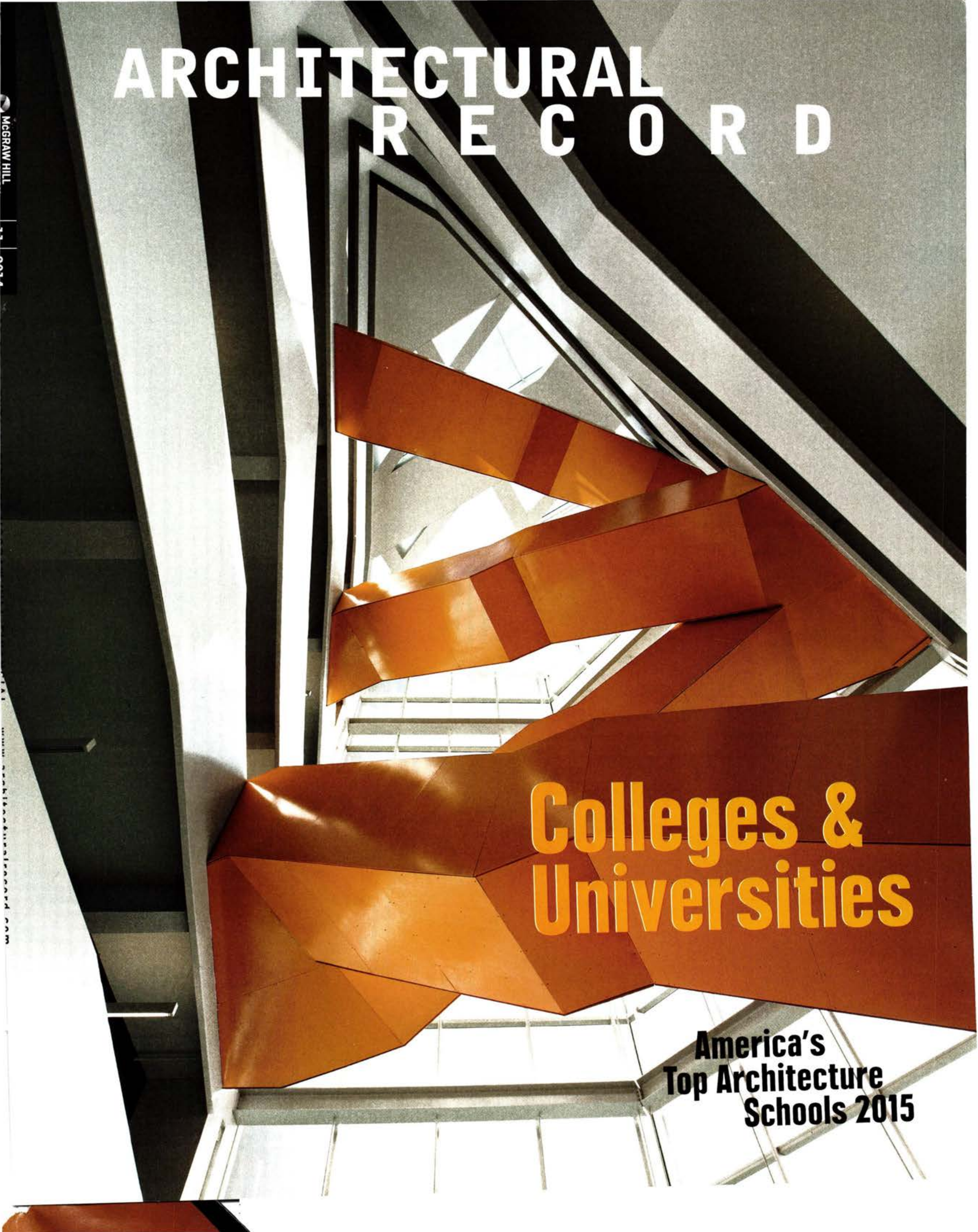
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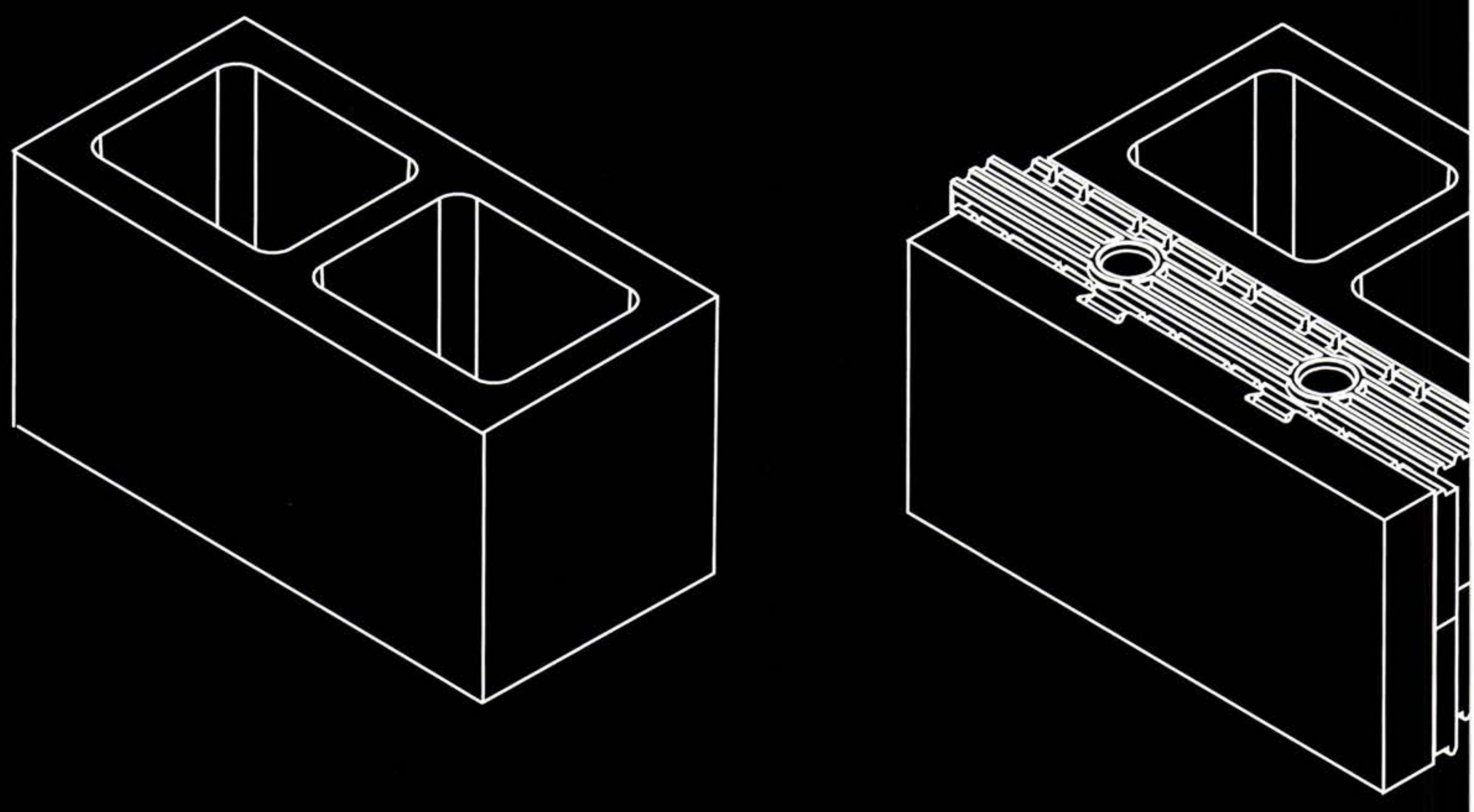

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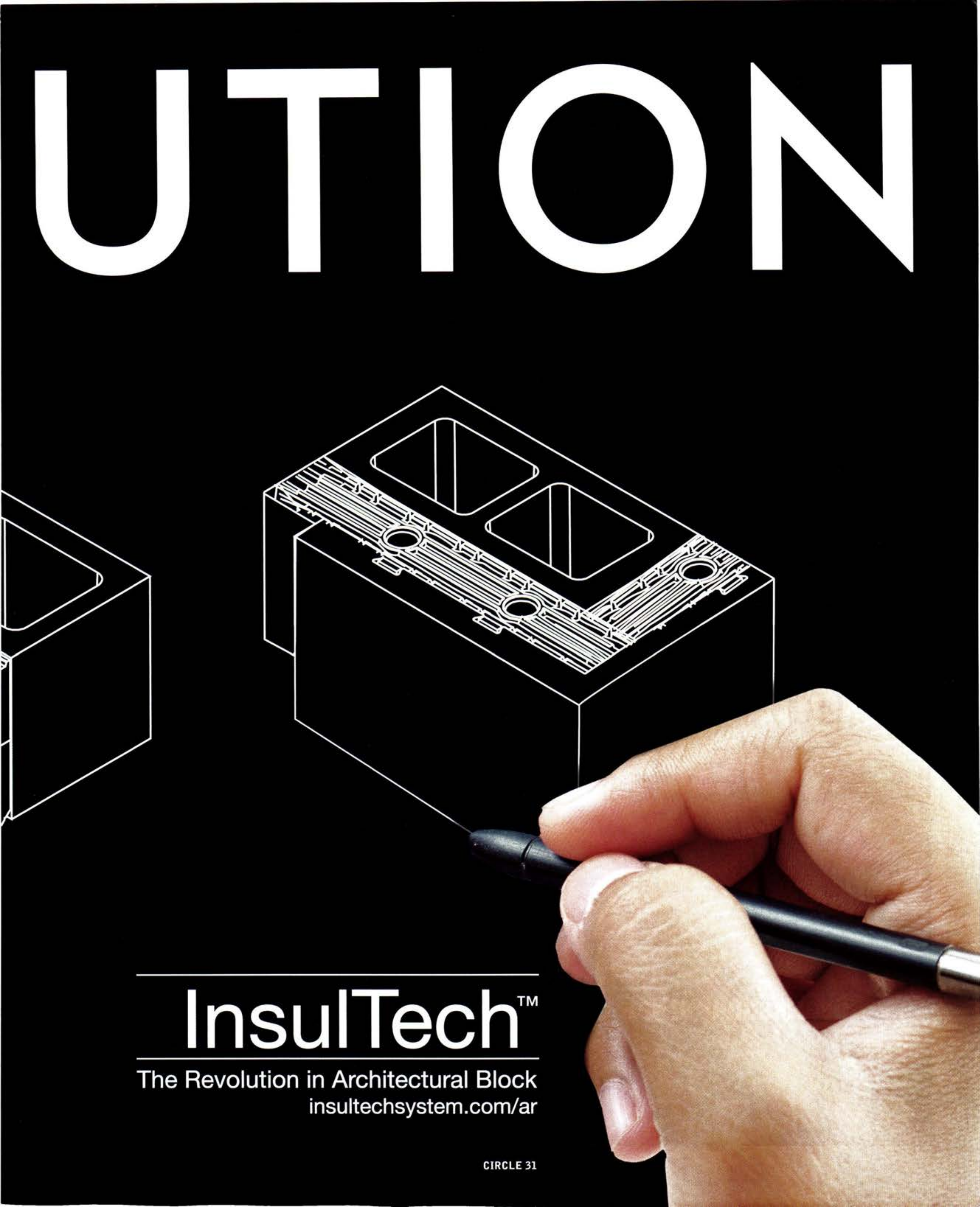
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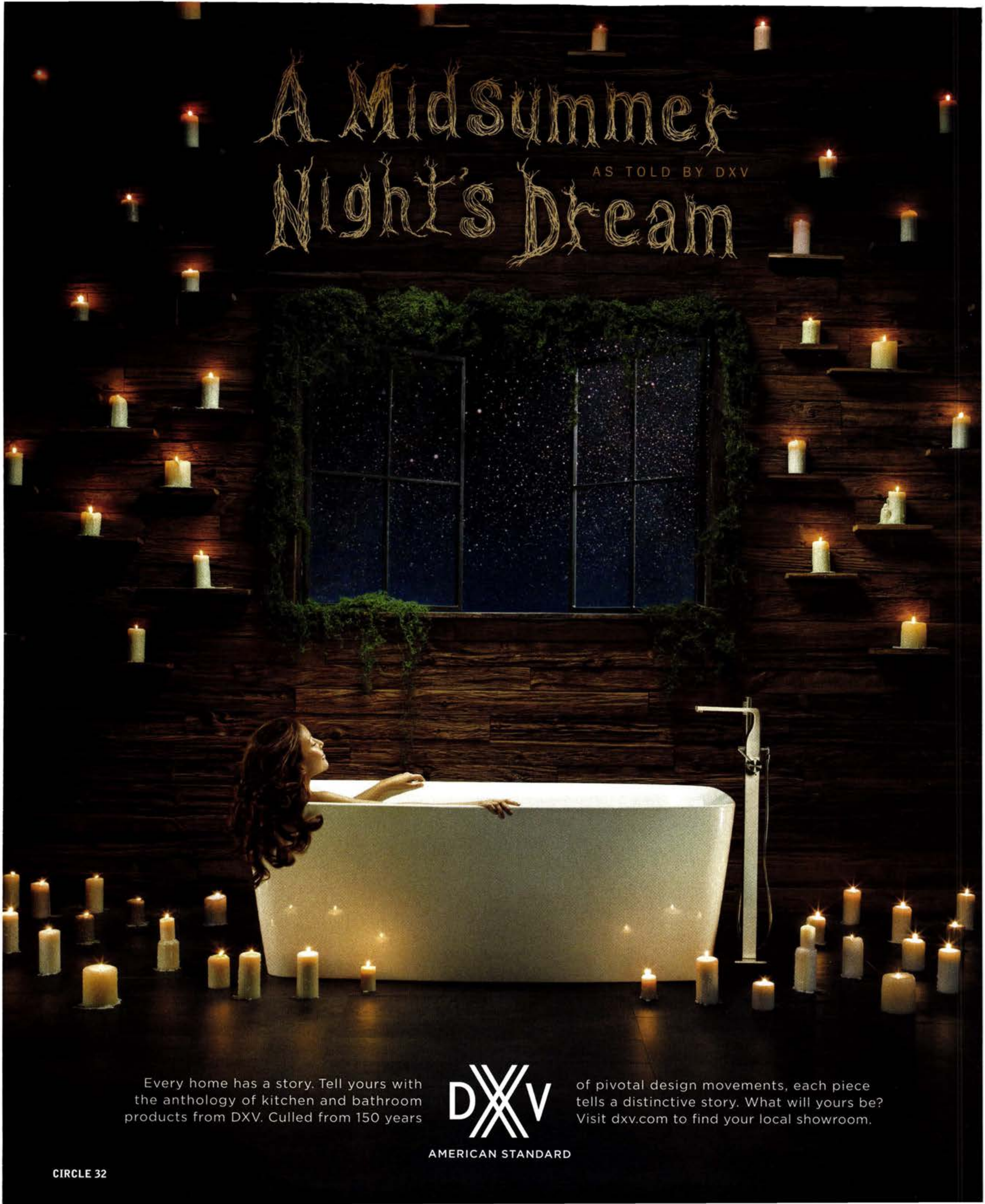
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editor's letter

Big Ideas on Campus

Architecture education must change to keep up with the evolving profession.

AS SURE as the Harvard–Yale football game (or just The Game to its passionate alumni) is played every November, so does RECORD bring you our annual Top 10 architecture school lists (page 62). The rankings of undergraduate and graduate programs, from a survey undertaken by the Greenway Group, are a lot less suspenseful than The Game—Harvard's Graduate School of Design comes out on top almost every year, unlike the college's performance in football over the decades. But the two rivalrous architecture schools, Yale and the GSD, along with Columbia, MIT, and Cornell, have been shoving each other around the field for the last several seasons, to land somewhere in the top five slots.

What has changed, however, is architectural education. Various programs have different strengths, but digital design and fabrication, sustainability, and the phenomenon of globalization are having a big impact on the training of future professionals. Science, technology, engineering, and mathematics—or STEM—are increasingly central to architecture curricula. "The trend indicates that art and theory are less important," says James P. Cramer, Greenway's chair. "The highest-paid careers will be in the STEM domain."

Offering more courses in those areas, while also reflecting the growing importance of urban design, global practice, business skills, and interdisciplinary work, have made the job of dean at an architecture school tougher than ever (page 68). These days, Mohsen Mostafavi, the dean at Harvard, is looking to university programs across campus to shape the education of his students and broaden their understanding of how design can engage disciplines such as medicine, public health, education, and law. "The practice of architecture can't just focus on being a service sector, waiting on clients to come to us," he told RECORD. "If we're going to be effective, we must gain greater importance as designers."

But if architects are seeking a bigger role on the world stage, the profession needs to better reflect the world—and diversity should begin in the schools. According to a report cited by the Association of Collegiate Schools of Architecture, 43 percent of students enrolled in accredited B.Arch., M.Arch., and D.Arch. programs in 2012–13 were female—still shy of 50 percent, but a lot more than the 26 percent of licensed architects in firms who are women. (And the numbers for African Americans in schools is far lower.)

In other areas of education, the representation of women falls short too: about 19 percent of architecture deans are female, and only one in four guest lecturers is a woman. The Topaz Medallion, awarded each year to someone who has influenced "a long line of students," has been given to a woman just twice in nearly 40 years: to Denise Scott Brown in 1996 and in 2009 to Adèle Naudé Santos, who just stepped down as dean at MIT.

Yet we're hearing the strong voices of women about shifts to a broader set of ideas and aspirations in architectural education, which could help attract a wider range of students (if only tuitions weren't rising so fast and burdening them with debt). Among the great speakers at RECORD'S 12th annual Innovation Conference in New York last month (page 26) was Amale Andraos, the new dean at Columbia's Graduate School of Architecture, Planning and Preservation, a proponent of interdisciplinary study and global experience (page 70). The Paris-based architect Odile Decq not only gave the audience a close-up look at such projects as her new office building in Lyon, France (RECORD, July 2014), but spoke about the architecture school she has just started in that city. Called the Confluence Institute for Innovation and Creative Strategies in Architecture, it departs radically from most of Europe's architectural education, which has been increasingly standardized by the Bologna Process, guidelines under the European Union that seek to "harmonize" higher education across borders.

The boundaries that Decq's school means to tear down are those that constrict ideas. She emphasizes architecture as a way of thinking and acting, both ethically and entrepreneurially. Who can be a student there? "Anyone can apply," says Decq, "but only if they want to change the world." ■

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief

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Page 180

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Page 184

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Page 188

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Meeting and Exceeding Energy Objectives in Wood Buildings
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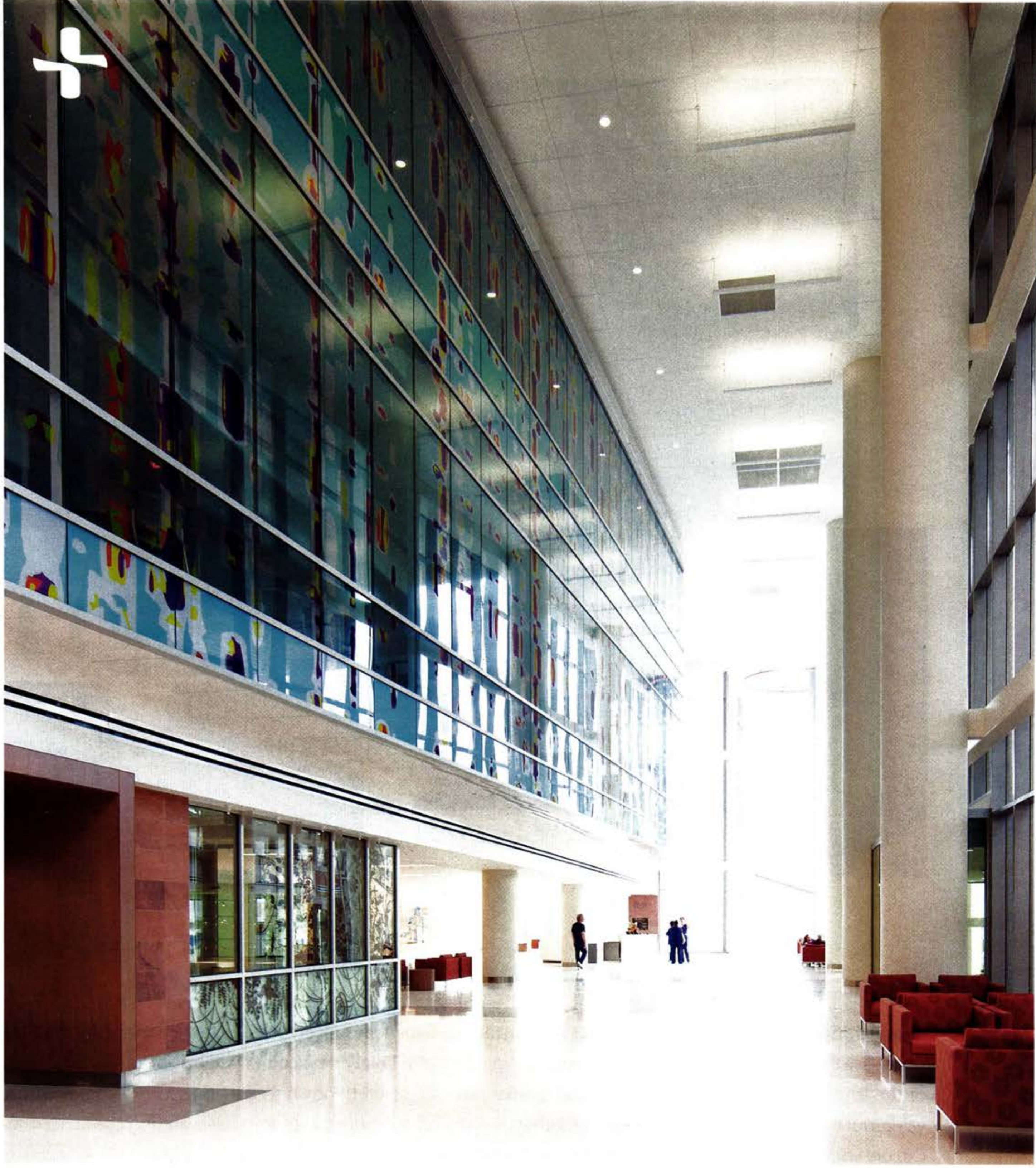

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I can't think of a profession better equipped for social change than architecture.

—Ivenue Love-Stanley, cofounder of Atlanta-based architecture firm Stanley Love-Stanley, speaking at RECORD's first Women in Architecture Forum & Awards on October 10 in New York City.

What Is Frank Gehry Doing About Labor Conditions in Abu Dhabi?

BY ANNA FIXSEN

Saadiyat Island's Cultural District will include (above, from left) Frank Gehry's Guggenheim Abu Dhabi, Jean Nouvel's Louvre satellite, and Zaha Hadid's Performing Arts Centre.

SINCE THE GUGGENHEIM Museum announced plans for its Frank Gehry–designed satellite in Abu Dhabi eight years ago, the project has been part of debates and protests concerning the treatment of migrant construction workers and the role of architects in their safety and well-being. But, behind the scenes, Gehry has been working with a human-rights lawyer and the country's state-run development authority to improve conditions for laborers on his site.

"Gehry Partners has been engaged in a substantial and ongoing dialogue over many years now that has involved government, the construction industry, architects, project, sponsors, and NGOs," according to a statement from Gehry's office. "It is a process in which we will strive to be continuously engaged, not something that is simply done at any one stage."

Gehry may be the first prominent architect to take steps toward labor reform on Saadiyat Island, the luxury arts and real-estate development 500 meters off the shore of Abu Dhabi where the Guggenheim, after years of delays, is expected to soon begin construction. The museum will join Rafael Viñoly's New York University Abu Dhabi (completed this year), Norman Foster's Zayed National Museum (opening in 2016), and Jean Nouvel's Louvre satellite, expected to open next year. Tadao Ando and Zaha Hadid have also designed buildings for future development phases.

Focus on labor issues surrounding Persian Gulf–area projects sharpened this spring after Hadid, at a press conference reported by the *Guardian*, said that as an architect she has nothing to do with the workers, but that the local government should take responsibility for problems with labor conditions. (On August 21, Hadid filed a lawsuit in New York County Supreme Court against critic Martin Filler and *The New York Review of Books* for errors in an article about conditions on the site of her Al Wakrah soccer stadium in Qatar, which had yet to begin construction.) "I don't have the power to make these changes," Hadid told the *Architects' Journal* in an interview published in September. "But maybe I am wrong and I could help. But I don't know how."

Gehry's plan could be a template for architects who feel similarly unsure how to help. "What is the proper role for the architect? That's the fundamental question," Scott Horton, Gehry's lawyer, said in an interview with ARCHITECTURAL RECORD. "It's not a legal

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responsibility, but it's a moral responsibility."

For Gehry, the conversation about worker conditions began at the start of his involvement with the Guggenheim Abu Dhabi. After Human Rights Watch painted a grim portrait of worker conditions on Saadiyat Island in a report in 2009, Gehry approached Horton—an expert in human-rights law—to give him advice in connection with the project. Before contracts were finalized with the state development agency, Tourism Development & Investment Company (TDIC), Gehry raised concerns informed by that report and those of other groups on workers' conditions.

While Abu Dhabi already has a comprehensive labor code, it is feebly enforced. By working directly with the Abu Dhabi authorities, Horton reasons, the law and policies can be implemented and worker conditions improved.

