custom templates. This feature allows users to customize contracts – including adding favorite language or requirements that are unique to a particular project – and save them for future use.

"It's great to be able to put templates together, save them, use them at whatever level you want to take them to, share that document, and not have to duplicate things you've done in the past," Middlebrooks said. "And you also do not have to worry about whether you've incorporated all the odd clauses that you might need to incorporate because you can embed them in the custom templates."

With the new AIA Contract Documents software, a wide range of new capabilities – improved ease-of-use, superior collaboration and an intuitive software design – combine to offer the construction industry an infinitely better way to conduct business. ■

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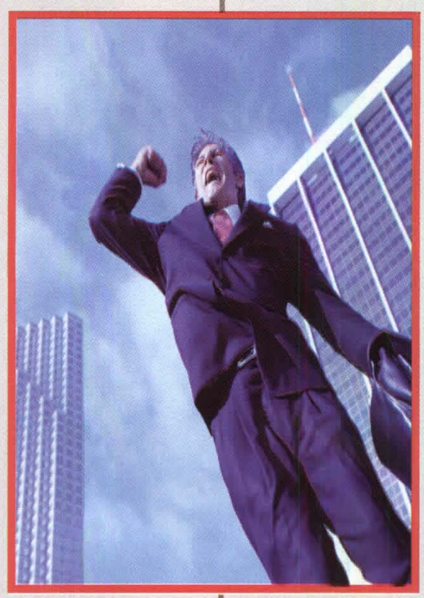

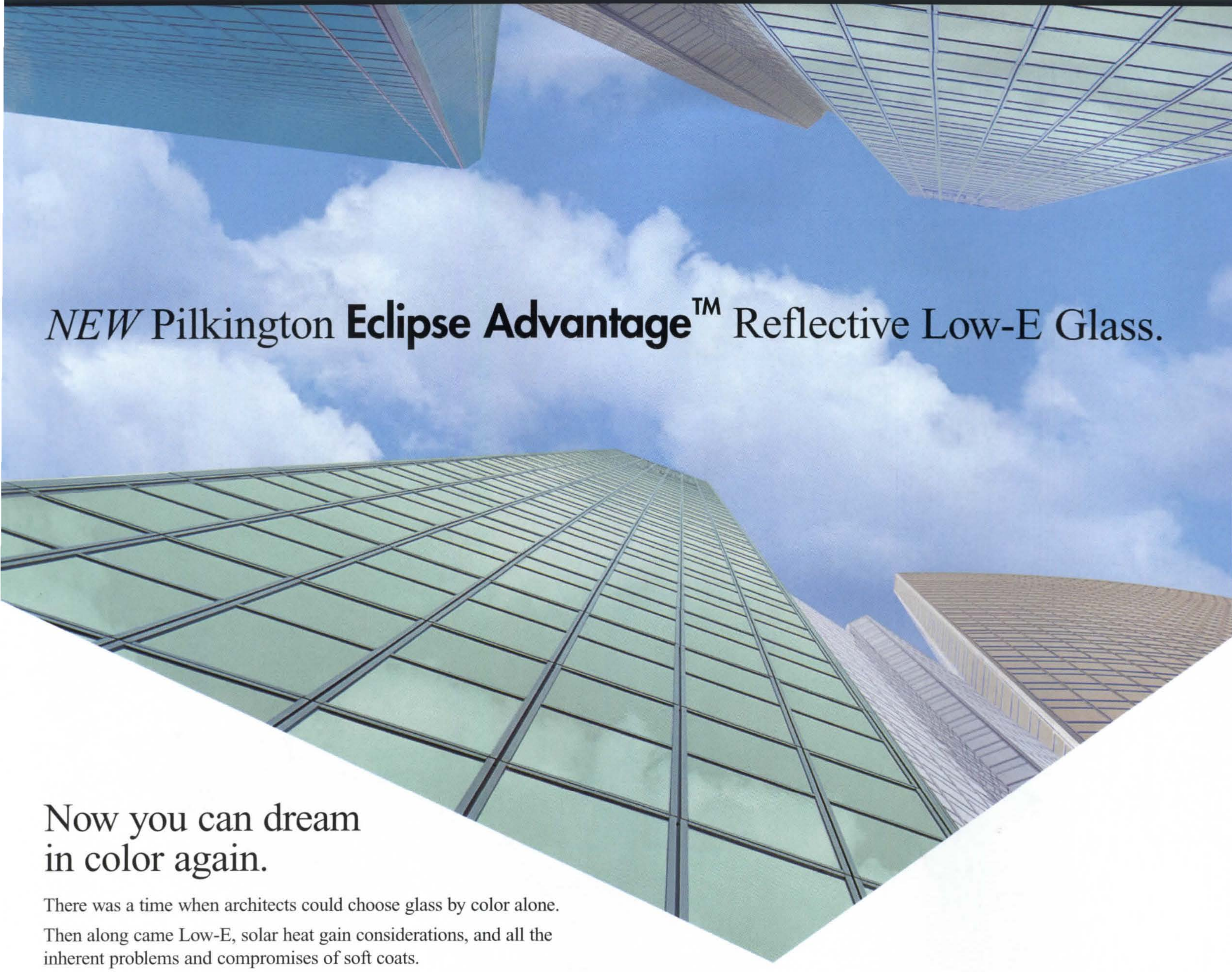

NEW Pilkington **Eclipse Advantage™** Reflective Low-E Glass.

Now you can dream in color again.

There was a time when architects could choose glass by color alone.

Then along came Low-E, solar heat gain considerations, and all the inherent problems and compromises of soft coats.

But now, Pilkington advanced technology makes color practical again with an exciting new choice.

New Pilkington **Eclipse Advantage™** Glass.

The world's first ***pyrolytic*** reflective Low-E.

In a palette of natural colors that – because it's pyrolytic and not just a soft coat – won't shift, mottle or fade, even when heat-treated or bent.

An innovative Low-E glass that combines low emissivity with solar control, high visible light transmission and glare control. And subtle reflectivity with crisp, consistent color.

For the performance your buildings demand.

And the color your dreams deserve.

Without compromise.

For more information or glass samples, contact Pilkington at 800 221 0444, or visit www.pilkington.com.

PILKINGTON

First in Glass

Pilkington Building Products North America
811 Madison Ave., P.O. Box 799 • Toledo, OH 43697-0799
Main Office Phone: 419 247 3731; Fax 419 247 4517
E-mail: building.products@us.pilkington.com • Website: www.pilkington.com

Clockwise from top left: Arctic Blue™, Grey, Blue-Green, Bronze, Clear and EverGreen **Eclipse Advantage™** Glass.