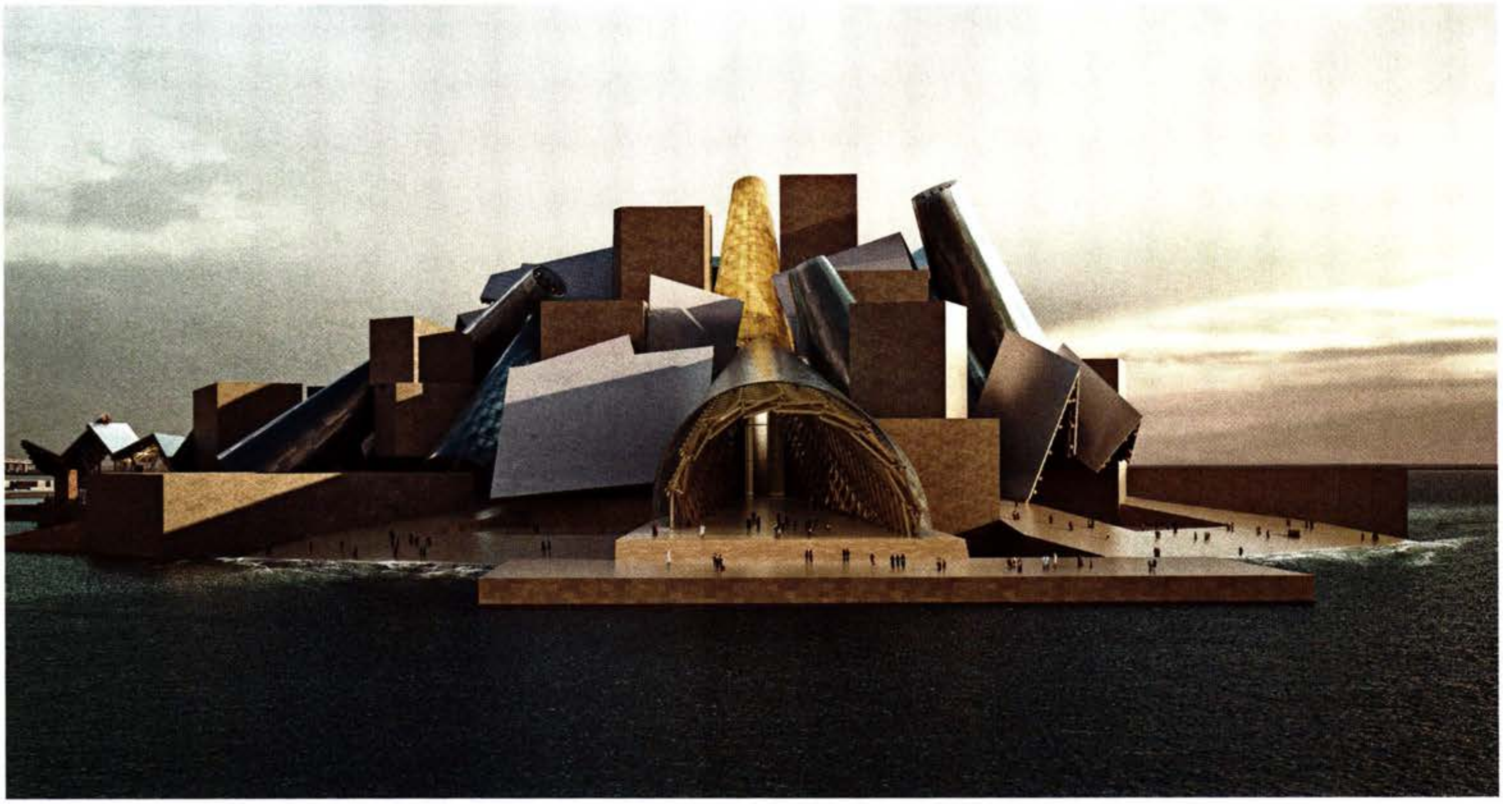
Horton and Gehry have targeted five primary concerns: the prioritization of worker health and safety, the accessibility to passports and other documents typically retained by employers to prevent laborers from leaving the country, the appointment of a law-abiding and accountable general contractor, the establishment of an independent site monitor, and the abolition or reimbursement of steep recruitment fees associated with the *kafala* system—the worker-sponsorship approach prevalent in the Gulf region.

Gehry urged the Guggenheim, with the TDIC, to issue a joint statement outlining these measures; it has been on the museum's website since 2010. Human Rights Watch and other activists said their statement was not enough. In a similar situation in February 2010, New York University had issued a statement of the institution's commitment to proper working conditions on its new Abu Dhabi campus, but according to a *New York Times* investigation of the construction site this year, it was not followed through on. In late June, the university appointed an international investigator to review the allegations.

Gehry's lawyer says they are working in tandem with Abu Dhabi officials to generate changes, which they hope will soon become realities. To alleviate squalid living conditions, Gehry and Horton are encouraging the building of additional housing. TDIC has already built a village for some construction workers, but it is not big enough to house the rapid influx of migrant workers with the resumption of the Guggenheim project, set to open in 2017. To offset the steep fees charged to potential workers by foreign recruiters—often more than three times a worker's annual income—the Gehry team proposes that the contractor reimburse the worker to cover the cost. TDIC appointed PricewaterhouseCoopers as an outside monitor; it has issued quarterly reports for the last two years. Contracting bids were submitted in late August, and TDIC is now on the cusp of hiring a general contractor, a pivotal component of fair worker treatment.

Horton acknowledges the challenges of accomplishing their goals. "It's going to be a process that will go to the end of the project," he said. "We are optimistic that, as an approach, this makes sense and is likely to improve the position of workers on our project."

By engaging with these issues, Horton believes the Guggenheim project has the potential to influence the treatment of workers on other sites: "This could serve as a model for doing things right." ■



The Frank Gehry-designed Guggenheim Abu Dhabi, scheduled to open in 2017, will be composed of cone-shaped volumes. Set to be the largest Guggenheim satellite in the world, the structure will encompass 450,000 square feet. Construction is expected to begin by the end of the year.

Driving the Green Discussion

BY FRED A. BERNSTEIN

"WE WANT to shift the discussion of sustainability from engineering to design," says Ali Malkawi, the director of Harvard's new Center for Green Buildings and Cities, which hosts an inaugural conference on November 7. In Malkawi's view, the focus of green building research has too often been on new, and costly, systems. "The current approach is very fragmented—it's about a lot of components, not about overall performance," he says.

True, those components may satisfy the "checklist" approach to sustainability, exemplified by LEED. But checklists, Malkawi says, make buildings more expensive, without necessarily making them greener. He is especially troubled that such systems are now being exported to countries like China, where the checklists and local building traditions may not jibe.

Meanwhile, Malkawi says, the climate crisis is too urgent to let academic research on sustainability be swayed by corporate agendas. "We will collaborate with the building industry but we want to be driving the discussion," he says of the new center, which was established in January with a gift from the Evergrande Group, a Chinese conglomerate.

Malkawi, a Jordanian-born architect, computer scientist, and engineer, was a professor at the University of Pennsylvania when, in 2013, he accepted an offer to join Harvard's Graduate School of Design as a professor of architectural technology. Soon after arriving, he wrote a proposal for the new center, and when the Evergrande gift came through, he was named its founding director. Now he is assembling a team of architects and experts in economics, material sciences, electrical engineering, business, mathematics, mechanical engineering, and atmospheric sciences to begin researching how buildings can be designed for maximum efficiency.

Already the team is experimenting on a house in Cambridge, Massachusetts, near the Graduate School of Design's Gund Hall, that will serve as the headquarters of the new center. It will be retrofitted to become a net producer of electricity; Malkawi is talking to Harvard scientists about the kind of batteries to use to store excess capacity.

Malkawi has a Ph.D. from Georgia Institute of Technology in architecture, artificial intelligence, and mechanical engineering and has consulted on projects like the new Monterrey International Airport terminal in Mexico by Victor Marquez Architects. Focusing on energy consumption, he helped divide the terminal into zones that required "full" climate control, some climate control, and zones that required none—in both plan and section.

Still, he doesn't know how the building is performing; consultants, he says, have a limited role, which usually ends before the building has even broken ground. With Harvard's clout and Evergrande's money, he hopes to have greater impact on how buildings perform. ■

Malkawi directs the Center for Green Buildings and Cities.

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Recap: AR Innovation Conference

BY FRED A. BERNSTEIN

Odile Decq gave the closing keynote at the Innovation Conference.

ARCHITECTURAL RECORD's 12th annual Innovation Conference, held in Manhattan on October 9, was a master class in the ways architects find inspiration. The day began with Massimiliano Fuksas, who runs a Rome-based practice with his wife, Doriana, unfurling a sheet of honeycomb paper. It once wrapped a gift from a client, but the Fuksases barely noticed the present, so taken were they by the paper, which went on to inspire the roof of their 5.4 million-square-foot Shenzhen Bao'an International Airport.

David Benjamin, founding principal of The Living, finds inspiration in natural phenomena. His largest project to date, a temporary tower in the courtyard of MoMA PS1, the Museum of Modern Art's contemporary-art space in Queens, New York, was composed of bricks created from hemp and cornstalk matter bound together by mycelium (mushroom filaments). The goal, he said, is to create building materials using organic processes with "no waste and almost no carbon emissions." By contrast, Marlon Blackwell finds his inspiration in the culture of his home state, Arkansas. Blackwell's Saint Nicholas Eastern Orthodox Church in Springdale, Arkansas, has a dome made from a recycled satellite dish. "Part of our mission is to demonstrate that architecture can happen anywhere, at any scale and any budget," he said.

If there was a subtext to the conference, it was that globalization has enriched the profession. Dan Wood and Amale Andraos of WORK Architecture Company are building a conference center in Gabon with stone that is being shipped from Africa to Italy for fabrication. Florian Idenburg and Jing Liu of SO-IL found a supplier of the chain mail they needed for a gallery in Seoul on the website Alibaba.

The last speaker of the day was Odile Decq, the Paris-based architect. Like nearly all the participants, she is as interested in architecture's soul as in the buildings produced. The goal of the architecture school she just opened in Lyon, France, Confluence: Institute for Creative Strategies and Innovation in Architecture, is to train architects who are both ethical and able to realize their ambitions entrepreneurially. The school's slogan could also apply to the Innovation Conference: "Anyone can apply, but only if they want to change the world." ■

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Sheila O'Donnell and John Tuomey

BY HUGH PEARMAN

THE PREMIERE architecture award in the UK—trumping even the annual Stirling Prize for best building—is the Royal Gold Medal, the annual award for individual long-term excellence that has existed since 1848. It is presented by the Royal Institute of British Architects (RIBA) with the approval of the monarch, and counts everyone from Le Corbusier and Louis

Kahn to Richard Rogers and Archigram among its recipients. Each year a new name is chiseled into the stone-lined foyer of RIBA's London headquarters–as will be, in early 2015, the names of Dublin-based pair Sheila O'Donnell and John Tuomey.

It's a tribute to the respect and affection in which they are held: husband-and-wife partners who—having cut their teeth working for James Stirling and Michael Wilford, among other practices in London—returned to Dublin at the start of the 1980s to set up their own studio. With like-minded colleagues of the same generation in the Group 91 collective, they jointly master-planned the revival of the Temple Bar district, then threatened with demolition. Their practice evolved through a series of much-lauded buildings, in both the Republic and Northern Ireland. Finally they landed back in London, most notably with their Saw Swee Hock Student Centre for the London School of Economics.

What does winning the medal mean to you?

O'Donnell: We were totally surprised. When Stephen Hodder (RIBA president) phoned us, I was completely gobsmacked. I hadn't seen this in the ether at all. But I was honored and delighted, because the Royal Gold Medal has a position in one's mind as a remarkably significant thing. The names on the wall . . .

Tuomey: We've had hundreds and hundreds of letters, cards, and e-mails from people in all corners of the world. They seem to think that it says something about the recognition of architects of our kind. The medal has got a ranking in the world, it feels like it has credibility, integrity.

You made a conscious decision to return to Dublin in uncertain economic times, rather than continue to work for others in London. Did you have a clear goal?

Tuomey: We certainly did. It was the early 1980s. Had we stayed in London, we would have been creatively engaged and usefully employed. I would have been made an associate in Stirling's office. But I thought, now is the time to go. We had a sense of mission, to put some meaning into unformed Irish architecture. We were worried that the architecture we'd grown up with in Ireland had lost its European character and scale.

O'Donnell: John came back in 1980; I did in 1981. At the time, it seemed an unpromising environment in which to make architecture. We were part of a movement in London in the late 1970s and early 1980s. The history of the European city was starting to impact architecture. But people were using history as shorthand, as motif. Perhaps part of coming back was a return to essentials—not what history looked like, but what it meant, how architecture grows out of context and culture.

How important is Stirling to you today?

O'Donnell: There's the sense of his tenacity, of hanging onto an idea, but also his work method and the culture of his office. We made huge 1:50 drawings, gradually building up the layers on a key drawing that showed everything. We took that with us when we set up our own practice. We decided that was the way to make things.

Tuomey: Stirling's office model underpins our practice. He was involved in every single aspect. We see ourselves as being like that: I should know every railing on every half-landing. You can hold the whole scheme in your hand or head.

You are known for small- to medium-scale projects. Do you hanker after a megaproject?

Tuomey: Absolutely. We haven't yet had that reach, but that's not our choice. We would like to think about things on a larger scale. We don't want to feel confined or defined by what we have done.

O'Donnell: A piece of city, yes. But also single buildings that are larger than the often complex single buildings we've already done! There's as much work and detail in them as there is in a building five times the size. And housing: wouldn't it be great to do the equivalent of a Georgian square? ■

noted

Deborah Berke to Design Historic D.C. Tower Interiors

The 1928 Wardman Tower in Washington was home to Dwight D. Eisenhower and Marlene Dietrich. Renovation is under way, and developer JBG Companies tapped Berke to design all interiors and the 32 private residences in the Georgian Revival building.

Getty Awards Grants to Save Modern Architecture

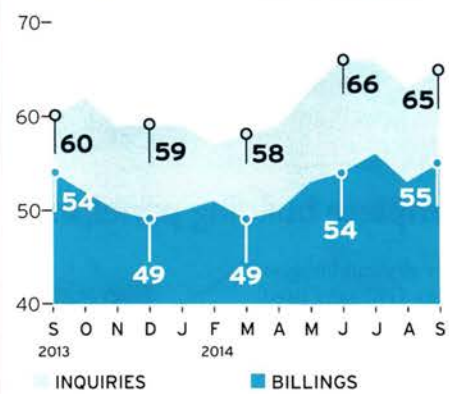
The 10 grants for significant modern buildings are part of an initiative to conserve 20th-century architecture, addressing the challenges of conservation through the support for key projects such as Hilario Candela's Miami Marine Stadium and Le Corbusier's apartment and studio in Paris.

Maya Lin Receives Dorothy and Lillian Gish Prize

The renowned artist, designer, and environmentalist is the recipient of the $300,000 21st annual prize, in recognition of her "artistic contributions to society and to the beauty of the world."

HUD Launches $1 Billion Resilience Competition

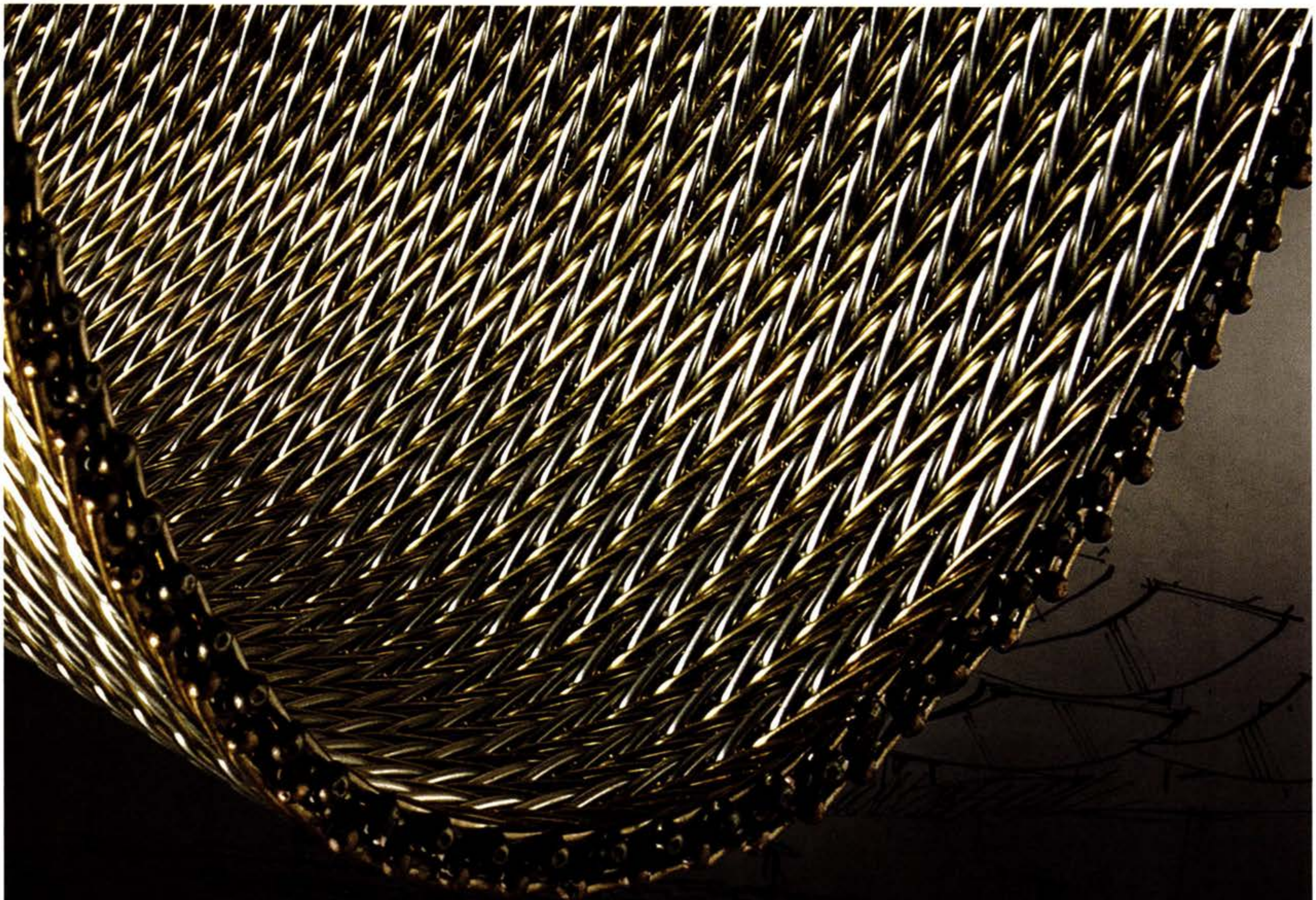
The competition promotes risk assessment and planning and will fund resilience projects in communities recently stricken by natural disasters. The winning *Rebuild by Design* projects, inspired by the havoc after Hurricane Sandy, will serve as models of how philanthropic resources and the federal government can support communities.



ABI Keeps Going Strong

The AIA reports that the September ABI score was 55.2, up from a mark of 53 in August (any score above 50 indicates an increase in billings). "The recently resurgent institutional sector is leading to broader growth for the entire construction industry," says AIA chief economist Kermit Baker.

PHOTOGRAPHY: © AMELIA STEIN



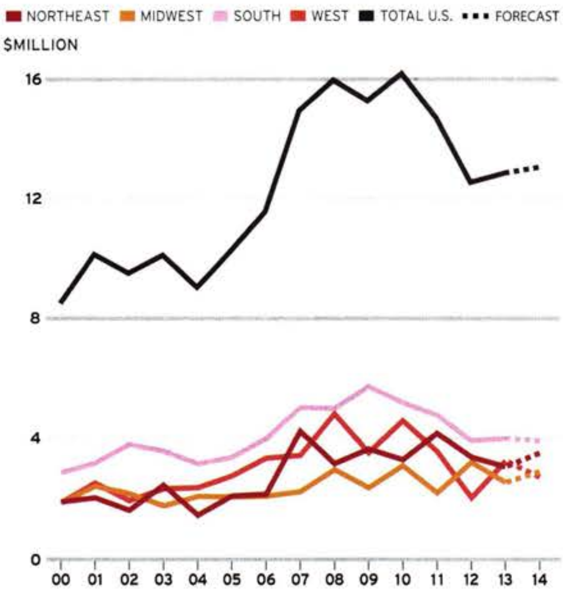
Data from McGraw Hill Dodge Analytics

MARKET FOCUS
HIGHER-EDUCATION CONSTRUCTION

Construction activity in the higher-education sector is beginning to slowly rebound as the stock market improves and college and university endowments, along with gifts from alumni and other benefactors, grow.

Higher-Education Starts by Region

In addition to U.S. total and 2014 forecast figures



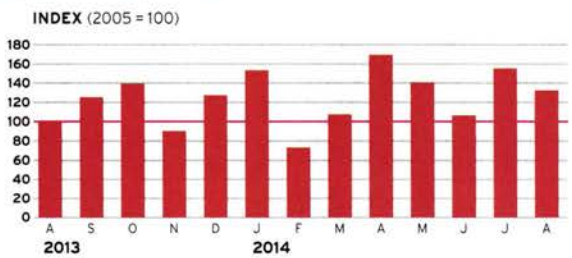
Top Metro-Area Markets

Ranked by total higher-education construction starts 1/2014 through 8/2014

	REGION	$MILLIONS
1	NEW YORK CITY	692
2	BUFFALO, NY	317
3	WASHINGTON, D.C.	293
4	BOSTON	260
5	CHICAGO	229

Princeton Neuroscience Institute & Peretsman-Scully Hall; Princeton, New Jersey; Rafael Moneo Architects (page 112)

The Dodge Index for Higher-Education Construction 8/2013–8/2014



The index is based on seasonally adjusted data for U.S. higher-education construction starts. The average dollar value of projects in 2005 serves as the index baseline.

Top 5 Design Firms

Ranked by higher-education construction starts 1/2011 through 8/2014

1. **Perkins+Will**
2. **ZGF Architects**
3. **Jacobs**
4. **Ayers Saint Gross**
5. **Goody Clancy**

Top 5 Projects

Ranked by higher-education construction starts 1/2013 through 8/2014

$252 MILLION

PROJECT: New York City College of Technology New Academic Building
ARCHITECT: Perkins Eastman
LOCATION: Brooklyn, NY

$251 MILLION

PROJECT: University of Buffalo School of Medicine and Biomedical Sciences
ARCHITECTS: HOK, Foit-Albert Associates
LOCATION: Buffalo, NY

$218 MILLION

PROJECT: University of Maryland Health Sciences Facility III
ARCHITECTS: HOK, Design Collective, Jacobs, Melville Thomas Architects
LOCATION: Baltimore

$191 MILLION

PROJECT: Jackson Laboratory for Genomic Medicine
ARCHITECTS: Tsoi/Kobus & Associates, Centerbrook
LOCATION: Farmington, CT

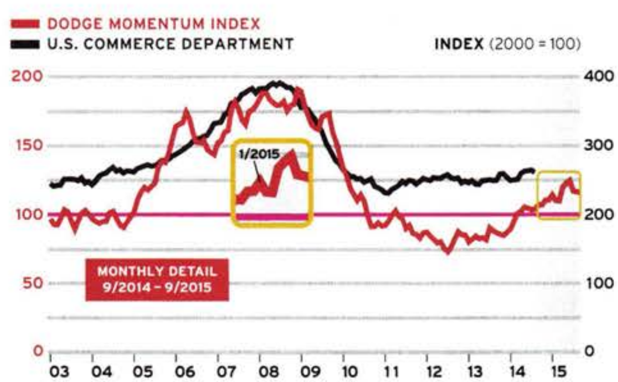
$155 MILLION

PROJECT: 20 Washington Road, Princeton University
ARCHITECT: KPMB Architects
LOCATION: Princeton, NJ

MOMENTUM INDEX DIPS

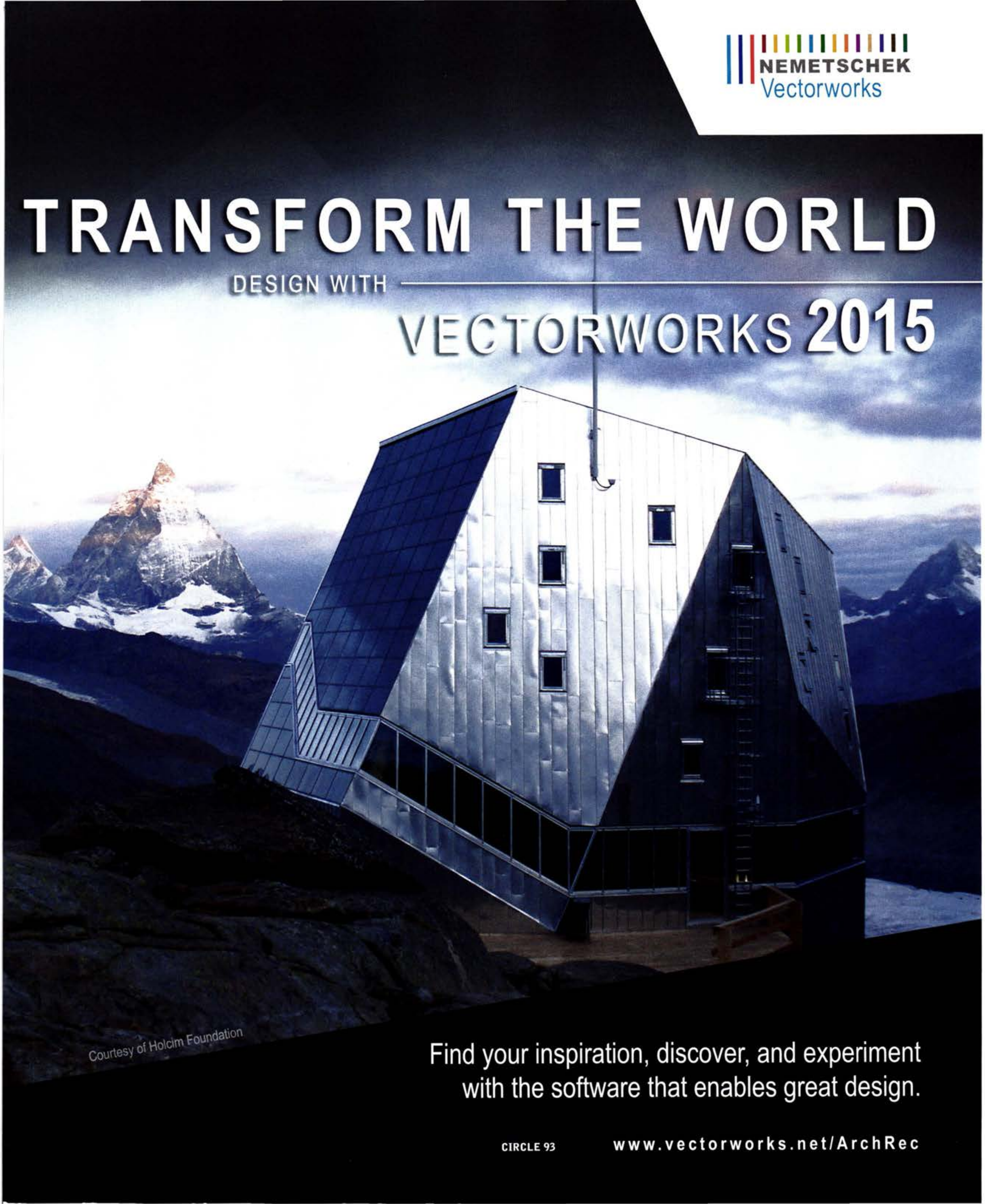
In September, the Dodge Momentum Index fell 0.7%, to 155.8. Despite the drop—the third in a row—the index is up 8% versus this time last year, after 13% growth in the first half of 2014.