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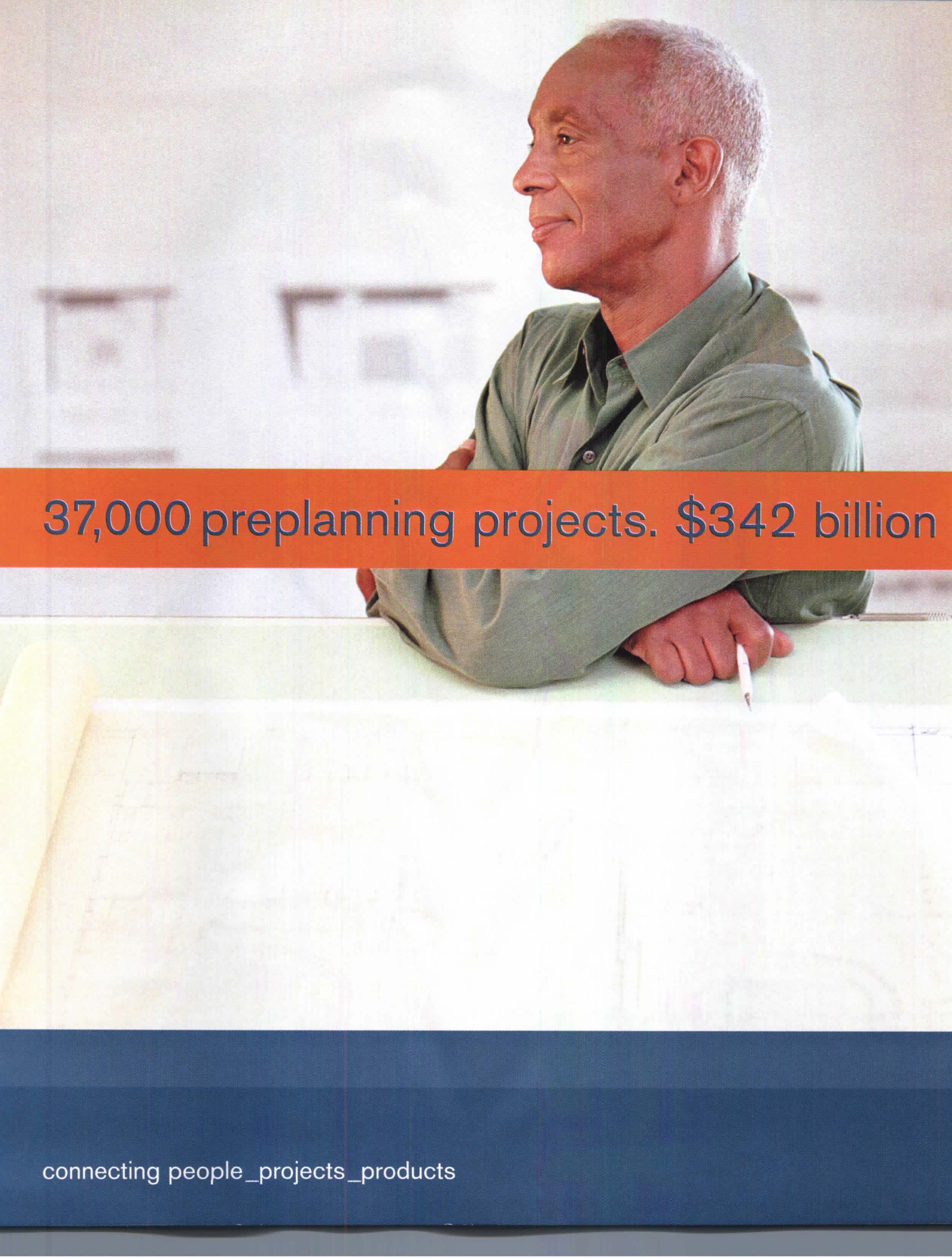

37,000 preplanning projects. $342 billion i
connecting people_projects_products

McGraw_Hill CONSTRUCTION Architectural Record

INNOVATION

Innovation is the pulse that keeps the design and construction industry beating. On the following pages, architectural product and material manufacturers present their latest R&D products, plans and visions.

R&D Company Profiles

SPECIAL ADVERTISING SECTION

CENTRIA Architectural Systems

Hunter Douglas Architectural Products

L. M. Scofield Company

Lutron Electronics Co., Inc.

Mortar Net USA, Ltd.

MóZ Designs

PPG Architectural Finishes

Rheinzink America, Inc.

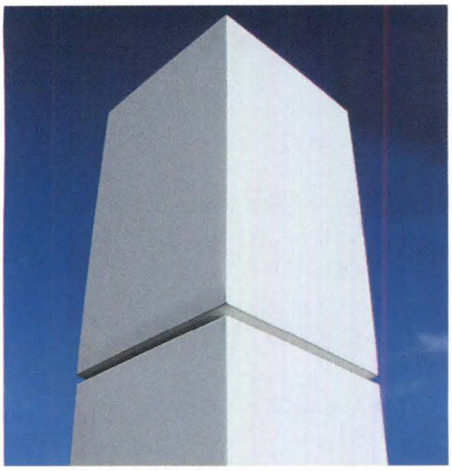
Robin Masso Fine Leather Case Company

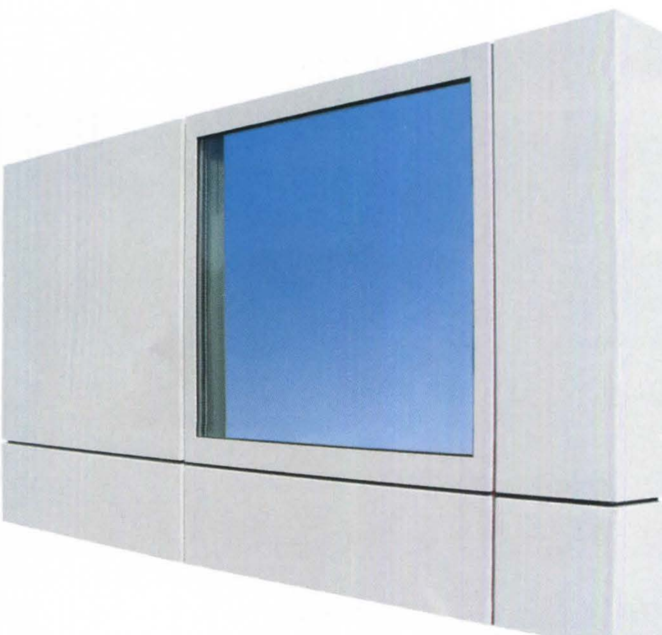
Smart VENT Inc.

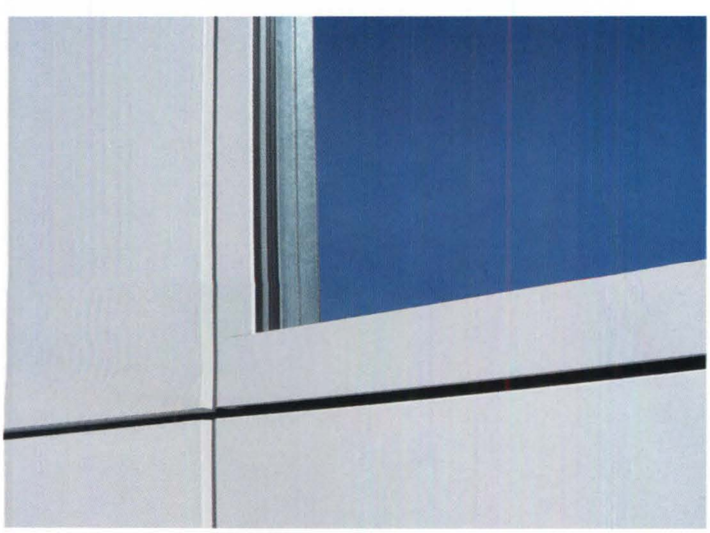
TOTO USA (PAGE 20)

W&W Glass, LLC

CENTRIA Architectural Systems







Delivering the Products the Industry Wants

CENTRIA sits down with hundreds of architects every year, asks them what they want, and then works to develop those products that are most requested and most needed.

"The architects comment on product and system concepts and also tell us what their design problems are," explains Rick Mowrey, CENTRIA's Director of Marketing and Business Development.

"CENTRIA's efforts to really understand the design and functionality needs of architects, and build products to meet those needs, have been incredibly well-received in the architectural community," adds Alexander Thome, an architect with Fentress Bradburn Architects LTD in Denver. "We know that we can rely on CENTRIA to help us create beautiful structures, no matter how difficult the design may be."

For example, when CENTRIA began to discuss the idea of entering the Aluminum Composite Material market, architects were quick to tell them what was needed.

"Feedback from architects who have participated in our focus group sessions and from our sales force indicated a need for a new, systematized aluminum composite panel," Mowrey said. "Architects needed a high quality, competitively priced, dry seal ACM System that is provided by a single, reliable source."

The result of that feedback is FormaBond®, the first single source ACM panel system. FormaBond panels are formed, complete with a rainscreen, pressure-equalized joinery system, and are delivered from the factory to the jobsite, ready-to-install.

Designed, engineered, manufactured, fabricated and installed entirely by CENTRIA, FormaBond eliminates the shipping and manufacturing costs, and time delays associated with traditional ACM, where fabrication represents an additional manufacturing step.

Another recent CENTRIA innovation resulting from the focus groups is the Formawall Dimension Series line. These factory foamed metal panels are available with variable reveals, profiles and thickness, and a complete line of design and finish options, all requested by architects.

Design options include sunshades, louvers, screenwalls and windows—all manufactured for seamless integration, creating energy-efficient and attractive buildings.

Design options enhance and extend the product line, creating endless possibilities and a high level of design freedom. Creating mass-customized products allows CENTRIA to offer architects the products they want at a reasonable price, without compromising their design.

"By listening to architects, we've been able to truly meet their need for mass customization," added Mowrey. "Not only do we have the engineering staff capable of meeting the architects' design needs, but we also have the manufacturing capability to produce these customized products in large quantities with rapid turn-around."