The Dodge Momentum Index is a leading indicator of construction spending. The information is derived from first-issued planning reports in McGraw Hill Construction's Dodge Reports database. The data lead the U.S. Commerce Department's nonresidential spending by a full year. In the graph to the right, the index has been shifted forward 12 months to reflect its relationship with the Commerce data.



PHOTOGRAPHY: © DUCCIO MALAGAMBA

McGraw Hill Dodge Analytics tracks projects from predesign through construction to capture hard construction costs, square footage, and other key statistical information.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perspective **house of the month**

ON A WOODED SITE IN DEEPHAVEN, MINNESOTA, SNOW KREILICH ARCHITECTS CONCEIVED A GEOMETRIC CEDAR-CLAD RETREAT OVERLOOKING LAKE MINNETONKA. BY SARAH AMELAR

A combined living, dining, and kitchen area has views to the lake, as does the master suite perched on the floor above it (far left). The sculptural stair that connects the two wings of the house is custom-fabricated from folded blackened-steel plate (left). The house is made of two L-shaped volumes, one lying on its "back" and the other tipped on its "foot" (bottom, left).

SECOND FLOOR

GROUND FLOOR

1 ENTRY
2 GARAGE
3 STORAGE
4 MUD ROOM
5 BATHROOM
6 LAUNDRY ROOM
7 KITCHEN
8 DINING
9 LIVING
10 OUTDOOR DINING
11 POOL
12 SPA
13 POOL MECHANICAL
14 GUEST SUITE
15 CLOSET
16 MASTER BEDROOM
17 CHILD'S BEDROOM
18 MEDIA ROOM

THOUGH INSPIRATION sometimes emerges slowly, it can also flash unexpectedly, like a bolt of lightning—as it did the first time architects Julie Snow and Matthew Kreilich caught a glimpse of their clients' site along Minnesota's Lake Minnetonka.

Partners at Snow Kreilich Architects, they'd just made their way up the driveway, across the 2.6-acre parcel's forested terrain to a clearing. "As we pulled up," recalls Kreilich, "the existing low, rambling cottage blocked our views of the lake, except its front door was open, and suddenly we saw the water clear through the back windows." It was a dazzling moment. "Julie and I looked at one another," he continues, "and we knew, whatever we built there had to capture that experience."

The cottage wasn't salvageable. But that sense of portal and framing became essential in designing its replacement: a weekend getaway for a family of four based in Minneapolis, about a 25-minute drive away.

Minimizing the house's footprint, the architects designed a 7,200-square-foot primarily wood-frame building made of two L-shaped volumes. By propping one volume perpendicularly across the other, the architects created a broad gateway to the lake. The main living areas (with a master suite above them in an extruded second floor), occupy the more grounded L, clad in black-stained cedar and set on an east–west axis. The spanning, north–south component with its contrasting natural-cedar siding, contains the children's rooms. A skylit sculptural stair connects the two volumes where they intersect.

Just inside an upper-floor window in the bridging volume, the owners hung a painting proclaiming "The Final Frontier" in bold letters. Highly visible through the window as you approach the house, it reads like a title for the framed panorama. "That was an unplanned gesture," says Kreilich, "but I think it playfully sums up the clients' feelings about this lakeside retreat." ■

PHOTOGRAPHY: © PAUL CROSBY

View additional images at architecturalrecord.com.

Bright Lights, Big Data

The City as Interface: How New Media Are Changing the City, *by Martijn de Waal. nai010 Publishers, August 2014, 224 pages, $33.*

Smart About Cities: Visualizing the Challenges for 21st Century Urbanism, *edited by Maarten Hajer and Ton Dassen. nai010 Publishers/ PBL Publishers, June 2014, 250 pages, $33.*

Reviewed by Zachary Edelson

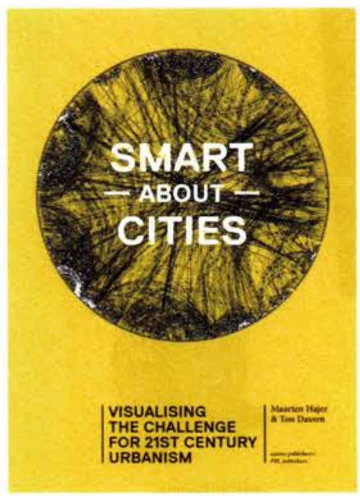
PREDICTING THE FUTURE of the city is a lot like predicting the future of human society. Urban areas embody the physical infrastructure of our cultures and economies, and will house 70 percent of the world's population by 2050. They are too complex for detailed extrapolations, yet we can make insightful observations about their current behavior.

For example, in 1991 Saskia Sassen popularized the term "global city" to indicate a metropolis that is a critical node in the global economy. That definition stuck, but now urbanists, policymakers, and programmers are heralding the new "smart city." The premise is simple: a smart city integrates hardware and software to improve living and working conditions. However, the broad debate on what "smart" means in practice only proves that the endgame scenario is still unknown.

Multinational companies like Cisco, IBM, and Siemens are all promising that their proprietary urban hardware and software will make cities more efficient, desirable, and competitive in the global marketplace. Universities are opening smart-city labs and institutes to study the phenomenon. Independent programmers are working to produce the next smart-city killer app. Change is certainly coming: the World Bank predicts a $30-to-50 trillion investment in urban infrastructure worldwide in the next 20 to 30 years. So how will cities decide what to implement? What factors should they consider and prioritize?

The City as Interface and *Smart About Cities* try to answer those questions in different ways. The former offers a broad survey of smart-city technology and an exploration of how individuality and community will balance out in the city of the future. The author, Martijn de Waal, an assistant professor at the University of Amsterdam and cofounder of the urban and digital media research group The Mobile City, offers a book that's heavy on academic terminology from sociologists, architects, and media gurus past and present. There are no illustrations or diagrams beyond its eye-catching cover. Instead, the book is littered with questions that articulate what is at stake but offers frustratingly little prognostication.

De Waal understands that even a robust accounting of current technology and social thought cannot forecast the future with certainty. However, one can't help but feel disappointed that he didn't imagine some future urban scenarios to enliven and conclude his academic labors. What would Hannah Arendt, Marshall McLuhan, or the Archigram group see in Songdo, a brand-new city in South Korea built with smart-city hardware and already home to 70,000 residents? Will its urban data collection become politicized? Might residents rise up and offer alternatives? Instead of synthesizing his philosophical investigations with his survey of technology and policy to bring new ideas to the field, he concludes that "my aim here has been to make a start on this philosophical exercise" and that a future "generation of test cases" will translate that philosophy into practice.



Conversely, the editors of *Smart About Cities*—Maarten Hajer and Ton Dassen—argue that sustainability should be central to the ongoing smart-city discussion. Hajer is a public policy professor and director general of the Netherlands' strategic environmental and planning policy institute. Dassen and many chapter authors also work at the agency as researchers, though some have architectural backgrounds and are joined by two contributing designers. They argue that urban technology will be the infrastructure of human society and, consequently, that cities should be seen in terms of the global production and consumption of natural resources.

Its chapters read like a data-driven urban *Whole Earth Catalog*, with each section providing an executive summary and essential statistical information for a specific subject (Demography, Air, Water, Food, Cargo, Energy, etc.). Its slick charts and vibrant graphs—showing the sheer volume of kilometers of travel, kilograms of waste, and gigajoules of energy—demonstrate that the vaunted city-of-the-future must be built with the global ecological crisis in mind. "Our urban metabolism is literally hidden," writes Hajer. "Visualizing the urban metabolism shows what current city life entails and gives us a sense of what decoupling," i.e. the creation of a sustainable metabolism, "would require" in the near future.

Both books approach the subject from a very Dutch perspective. Sometimes de Waal's thoughts on community and individuality feel too rooted in Dutch history, while much of the *Smart About Cities* data is, despite its global argument, focused on the Netherlands. The books strain to match local data and history to global rhetoric, suggesting the obvious: despite their interconnectedness, the world's cities will become "smart" according to their own idiosyncratic economic, cultural, and political circumstances. ■

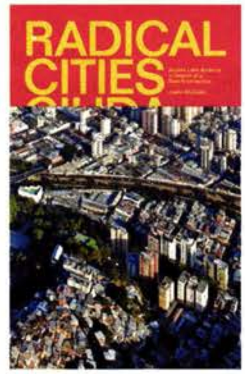
Zachary Edelson is an art and architecture journalist and an instructor at the School of Visual Arts in New York.

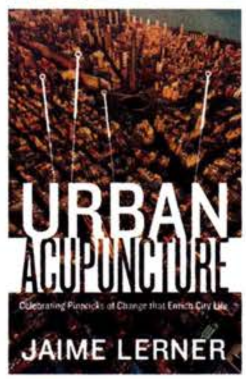
Radical Cities: Across Latin America in Search of a New Architecture, *by Justin McGuirk. Verson, June 2014, 288 pages, $30.*

Urban Acupuncture: Celebrating Pinpricks of Change that Enrich City Life, *by Jaime Lerner. Island Press, September 2014, 160 pages, $20.*

Reviewed by Jorge L. Hernandez

THESE TWO new books provide strong and timely messages for people concerned with the present and future of cities. Both of them look at the dense, often chaotic conditions of big cities and find solutions where others have seen mostly problems.





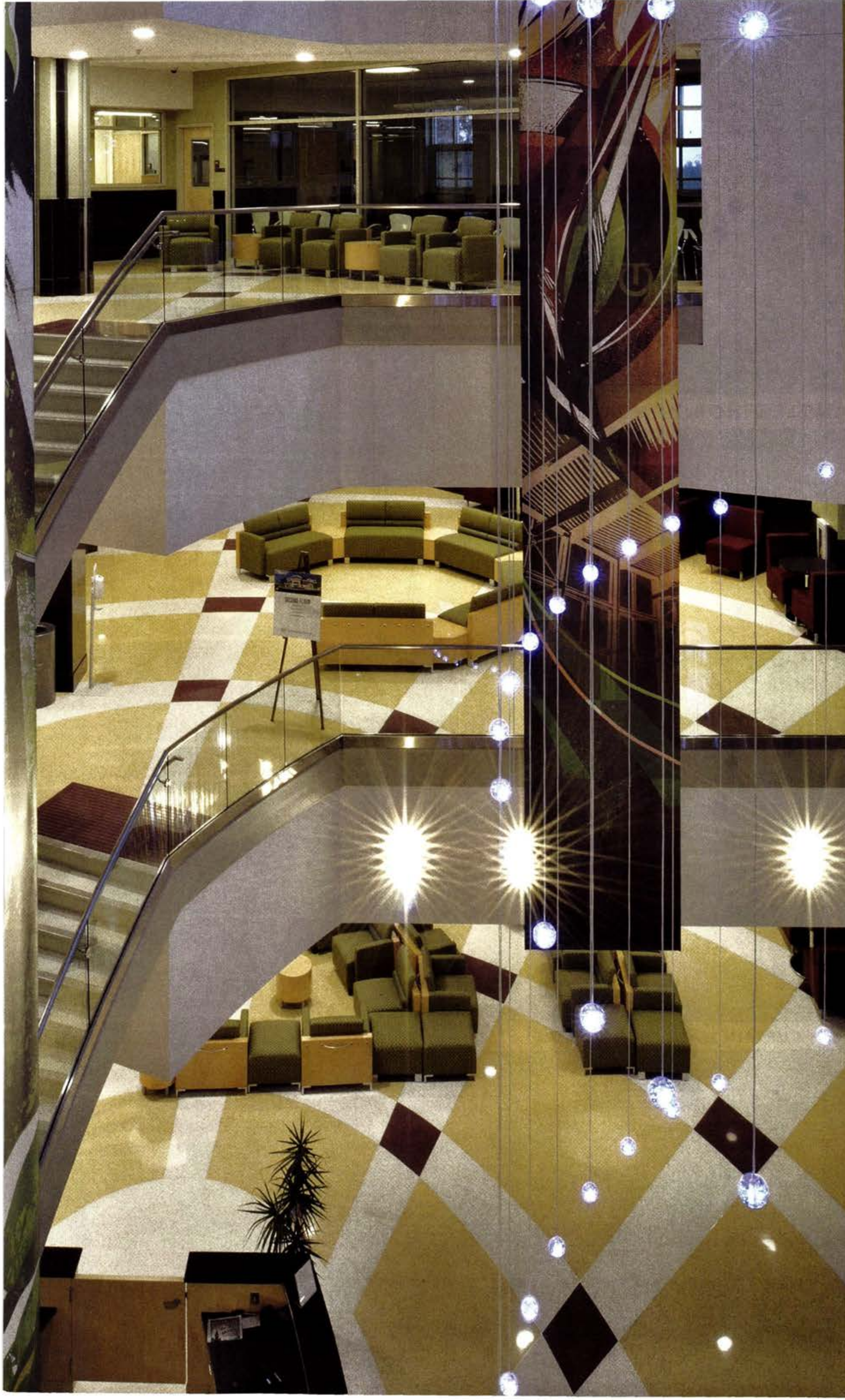
Focused on Latin America, McGuirk's book is carefully constructed, striking a balance between reportage and interpretation. A writer and curator who has worked as the design columnist for *The Guardian*, McGuirk describes what activist architects and politicians are doing to improve informal settlements in cities such as Buenos Aires, Lima, Rio de Janeiro, Caracas, Medellín, and Bogotá.

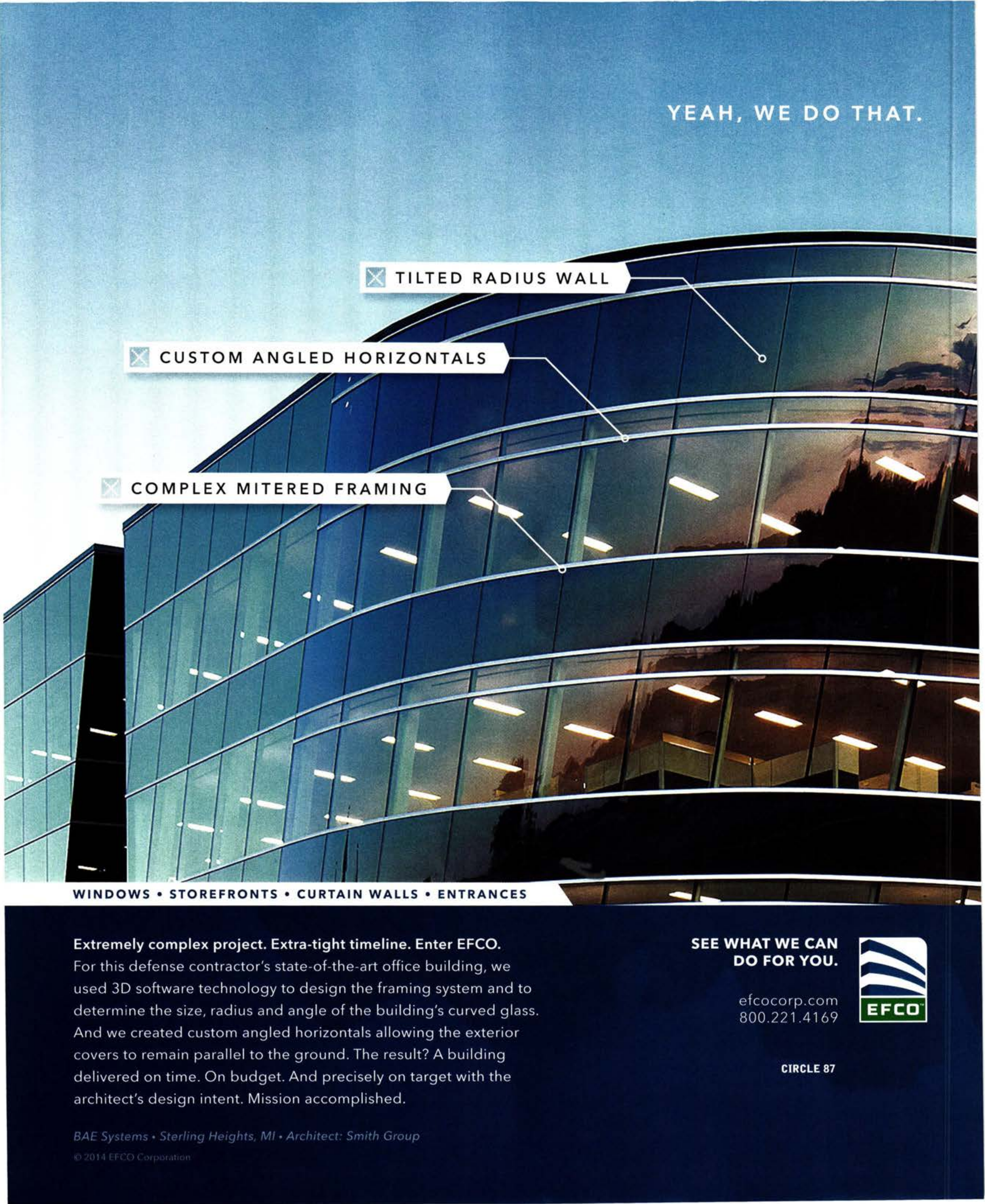
While architects and planners in North America and Europe distanced themselves from roles as advocates for social change in recent decades, many of their colleagues in Latin America found ways of addressing the issues of poverty and inequality, says McGuirk. In the north, "the pinnacle of architectural ambition . . . was the museum," he writes, and architects came to see "the museum as a tool of urban regeneration, not to mention urban branding . . ." But in Latin America, a new generation of architects has emerged in the past decade that is engaging with low-income communities and helping them find solutions to their problems.

Looking at his subject from a range of perspectives—socioeconomic, political, and architectural—McGuirk tells the stories of people like Alejandro Aravena, the Chilean architect who has initiated social housing projects and gotten residents to help complete them, and Jorge Mario Jáuregui, who has worked to improve the quality of housing and public spaces in the favelas of Rio de Janeiro. He ends with a chapter on Tijuana that examines the efforts of people such as Teddy Cruz and Raúl Cárdenas, who reimagine the border with the U.S. as a future center, rather than an edge.

In *Urban Acupuncture*, Jaime Lerner, an architect, planner, and former three-term mayor of Curitiba, Brazil, explains how small but smart interventions can make a big difference in cities. As mayor of Curitiba, he pioneered the use of dedicated bus lanes, showing how this humble means of transit could work in much the same way as subways do, but at a fraction of the cost. He casts his eye on places as disparate as San Francisco, Edinburgh, Paris, Moscow, and Tokyo, identifying the things he loves about cities. Pragmatic, idealistic, poetic, and humane, Lerner's book is both a primer and a manifesto on the necessity and indispensability of the metropolis. The author poignantly encourages the reader to save, heal, and love cities. ■

Jorge L. Hernandez is a professor at the University of Miami School of Architecture and a trustee of the National Trust for Historic Preservation.

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CIRCLE 87

ARCHITECTURAL RECORD

Guess the Architect Contest

ENTER NOW! **A monthly contest from the editors of RECORD asks you to guess the architect for a building of historical importance.**

CLUE: THIS INFLUENTIAL ARCHITECT WAS KNOWN FOR BRINGING TO MODERNIST DESIGN A MONUMENTAL SENSE OF SOLIDITY IN HIS CHOICE OF MATERIALS AND TIMELESS FORMS.

The answer to the October issue's Guess the Architect is **MICHAEL GRAVES**, who designed the Sheraton Miramar Resort El Gouna in Egypt in 1995. For more details, including the winner, go to archrecord.com.

By entering, you have a chance to win an iPad mini.
See the complete rules and entry form online at archrecord.com.

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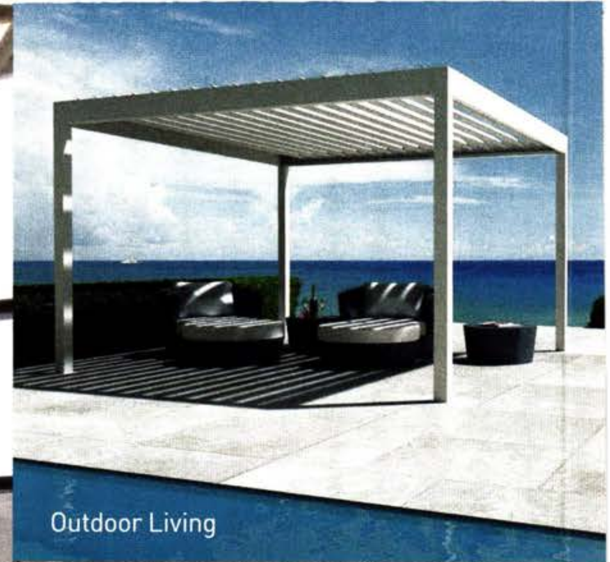
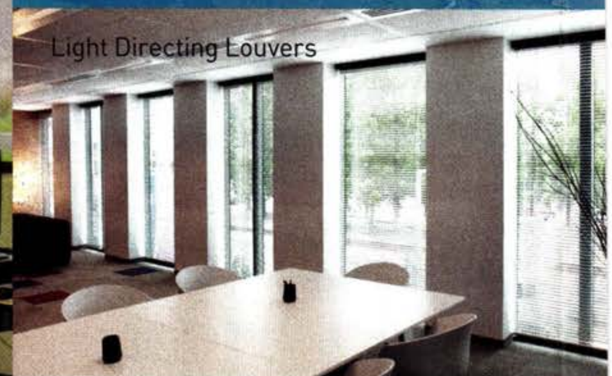
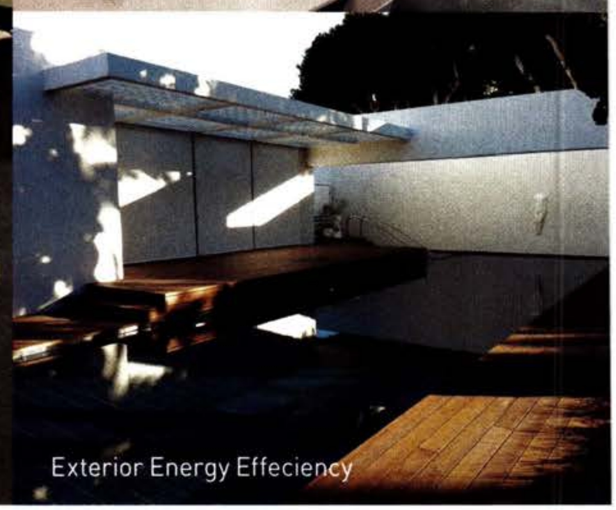
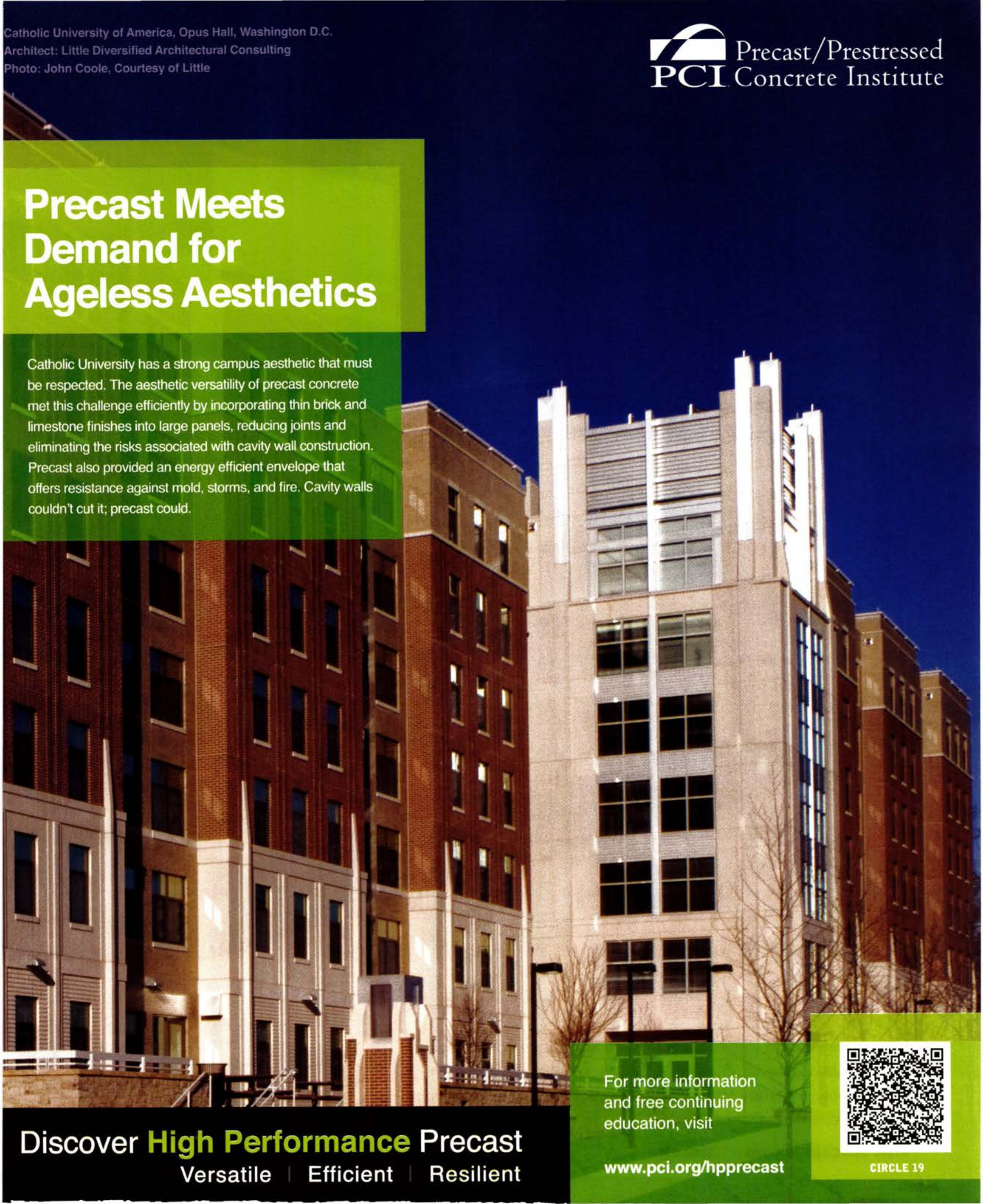
CIRCLE 37


Interior Solar Control


Outdoor Living


Light Directing Louvers


Exterior Energy Effeciency


Catholic University of America, Opus Hall, Washington D.C.
Architect: Little Diversified Architectural Consulting
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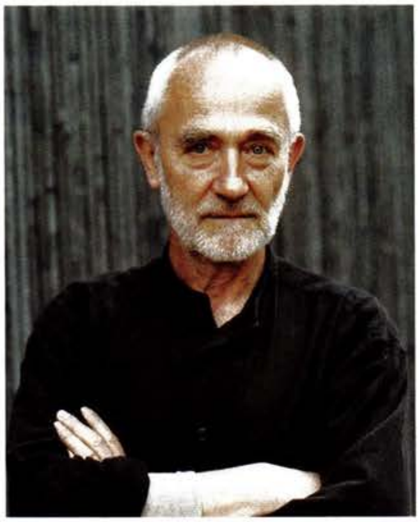
CIRCLE 19

The Blob that Ate Wilshire Boulevard

Architect Peter Zumthor talks about the evolution of his design for the Los Angeles County Museum of Art

BY SARAH WILLIAMS GOLDHAGEN

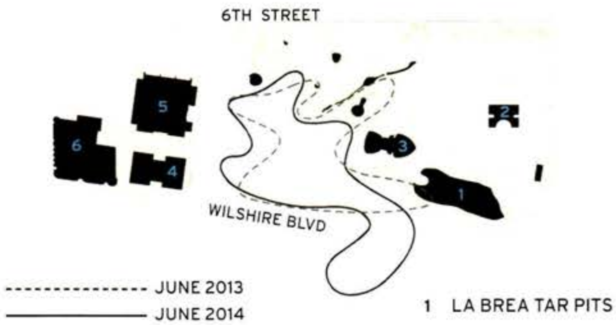


Peter Zumthor says his design for LACMA has developed in the months since the museum released his revised scheme in June 2014 (left and below).

IMAGES: © GARY EBNER (TOP, RIGHT); ATELIER PETER ZUMTHOR & PARTNER, (TOP, LEFT)

CRITICALLY ASSESSING Peter Zumthor's proposed 400,000-square-foot redo of the Los Angeles County Museum of Art—or indeed any major project in progress—is a risky enterprise. A sizable privately developed urban project that primarily serves the public tends to get people riled up. All that is much more so these days, since New York's Museum of Modern Art, of which LACMA might be a West Coast quasi-equivalent, has harmed its reputation because of two highly interventionist building campaigns, the first by Cesar Pelli in 1984 and one by Yoshio Taniguchi in 2004. Under no circumstances should the gigantism, commercialization, and appalling design judgment that has ensnared MoMA poison another major museum, and certainly not one as important as LACMA.

Designs are not buildings. Designs are not even half buildings. Designs are promises, flashbulbs of an idea. This past summer, Zumthor exhibited a newly revised design at LACMA, a black



1 LA BREA TAR PITS
2 PAGE MUSEUM
3 PAVILION FOR JAPANESE ART
4 BROAD CONTEMPORARY ART MUSEUM
5 RESNICK PAVILION
6 LACMA WEST (THE FORMER MAY COMPANY DEPARTMENT STORE)

concrete-and-glass Rorschach inkblot of a building raised 30 feet off the ground, oozing this way and that around the La Brea Tar Pits, with one part bridging Wilshire Boulevard before landing in a parking lot across the street. However prematurely, we must still try to understand and assess this work, because it is surely one of this country's most important current civic projects.

How to proceed, then? By trying to understand Zumthor's design *process*, that's how. This happens to be a topic that he and I have discussed several times over the course of many years—most recently this past summer, at his exquisite country home in Leis, Switzerland, about a 90-minute drive (depending upon the strength of your stomach) from his office in Haldenstein.

Zumthor begins most projects with an in-depth analysis of the site, of which he builds one or more large models. From there, he works slowly, and he works iteratively: once, he told me that for the *Swiss Sound Box* pavilion (Expo 2000, in Hanover, Germany), it took him nearly two years to come up with the 22 "rules" guiding the design. The design concept is only a start. Zumthor revisits it repeatedly, rethinking the site plan and its program, considering multiple structural solutions, visiting and revisiting the circulation system and the configuration of the interior spaces. Then he rethinks it all again. Long after most architects of his stature (he won the Pritzker Prize in 2009) would have handed off drawings to design associates, leaving them mainly in charge, Zumthor is still thinking.

This can go on for some years.

Our recent conversation confirmed that whatever gets built will be different—indeed, might be quite different—from even the most recently exhibited drawings and models. Zumthor's central form-concept, however, is likely to hold: LACMA will be a single-story building, elevated off the ground plane. It will be black concrete, and it will bridge Wilshire Boulevard, a revision that was necessary to retain the museum's projected square footage while steering clear of the 40,000-year-old La Brea Tar Pits, an active excavation site.

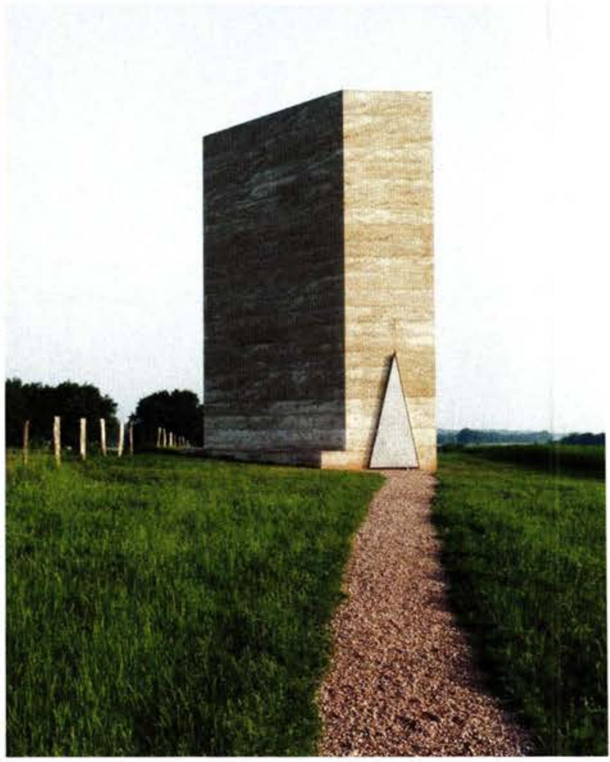
For many baby boomers, trying to envision a large building elevated off the ground plane ignites memories of dank, shaded, desolate spaces beneath Corbusier-influenced pilotii-supported buildings. But Zumthor is thinking that LACMA will be high enough above the ground—30 feet is more than the upper range of Lina Bo Bardi's widely admired São Paulo Museum of Art. As for LACMA's projected color, I was concerned that a large flat, dark, elevated expanse of a building might feel forbidding, and so inquired why Zumthor had chosen black. In the past, he has maintained that his color choice is consistent with LACMA's goal of radically reducing the museum's carbon footprint, but, this time, Zumthor's reply reflected how determinedly he circles back over decisions, refining forms and details, rethinking it all. "It might *not* be black," he said with a wicked smile. "It might even be white. In fact it *was* white—all last week it was white. But then I woke up one morning, and it was black again. And now I'm pretty sure that's right." Limiting the building to one story ensures that the galleries will (or at least could) be illuminated by daylight, via skylights, and elevating that single story 30 feet above the ground makes the entire building into a sort of horizontal watchtower, enabling visitors to really *see* the city's horizon. It could change how we see Los Angeles even more than the High Line has changed people's perspectives on Manhattan.

The biomorphic form emerged, Zumthor explains, "out of a long period of trial and error." At the Kunsthaus in Bregenz, Austria (his first ground-up museum), Zumthor had already demonstrated his deft urban sensibility by splitting off the exhibition spaces from the bookstore, admissions, offices, and café, placing them in a separate building. Together, the two buildings create a lovely little urban plaza, exquisitely scaled to the street and the city. But for LACMA, Zumthor explained, during the conceptual phase "there were moments of despair because classical urbanistic patterns" could not pull together all the disaggregated components at Hancock Park—Piano's neoclassicizing buildings; Bruce Goff's idiosyncratic Pavilion for Japanese Art; the tar pits; the Page Museum; and the May Company Department Store to the west. The site needed a new focal point, Zumthor knew. But he wanted something "soft on the edges, like a flower." Were the tar pits an inspiration? Yes and no. "Those tar pits are the soul of that site," he declares. But he insists—even when pushed on the obvious isomorphism of the tar pits and the LACMA footprint—that the LACMA design does not represent the image of the feature, or anything else.

Critics wondering if Zumthor "gets" Los Angeles may be asking the wrong question. The city matters, but so does the Ice Age site on which LACMA sits. Looking at art, Zumthor has said, can be a profound, even transcendental experience. For Los Angeles, Zumthor is less focused on the perpetual transience of the city than he is on the permanent—on what was there in Los Angeles before there even *was* a Los Angeles.

As for the interior galleries, Zumthor knows that sometimes the best way to absorb art is to be able to step away from it; that's one of the lessons from Louis Kahn's beloved Kimbell Art Museum and from the Yale Center for British Art. Zumthor intends to wrap the perimeter of the LACMA blob with a continuous, glass-enclosed ribbon of a veranda, varying its depth and the relationship of its walls to overhangs, depending upon view and geographic orientation. The result: in steamy Southern California, the veranda will offer climate-controlled public space, with yet more shaded public space below it. Users can come just to perambulate, taking in the scenery. Or they can use it to escape the art and look at the city spreading into the horizon. Or they can use it to escape Los Angeles *en route* to taking in the art.

Years ago, Zumthor told me how deeply impressed he was by the Process Art and Environmental Art that he saw exhibited in New York galleries in the late 1960s, when he was a student at Pratt Institute. His more recent work—the



The Kunsthaus Bregenz (KUB) in Austria, which opened in 1997, is Zumthor's first ground-up museum project (above, left). Zumthor is famed for his small yet monumental projects such as the Brother Klaus Field Chapel (above), completed in 2007 and located in a farming village, Wachendorf, in Eifel, Germany.

PHOTOGRAPHY: © MATTHIAS WEISSENGRUBER/KUNSTHAUS BREGENZ (LEFT); THOMAS MAYER (RIGHT)

(Zumthor, continued)
LACMA design, the addition to his own house and studio in Haldenstein, and the Brother Klaus Field Chapel in Germany—seems ever more inspired by the monumentality and land interventions of Robert Smithson, Richard Serra (with whom he is collaborating on a project), Robert Irwin, perhaps even Michael Heizer. For Zumthor, as for many of these land artists, architectural *form* is never the point. "At the office," he says, "we *never* talk about form"—a building's form emerges from the *experience* Zumthor aims to create. When you look at that Rorschach inkblot of a model, keep in mind that visitors will practically never experience the museum that way: only on a plane ride into town would anyone get that bird's-eye view. Zumthor is still working through the materials, the planning of the structural systems, entry sequences, and galleries. Everything he says about the LACMA design indicates that he expects this building to exude the emotionally rich, monumentally authentic presence of his celebrated spa for the Hotel Therme in Vals.

So what exactly can we be confident about in the LACMA design at this stage? The concept is thoughtful. The elevated horizontal plane will probably be fine, since it leaves enough space for Zumthor to shape the entrances and the plazas on the ground into appealing, functional spaces. Even the part bridging the boulevard will probably be fine. The site planning is brilliant: the museum will have as many as five entrances, which should disperse the oppressive cacophony of art-smitten masses that makes MoMA and other museums Bosch-like spectacles. The concept captures Zumthor and LACMA director Michael Govan's radical vision for what the museum-going experience should be. In Zumthor's organization of the interiors, no single work of art or collection will be presented, by dint of spatial hierarchy, as superior to others: they want the architecture to promote the feel of a democratic institution. They also want serene, contemplative galleries.

LACMA's concept dispenses with the visual histrionics of a Zaha Hadid or a Gehry

LACMA's concept dispenses with the visual histrionics of a Zaha Hadid or a Gehry. But this is entirely consistent with Zumthor's aesthetic. For LACMA and for Los Angeles, that may be a good thing. At least, it's not necessarily a bad thing.

And the recently revised footprint of the building is superior to the original. Tugging the inkblot's blobs farther apart not only sidesteps the tar pits but accomplishes two additional, highly desirable goals: it better integrates the existing Goff pavilion into the new design and breaks down the huge museum's exterior mass and vast interior spaces into smaller, more coherent connected spaces. The museum's various functions (art galleries; conservation and education; gift shop, restaurant, and entrance) and its collections (Asian and Pacific Art, European and American painting and sculpture, modern art, media, and design) would be housed in discrete nodes, each revolving around its own entrance. In four of these nodes the entrances are centrally placed, like a nucleus in a cell, and visitors will enter via a staircase wrapped into a glazed cylinder enclosing a sculpture courtyard. That way, users can visit just one node in the museum, leaving others for fresher days.

Will Zumthor's LACMA be the symphony that Los Angeles and LACMA's art collections deserve? It's too soon to know, especially as the design, like all Zumthor's smaller-scale, built projects, is driven much less by formal (one might even say photogenic) concerns than by sensory, tactile, visual, social, and associative experience. The human body and its experience of the environment remain Zumthor's core concerns. So we can be assured that this jump in scale need not necessarily affect the work's quality, since the human body's size, proportions, and much of its sensory experience remain the same, no matter how big the building. As for Zumthor's famous attention to architectural detail, he plans to open an office in Los Angeles next year, and to keep it open until the project is finished.

By the time I called Zumthor's office to check some of the facts in this article prior to publication, parts of the design had already changed. Zumthor is still thinking. But the day we spoke, he told me that each time he has to explain the project "is another test of the design concept, for me to see if it is right." So let's just let the man think. ■

Sarah Williams Goldhagen is the architecture critic for The New Republic.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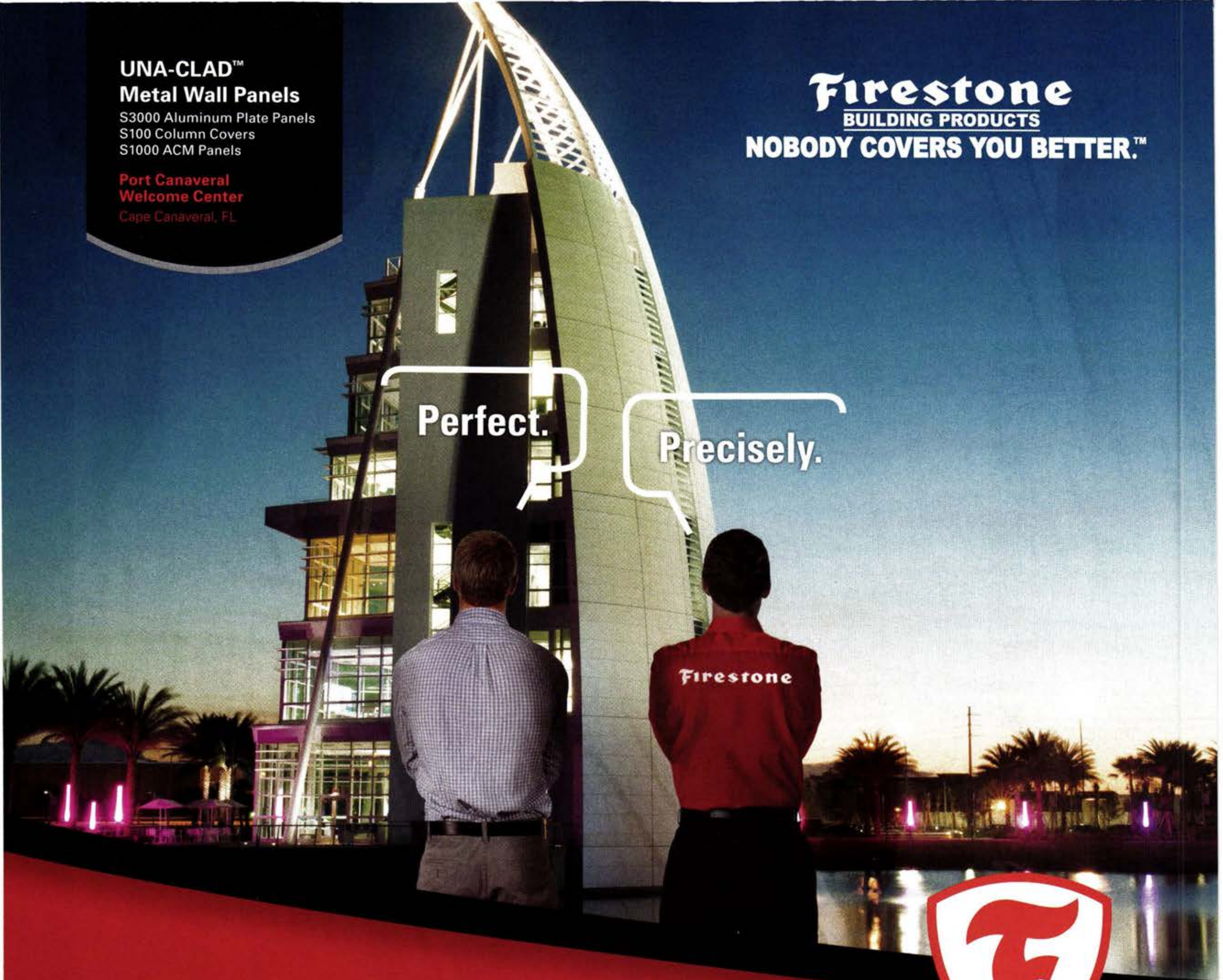
CIRCLE 86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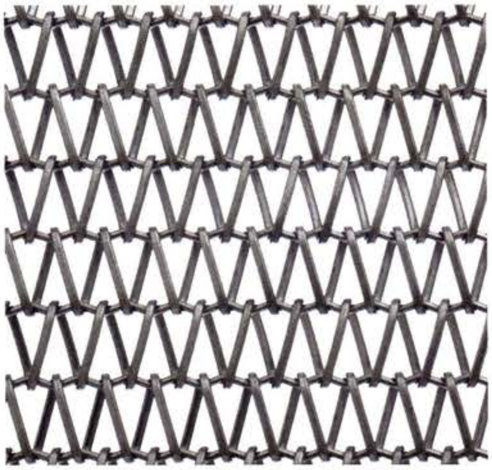
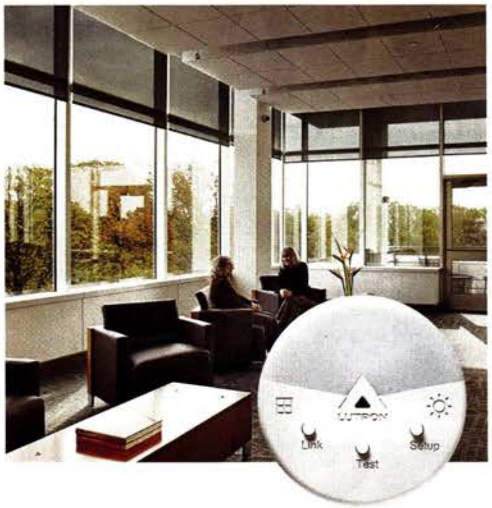
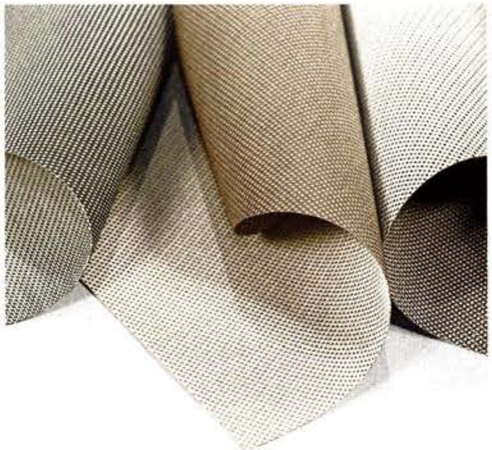
EXTERIOR AND INTERIOR SOLAR SHADING AND DIFFUSING SOLUTIONS RANGE FROM RESIN PANELS AND TEXTILES TO RESPONSIVE SYSTEMS.

BY SHEILA KIM







Custom Bus Shelters

3form 3-form.com

The San Bernardino Express (sbX) rapid transit system recently gained a series of bus stops designed by Gruen Associates to help shelter passengers from the California sun. The firm specified Transwhite 3form's Koda XT resin material, which was heat-formed in sizes ranging from 20" x 81" to 34" x 81" and then mounted onto a steel frame, resulting in subtly undulating canopies. **CIRCLE 200**

ShadeLoc

MechoSystems mechosystems.com

ShadeLoc eliminates the light gaps between shade bands by incorporating zippered edges that securely lock within 2"-wide side and 2½"-wide center channels. This motorized system enables the textile to glide smoothly and without the use of exposed hardware, such as guide cables, and stabilizes the cloth even as air pressure and flow within the room change. It is available with MechoSystems' 0700, 1300, and 6000 series shadecloths. **CIRCLE 205**

Mid Shade

Cambridge Architectural
cambridgearchitectural.com

One of five stainless-steel-mesh patterns recently introduced, Mid Shade features an open area of 54%, making it ideal for exterior solar shading on building facades. The 16-gauge, 1.4-pound-per-square-foot mesh can be tension mounted using the company's patented attachment systems. Mid Shade is also 100% recyclable after use. **CIRCLE 201**

Radio Window Sensor

Lutron lutron.com

The company's Hyperion Solar-Adaptive Shading software can now work in conjunction with a new Radio Window Sensor. The 1⅔" diameter, battery-powered units mount directly onto opposing mullions to detect the amount and intensity of natural daylight penetrating the windows. The Hyperion technology, in turn, uses those readings to automatically adjust Sivoia QS shades. **CIRCLE 204**

Bi-Color UniQuad

CPI Daylighting cpidaylighting.com

UniQuad consists of two independent translucent, insulated polycarbonate pieces, joined by interlocking aluminum connectors. In addition to diffusing daylight for a comfortable environment, the system makes a design statement when specified in the Bi-Color option, as demonstrated in the Eagle Center charter school (above, top) in Washington, D.C., by Shinberg. Levinas Architectural Design. **CIRCLE 202**

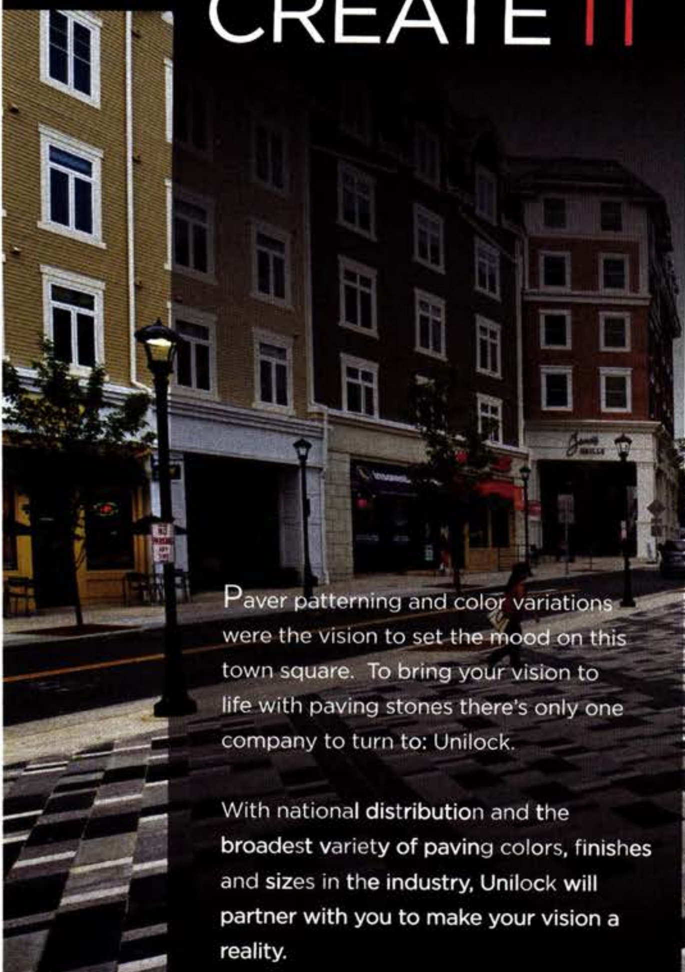
SheerWeave Style 4903/4901

Phifer phifer.com

The shade and screen manufacturer has added two new styles to its SheerWeave interior solar control series. Both 4903 (above) and 4901 are woven polyester-twill shade fabrics with coordinating reversible faces. Style 4903 has an openness factor of 3%, while 4901 features an openness of 1%. The two are available in 63" or 98" widths, and in 12 neutral colors that are well suited to a variety of settings, from health-care to residential and office. **CIRCLE 203**

For more information, circle item numbers on Reader Service Card or go to architecturalrecord.com/products.