CENTRIA Architectural Systems
(800) 759-7474
www.CENTRIA.com

CENTRIA

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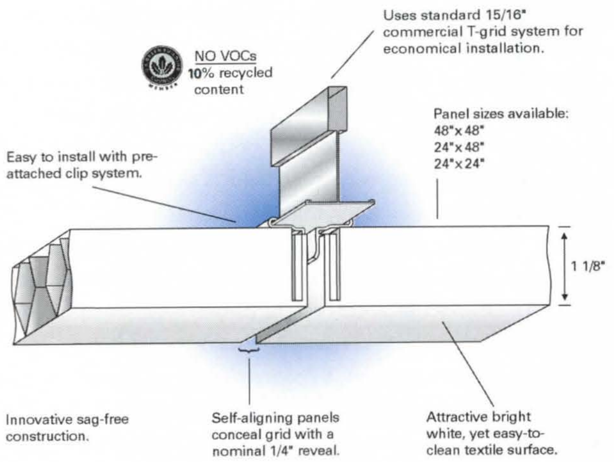
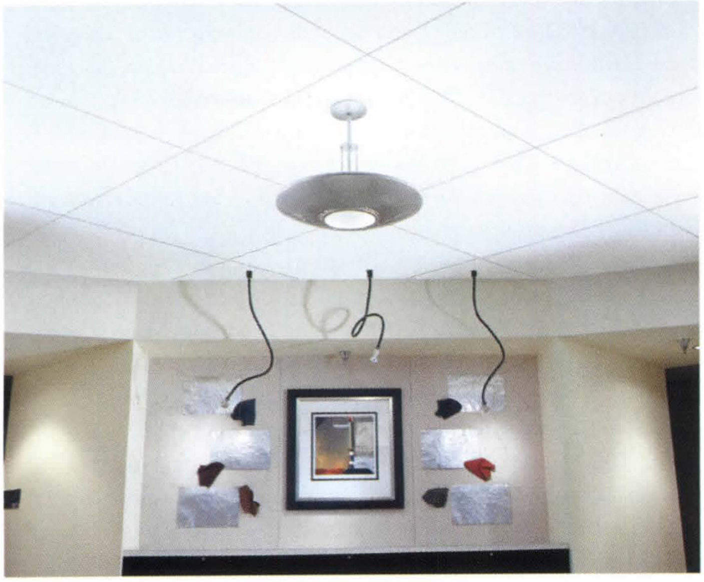
Hunter Douglas Specialty Products





Innovative Technology Creates an Elegant and Functional Acoustical Ceiling Panel from Hunter Douglas

The company that revolutionized the window coverings industry and pioneered metal-suspended ceilings worldwide announces a breakthrough in suspended acoustical ceilings. **Tech***style*® Acoustical Ceilings by Hunter Douglas are unlike any other ceiling panel available because they combine an innovative, lightweight structure with these qualities:

Clean, Monolithic Style: Available in 24" x 24", 24" x 48" and 48" x 48" bright-white panels, **Tech***style* Acoustical Ceilings let you transform spaces from drab to dramatic by providing the elegant, near-monolithic appearance of drywall. Panels conceal a 15/16" T-grid with a nominal 1/4" reveal, which can be maintained along walls using a reveal wall molding to create a "floating" ceiling effect.

Outstanding Acoustical Performance: The remarkable acoustical properties of **Tech***style* Ceilings result in sound absorption across the entire frequency spectrum to meet any of your acoustical requirements. In fact, they provide a Noise Reduction Coefficient (NRC) of 0.85 and a Sound Absorption Average (SAA) of 0.89, the latter of which is calculated over a wide range of frequencies to provide a more accurate measure of the total sound absorption characteristics of the ceiling panel.

Easy Installation and Access: You can quickly and easily install **Tech***style* Ceilings onto standard 15/16" commercial T-grid with their self-aligning clip/hinge system, which keeps panels aligned for the life of the ceiling. What's more, this unique system allows for total downward access to the plenum while the lightweight panels hang securely in position during maintenance. Panels are easily field modified for lights and sprinklers.

Lightweight, Yet Strong: **Tech***style* Acoustical Ceilings are incredibly lightweight (making them easier to handle and more affordable to ship), yet extraordinarily tough and resilient for long-lasting, sag-free durability. Their revolutionary design means they'll never break, chip or crumble like traditional ceiling materials.

Cost-Effective Retrofitting: Installing **Tech***style* Ceilings below the grid makes them ideal for retrofit applications. In many cases, existing tiles may be left in place or simply lifted and turned above the grid, saving time and costs associated with removing and disposing of old tiles. It's the ultimate in recycling!

Environmentally Friendly: Manufactured primarily from sand—one of the world's most abundant natural resources—and with over 10% recycled content, **Tech***style* Ceilings are "green." In addition, the inorganic components used do not promote growth of mold and mildew, and will not emit VOCs, which preserves indoor air quality.

Break free from ordinary ceiling choices. For more information on revolutionary **Tech***style* Acoustical Ceilings, please contact:

Hunter Douglas Specialty Products

One Duette Way
Broomfield, CO 80020
ph: (866) 556-1235
fax: (303) 876-3250
www.hunterdouglasceilings.com

Techstyle®
ACOUSTICAL CEILINGS BY HunterDouglas

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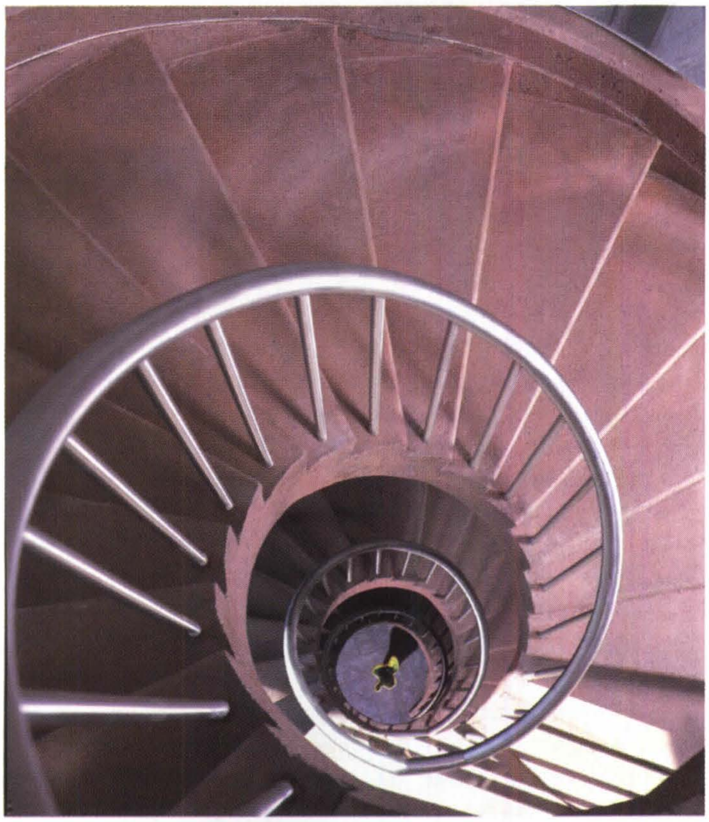
L. M. Scofield Company



This stunning free-standing spiral staircase rises four stories in Montvale, a private home near Atlanta. Integrally colored with CHROMIX Admixtures Dusty Mauve.

The Eagleton Center, a Federal building in St. Louis, Missouri, is a 27-story structure of precast panels colored with CHROMIX Admixtures in a custom color that also matches the surrounding hardscape.

L. M. Scofield Company provides a diverse range of engineered systems for coloring, texturing, and improving performance in architectural concrete for new construction or renovation. Scofield Systems transform ordinary concrete into extraordinary, creative, and durable surfaces for hard landscaping, vertical construction, and interior floors. The Scofield mark of excellence is backed by comprehensive technical documentation and confidential consultation for building industry professionals.

CHROMIX® Admixtures for Color-Conditioned™ Concrete are used to produce colorful architectural concrete that brings both strength and beauty to vertical or horizontal construction projects. The total CHROMIX engineered system delivers reliable, streak-free color conditioning and performance characteristics superior to concrete colored by raw pigments. The original CHROMIX P (powdered) and new CHROMIX L (liquid) both offer maximum design and construction flexibility. CHROMIX L (liquid) has been developed jointly with Master Builders, Inc. the leader in chemical and mineral admixtures since 1909.

LITHOCHROME® Color Hardener adds vibrant or subtle color to hardscapes while providing an attractive and durable, abrasion-resistant surface for pedestrian and vehicular traffic. Time-tested for over 75 years, it offers streak-free, uniform color in the widest color selection of any permanent concrete coloring method. LITHOCHROME Color Hardener is longer wearing, easier to maintain, and more resistant to the effects of freeze/thaw cycles and deicing salts.

SCOFIELD® Texturetop™ is a fast-setting, durable, abrasion-resistant, colored cementitious topping used for resurfacing and texturing concrete flatwork. Available in two formulations, Stamp Grade and Stencil Grade, fast-setting SCOFIELD Texturetop is ideal for projects where good-looking exterior hardscapes or interior floors need to resist high levels of pedestrian traffic. Stamp Grade is available in a hot weather version.

SCOFIELD® Overlay™ is a flowable, fast-track topping material that self-levels and cures to create flat, hard, abrasion-resistant colored interior surfaces that can be saw cut and stained.

LITHOCHROME® Chemstain™ Classic chemically reacts with the surface of cured concrete to produce unique and permanent color effects. It is formulated to add color to uncolored concrete or to change the color of colored concrete. LITHOCHROME Chemstain Classic creates uneven, variegated, or translucent color effects much like the shadings of natural stone or the aged appearance of a timeworn patina.

Scofield offers a total engineered system for coloring and texturing concrete, including compatible curing, coating and sealing materials, and stain resistant finishes. The industry leader, since 1915, Scofield provides products that extend the inherent versatility and functionality of concrete.

L. M. Scofield Company
(800) 800-9900
www.scofield.com

SCOFIELD

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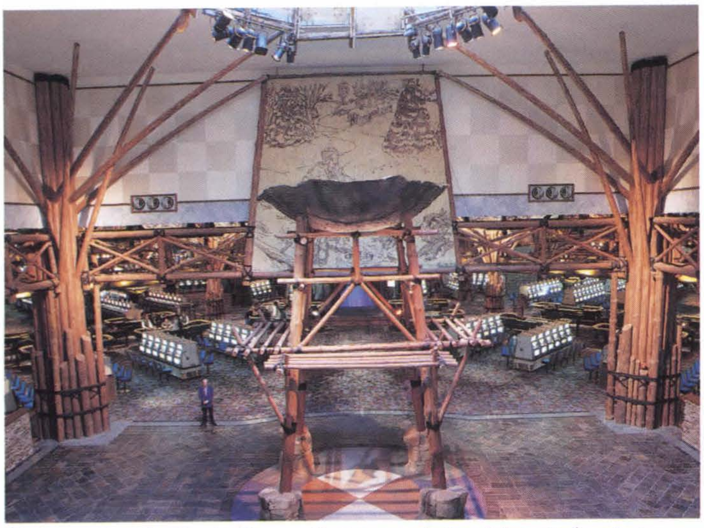
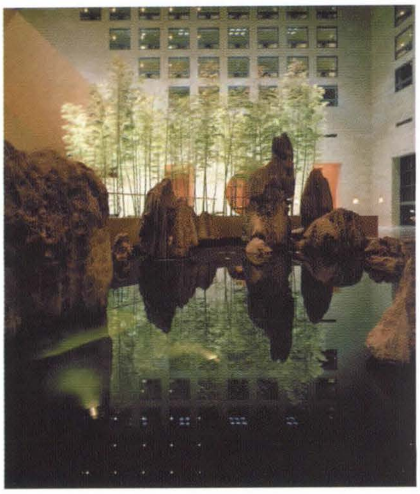
Lutron Electronics Co., Inc.

Sivoia QED™ Quiet Electronic Drive shading systems control natural light at the touch of a button.



Mohegan Sun Casino in Connecticut uses a Lutron integrated system to control and monitor lighting.



The Bank of China in Beijing creates a total lighting environment with Lutron integrated systems. Photography by Kiyohiko Higashide, courtesy of Pei Partnership Architects.

Today's design and construction professionals are increasingly focused on creating buildings that are sustainable, flexible, and energy efficient. Lutron is committed to supporting these goals with an innovative, two-fold approach. We offer leading-edge product solutions for integrated control of both electric and natural light, and unsurpassed customer support. Lutron project management teams are available to help design and layout any project, ensuring that the lighting control strategy complements and enhances your unique vision and the specific requirements of any design.

Breakthrough technologies such as integrated lighting automation are changing the face of the lighting control industry. Lutron's GRAFIK 7000™ system incorporates advanced, web-based lighting automation technology, and is adaptable to any size application from a single room to an entire corporate campus. The system offers a highly-intuitive, web-based graphical user interface that is based on internet protocol and can be operated and monitored from anywhere in the world. Customizable dimming, switching, monitoring, and control of natural light...Lutron integrated lighting automation is redefining lighting control for the 21st century.

The use of natural light is one of the key factors in sustainable architecture. Controlling natural light with Sivoia QED™ Quiet Electronic Drive shading systems is a compelling way to embrace natural light, and make it work to enhance any project. Sivoia QED ultra-quiet shades raise and lower in perfect unison, ensuring a uniform appearance, and eliminating harsh glare at the touch of a button.

Combine lighting and precise shade control to enhance every room, space, or place. Commercial facilities from boardrooms and restaurants, to sports arenas are using Lutron's Sivoia QED shading systems to integrate natural light without sacrificing control and efficiency.

For more than 40 years, innovation has been our keystone. Product firsts include the solid-state dimmer, fluorescent dimming ballasts and controls, and most recently, web-based integrated lighting automation. We help our customers design and specify the ideal lighting control system for their needs, and we support that choice with a toll-free technical service line 24 hours a day, every day of the year, from anywhere in the world.

Lutron's products and services allow architects, specifiers and lighting designers to achieve new heights in building design. In any commercial space, in every corner of the world, Lutron controls the light.

Lutron Electronics Co., Inc.

(877) 258-8766 ext. 203

www.lutron.com

LUTRON

Lutron controls your light.™

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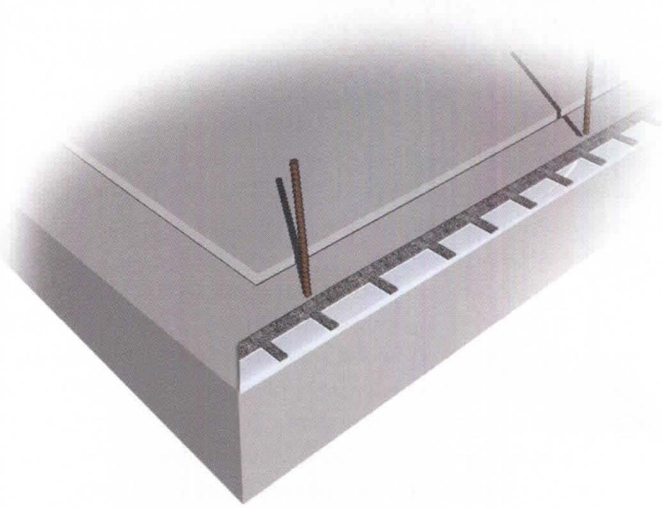
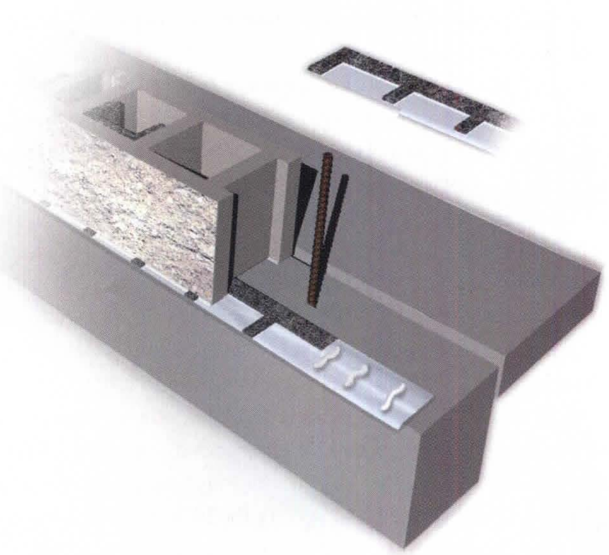
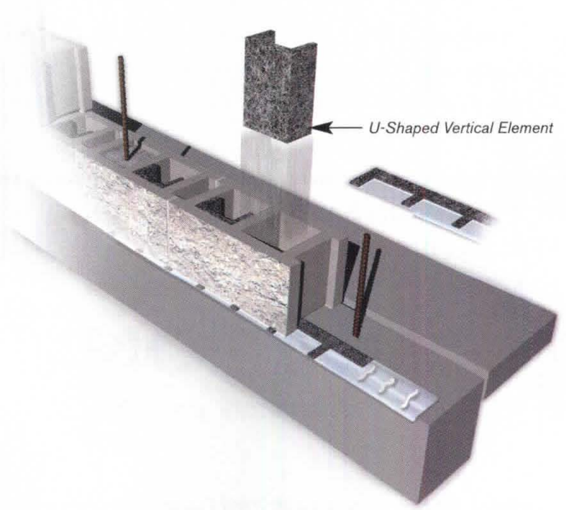
Mortar Net USA, Ltd.