CREATE IT



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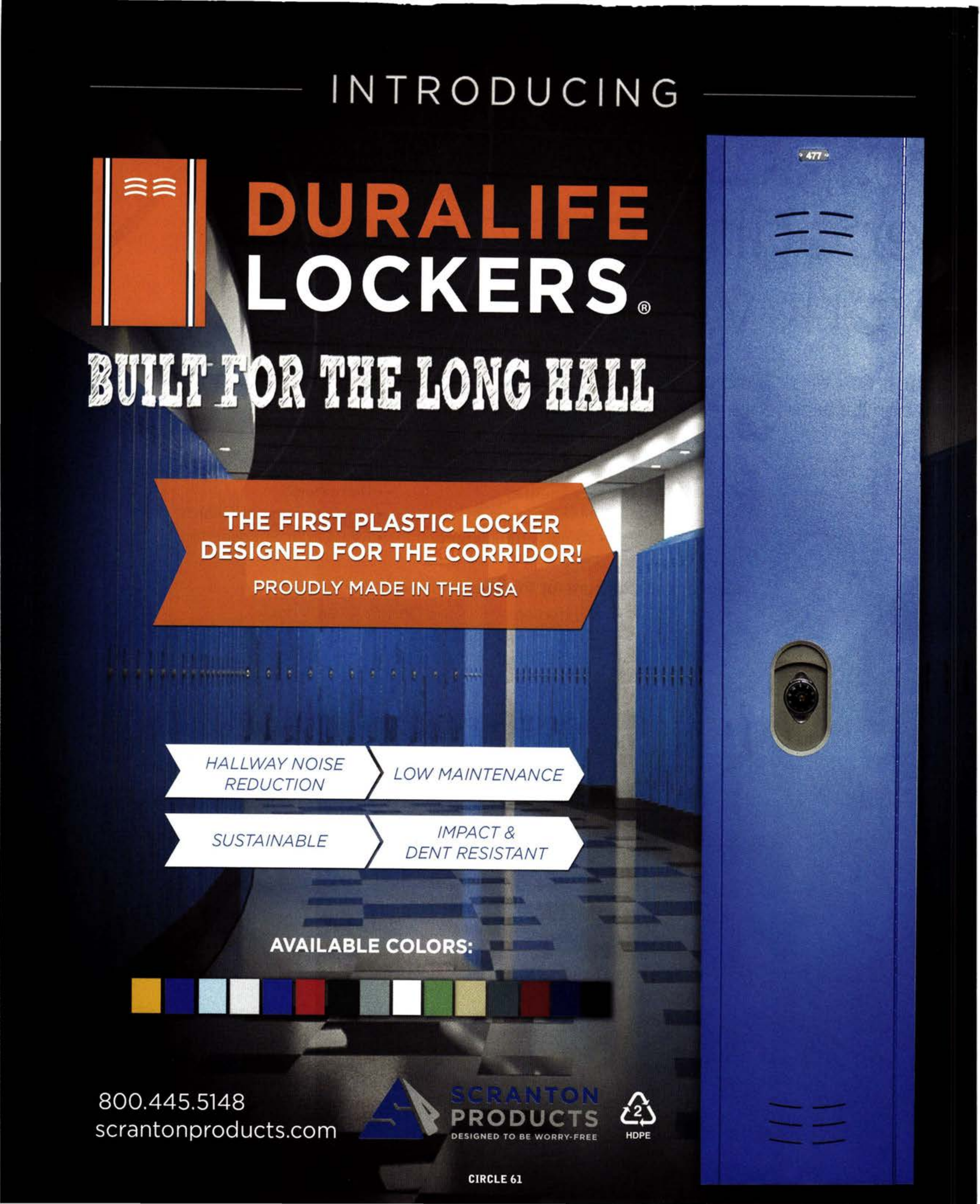
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CIRCLE 61

ARCHITECTURE EDUCATION NOW

GETTING STARTED Undergraduate students in Pratt Institute's Architecture School analyze design problems in a studio led by assistant professor Anne Nixon, principal of Brooklyn Office Architecture + Design in Manhattan.

With the soaring cost of architectural education, it is no surprise that students today question what the return on their investment is likely to be. These days, they can expect to pay over $44,000 in annual tuition for an undergraduate or graduate program that results in a job with a starting salary around $44,000. So it is little wonder that school rankings—which reflect practitioners' assessments of quality education based on graduates they would hire—attract so much interest. With this in mind, RECORD once more presents "America's Top Architecture Schools," the annual ratings compiled by the Greenway Group, a management consultancy. Given the high stakes, it is all the more important that the schools' leadership prepare their students for the demands of the profession. This year's report on the "Dean Scene" explores the varied challenges that recently appointed heads of highly regarded programs face in guiding architectural education into the future.

America's Top Architecture Schools 2015

RECORD presents the rankings of the top 10 undergraduate and graduate programs in U.S. schools, compiled by the Greenway Group.
James P. Cramer, chair of Greenway, talks about this year's findings.

BIOTECH BRAVURA
In December 2013, MIT architecture students of José Selgas created a pavilion of plastic and algae on the campus. The Madrid architect, a principal of the firm Selgas Cano, led the studio, aptly called Burglars of Transnature Technologies.

THE 2015 RANKINGS of top architecture school programs undertaken by the Greenway Group reveal few surprises. On the undergraduate level, Cornell University's B.Arch. program came in No. 1. While last year, the University of California, San Luis Obispo, knocked Cornell off a perch it had long held, Cornell wrested back its prime spot for 2015.

And once again, Harvard University's graduate architecture program places at the top. How do schools maintain their position or, better, move up? Greenway's chair, James P. Cramer, explains there are many reasons for the ratings, which appear in detail in the firm's November/December issue of *DesignIntelligence*. Two important factors, he says, are the number of firms responding to the survey, and the involvement of those architectural offices with their alma maters.

Adding heft to the findings this year is the size of the sample: in its survey for 2015, Greenway received responses from 1,059 professional practices and corporations, almost double the 693 participants last year (RECORD, November 2013, page 96). To enrich its data, Greenway also obtained responses from 78 deans and chairs and 2,619 students regarding significant concerns facing educators and future architects.

It seems that architectural education is still attractive as a serious pursuit. The most recent data from the National Architectural Accrediting Board (NAAB)—for the academic year 2012–13—lists 49 B.Arch. programs, down from 50 in the academic year of 2011–12. At the same time, the number of Master of Architecture programs, tallied at 102 for 2012–13, went up from 99 programs in 2011–12. Enrollment of students in B.Arch. programs, however, has decreased in the 2012–13 NAAB findings—to 14,418, down from 15,187 in the previous year. Nevertheless, at the graduate level, 11,412 students were enrolled in 2012–13, a slight rise over the 11,277 seeking an M.Arch. in 2011–12.

The reasons for fewer students' going after a B.Arch. last year could be many, says Andrea S. Rutledge, executive director of NAAB: it might stem from the higher cost of education, or a population dip in that age group. The growing popularity of four-year undergraduate architecture majors with a two-year master's—the so-called "four-plus-two"—also needs to be considered. Since undergraduate majors in preprofessional degree programs in architecture are not accredited by the NAAB, they are not ranked in Greenway Group's survey. However, Cramer says this would be high on Greenway's list to investigate for future rankings. *Suzanne Stephens*

The Top 10 Undergraduate Programs

1. **1** Cornell University
2. **2** California Polytechnic State University, San Luis Obispo
3. **3** Rice University
4. **4** Virginia Polytechnic Institute and State University
5. **5** Syracuse University
6. **6** University of Texas at Austin
7. **7** Rhode Island School of Design
8. **8** Southern California Institute of Architecture
9. **9** Pratt Institute
10. **10** University of Southern California

The Top 10 Graduate Programs

1 Harvard University
2 Columbia University
3 Yale University
4 Massachusetts Institute of Technology
5 Cornell University
6 University of Michigan
7 Rice University
7* University of Pennsylvania
9 University of Virginia
10 University of California, Berkeley

COMPARISON OF PREVIOUS RANKINGS: UNDERGRADUATE

	2015	2014	2013	2012	2011	2010	2009	2008
Cornell	1	2	1	1	1	1	1	2
Cal Poly San Luis Obispo	2	1	5	4	4	3	3	4
Rice	3	3	3	5	3	9	8	11
Virginia Tech	4	5	7	3	4	4	2	1
Syracuse	5	6	3	7	2	2	4	3
UT Austin	6	4	6	2	7	5	6	6
RISD	7	10	7	6	11	7	4	17
SCI-Arc	8	9	2	7	6	-	19	-
Pratt	9	11	11	10	9	15	12	9
USC	10	7	16	12	9	10	12	12

COMPARISON OF PREVIOUS RANKINGS: GRADUATE

	2015	2014	2013	2012	2011	2010	2009	2008
Harvard	1	1	1	1	2	1	1	1
Columbia	2	3	2	3	4	4	3	3
Yale	3	2	3	2	3	2	4	13
MIT	4	4	4	6	5	3	4	2
Cornell	5	5	5	6	6	7	6	3
U Michigan	6	7	11	8	1	-	9	8
Rice	7	5	15	14	16	15	16	10
U Pennsylvania	7	14	15	8	8	11	-	18
UVA	9	18	7	11	14	9	11	13
UC Berkeley	10	9	7	14	10	9	17	8

*Where more than one school receives the same number of votes, the schools are given the same numerical ranking, and the next rank is omitted.

RECORD: Do you see particular trends in the rankings of architectural schools this year?

JAMES P. CRAMER: The rankings reflect a changing approach to architectural education. Advances in technology, materials, and methods such as integrated design—along with increasing globalization and the intensive adoption of sustainability principles—are changing the profession. This is causing architecture school faculties to interact with the profession to a greater degree than in the past.

What are the biggest changes in the rankings? And what is the cause?

In just one year, the University of Pennsylvania moved up from number 14 to number 7 in the M.Arch. rankings. I would say Penn is perceived as being increasingly in sync with changes in the profession because of its emphasis on urban design. When I visited last spring, I could feel the energy. Also, the University of Virginia climbed from number 18 to 9 in the graduate school rankings. The school has put increasing emphasis on communicating with the profession. The UVA students themselves report high satisfaction: 64 percent tell us that their education was excellent, while 34 percent said it was above average. That is an impressive 98 percent in the top two levels.

Just below the top ten we find some interesting activity, which *DesignIntelligence* will be revealing in its November/December 2014 issue. There is a marked ascendancy in ranking of programs at University of Illinois, Urbana-Champaign; Tulane; University of Arkansas; and the Savannah College of Art and Design.

Science, Technology, Engineering, Mathematics (STEM) seems to be influencing architecture schools' curriculums. What is that about?

In essence the trend indicates that art and theory are less important and that the highest-paid careers will be in the

STEM domain. We all know that architecture is both an art and a science, but we expect to see more research and alliances with the product manufacturers on materials, and with the public sector on city planning and urban design. Science is quite strong in the studios of many architecture schools, with initiatives at MIT, Georgia Tech, New Jersey Institute of Technology, the University at Buffalo, and RPI, to name a few. These schools are not only exploring new metrics of evidence-based design research, but they are measuring characteristics of green materials and the impact of resilient design and sustainability. These schools are playing a leadership role.

With more interaction between architecture schools and the profession and less of an emphasis on art, history, and theory, will architectural education become more vocational?

Not necessarily. Architects increasingly say that schools should be responsive to the shifts, trends, and game-changing developments as they appear. Of course, schools are all different: some have a stronger emphasis on history and theory and are still relevant. At the same time, you see places cited for other aspects: Auburn University stands apart for its construction methods and materials coursework; the University of Oregon has positioned itself well in sustainable design; and Virginia Tech has become known for its technology and computer applications. This year, 321 firms told *DesignIntelligence* that Cal Poly, San Luis Obispo, is one of the schools they admire most because of its emphasis on computer applications on design and construction.

What is the job market today for students just coming out of school?

The economic effect of the Great Recession on all the traditional professions was ugly. And yet according to the Design Futures Council, there is zero unemployment in architecture. Indeed, we are on the cusp of a severe shortage of talent. The Bureau of Labor Statistics estimates a 17 percent growth rate for architecture between now and 2022. Architectural firms tell us they have the work but can't find enough of the right people—particularly architects skilled in specialized building types and sustainable design practices.

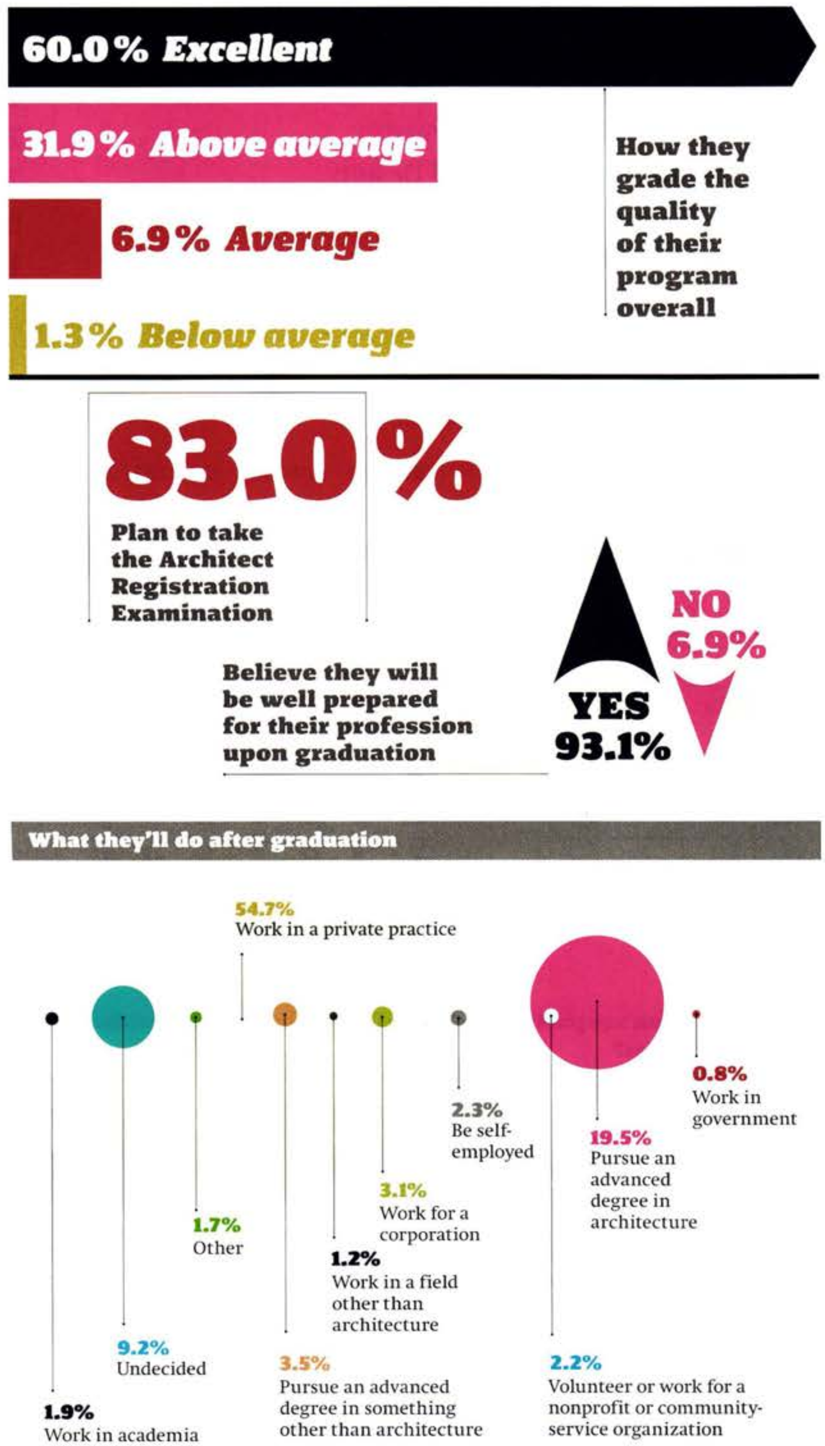
The construction industry is cyclical, and smart firms are diversifying their market mix of building types while putting emphasis on project management, service, and profitability. No doubt there will be some more curveballs thrown at the profession by the economy and world events, but the recession taught the profession to be creative and resilient with its management tactics and design priorities.

Architects don't get paid very much. Why do you think it will be a strong profession in the years ahead?

While it's true that architects currently don't make as much money as some other professionals, they can expect to have a starting salary of about $44,500 a year, and about $3,000 higher if they have an M.Arch instead of a B.Arch. Some firms are recruiting top graduates with $60,000-a-year packages, which usually include overtime. After three to five years, the income level begins to rise steadily and outpace many other professions'. Licensure adds more. Over a 40-year career, a typical architect will earn something more than $4.1 million in today's dollars—much more if he or she becomes a partner with equity in a successful firm. Architects with entrepreneurial and leadership abilities

Architecture Student Survey

This year, 2,619 students responded to *DesignIntelligence*'s questions about their satisfaction with their education in 60 schools. Of this group, 36 percent is B.Arch. and 31.6 percent is M.Arch.; if all undergraduate architecture programs are grouped, including B.Arch., B.S. (16.9 percent), and B.A. (11.4 percent), that percentage rises to 65 percent. As the sample indicates, the students generally approve of the education they are receiving, and many consider it superlative.

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Skills Assessment

The academic programs that practitioners deem strongest for each skill area:

DESIGN

1	Harvard
2	SCI-Arc
3	Yale
4	Columbia
5	Cornell

SUSTAINABLE-DESIGN PRACTICES & PRINCIPLES

1	U of Oregon
2	UC Berkeley
3	Cal Poly SLO
4	MIT
5	Auburn

COMPUTER APPLICATIONS

1	MIT
2	Columbia
3	SCI-Arc
4	Harvard
5	Cal Poly SLO

CONSTRUCTION METHODS & MATERIALS

1	Cal Poly SLO
2	Auburn
3	Virginia Tech
4	U of Michigan
5	GA Tech

CROSS-DISCIPLINARY TEAMWORK

1	Harvard
2	MIT
3	Cornell
4	Cal Poly SLO
5	Columbia

These charts reflect combined accredited B.Arch. and M.Arch. programs.

Top 5 Significant Issues

This year, *DesignIntelligence* polled 78 deans and chairs, along with 1,059 professional offices and corporations, to assess the top five significant issues from each of their perspectives.

DEANS AND CHAIRS

1	Sustainability/Climate Change
2	Speed of Technological Change
3	Integrated Design
4	Urbanization
5	Maintaining Design Quality

FIRM LEADERS

1	Sustainability/Climate Change
2	Maintaining Design Quality
3	Integrated Design
3	Speed of Technological Change
5	Retaining Quality Design Staff

should do very well in the years ahead.

How can architecture schools prepare students to become leaders?

They can develop a leadership culture. The design studio is a great place to learn these skills, and trends indicate that both sustainability and business acumen can be taught well in the studio. Fortunately for students, design thinking and business leadership are in good supply at many of the accredited schools such as Harvard, Columbia, Yale, Cornell, and UC Berkeley. But I see compelling evidence of this effort at such schools as the University of Arkansas, University of Oregon, Kansas State, and Georgia Tech, or even Mississippi State University, which has a small but well-run undergraduate program. Every school should have a leadership agenda, with a faculty that supports it.

Are more architectural offices going to merge into mega-firms? Will there be a place for the smaller practice?

According to our interviews, mega-sized architecture firms that are publicly held (AECOM, Jacobs, Stantec, etc.) represent an experimental phase for the profession, not a paradigm shift. The question is, will they be able to retain the top talent they acquire? Meanwhile, smaller professional practices can still serve as hothouses of creativity, and firms of all sizes can thrive as long as they have leadership and a strategic plan.

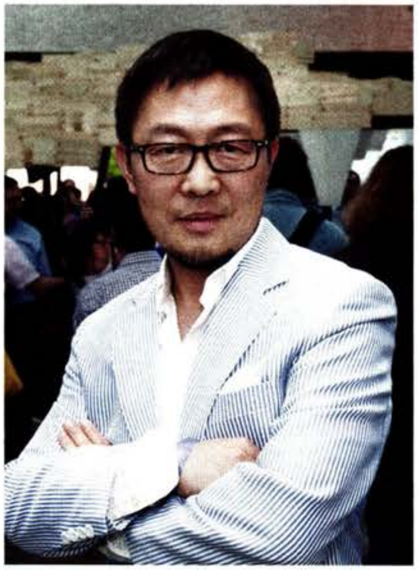
What about the trend for online education? Do you see any significant attempts in accredited architecture programs?

I am familiar with three online initiatives: Boston Architectural College; Southern Illinois University; and Lawrence Institute of Technology, which was just accredited by the NAAB. Each requires students to be on campus for some portion of their education—there are no full-time online track programs yet. I would add that these three programs are suited for someone with a BS in Architecture who is seeking to get licensed but currently does not have an accredited degree. ■

James P. Cramer is founding editor of DesignIntelligence *and chair of the Design Futures Council. He is also chairman of Greenway Group, a management consultancy.*

Methodology

Greenway Group, as it usually does, sent surveys to CEOs, managing partners, and human resource directors asking about their findings in hiring architecture graduates. The respondents could select up to 10 NAAB-certified undergraduate and graduate programs in each category. Each survey response was checked for authenticity and validated by the research staff at Greenway Group. In cases of dubious or unreliable information that could not be confirmed, researchers eliminated the questionable return. Researchers also confirmed that the person responding to the survey was in a hiring capacity. In addition to the architectural component of Greenway Group's research, the study includes rankings and satisfaction surveys for the professions of interior design, landscape architecture, and industrial design. This information is published in *DesignIntelligence* annually, along with a comprehensive list of the firms and employing organizations participating in the research.


TOP ROW, LEFT TO RIGHT

CORNELL Since 2008, Kent Kleinman has led its College of Art, Architecture and Planning through a transformative period.

UNIVERSITY OF SOUTHERN CALIFORNIA A practitioner in his native China, Qingyun Ma wants architecture to propel global urbanism.

RENSSELAER POLYTECHNIC INSTITUTE Evan Douglis sees architecture as a necessary combination of art and science.



BOTTOM ROW, LEFT TO RIGHT

HARVARD Mohsen Mostafavi hopes to realize a truly interdisciplinary practice of design.

UNIVERSITY OF MICHIGAN For Monica Ponce de Leon, academia is a laboratory unencumbered by the contingencies of practice.

ILLINOIS INSTITUTE OF TECHNOLOGY A prolific builder, Dutch architect Wiel Arets takes on the legacy of Mies at IIT.

The Dean Scene

by Josephine Minutillo

Much like the practice of architecture itself, the job of shaping professional education is increasingly complex.

PHOTOGRAPHY: (CLOCKWISE FROM TOP LEFT, OPPOSITE) © WILLIAM STAFFELD/CORNELL UNIVERSITY; CHRISTA MAE; RENSSELAER/MARK MCCARTY; JOHN BOEHM; COURTESY UNIVERSITY OF MICHIGAN; COURTESY HARVARD GRADUATE SCHOOL OF DESIGN

On October 1, Alejandro Zaera-Polo abruptly stepped down as dean of Princeton's School of Architecture—a resignation that put an end to his embattled tenure of two years. While the circumstances surrounding his sudden departure have not been officially clarified, speculation is rife that conflicts with students and colleagues may have played a role. Whatever the reason, the situation spotlights the challenges faced by the leaders shaping architectural education and the schools looking to fill those positions. Zaera-Polo's predecessor, Stan Allen, will serve as acting dean and chair the search for a replacement. Finding a new dean may not be easy.

Princeton is just the latest top-tier architecture program embarking on such a mission. In June, MIT named Mark Jarzombek acting dean of its School of Architecture + Planning, while a search committee to replace outgoing dean Adele Naude Santos hoped to conclude its work this fall. In May, Elizabeth K. Meyer was named dean of the University of Virginia School of Architecture, where she has been widely respected as a professor for decades. Her two-year appointment, however, rather than the standard five-year contract, gives U.Va. some time to look for a more permanent replacement. Hernan Diaz Alonso will succeed Eric Owen Moss as director at SCI-Arc next year. At the once tuition-free Cooper Union, which has been facing annual budget deficits in the tens of millions, a year-long search continues since Anthony Vidler stepped down as dean after 12 years. The process has been made more complicated amid unconfirmed reports that former Harvard architecture chair Preston Scott Cohen turned down an offer.

The job of dean, like the practice of architecture itself, has become increasingly complex. It's not enough to be a well-regarded academic or a capable administrator; deans are expected to be visionaries, diplomats, and, maybe most important of all, superb fundraisers. Having a big name appears to be desirable as well, since the architects filling deans' shoes these days often have high-profile reputations in design, research, teaching, and lecturing.

Of course, leading architectural figures have run schools before. But unlike Mies van der Rohe's postwar transformation of Chicago's Illinois Institute of Technology (IIT) or John Hejduk's quarter of a century as the first architecture dean at Cooper Union, the one thing schools today are not looking for is someone with a single distinctive orientation. As dean of the Yale School of Architecture for 17 years, Robert A. M. Stern has been extremely successful thanks to his dynamic curriculum, which provides students with a wide range of design perspectives, despite the traditional nature of his own architecture.

Deans today need to manage programs that are nimble enough to prepare students for the global nature of practice, the increased emphasis on sustainability, and the integration of digital design and fabrication, among other things. At the same time, they must address such pragmatic concerns as tuition costs that are outpacing starting salaries in the profession and the slow path to licensure.

Many schools have embraced interdisciplinary education to anticipate the future of practice. At Harvard's Graduate School of Design, there has been a recent emphasis on collaborating more systematically across departments and with other schools on campus. "We are working hard to bring together thoughts and ideas from different design disciplines and understand that relationship to other disciplines including medicine, public health, education, and law," says Mohsen Mostafavi, dean of the GSD since 2008. "The practice of architecture can't just focus forever on purely being a service sector, waiting on clients to come to us. If we're going to be effective, we must gain greater importance as designers. A key component of that is the capacity of architecture to have greater influence–to matter more."

Mostafavi, overseeing ongoing work at the GSD's Gund Hall and additional renovations at newly acquired facilities, explains, "The traditional studio space may not be sufficient." A proposal is in the works to build a research tower too. State-of-the-art facilities obviously help attract faculty and students, and Mostafavi has experience spearheading building campaigns: in his previous post as a dean, he helped bring Rem Koolhaas to design Milstein Hall (RECORD, February 2012, page 44), the first new building at Cornell's College of Architecture, Art, and Planning in over 100 years.

His successor at Cornell, Kent Kleinman, battled to get Milstein built during the depths of the recession and mounting opposition to spending money on its construction. Since its completion in 2011, the building–with its open studios and absence of formal classrooms–has been transformative for the school, according to Kleinman. "Every student can see what others are doing," he says. "This oblique form of pedagogy is very powerful."

Other schools with new facilities include Marlon Blackwell's addition to the University of Arkansas' school of architecture (RECORD November 2013 page 128) and Thomas Phifer's architecture school addition for his alma mater, Clemson University in South Carolina (RECORD, November 2013, page 116). Such buildings underscore a university's commitment to its architecture program, but location and opportunity to travel may play an even greater role in preparing students for today's international scope of practice. A challenge for Peter MacKeith, the new dean at Arkansas, is spurring the place-based architectural legacy of Fay Jones (for whom the school is named), to evolve from a local and regional level to an increasingly global one.

And while Cornell's remote campus in Ithaca, New York, has the advantage of producing "an intensity, focus, and type of thought process that is almost monastic," according to Kleinman, he adds, "I don't think you can be a well-educated architect today and not be grappling with the question of the city." Cornell's program in New York, begun eight years ago, has grown to be as popular as the school's nearly 30-year-old Rome program.