Mortar Net™ USA, Ltd., the world's leading producer of mortar dropping collection products for the masonry industry, has solved the problem of how to reliably and consistently channel water out of single wythe block walls.

Introducing The BlockNeT™ system by Mortar Net™. Because concrete block is permeable, proper block wall drainage is vital in keeping walls attractive and structurally sound. This new product, patent pending, forms a continuous drainage system around the entire perimeter of a concrete block building.

Concrete block, a very popular construction material, is highly susceptible to damage caused by water infiltration—damage such as efflorescence, staining or freezing and thawing. It can also create an environment for mold growth creating health issues such as asthma, allergies, infections, and worse.

The BlockNet™ system is comprised of a specially shaped 3 3/8" deep stainless steel flashing with an integrated drip edge and a horizontal mesh material adhered to the top of the stainless steel plus a separate 7" x 7" vertical mesh element. Both mesh materials are 1/4" thick made of a 90% open weave recycled plastic. The product is shipped in boxes of 20, 6' long drainage strips, plus 150 vertical elements. Because of a 6-inch overlap where the strips join, one box will provide drainage for approximately 110 lineal feet of wall.

Each drainage strips extends 3 inches into the wall. According to Robert Nelson of Robert L. Nelson & Associates, a nationally recognized masonry materials testing laboratory located in Schaumburg, Illinois, "I have tested hundreds of walls over the years and moisture, even wind driven rain, will consistently run down the inside of the exterior face shell of the block. Moisture rarely penetrates beyond an inch inside the core."

When water enters the wall, it flows down the inside of the face of the block, through the BlockNet™ vertical 7" x 7" piece onto the horizontal mesh elements and out the building. The rear dam channels water toward the front of the drainage strip and out of the wall through the integrated drainage tabs.

To install the mason simply places the stainless steel drainage strip on the foundation or first block course. BlockNet™ drainage strips will not interfere with the vertical rebar installed in the block core. The 7" x 7" vertical mesh elements are placed in the block above the stainless steel drainage strip and wick moisture to the drainage strip.

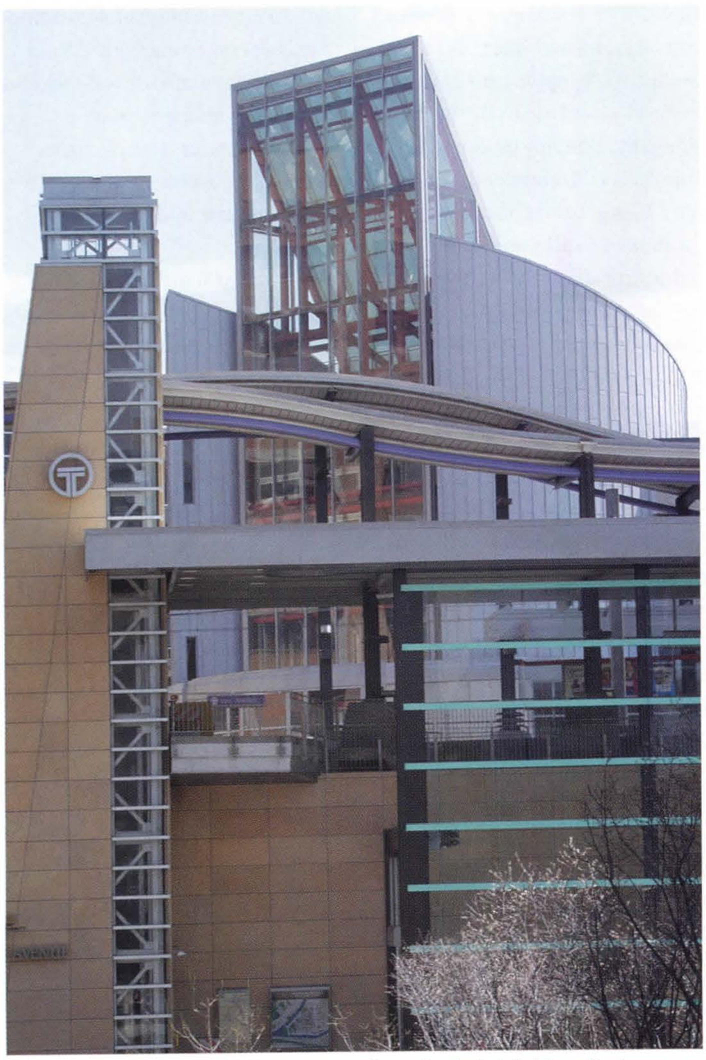
Tom Sourlis, founder of Mortar Net™ and the inventor of The BlockNet™ system, says, "Mortar Net™ solved the problem of directing water in brick masonry out of the building and saved architects, building owners and contractors thousands of dollars in callbacks and repairs. The BlockNet™ system will do for block construction what Mortar Net™ did for brick construction".

The BlockNet™ system is effective in channeling water that infiltrates through voids to the exterior of the wall. Mortar Net USA, Ltd. recommends using a reliable water repellent to inhibit moisture or dampness, which can wick or migrate from the outside face of the block to the inside at any level.

Mortar Net USA, Ltd.
(800) 664-6638
www.mortarnet.com

BLOCKNET by Mortar Net™

PPG Architectural Finishes



Coraflon® ADS is a revolutionary new line of colorful, field-applied fluoropolymer coatings.

The Color of Green

Ask about architectural innovation and most people think of great buildings. In recent years, however, the most heralded architectural advances relate less to design than to the increased focus on environmentally sustainable building.

PPG Architectural Finishes, one of the world's largest manufacturers of paints and coatings, is proud to serve as a leading developer of products that support and promote this movement.

Our latest contribution is *Pure Performance*™, the industry's first premium, zero-VOC, low-odor latex paint. The newest addition to the signature Pittsburgh® Paints' line, *Pure Performance* represents an industry milestone, offering architects an unprecedented opportunity to specify environmentally progressive paint without compromising on attributes such as color, coverage, durability, hiding and touch-up.

Pure Performance is the first paint to earn the coveted Green Seal Class A Certification, having met rigorous set of standards for energy usage, chemical composition, VOC emissions, packaging design, disposal and other life-cycle considerations. BuildingGreen, Inc., publishers of the GreenSpec Directory and *Environmental Building News*, also named *Pure Performance* as one of last year's top 10 green building products.

Safety First

Coatings do more than beautify a building; they protect it, too. A pioneer in the development of fireproof coatings, PPG recently introduced *Firetex*™, a quick-drying, intumescent coating that helps fortify structural steel used in new and retrofit construction. With its thin-film formulation, enhanced adhesion and fast, easy air-spray application, *Firetex* is especially suited to fast-track construction projects.

Together with *Pitt-Char XP*® and *Speedhide*® *42-7, Firetex* offers architects the industry's most comprehensive single source of fire protective coatings.

PPG also is making industrial floors more attractive—and safer, too. *MegaSeal SL* is a new line of tinted floor bases that bring color to the dreary world of industrial floors. While the aesthetic benefits of colorful industrial floors are obvious, the primary benefits are safety-related. Thanks to this new technology, hard-working floors in plants and warehouses can be color-coded to identify high-caution areas or to aid in the coordination of traffic and work flow.

Lasting Color

Weathered panels were once the bane of many building restoration projects. No more. *Coraflon® ADS* is a revolutionary new line of colorful, field-applied fluoropolymer coatings that reinvigorates weathered building panels at a fraction of the cost of new panels. As durable as any factory-applied coating, *Coraflon*'s proprietary cross-linked, low-VOC formulation also enables architects to meet strict environmental building codes, while yielding an exceptionally vivid palette of colors, metallics and special effects.

PPG Architectural Finishes
One PPG Place
Pittsburgh, PA 15272
(412) 434-3131
www.ppgaf.com

FIRE PROTECTIVE COATINGS
PPG High Performance Coatings

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RHEINZINK America, Inc.

RHEINZINK® is titanium zinc used for high quality architectural cladding of roofs, facades and interiors. This crafted metal, combining 99.995% high-grade zinc with copper and titanium alloys, is environmentally friendly and 100% recyclable. Due to the wide range of possible variations in its detailing, the fine line design of the double standing seam complements traditional architecture with the same degree of self-assurance as modern designs. Convex and concave curves, conical assemblies and other applications can also be formed without difficulty.

Additionally, RHEINZINK's Technical Service provides support and assistance to architects and craftsmen alike, not only with tendering and shop drawings but also with specifications and mock-ups. With a large number of installers throughout America and material stocked in several states, craftsmanship and order time are not an issue.

Whether in the classic or modern style, RHEINZINK®, provides an elegant contrast to all construction materials. With RHEINZINK®, architectural elements such as dormers, chimney facings and towers will become special features. RHEINZINK® material thus represents a versatile component of harmonious architectural design.

RHEINZINK® is available in bright rolled and in preweathered formats. RHEINZINK® preweathered material has an attractive blue-gray color that offers the benefits and qualities of natural weathering without the wait, and unlike other materials without run-off staining. This timeless material has an 80 to 100 year lifespan on a roofing application and a 200-300 year lifespan on a wall cladding application, with the ability to self heal and will not fade over time. If you are thinking of the future, you are thinking RHEINZINK®.

RHEINZINK America, Inc.
955 Massachusetts Ave, Suite 770
Cambridge, MA 02139
Phone: (617) 871-6777
Fax: (617) 871-6780
Email: info@rheinzink.com

RHEINZINK

DIN EN ISO 9001

QUALITY ZINC

CERTIFIED BY THE ASSOCIATION FOR ENVIRONMENTALLY PROOFED BUILDING PRODUCTS NUMBER OF CERTIFICATE Z.RHE 102

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Robin Masso Fine Leather Case Company

The Tuscan Collection offers a variety of colors and sizes.

Laser engraving on the caps adds a distinctive note.

Easy to carry with over-the-shoulder strap or leather handle.

A Case For Excellence

Robin Masso Fine Leather Case Company has created a unique line of architectural presentation cases: The Tuscan Collection. Shaped and sized to hold drawings, blueprints and plans, these cases are handsome, durable and finely crafted. Classic in design, they offer a traditional look with contemporary elegance. Each case is made from quality leather hides; the cylinder cut from a single piece. Using fine, naturally grained leather, all cases are handcrafted in the U.S. The top cap is affixed with a buckle and strap that extends the length of the case. It can be carried by the top handle or the adjustable over-the-shoulder strap. The interior is lined with a plastic sleeve that allows rolled plans to slide in and out smoothly and easily.

New Business Presentations: For important meetings, one of the Tuscan cases can be an elegant introduction. Engraved with the name of the firm or architect, it adds a memorable note to any presentation.

Unique Client Gift: The project is complete and it's time for a thank-you gift. Present the final plans and renderings in a case from the Tuscan Collection and your work will be long remembered. Add an engraving of names, dates or addresses for a truly personalized touch.

Impressive Graduation Present: Classes are over. Commencement is complete. Give the new architect a case from the Tuscan Collection for a professional start to his or her career. Whether it's used at interviews or as a new job begins, it adds a certain polish to any portfolio. Add a name or monogram to the cap to make it a true one-of-a-kind gift.

Colors to Suit Your Style: If you like the look of heirloom leather, choose our natural finish and watch it age beautifully. For a hand rubbed finish, choose the deep richness of cognac or the contemporary cool of black. Mix black and cognac together for looks that are a modern take on the classics. Any cap can be laser engraved with name, logo, monogram or any other lettering, at an additional charge.

Sizes to Meet Your Needs: Presentations come in all sizes, so that's why the Tuscan Collection comes in two diameters and three lengths. The larger ones offer greater flexibility, while the smaller ones may be the perfect choice for client gifts. Cases are available in diameters of 3 and 4 inches, with lengths of 26, 32 and 38 inches.

The Tuscan Collection is priced from $119 to $275 dollars depending on size. To order or inquire further about The Tuscan Collection of presentation cases, please visit www.robinmasso.com or call 1-888-2RMASSO (276-2776).

Robin Masso Fine Leather Case Company

Providence, Rhode Island
(888) 2RMASSO (888-276-2776)
www.robinmasso.com

ROBIN MASSO RM FINE LEATHER CASE COMPANY

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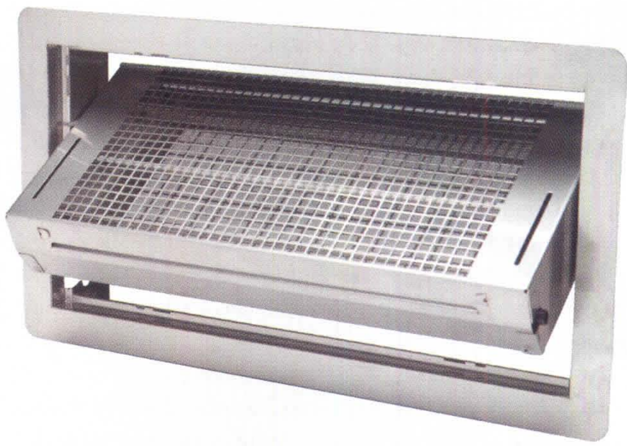
Smart VENT® Inc.



Smart VENT® Installation

Flood VENT™ Installation

An Innovative Solution to Meeting the Latest ICC Requirements for Use of Foundation Flood Vents in Flood Zones

Smart VENT® Automatic Foundation Flood Vents have been certified by the ICC Evaluation Service as an approved method of relieving the hydrostatic pressure exerted on foundations at the time of a flood event. They open automatically, are bi-directional and manufactured from Stainless Steel to meet the IRC and IBC building code requirements along with the NFIP Flood insurance regulations.

Smart VENT's pivoting door is locked in the closed position by means of a patented floating release device, which resists the entry of rodents and other pests. It automatically rotates out of the path of floodwater providing the 3-inch minimum diameter unobstructed open area required to prevent clogging by floating debris.

All Smart VENT products are Certified as Engineered Openings, allowing one 8" by 16" vent to protect 200 square feet of enclosed area below the Base Flood Elevation and meet all applicable flood mitigation requirements. This reduces the number of floodvent openings required by two thirds, resulting in a cleaner appearance and peace of mind, knowing that the codes are met.

Smart VENT Model #1540-510 provides flood protection AND ventilation. Along with providing coverage for 200 sq/ft of flood protection, it is louvered and provides 50 square inches of net free area of ventilation. The unit's bi-metal coil controls the opening and closing of the louvers to protect pipes from freezing while providing ventilation in warmer temperatures. This model is used in a crawl space beneath the first floor where ventilation is required.

Flood VENT Model #1540-520 provides flood protection only, and is insulated and weather sealed for use in conditioned spaces. This model is used in a garage or storage area where ventilation is not required.

Overhead Door Model #1540-524 is designed for ease of compliance where a garage is located below Base Flood Elevation, wall area is at a minimum, and retrofit is difficult. This model is designed for installation in an existing overhead door.

Along with our 8" x 16" standard models, two vents may be stacked in a 16" x 16" configuration to provide 400 sq/ft of coverage.

Please visit our website: www.smartvent.com to learn more about our product, download copies of codes, product specifications and drawings. Learn how to earn one AIA Continuing Education Systems credit in Health Safety and Welfare by attending our "Understanding Foundation Flood Vents and Your Liability" program.

Smart VENT, Inc.
20 Warrick Avenue
Glassboro, NJ 08028
1-888-628-4115
www.smartvent.com

SMART VENT®
Go with the flow™

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W&W Glass, LLC

Product Presentation: W&W Glass LLC, one of the largest glass and glazing companies in the U.S., is the exclusive U.S. representative of Pilkington PLANAR™. W&W has been doing structural glass across the U.S. since 1980. W&W and Pilkington came together in 1993 when W&W was appointed the sole U.S. representative of the Pilkington PLANAR System, invented by Pilkington over 40 years ago.

Pilkington PLANAR is the leading structural glass system in the world. Pilkington and W&W recently completed the reconstruction/new addition to the Wintergarden at the World Financial Center in NYC which was severely damaged during the attack on the World Trade Center on September 11, 2001. Other recent projects include the building of the AMNH Rose Center for Earth and Space in NYC and the façade at Harvard Medical Center in Cambridge, MA.