Since Wiel Arets became dean at IIT in 2012, some people wondered if the Illinois school would get enough of his attention because of the demands of his international practice–he has offices in Amsterdam; Maastricht, Holland; and Zürich. But according to Arets, his focus is Chicago. He wants to bring big thinkers into the school, as he did when leading the Berlage Institute in the Netherlands. He also looks to the legacy of Mies–whose birthplace in Aachen is just 7 miles from where Arets was born–as an example of how to play a role in the city and the discipline at large. "Mies was an architect, but also a speculator and a theorist," says Arets. "Like Mies, I want to develop ideas that can be

Amale Andraos Speaks

by Aleksandr Bierig

The newly appointed dean of Columbia University's architecture school discusses the challenges ahead.

PHOTOGRAPHY: COURTESY COLUMBIA UNIVERSITY

AFTER AN extensive search, Lee Bollinger, president of Columbia University, announced on August 12 the appointment of Amale Andraos as dean of the Graduate School of Architecture, Planning and Preservation (GSAPP). Those who had been following the process were caught off guard–Andraos had been on the school's search committee, which does not usually consider its own members as candidates. Yet, as Bollinger explained, her contributions to the discussion convinced him that the future dean was right in front of him.

Andraos, whose father practiced architecture, was born in Beirut, Lebanon, and has lived in Saudia Arabia, France, Canada, and Holland. She attended McGill University before receiving her M.Arch. from the Harvard Graduate School of Design, later working for the Office for Metropolitan Architecture in Rotterdam. Andraos founded the New York–based WORK Architecture Company (WORKac) with Dan Wood in 2003. Though she has taught in a number of architecture schools throughout the northeastern United States, she is still a relatively young practitioner–age 41–with a modest body of work. RECORD recently spoke with Andraos about the current direction of the school and of the architectural discipline.

ALEKSANDR BIERIG: There's been some sense that you are the first dean from a "new generation" of architects. Do you see yourself in that light?

AMALE ANDRAOS: I do feel part of a network of architects working globally, who encounter similar struggles and find similar ways to deal with them. I also feel very strongly that we are a kind of post-starchitect generation, interested in architecture and social engagement and environmental concerns. Practices are more collaborative, and hybrid models involving various disciplines are emerging.

How could Columbia promote these new ways of working?

Something unique about GSAPP is that we don't have a single definition of "practice." We have people like David Benjamin, who moves between the digital and the material worlds, or Laura Kurgan, who is defining another model through data visualization, or Kate Orff, who has pioneered thinking between urbanism and ecology. And there is Hilary Sample, whose work is very architectural but at the same time engaged with questions of public health. In my case, WORKac started researching food, and now we're building the Edible Schoolyard in Brooklyn. This is not an either/or condition, where either you do architecture or you are socially engaged. You can find ways to do both.

There are also negative effects of global practice—for example, how it often reinforces economic or ecological inequalities. Is Columbia a place for conversation about these issues?

Columbia should certainly lead the discussion. In October, I cohosted a symposium, "Architecture and Representation: The Arab City," that addressed questions of cultural representation and the reductive nature of what is often produced in this kind of global practice. Intense collaboration among architects who are working in a particular place allows us to understand these contexts, but there are also issues that are not specific to place. If you are concerned with ecology and environment, or with issues of equity, you'll find that the dynamics of globalization are producing similar conditions around the world.

Are there things you'd like to change in the coming years at Columbia?

I'm obsessed with architectural models. Students today can sometimes show too much reliance on heavy technology—I don't think you need to make a cube with a 3-D printer. I want to bring back the culture of physically making things.

Are you suspicious of some of the technological tools available?

No, not suspicious. It's about choice. If you're simply waiting for your laser-cut file, you're not in control. GSAPP has a great legacy of working with a lighter, softer infrastructure rather than a heavy, weighty type—one thinks of [former dean] Bernard Tschumi's paperless studio, or [former dean] Mark Wigley's interest in networks. We need to have agility to move across different platforms.

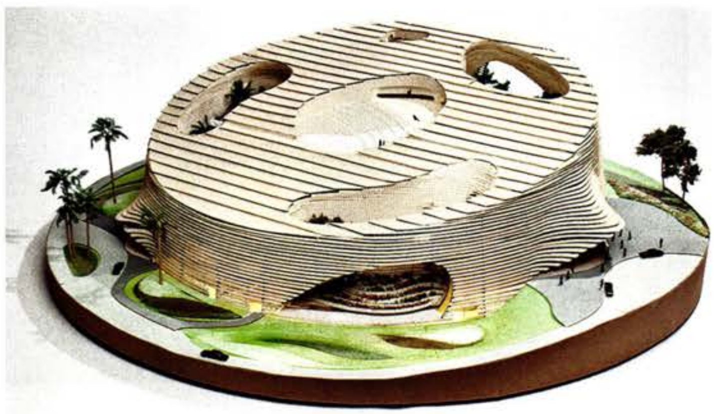
How do you balance that agility with discussion of structural issues that are difficult to change? Is the school a place for utopian thinking? For design ideas based on imagining new societal structures?

A school should engage the world as it is, with a high optimism in its ability to change it. I would say that we now realize that working with the real is as utopian as anything else. But *utopian* is such a loaded word. Students are creative, critical, entrepreneurial, strategic. But I wouldn't see the school as utopian.

Do you think that position is partly a result of the conditions under which you've practiced over the past 20 years?

I don't see my practice as the same as the school. I think they're very separate, and in my practice we have had an interest in visionary urbanism and its agency. But the goal is to work with the real and be utopian at the same time, with a kind of stubborn insistence that we can engage the real. But it's not an unconditional engagement. It's not "yes to everything." It's a very conditional engagement, but it's an engagement nevertheless. ■

Aleksandr Bierig is a Ph.D. student at Harvard's Graduate School of Design and a former editorial assistant at RECORD. *His writing has appeared in* RECORD, Architectural Review, Log, Clog, *and* Pidgin.



WORKac designed the Assemblée Radieuse, a conference center under construction in Libreville, Gabon (left). The firm just completed offices in New York City for Weiden & Kennedy (below).

PHOTOGRAPHY: © RAYMOND ADAMS (TOP); BRUCE DAMONTE (BOTTOM)

RICE UNIVERSITY Sarah Whiting has led Rice's small but prestigious programs since 2010.

UNIVERSITY OF ARKANSAS Peter MacKeith was installed this fall as the dean of the Fay Jones School of Architecture.

implemented in our urban context."

Despite the interest in metropolises such as New York, Rome, or Chicago, there is a shift in focus from the capitals of Western civilization to the centers of contemporary building activity. At the University of Southern California School of Architecture, dean Qingyun Ma looks to the vitality and cross-disciplinary nature of the Rome model but applies it to his mobile American Academy in China. Studio-X Global, an initiative of former Columbia Graduate School of Architecture, Planning and Preservation dean Mark Wigley, encourages students and faculty to explore the future of cities with labs in changing locations from Beijing to Johannesburg. His replacement, Amale Andraos (see sidebar), is a practitioner who works globally, currently in Africa.

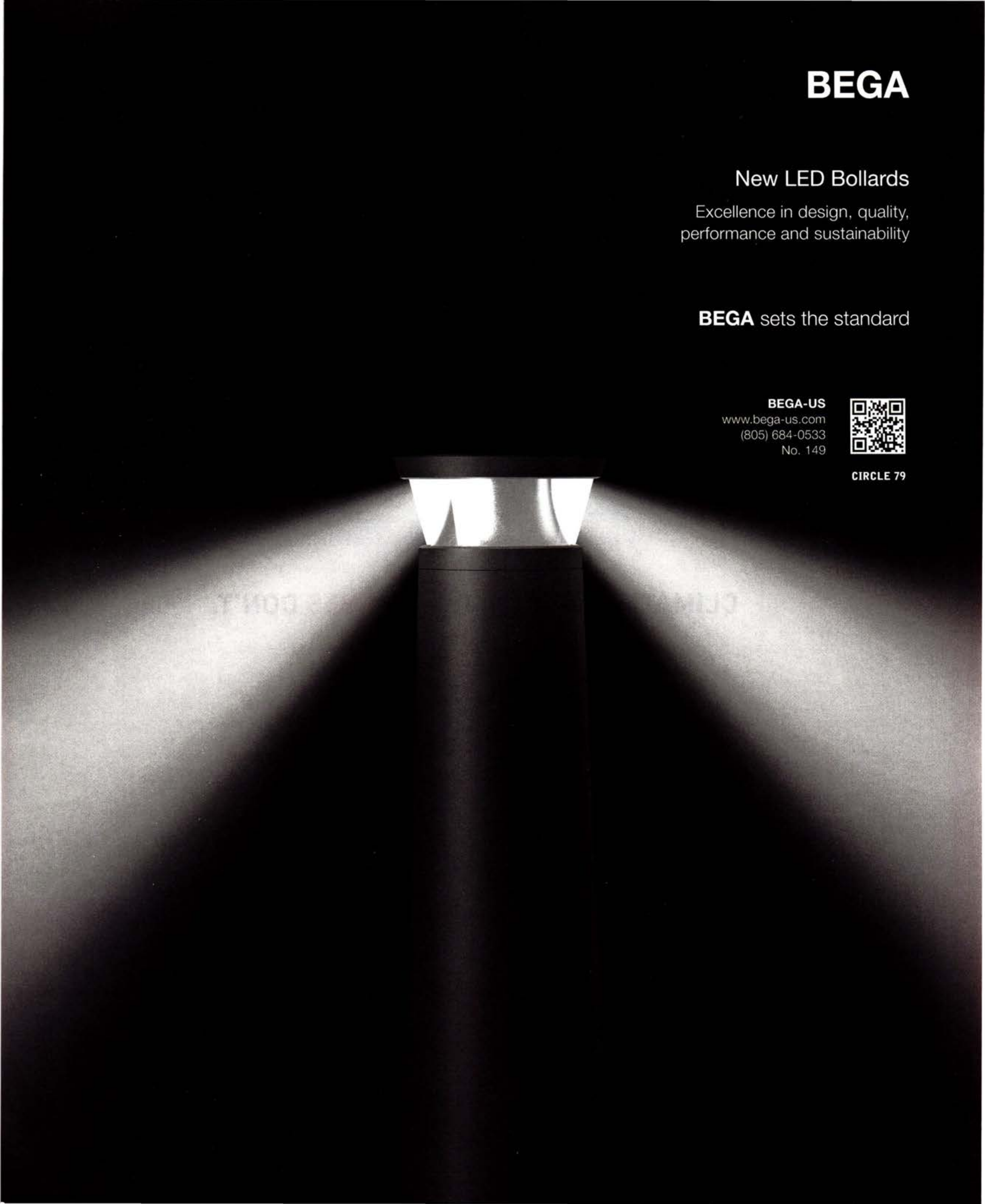
Monica Ponce de Leon, dean of the University of Michigan's Taubman College of Architecture and Urban Planning since 2008, has also put an emphasis on introducing students to the world at large. More than a quarter of the students enroll in travel-abroad courses, although a new urban design program focuses on one city—Rio de Janeiro, Mumbai, and Mexico City thus far—for an entire year, engaging local institutions and government.

De Leon also understands that the practice of architecture "is messy" and feels students should be given the space in school to think about an alternate future for the profession. She is one of several deans interviewed for this article opposed to the recent announcement by the National Council of Architectural Registration Boards (NCARB) considering the creation of an alternative—and optional—path to architectural registration that would permit candidates to be licensed upon graduation. "To embed the Intern Development Program (IDP) in schools would damage the profession profoundly," says de Leon. "We already struggle to fit everything into two- and three-year programs."

At Rice University School of Architecture, the unique preceptorship program offers real office experience in top architectural firms to its small class of Bachelor of Architecture candidates. While Sarah Whiting, dean of the school since 2010, calls her B.Arch. graduates "eminently hirable," she also recognizes that offices do not have a lot of time or money to innovate. "Schools need to push architecture forward," Whiting explains. "We need to see how ideas developed here can become manifest in the field."

Schools like Rensselaer Polytechnic Institute in Troy, New York, also look for ways to advance the profession through the curriculum, particularly in the area of sustainability. Its Center for Architecture Science and Ecology, located in Skidmore Owings & Merrill's offices in Manhattan, has graduate students collaborating with material scientists and engineers, to further what RPI dean Evan Douglis says is the challenge for the 21st century: "how to get off the grid."

From new facilities and global studios to cross-disciplinary study, sustainability, and real-world experience, students are given every opportunity to excel at a rapidly changing kind of practice. But can these programs fill the needs of a future they can't entirely predict? The recent upheavals at architecture schools and the drawn-out searches reflect the difficulties of finding deans: they need to have professional and academic knowledge, building experience, and even the charisma required to articulate a larger vision for the profession, while being accountable to university leadership, students, and the discipline itself. ■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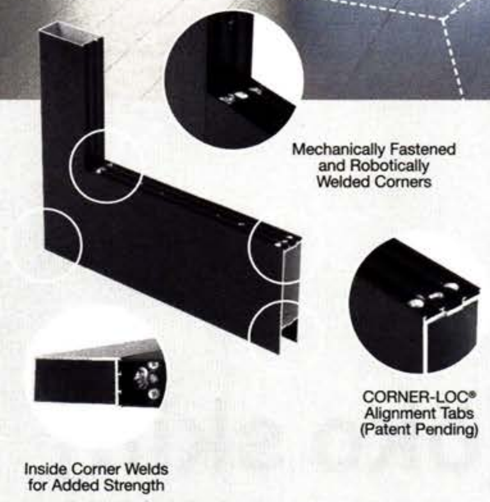

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COLLEGES & UNIVERSITIES

In recent years, the role of college and university facilities has evolved from simply housing academic programs to playing an active role in the learning process. From a research institute that fosters collaboration between disciplines to a former rice plantation that is now a "conservationist's classroom," the following projects demonstrate design's crucial role in education. The section concludes with three projects where architects have updated midcentury campus icons. Adding another layer to the theme, readers can earn CEU credit by reading these stories and completing a quiz online.

MIAMI DADE COLLEGE STUDENT CENTER AND CLASSROOM COMPLEX BY PERKINS+WILL

PHOTOGRAPHY: © ROBIN HILL

Adapting Modernism to local cultures and climates has been a driving force behind the work of Pat Bosch. The design principal of Perkins+Will's Miami office, Bosch studied "critical regionalism" with Kenneth Frampton at Columbia University, then attended the ETH in Zurich when Jacques Herzog and Pierre de Meuron were teaching assistants, and went on to work for Richard Meier on projects in France and Germany in the 1990s. Such training helped when Miami Dade College (MDC) asked her to design a 130,000-square-foot student center and classroom complex for its Kendall Campus, the first and largest of the school's seven hubs.

With more than 165,000 students—and a leader, Eduardo Padrón, named by *Time* magazine in 2009 as one of the 10 Best College Presidents—MDC aims to provide quality, affordable education to an ethnically diverse population. Bosch's challenge was to design a building that would point the school in a new direction, while extending its legacy of Floridian Modernism.

Asked what she thinks critical regionalism means, Bosch says, "It's the abstraction of references," both in terms of formal building elements and social context. At Perkins+Will, she has applied her ideas on the topic to a research headquarters for L'Oreal in Brazil, a hospital in Ghana, and an enormous women's university campus in Saudi Arabia. Bosch inherited her design gene from her parents. Her father, who was born in Spain and raised in Cuba, worked for Vittorio Garatti in the 1960s on two of Cuba's National Art Schools, which represented a radical fusion of Modern design, Catalan brick vaults, and Latin American exuberance. Her mother was an architect too.

The MDC project began not with a building but an investigation into how the college should move forward. "We were hired to look at the big questions, such as, 'How do we build the future?'" says Bosch. Because the school wants to keep growing, while keeping costs low, Perkins+Will developed a thick set of standards and a kit-of-parts approach to be applied to future buildings. The research identified everything from the dimensions of different types of classrooms, prototypes for various spaces, and ways for all the pieces to come together. By using prototypes, the college could build faster and cheaper, while bringing coherence to seven campuses that had each developed in its own quirky fashion.

Having put together the rule book, Perkins+Will got the chance to test it out on the Kendall student center. According to the firm, the project took 18 months to build and cost $23 million, or $177 per square foot.

The building serves as a new gateway on the east side of the campus and will anchor future growth there. To the west, the school's original low-slung buildings spread out around a series of plazas connected by covered walkways. Designed by Hilario Candela and built in the 1960s, the exposed-concrete structures provide lots of shaded outdoor spaces and show how Brutalism could work with the southern Florida climate.

At five stories, the new student center is much taller than its neighbors. But like its predecessors, it flaunts concrete as both a structural element and a means of expression. Bosch emphasized the material by literally framing each of the long elevations in poured concrete and recessing the non-load-bearing facades, mostly precast-concrete panels on the south and glass on the north. An impressive concrete roof hovers above the south portion, sitting on slender columns and turning what could have been a heavy plane into something that almost appears to float. Flat-plate concrete construction allows floors to rest directly on columns, eliminating the need for beams and simplifying the building's visual expression.

Driven by the project's main programmatic components, the architects designed the building as a sandwich: a long wing on the south containing spaces for student services (such as registration, financial aid, and counseling), a similar wing on the north with classrooms, and a long atrium in between.

View additional images at architecturalrecord.com.

Miami Dade College Student Center and Classroom Complex | Miami | Perkins+Will

CONCRETE SOLUTION

An imposing building anchors the edge of an expanding campus and acts as a social hub for students.

BY CLIFFORD A. PEARSON

PHOTOGRAPHY BY ROBIN HILL

SUN BLOCK On the south elevation, the architects used precast-concrete panels with two different textures to provide subtle contrasts to the poured-concrete frame. Vertical strips of metal help shade narrow windows from the sun, while a long concrete canopy on columns protects a roof terrace where the college can host parties and special events.

credits

ARCHITECT: Perkins+Will – Pat Bosch, design principal; Gene Kluesner, managing principal; Carlo Chiu, project director; Angel Suarez, project architect, Denise Gonzales, Ruben Ramos, David Chamberlain, Alejandro Branger, Sihui Ma, Elizabeth Torres, team

ENGINEERS: DDA Engineers (structural); Johnson, Avedano, Lopez, Rodriguez & Walewski Engineering (m/e/p)

CONSULTANT: Miller, Legg (landscape)

GENERAL CONTRACTOR: Kaufman Lynn Construction

CLIENT: Miami Dade College

SIZE: 130,000 square feet

CONSTRUCTION COST: $23 million

PROJECT COST: $32 million

COMPLETION DATE: January 2013

SOURCES

CURTAIN WALL: Alumiglass

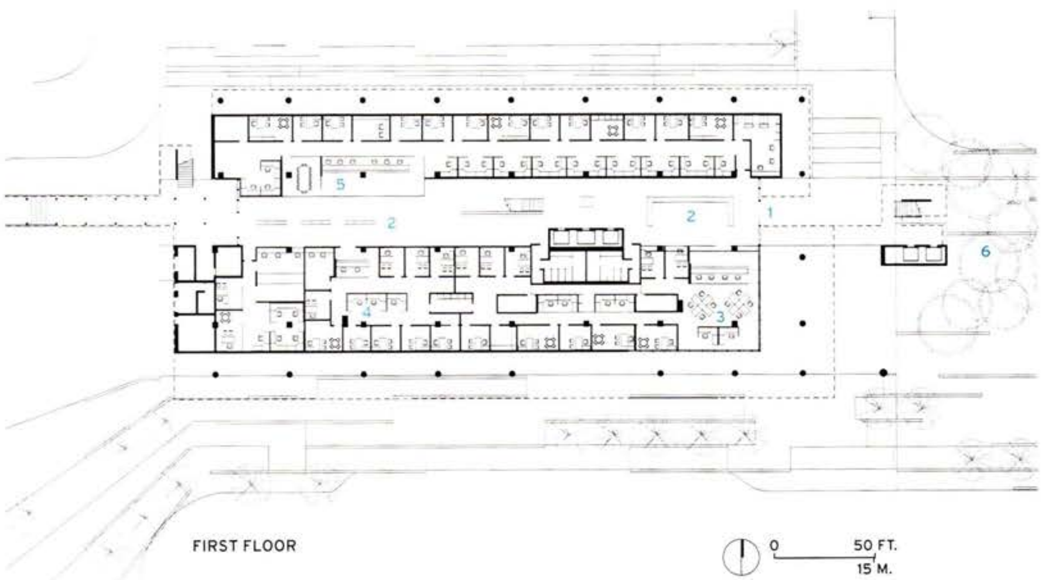
GLAZING: Guardian (SunGuard Super Neutral)

RESILIENT FLOORING: Mohawk Group

CARPET: Tandus

FOURTH FLOOR

SECOND FLOOR



FIRST FLOOR

1 ENTRY COURT
2 ATRIUM
3 NEW STUDENTS
4 STUDENT-SUPPORT SERVICES
5 REGISTRATION AND ADMISSIONS
6 OUTDOOR CLASSROOM
7 CLASSROOM
8 DEAN OF STUDENTS
9 ADVISEMENT
10 MULTIPURPOSE SPACE
11 BUSINESS SCHOOL FACULTY
12 BUSINESS RESOURCE LAB

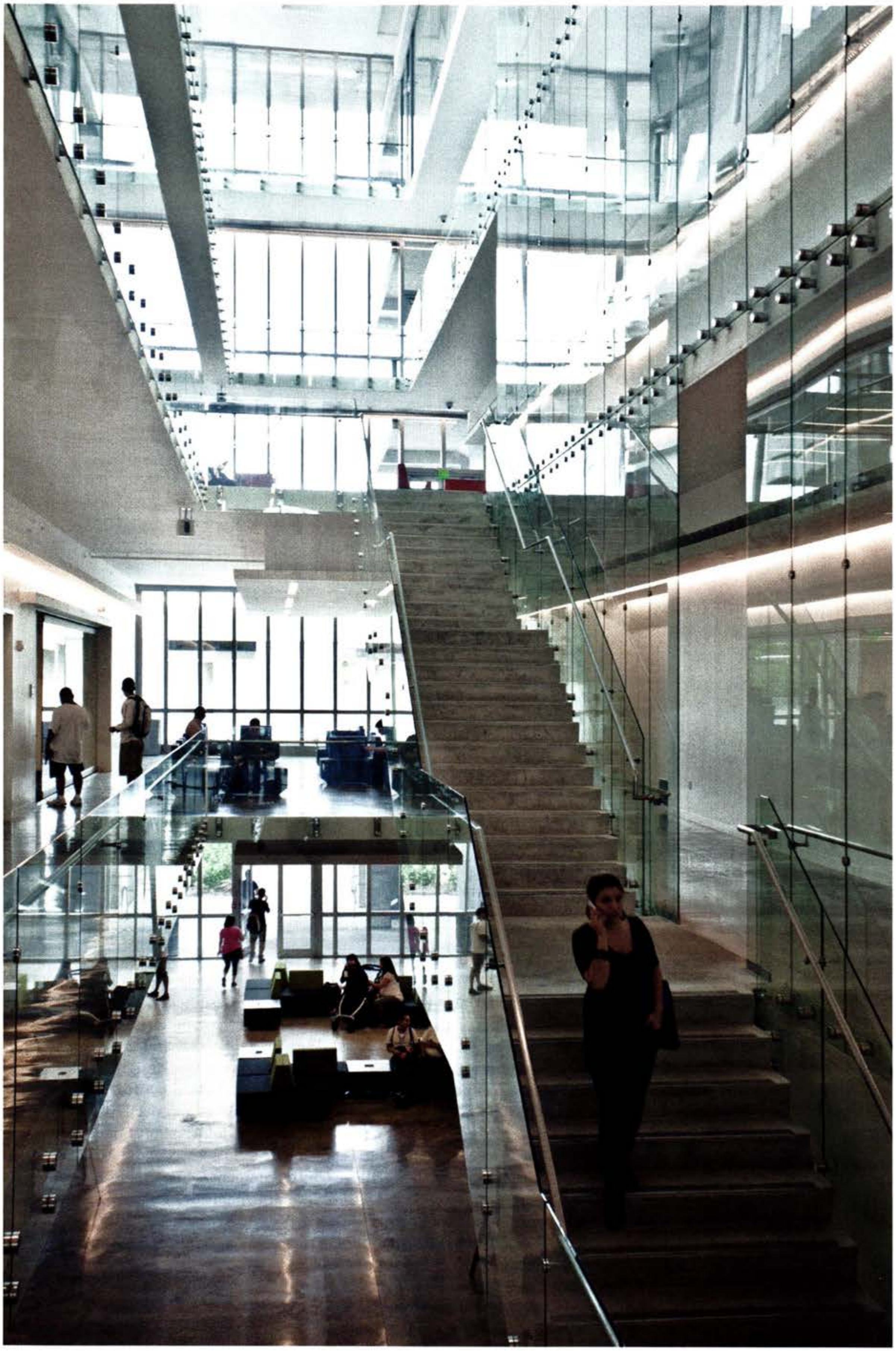
TWO-FACED
On the north facade, floor-to-ceiling glazing brings daylight into classrooms, while precast panels on the top floor provide privacy for a testing center (above). A landscaped area adjacent to a sculptural stair tower (opposite, bottom) filters rainwater, which is kept in a cistern for use in toilets and irrigation. Such green design strategies helped the building earn a LEED Gold rating.

Bosch treated additional functions—such as a vertical circulation tower on the east and a double-height multipurpose space emerging from the upper part of the southeast corner—as sculptural elements within the larger composition.

Most people approach the building from the south and enter on the east near the circulation tower. Inside, they find a five-story atrium glazed at its east and west ends and animated by a grand stair connected to landings and bridges that act as social hubs. Students hang out there and at the clusters of colorful furniture on each floor. Queuing for registration and other services is electronic, so students get a number and can relax until a text tells them it's their turn.

Flexibility was a critical concern for the university, so most internal partitions are nonstructural and can be moved when needed. In fact, as the project moved forward, its uses kept changing, with the business school and other programs moving in after design had been done. So the architects' kit-of-parts strategy was tested, and it passed, says Vicky Owles, the college's dean of students. The building has changed patterns of behavior, she says, with students lounging here instead of dispersing around the campus.