Applications: The Pilkington PLANAR System is the key element for glass fin structures, tension structures, skylights and canopies and total building cladding. W&W offers strong domestic design and engineering services to architects and engineers to ensure safe and optimal use of the system. W&W and Pilkington engineer, supply and erect or supervise the erection of all applications. No project is sold material only.

Features: Clear or tinted glass is produced to unparalleled levels of flatness. A new oven was recently installed. This furnace, which is one of only two in the world, can now produce glass to roller wave specifications 70-80% flatter than normal tempered glass. This means a beautiful end result. All glass is heat soaked to the highest standard of heat soaking in the world. Insulated glass units are supplied with Pilkington's exclusive long-life spacer. All fittings are solid 316-grade stainless steel. Recent testing has added bomb blast resistant systems and new triple insulated units to the line. The triple unit is 1.7 times stronger than standard insulated glass units. We provide a single source responsibility from design through installation.

Performance Capabilities: Backed by the highest standards of structural engineering and rigorous independent testing, Pilkington structural glass walls have been installed in thousands of projects over the past 40 years without suffering a failure to their system. We meet the most stringent seismic requirements, the highest wind loads, and can meet Florida impact requirements. We can now supply insulated and/or laminated unit sizes up to 98" x 196"!

Materials Used: All glass is manufactured and fabricated by Pilkington and is custom-sized for each project. Systems can be monolithic, insulated, laminated, triple insulated, reflective or combinations of the above.

Warranty: Pilkington, as the sole source producer, provides a single, all encompassing warranty directly to the end user. There is no question as to who is producing what element of the system. The only possible source is Pilkington.

W&W Glass, LLC

302 Airport Executive Park
Nanuet, New York 10954-5285
(800) 452-7925 • (845) 425-4000
Fax: (845) 425-6156
www.wwglass.com/ar

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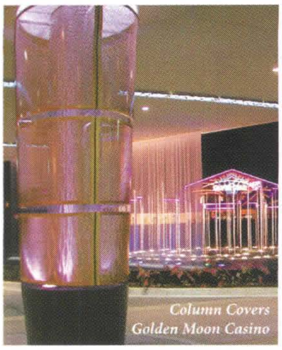
MóZ Designs


Column Covers
Golden Moon Casino

Dynamic Environments for Commercial Interiors

For nearly a decade, the Architectural and Design community has been specifying MóZ unique Decorative Metals for innovative projects both nationally and internationally. But Móz is more than a metal sheet manufacturer; MóZ is a single, versatile source for custom fabrication projects in corporate, retail, entertainment, hospitality, institutional and transportation environments.

MóZ Engineers, Builds & Installs

Start to Finish Services

MóZ works closely with all of the key players to ensure that projects are executed on time and within budget. They offer support, knowledge and coordination of all design/build phases including:

- Design/Detail Development
- Project Management and
- Value Engineering

Creative Projects with Structural Integrity

The company's in-house level of craftsmanship and expertise gives MóZ the manufacturing capability to integrate metal, wood, plastics and glass, which provides them with the versatility to build what clients envision.

Custom Products Combined with the Ease of a System

In response to client needs, MóZ developed easy to specify, easy to install systems for Column Covers, Wall Panels and Room Dividers to help architects and designers create the architectural elements they need with the look they want.

- Just choose the size, shape and finish.
- Add any aesthetic details such as seams and reveals.
- The clip system attachment is included and it's ready to install.

Ease and Efficiency

MóZ helps bring it all together. Whether installing a project or sharing first-hand knowledge at the job site, they make the installation process as time-efficient and cost-effective as possible.

MóZ simplifies the process for clients, contractors, architects and designers, and responds well to individual concerns, interests and schedules. From start to finish, MóZ is there to help along the way. Whether it is assisting in the design process or handling contractor concerns, they make custom easy.

MóZ Decorative Metals are available in 10 patterns and 16 colors. MóZ Metals are recommended for interior use on vertical surface applications. For horizontal or/and exterior applications special finishes and coatings are also offered.


Column Covers, Wall Panels
AT&T

MóZ Designs, Inc.
Oakland, CA
(510) 444-0853 • Fax: (510) 444-0852
info@mozdesigns.com
www.mozdesigns.com

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Barrett Company

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Cement Board Fabricators

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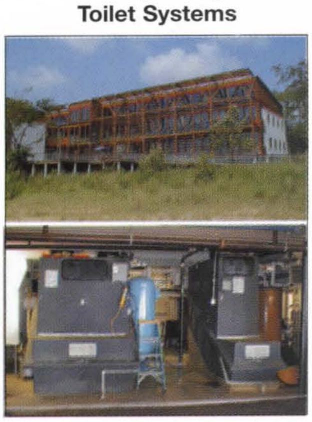
Composting Toilet Systems



Clivus Multrum Composting Toilet Systems at the Phillip Merrill Environmental Center of the Chesapeake Bay Foundation convert all toilet waste into fertilizer. For over thirty years, Clivus has been helping to protect the environment and save water. Clivus offers a full line of composting and greywater systems for every application. Clivus provides design/engineering, installation and maintenance services. 800-425-4887 www.clivusmultrum.com

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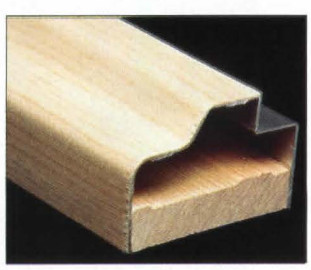
Veneer Wrapped Aluminum



At Contact Lumber, our business is turning your design ideas into reality. Using innovative technologies, we can wrap real wood veneer of any species over profiles made from softwood, MDF, aluminum, vinyl, just about anything. That means you can have the look of wood, even when the specs call for something else. So let your imagination run wild, and let us turn your ideas into reality. 800-547-1038; www.contactlumber.com.

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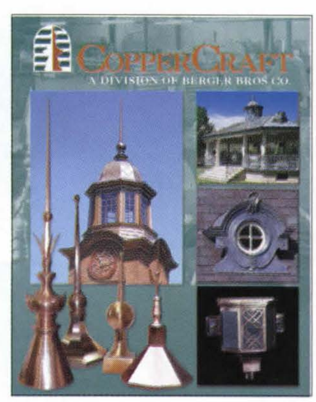

CopperCraft can provide your home or project with the highest quality sheet metal accessories available. CopperCraft was established with the goal of preserving the high quality and craftsmanship found in Old World metalworking, while enhancing those techniques with computerized layout, cutting, and forming. Visit www.coppercraft.com, or call 800-486-2723.

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A new addition to the Dalton line, the Heritage Series is designed using classical architectural elements and specialized materials to create an individualized structure of superb proportion. The Heritage Series emphasizes minimized maintenance through the use of composite materials for the columns, baluster, and railings. Visit www.daltonpavilions.com.

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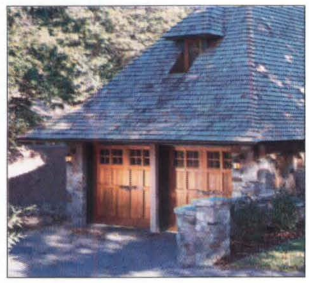
Custom-Crafted Garage Doors



Designer Doors, Inc., is the pioneer and innovation leader in custom-crafted wood garage doors. No other company can match the craftsmanship, expertise, and service of Designer Doors. Since 1987, Designer Doors™ has worked with architects, designers, and homebuilders across the country to add architectural continuity to homes by manufacturing unique and elegant doors. Visit www.designerdoors.com, or call 800-241-0525.

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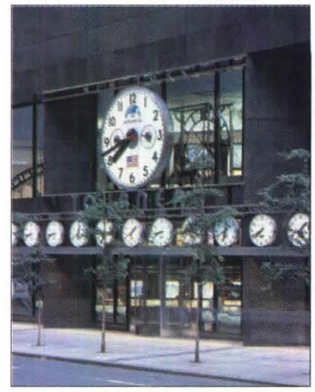
Wall & Street Clocks



Electric Time Company, Inc., of Medfield, MA, manufactures both standard and custom-designed tower, wall, and street clocks. Quality and craftsmanship are their hallmarks. Special design requests are welcomed, and computer-automated design assistance is available. Visit their Web site for specifications and examples of quality, custom clocks at www.electrictime.com.