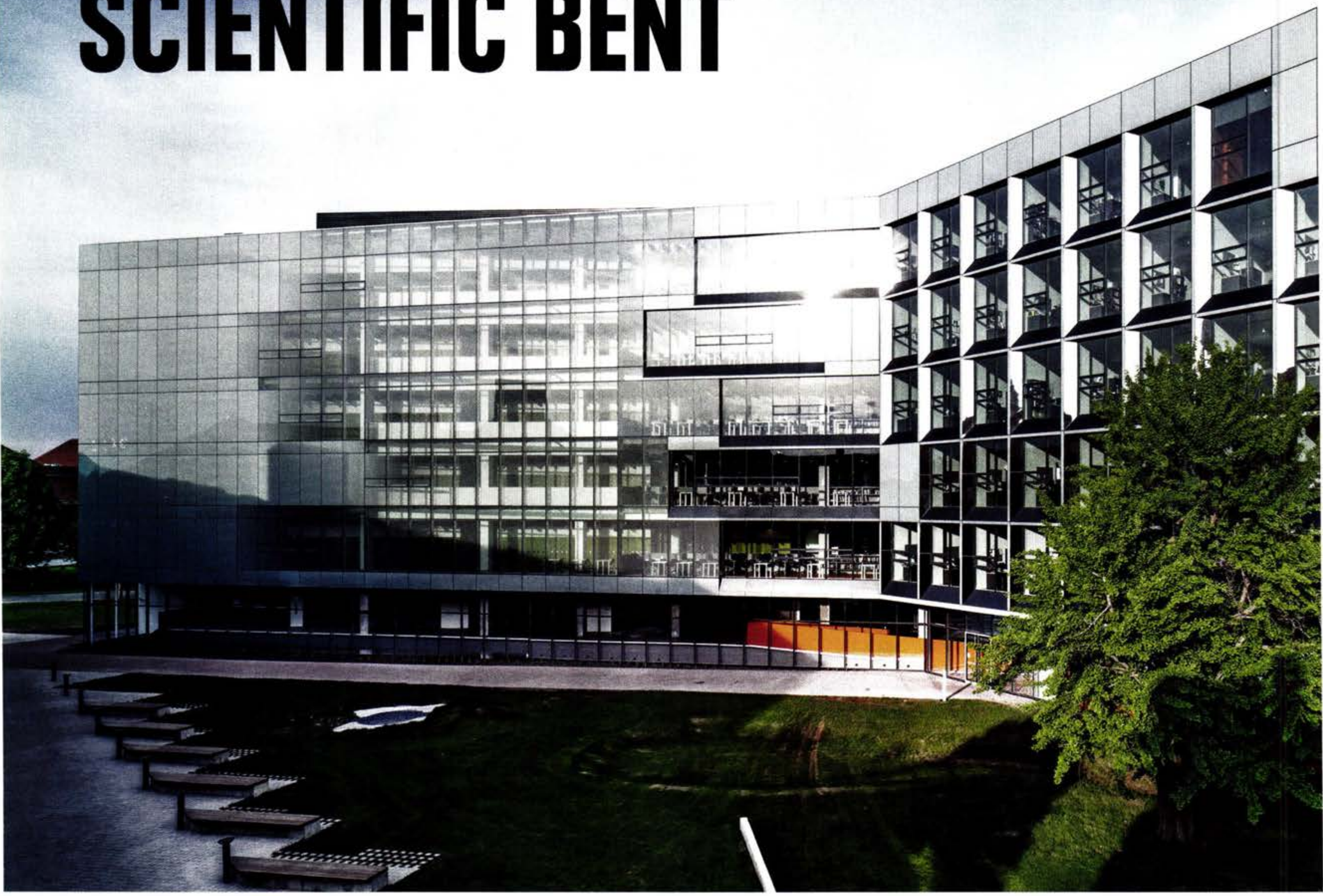
Bigger than MDC's original buildings, the new student center seems a bit out of scale right now. Future buildings nearby, though, will temper that impression. And its heroic brand of Modernism connects it to Candela's tropical Brutalism, while striking out in its own direction. ■



HANGING OUT
The entry plaza offers a covered space to gather outside (opposite, top). The architects treated the five-story atrium as an indoor street where people can see and be seen (left). Clusters of furniture on each floor encourage students to relax before and after classes. Electronic queuing for registration and support services means that students can get a number, wander off, then come back after getting a text message (opposite, bottom). As a result, they don't need to line up in one place, but can disperse throughout the building.

John Abbott College | Anne-Marie Edward Science Building | Quebec Province | Saucier + Perrotte Architectes

SCIENTIFIC BENT



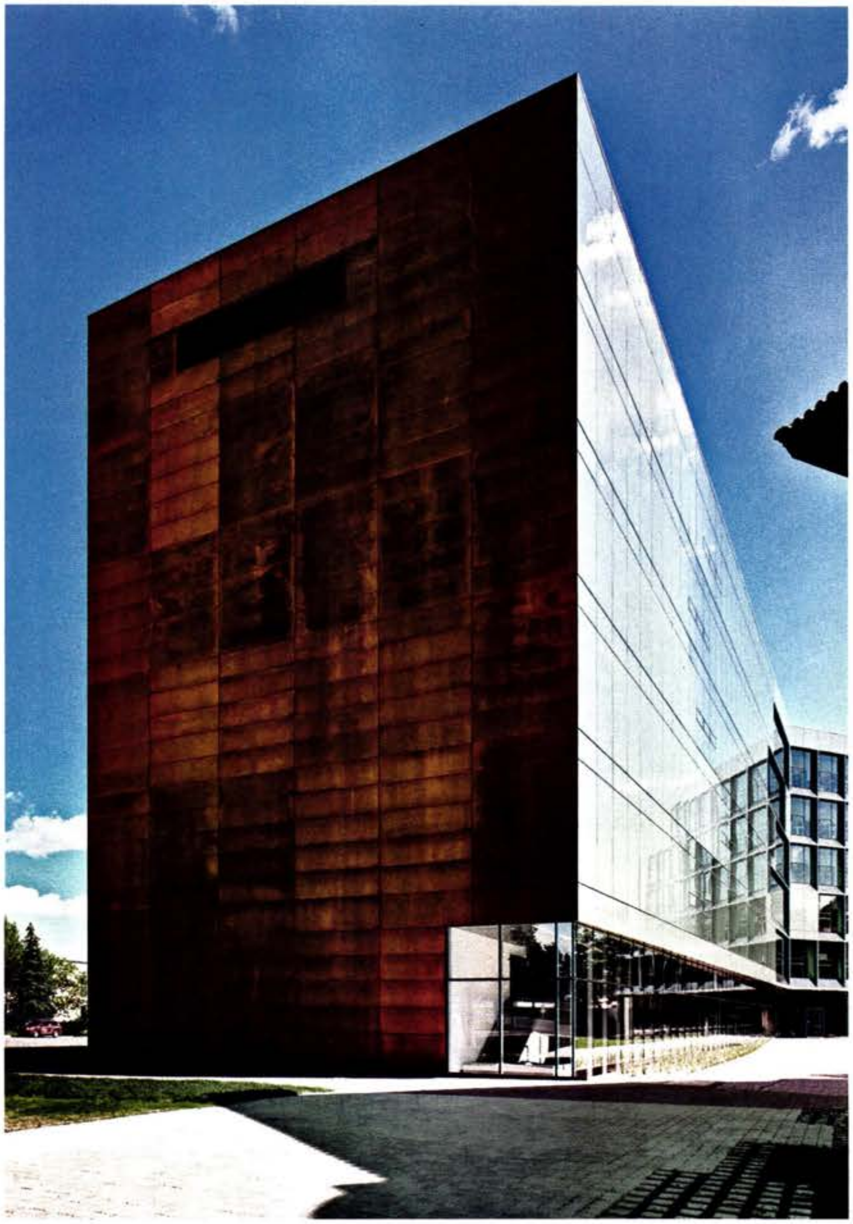
A crystalline building for a small college in rural Quebec engages nature in a dialogue about design, learning, and context.

BY LISA ROCHON

A century-old gingko tree was the catalyst for the L-shaped design of the Anne-Marie Edward Science Building at John Abbott College outside of Montreal. The six-story structure, designed by Saucier + Perrotte Architectes, bends like an elbow around the gingko, creating a leafy courtyard outside and, inside, neatly dividing laboratories from classrooms and teacher offices. Gilles Saucier, the lead design architect for the job, studied biology before switching to architecture. Celebrating, protecting, and reflecting the tree as a life force defined his approach to this project.

Located in a rural setting overlooking a small lake, John Abbott College (named after Canada's third prime minister) is part of a public post-secondary education system unique to Quebec called Collège d'Enseignement Général et Professionel (CEGEP). The school offers specialized studies for 6,500 full-time day students at the equivalent of grades 12 and 13, including pre-university science programs, dental hygiene, and biopharmaceutical production technology. It also serves an additional 2,000 students enrolled in continuing-education programs.

Initially, the college administrators asked Saucier + Perrotte to spread a three-story building over a lightly wooded landscape and connect it seamlessly to Macdonald College (1907), an agriculture training institute next door that is char-



CAMPUS CONTEXT
The 112,000-square-foot building bends around a 100-year-old gingko tree and connects to an existing curved passageway that is roofed with terra-cotta tiles (far left). Although its mostly glass envelope contrasts with the masonry of its neighbors, Cor-ten panels on its north facade (left) offer an abstracted allusion to the older buildings' brick construction.

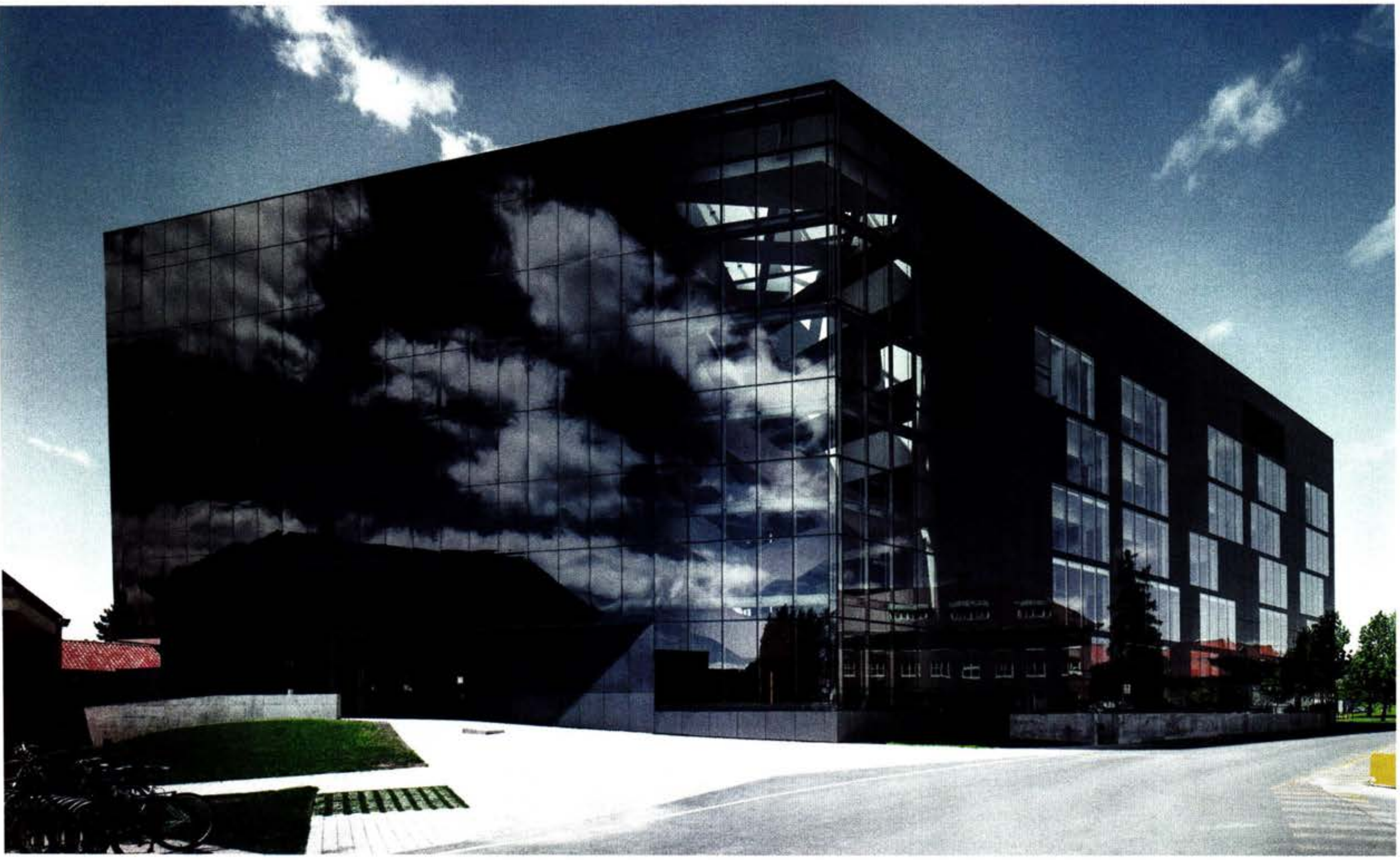
PHOTOGRAPHY: © MARC CRAMER

acterized by red-brick buildings with mansard roofs and copper-clad cupolas. For Saucier, it was unthinkable to chop down the site's trees to construct a building dedicated to teaching biology and chemistry. So he convinced the client to save the old gingko, as well as nearby cedar trees. During construction, special care was taken to protect the tree's roots. Today, the gingko is alive and well. "Nature is more important than architecture," said Saucier at the building's opening in the fall of 2012 when he was joined on stage by Canadian environmentalist David Suzuki. "Erasing the memory [of the trees] would have been the worst symbol for a science building."

The first work of contemporary architecture at the bucolic campus, the 112,000-square-foot building acknowledges its historic neighbors with Cor-ten steel cladding on its north facade that refers to the color of their bricks, though with a different surface texture. Combined with the flex of the building plan and its embrace of the gingko tree, the modern intervention strengthens rather than upsets the aesthetic of the campus. It also responds to the campus plan, orienting its entry to the southwest, where visitors come from the school's central oval. Saucier accommodated an existing curved passageway roofed with terra-cotta tiles by attaching his building to it while adding a metal entry portal in front of it.

As in many of the Montreal-based firm's educational buildings, this one uses various fritted patterns on glass, ranging from opaque (defining the zone for science labs) to translucent (for learning spaces) to transparent (for teachers' offices). Each of the three glazed facades employs mostly a single color of glass—opalescent white, light gray, or dark gray—creating a subtle play of hue and light on the surfaces. The building's many angles and various glass surfaces reflect nature and nearby structures in a complex, almost cinematic manner.

Inside, Saucier envisioned the central stair as an abstract tree—a jagged, kinetic form and a powerful symbol of design in nature. His firm's buildings often feature sculptural, Donald Judd–like stairs, such as those at the Communication, Culture and Technology Building at the University of Toronto at Mississauga and the University of British Columbia Faculty of Pharmaceutical Sciences (RECORD, May 2013, page 98). Most of Saucier + Perrotte's buildings are



REFLECTED GLORY Both inside and out, the architects used a limited material palette dominated by gray glass (above), polished concrete, and white-painted gypsum board (left). The main stair rising through the atrium, however, injects a dramatic note of color (opposite).

known for their restrained palettes. But at John Abbott, the firm used a saturated ochre on the stair balusters and landings as a powerful accent. "I hate gratuitous color," says Saucier. "For this project, I wanted to choose a color that would create a moment and add some warmth."

Following discussions with the client, the architects pushed the few classrooms to the inside of each floor and placed communal seating areas along the perimeter to exploit the daylight. On a recent autumn day, sunlight poured in from glazing above the central atrium and on two sides, turning the main stair into a critical social space filled with students going up and down. The elevator was rarely used.

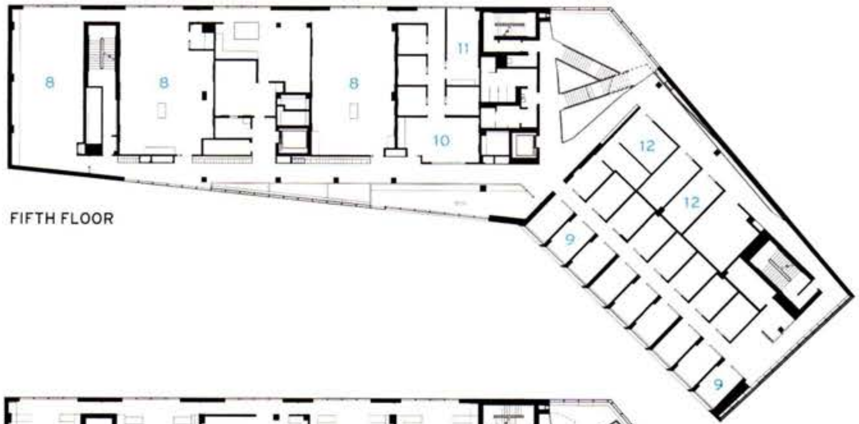
Designed to achieve a LEED Gold rating, the building captures heat and cool air from geothermal wells located across from the main entrance. It distributes this air through radiant floors at all levels in the atrium and through radiant ceilings in the office areas. The atrium also operates as a chimney, capturing heat for recycling throughout the building. Operable windows on the southwest and west elevations, and in the atrium skylight open automatically in warm weather to provide natural ventilation.

Gilles Saucier's architecture often pinwheels around iconic elements like the century-old tree or free-floating stairs. Though he confronted a more modest construction budget at the Anne-Marie Edward Science Building than he had for some other university projects in Canada, he was able to orchestrate a sequence of spatial experiences with similar impact. He pushed spaces together, then pulled them apart. He carved out big volumes, then dropped ceilings to create more intimate areas. He scattered tubes of light in the main lobby ceiling, then washed the atrium in daylight. Throughout the building, he used a series of visual magnets to draw the visitor forward, which are all the more powerful for being set within a stripped-down palette of concrete columns, white gypsum walls, and gray-tinted glass.

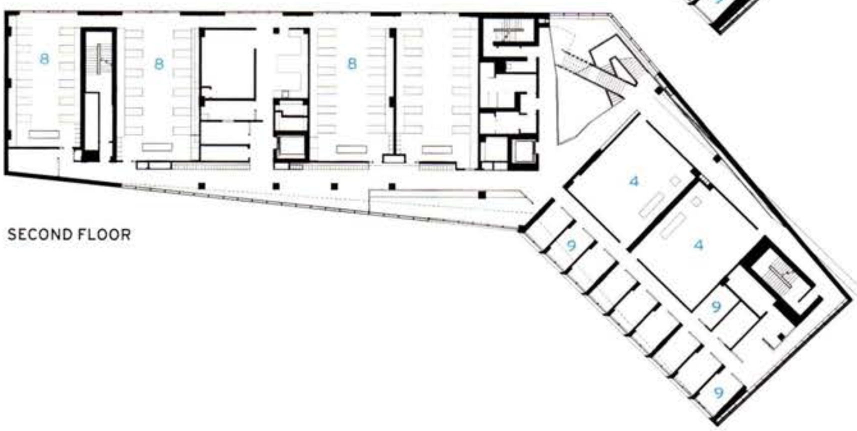
Just as important is the care with which he sited the building, its form bending not just around the ancient gingko but toward the campus's central void and views of nearby Lac St.-Louis and the town of Sainte Anne-de-Bellevue. ■

Lisa Rochon is a Toronto-based architecture critic and a senior fellow with the University of Toronto's Global Cities Institute.

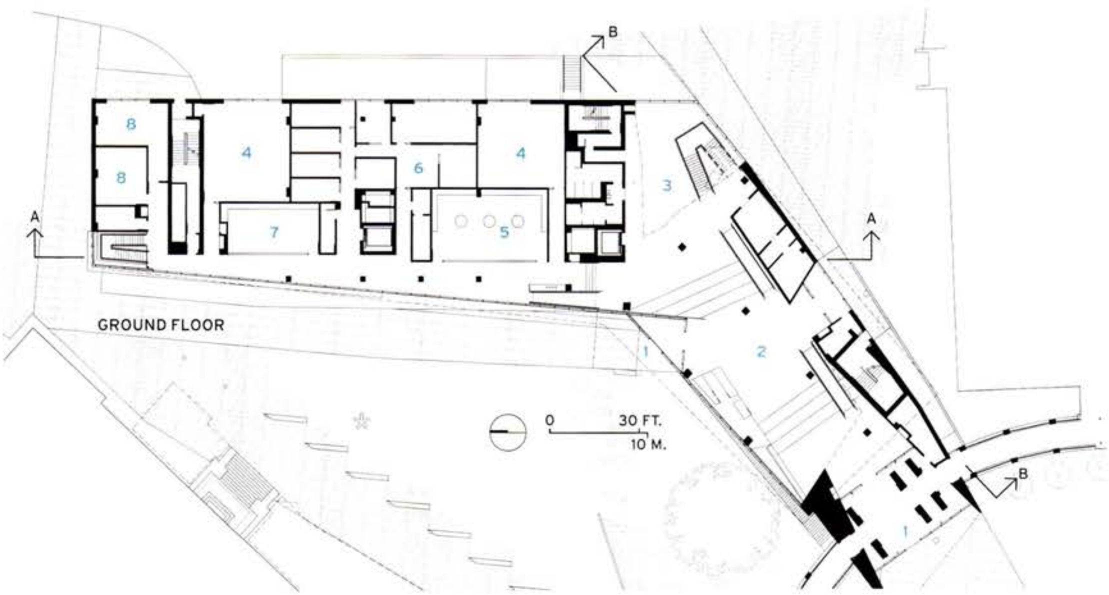
PHOTOGRAPHY: © MARC CRAMER (OPPOSITE); OLIVIER BLOUIN (ABOVE)



FIFTH FLOOR



SECOND FLOOR



GROUND FLOOR

credits

ARCHITECT: Saucier + Perrotte Architectes – Gilles Saucier, lead design architect; Andre Perrotte, principal in charge; Trevor Davies, project architect; Dominique Dumais, Vedanta Balbahadur, Yutaro Minagawa, Olivier Krieger, Marie Eve Primeau, Patrice Begin, Guillaume Sasseville, Christiane Reuter, team

ENGINEERS: SDK (structural); Pageau Morel (mechanical/electrical)

CONSULTANTS: Martin Roy et Associés (LEED)

GENERAL CONTRACTOR: EBC

CLIENT: John Abbott College

SIZE: 112,000 square feet

CONSTRUCTION COST: $30.5 million

COMPLETION DATE: September 2012

SOURCES

METAL PANELS AND CURTAIN WALL: Gamma Murs et Fenêtres

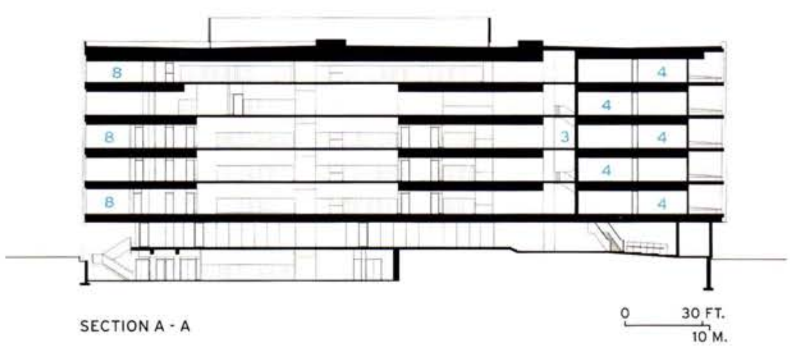
GLASS: Viracon

DOWNLIGHTS: Cooper Lighting

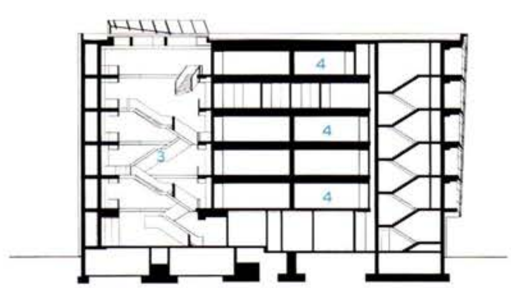
EXTERIOR LIGHTS: Cooper Lighting; FC Lighting

ELEVATORS: Otis

1 ENTRANCE
2 LOBBY/EXHIBITION
3 ATRIUM
4 CLASSROOM
5 STUDENT LOUNGE
6 ADMINISTRATION
7 LEARNING CENTER
8 LABORATORY
9 OFFICE
10 SIMULATION LAB
11 CONFERENCE
12 COMMON ROOM



SECTION A - A



SECTION B - B

PHOTOGRAPHY: © OLIVIER BLOUIN

LIVING COLOR
As he has done in other projects, Gilles Saucier used the main stair as a powerful sculptural element that animates a large volume and lures people to use it. The architect struggled with finding the right hue, finally settling on a saturated ochre that adds warmth and alludes to the terra-cotta tiles found on nearby buildings.