Electric Time Company, Inc.

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People can get away from the city right on their own roofs. By using the unique PAVE-EL® Pedestal system, you can transform a flat roof into an attractive, usable, maintenance-free, landscaped paver stone terrace. It is also ideal for laying walkways in green roof gardens. For more information on the PAVE-EL system visit the company's Web site at www.envirospecinc.com.

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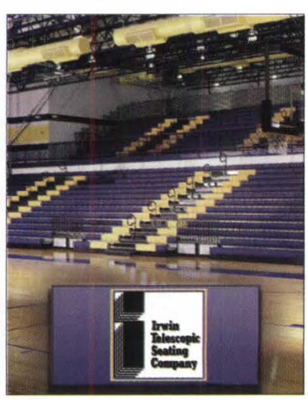
Telescopic Seating



After nearly 20 years of successfully manufacturing telescopic seating as The Folding Bleacher Co., a subsidiary of Irwin Seating Co., the company has changed its name to Irwin Telescopic Seating Company. While gym bleachers remain an important part of their business, many of their new designs have taken them into new areas, including the major arena market. Visit www.irwintelescopicseating.com for further information.

Irwin Telescopic Seating

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Fire-rated glass: Pyroshield™ Plus

In response to the changes in the IBC 2003 and NFPA 5000 building codes, General Glass International has introduced Pyroshield™ Plus, a laminated polished wire glass manufactured by Pilkington Glass UK. It is the most cost-effective 45 minutes fire-rated glass including hose stream and has been approved for safety glazing in CPSC Category I applications. For further information call 800-431-2042 Ext. 227.

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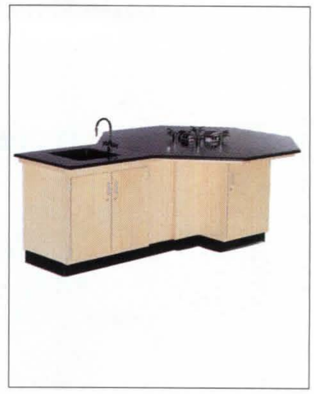
Science Laboratory Furniture



Modern School Supplies is pleased to introduce a proprietary line of high-quality hardwood science furniture. Designed and constructed by experienced craftspeople, this traditional-looking furniture is the newest addition to Modern's diverse selection of state-of-the-art learning environments. Modern Science Labs feature octagonal workstations constructed from solid maple framing. To learn more, visit www.modernss.com.

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National Wheel-O-Vator manufactures elegant residential elevators that are beautifully styled to suit any home decor. Car sizes are customized to fit almost any application, and at the same time, are very affordable. The walls and ceilings are available in finishes of cherry, maple, hickory, oak, birch, and more. The Destiny residential elevator takes quality to new heights. Visit www.wheelovator.com.

National Wheel-O-Vator

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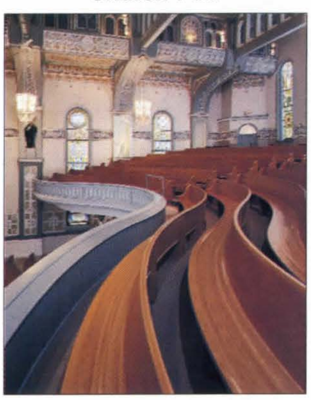
The Radius Curved Church Pew



Curved pews are "Round For A Reason" and are designed and manufactured by New Holland Church Furniture. Curved pews are designed for maximum seating, curved for efficient use of space, designed to enhance worship, created for community uniting the family of God. New Holland Church Furniture is a certified member of the Architectural Woodwork Institute (AWI) so you can be assured of the very highest quality. For information, call 800-220-1465.

New Holland Furniture

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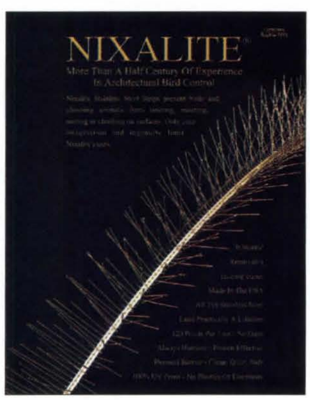
Architectural Bird Control



Nixalite® is a UV-proof physical bird barrier that outlasts and outperforms other steel, plastic, chemical, or electrical bird control devices. Nixalite stainless steel bird control strips provide effective, long lasting, and inconspicuous control of pest birds on any structure. Only Nixalite has installations that are 50-plus-years-old and still providing perfect bird control. Visit www.nixalite.com.

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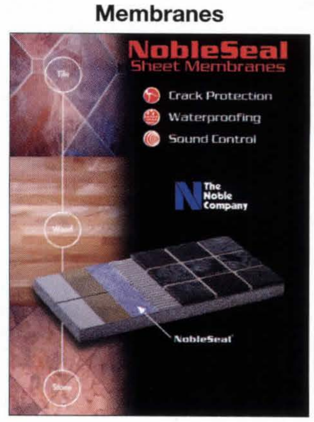

The Noble Company produces NobleSeal® Sheet Membranes for waterproofing, sound control, and crack isolation. Use over common substrates including gypsum concrete, radiant heat, and many wood subfloors. Applications under tile, marble, and many hardwood floors. Time tested performance. For more information, call 800-878-5788 or visit www.noblecompany.com.

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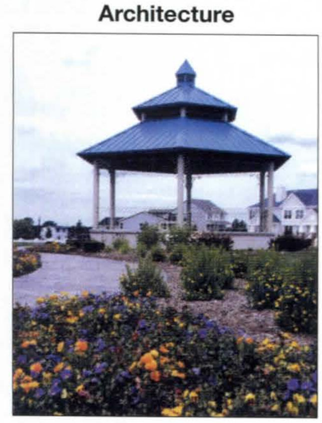
POLIGON Park Architecture



POLIGON designs, engineers and manufactures the largest *variety of tubular steel shelters,* gazebos and pavilions in the industry. Bolt together frames, colorful powder coat finishes, and three different roof systems are standard offerings. For a catalog or information on POLIGON's over 100 original designs call 800-354-7721 or visit www.poligon.com.

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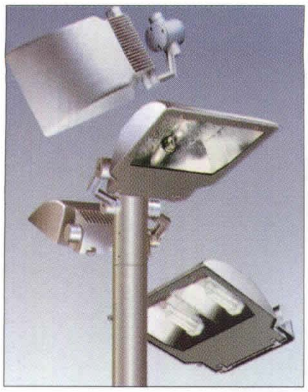
Reflectors



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Stairs built by Stairways, Inc. are distinctively styled, combined with the highest standards of craftsmanship. Stairs are built to your exact specifications into commercial, industrial, or residential projects. Stairs can be fabricated in steel, wood, stainless, brass, aluminum, and bronze, with other materials available. Visit the company's Web site at stairwaysinc.com.

Stairways, Inc.

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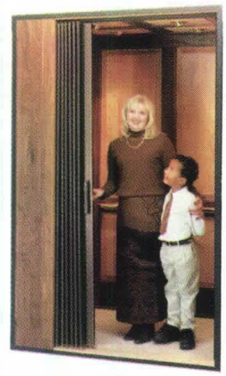
Elevators & Dumbwaiters



Waupaca Elevator specializes in the manufacture of customized winding drum and hydraulic elevators exclusively for residential use as well as in the manufacture of residential and light-duty commercial dumbwaiters. Waupaca Elevator prides itself on its craftsmanship and variety of options available to the homeowner. Call 920-991-9082, Fax 920-991-9087, or Visit www.waupacaelevator.com.

Waupaca Elevator Co.,

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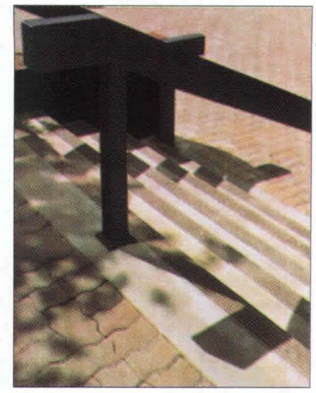
Safety Treads



Wooster Products Inc. has been a world manufacturer of quality safety stair and walkway products for 82 years. Since 1921, the company has developed the standards for the antiskid stair and walkway industry. New construction, renovation, coatings, and antiskid pressure-sensitive tape provide one of the most complete product lines in the industry. Visit www.wooster-products.com, or call 800-321-4936.

Wooster Products Inc.

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