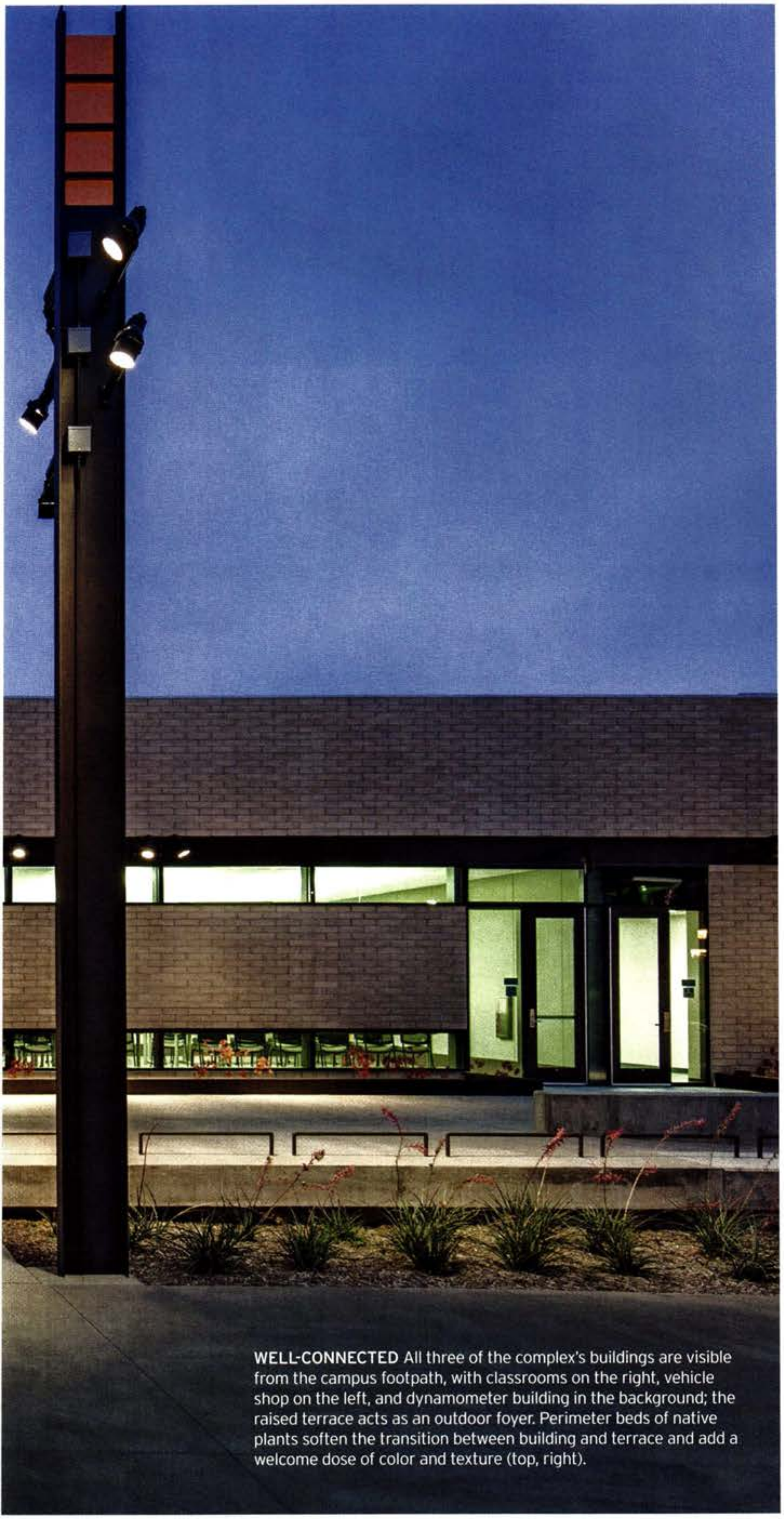
Miramar College Heavy Duty Advanced Transportation Technology | San Diego | Marlene Imirzian & Associates

KEEP ON TRUCKIN'

Elegantly pragmatic, a new complex is a teaching ground for students learning the latest in heavy-duty equipment servicing.

BY DEBORAH SNOONIAN GLENN

PHOTOGRAPHY BY BILL TIMMERMAN



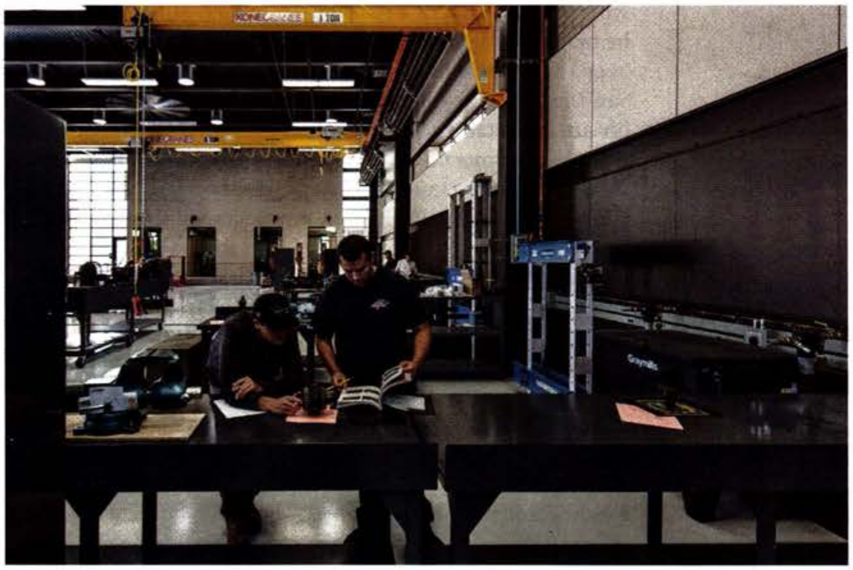
WELL-CONNECTED All three of the complex's buildings are visible from the campus footpath, with classrooms on the right, vehicle shop on the left, and dynamometer building in the background; the raised terrace acts as an outdoor foyer. Perimeter beds of native plants soften the transition between building and terrace and add a welcome dose of color and texture (top, right).

It's not every day that a client asks an architect to make room for a dirt yard in its plans for a high-tech facility. But, then, the diesel technology department at San Diego Miramar College, a public two-year school in the northern portion of the county, is not your everyday client. This one-of-a-kind program trains students to service and maintain diesel-powered trucks, tractors, and heavy equipment, using cutting-edge technologies for component analysis and real-time problem solving. A dirt testing yard is their proving ground. "Students use it to practice operating the machinery they've worked on," explains Dan Wilkie, the program's chair.

In fact, for decades, a sprawling dirt yard ringed by a chain-link fence was the only hands-on teaching area for the department. Lecture-style classes were held in an uninspired adjacent building. ("There wasn't even a bathroom in the original classroom," Wilkie says.) These makeshift spaces were put to rest in 2013, when architect Marlene Imirzian completed the Heavy Duty Advanced Transportation Technology (HDATT) building complex, where adroit siting and space planning, plus skillful massing and material selection, come together to form collaborative and flexible spaces that sustain the nationally recognized program and stand as a showcase worthy of its reputation.

From the outset, the client's requests reflected its special-

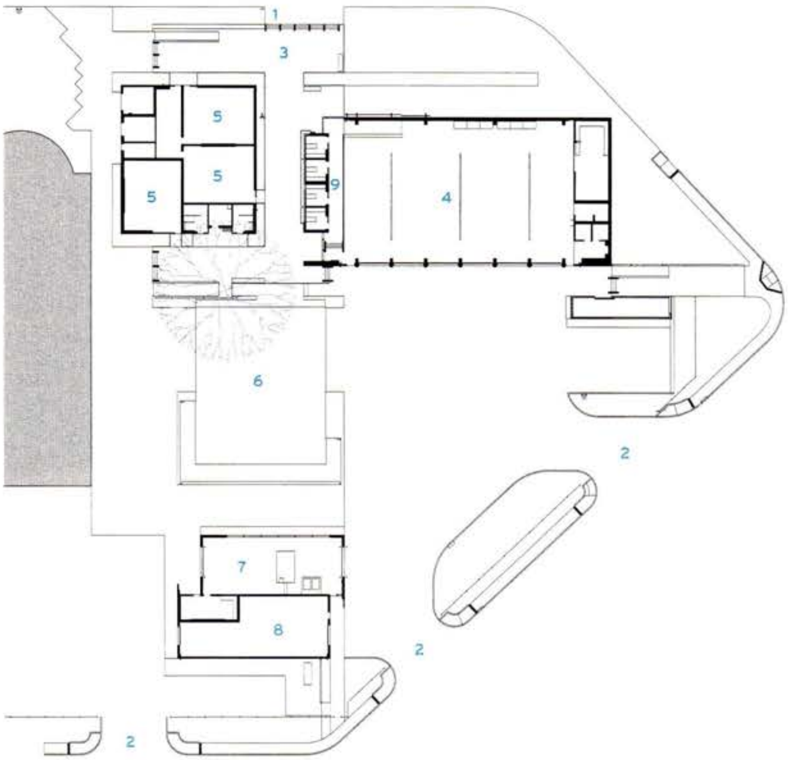
SHOP TALK A frame of I-beams announces the pedestrian entry (opposite, top); a display case in the vehicle shop wall holds memorabilia. Faculty offices are at grade with the terrace and a few steps above the shop floor (opposite, bottom). Roll-up glass doors with operable transoms admit daylight and ventilation into the workspace (right). Long tables support student learning in the shop (below) and a traditional classroom (bottom).



ized mission and a desire to use state-of-the-art facilities to attract top students and industry partners. In addition to updated classroom and hands-on teaching spaces—and, of course, the testing yard—the department wanted the option to host training sessions for industry partners, which contribute equipment and other resources; an indoor area to accommodate a dynamometer (a large testing bed that simulates real-world road conditions to permit assessment of vehicle performance at highway speeds); adequate parking and circulation for vehicles and equipment; and enhanced security indoors and out. “Obviously this is a highly unusual project type,” says Imirzian, founder of Marlene Imirzian & Associates Architects, with offices in Phoenix and nearby Escondido, California. “Our multidisciplinary team collaborated closely with the college from the start so we could meet our objectives and avoid cost overruns.” Her diverse portfolio of higher education, commercial, and civic projects in the region made her well qualified for this juggling act, and ultimately she delivered HDATT under budget—an impressive feat, given that the cost of the dynamometer and other major equipment upgrades were included in the public funding package.

The complex’s layout and circulation grew organically from a wish to improve the program’s visibility and to provide better connections to the campus proper. When Imirzian first visited the 4.6-acre site, largely just a dirt yard then, she glimpsed opportunity where others saw only a neglected facility. Now the revamped and smaller testing yard sits at the center of the complex, and a simple, gracious raised terrace, accessible via a major campus walkway, welcomes the entire college to drop by and witness the action firsthand. “It’s like having a monster truck rally every day on campus,” she deadpans. The test yard also acts as a natural barrier between pedestrians entering the terrace from the northwest and the large vehicles and equipment that access the teaching areas from the east. A perforated metal gate slides shut to close off the complex after school hours while still permitting views throughout.

Imirzian originally considered designing one large multi-use building. But the vastly different mechanical requirements of the program elements, coupled with the space needed for vehicles to circulate through the site, led



SITE PLAN

1 PEDESTRIAN ENTRY
2 VEHICLE ACCESS
3 TERRACE
4 VEHICLE SHOP
5 CLASSROOM
6 DIRT TEST YARD
7 DYNAMOMETER
8 STORAGE
9 FACULTY OFFICES

credits

ARCHITECT: Marlene Imirzian & Associates Architects – Marlene Imirzian, principal designer; Jacob Atherton, designer; Fritz Morton, job captain; Tom Brown, Robert Cannavino, Tom Conner, Alice Lee, Frank Morse, Helen Pierce, team

CONSULTANTS: KPFF (civil, structural); SC Consulting Engineers (mechanical); Syska Hennessy Group (electrical); Spurlock Poirier (landscape)

CONSTRUCTION MANAGERS: Gafcon, Soltek Pacific

CLIENT: San Diego Community College District

SIZE: 17,500 square feet (gross)

CONSTRUCTION COST: $9.85 million

COMPLETION DATE: September 2013

SOURCES

MASONRY: Orco Block & Hardscape (CMUs)

STOREFRONT, ENTRANCE DOORS & WINDOWS: Arcadia

GLAZING: PPG

SKYLIGHTS: Solatube

ACOUSTICAL CEILING: Armstrong

SOLID SURFACING: Corian

FLOOR & WALL TILE: Daltile

LIGHTING CONTROLS: Lutron

BRAWN AND BRAINS Equipment in the testing yard and vehicles in the dynamometer building face each other through full-height glazing as they're put through their paces (opposite, top). A low wall (opposite, bottom) separates the yard from the adjacent paved circulation and driving path; exterior light fixtures throughout the complex were made from vehicle parts slated for destruction.

to a three-building scheme instead. These structures comprise 17,500 square feet and form a lively mini-campus around the testing yard and terrace. At the dynamometer building, trucks being tested inside are visible through the glazed facade that looks onto the yard, offering another glimpse of big machines in motion. Lectures, classroom instruction, and computer labs take place in the building just south of the terrace, and across from it is the complex's signature space, a bright, airy six-bay vehicle shop where most hands-on instruction occurs. It's illuminated by daylight that pours in from an array of tubular skylights in the 29-foot ceiling. Fluorescent overhead fixtures add more light when needed and, in a first for the school, allow classes to be taught at night. Huge ceiling fans and natural ventilation keep the interior comfortable without air-conditioning in San Diego's forgiving climate. Worktables and storage lockers are mounted on wheels for easy reconfiguration or can be lifted and moved by an overhead crane. The concrete floor is coated in white epoxy paint—"a pain to keep clean," says Wilkie, though he admits that it reflects light well for working underneath vehicle carriages. The back wall, clad in plate steel, has recessed I-beams that serve as open electrical chases, which adapt handily to rapidly changing technologies and instrumentation. Faculty offices line a side wall and oversee the shop, so instructors are never more than a few steps away for quick consultations or floor visits.

All three buildings share a material language of glass, steel, concrete, and CMUs, with balanced, harmonious proportions determined in part by siting and function. Full-height glass walls for the vehicle shop and dynamometer create view corridors inside and out, while windows for the classroom are placed high and low so that the middle of the walls can serve as pinup space. Much of the steel has a brown, high-performance coating, and light-tan CMUs have bricklike proportions, lending the complex an appropriately industrial air that doesn't feel chilly or clinical.

Campuses are always a bit of an architectural hodgepodge, and, right now, HDATT stands as a breed apart and a cut above its context of unremarkable stucco buildings. It's refreshing to see design of such high quality at a public two-year college, where tight budgets and low bidders are often blamed for turning these campuses into aesthetic backwaters. At the moment, Miramar College is undergoing an ambitious construction effort that will include a science building by Imirzian (across from the transportation technology facility) to be completed in 2015. But, no matter how these other projects turn out, HDATT is poised to endure. With virtually no similar examples to follow, Imirzian conceived an imaginative and finely crafted complex that captures the aspirations of a forward-thinking educational program, meeting the community's needs today while helping them envision what they might become tomorrow. ■

A former senior editor for RECORD, *Deborah Snoonian Glenn lives in Los Angeles and writes about design and other topics.*


CATERPILLAR

Bill & Melinda Gates Hall, Cornell University | Ithaca, New York | Morphosis Architects

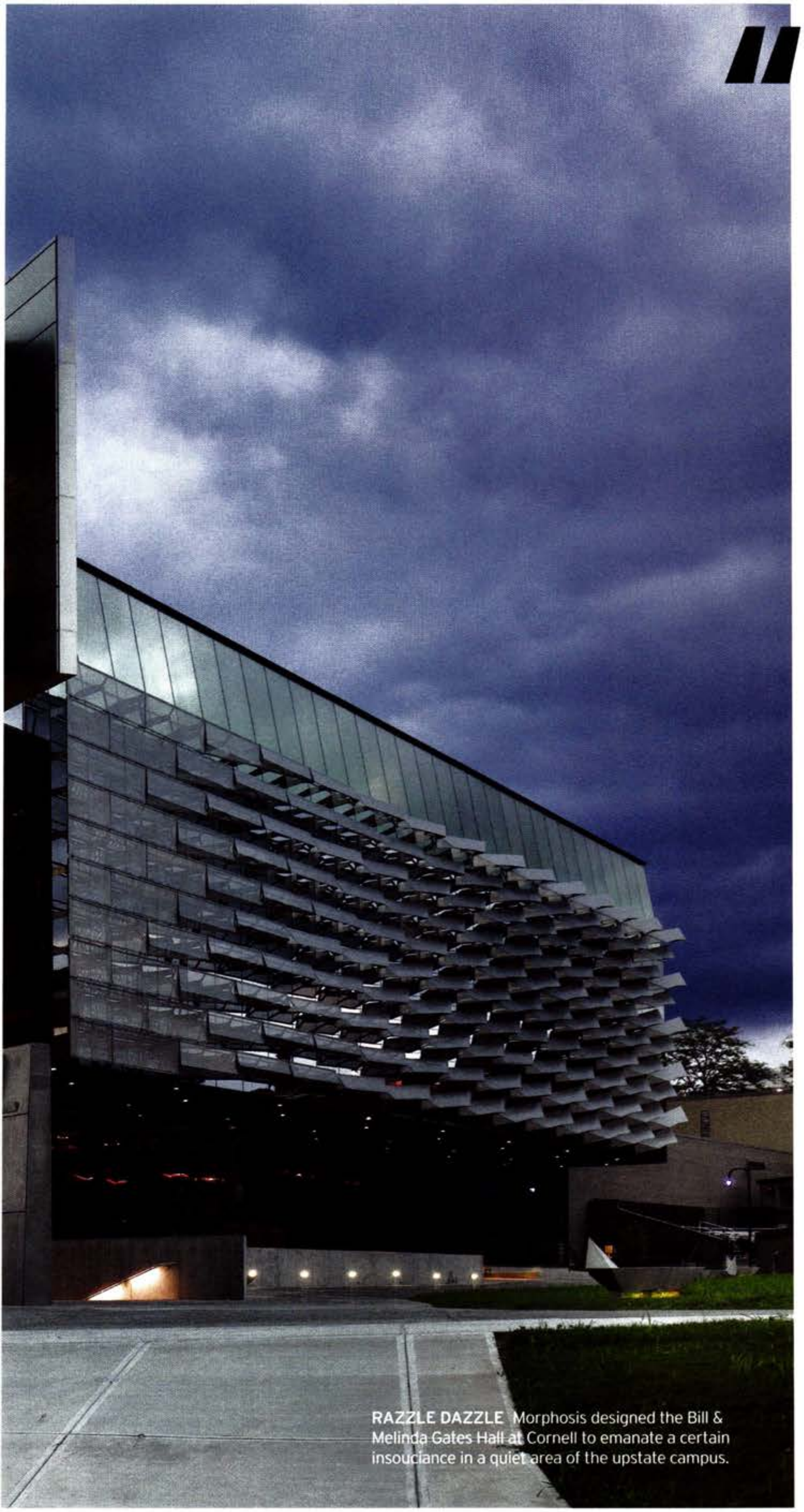
SEIZE THE SITE

Gleaming stainless-steel panels and the sculptural entrance of Cornell's new computer and information facility grab attention.

BY SUZANNE STEPHENS

PHOTOGRAPHY BY ROLAND HALBE

View additional images at architecturalrecord.com.



RAZZLE DAZZLE Morphosis designed the Bill & Melinda Gates Hall at Cornell to emanate a certain insouciance in a quiet area of the upstate campus.

"The natural environment of the Cornell campus is startling," says Thom Mayne, of Morphosis, about the gorge-riven and forested terrain of the 149-year-old university in Ithaca, New York. So is his recently completed Bill & Melinda Gates Hall. The 101,500-square-foot structure perches like a giant metal bird on a sloping site near the historic center of the Ivy League institution. With this facility for the combined departments of the Faculty of Computing and Information Science, the architects placed a rectilinear volume on the southwest corner of the narrow 60,000-square-foot site, then mounted feathery stainless-steel perforated panels on its long north and south elevations and across the upper west facade. On this short end facing the street, Morphosis carved out the first two floors, creating a deep, partially cantilevered overhang for an entry plaza slightly elevated above grade. The sheltering arced soffit is clad in orange metal, giving it a sunlike vibrancy that is "so helpful in fighting depression in the winter's dark, gray, snowy days," says project principal Ung-Joo Scott Lee, who should know: he was once a student on this northern campus.

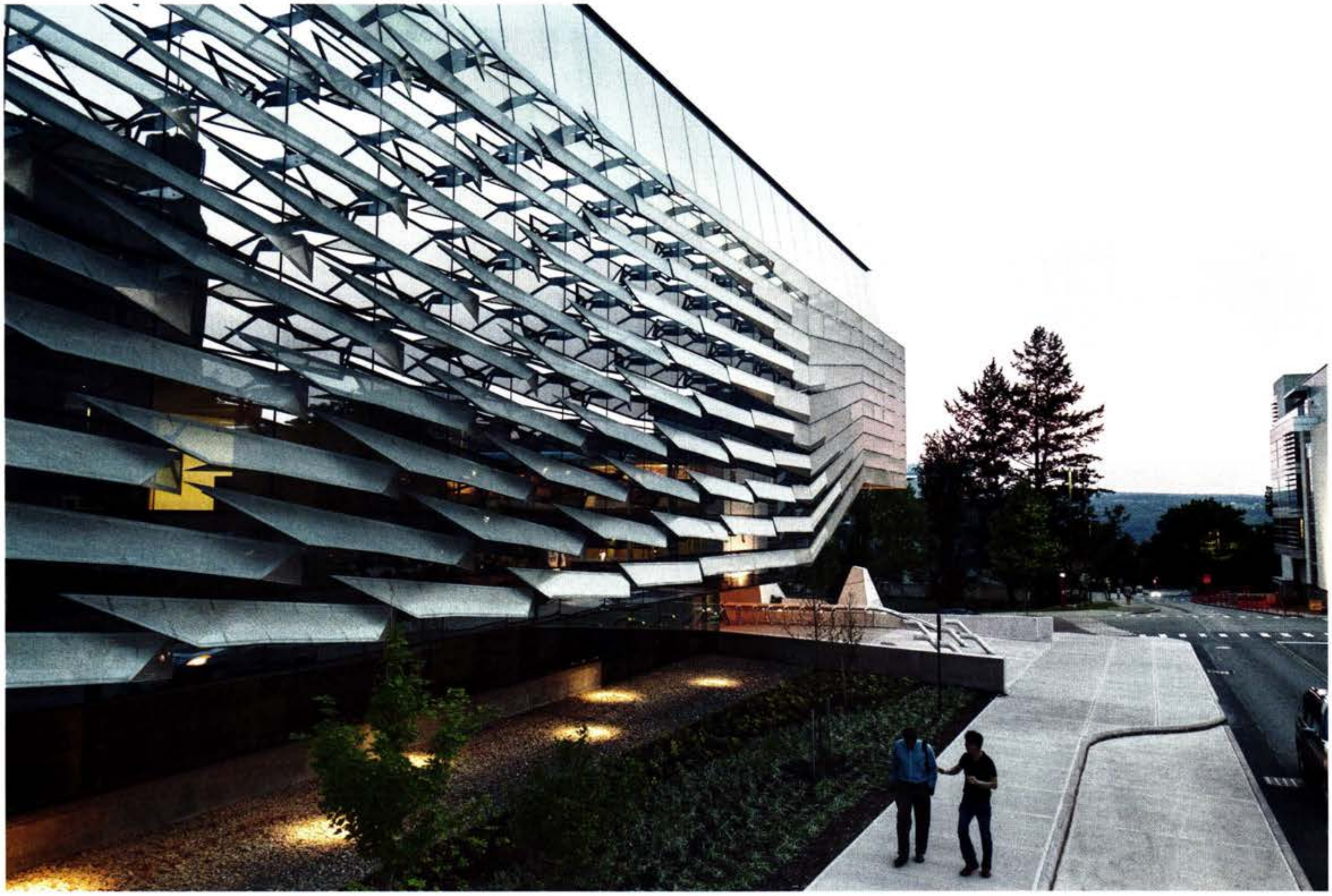
The deeply projecting top floors rest on two steel columns covered in precast concrete. A jumble of precast-concrete shards lies at the columns' base: they serve no real function but evoke the rocky topography of the gorges. The architects had originally planned that the shards and columns would be clad in the indigenous Llenrock limestone found in many of the university buildings. But budget concerns intruded, and the footings turned out to be light concrete. Someday, ivy and leafy plants may cover the shards so they become part of the landscape. But now they look like giant talons spreading out from the bird-leg columns.

Eventually, too, another entrance will open on the south elevation overlooking a baseball field, which, according to the 2008 campus master plan, will be transformed into a three-sided quad for Gates and two new engineering buildings. Because of a grade change, the entrance for the five-story building would be accessed at the lower level, where a 151-seat lecture hall is located.

The main entrance opens onto a skylit atrium, 54 feet high, with orange fritted glass on the north and east. "With the atrium and glass, the daylight and openness, we can feel connected to the various departments and people," says Kavita Bala, a professor of computer science. "It's a big difference in the quality of life for the students." (Information-science students used to be stuck in rented spaces at the edge of the campus, while computer-science students were crammed into nearby engineering buildings.)

Behind the glazed atrium and stairwell is a rectangular block for teaching and research functions—"an efficient chassis," says university architect Gilbert Delgado. The volume houses labs, offices, conference and seminar rooms, informal lounges, and open collaboration spaces for the 500 undergraduate majors and 350 graduate students to come together. "This is the workhorse," says Mayne. "The entrance and atrium are the architecture." In creating the plan, a simple U shape with double-loaded corridors, the architects gently splayed and angled the walls along the hallways to inject a spatial dynamic into an otherwise formulaic grid.

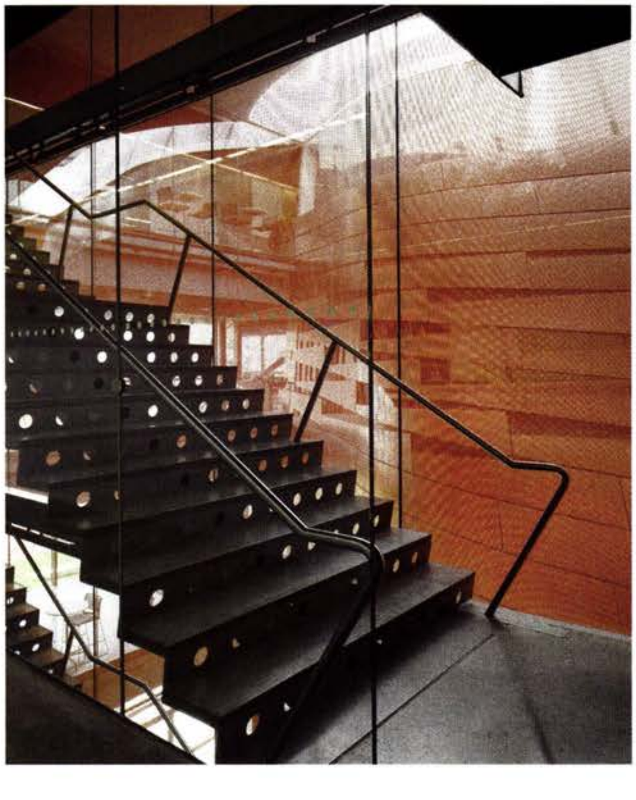
Considering that Mayne and his firm Morphosis are



currently designing the highly touted Academic Building for the Cornell NYC Tech campus on Roosevelt Island, in New York (to be completed in 2017), the opening of Gates Hall can be seen as a dry run. Both are devoted to computer technology and information systems—and both emphasize a fluidity of space to foster spontaneous interaction, communication, and collaboration—but the buildings' overall partis differ. As Mayne explains it, the design for the Roosevelt Island structure results from the commitment to create a net zero building, which determined the placement of an expansive roof of photovoltaics over a broad, open plan.

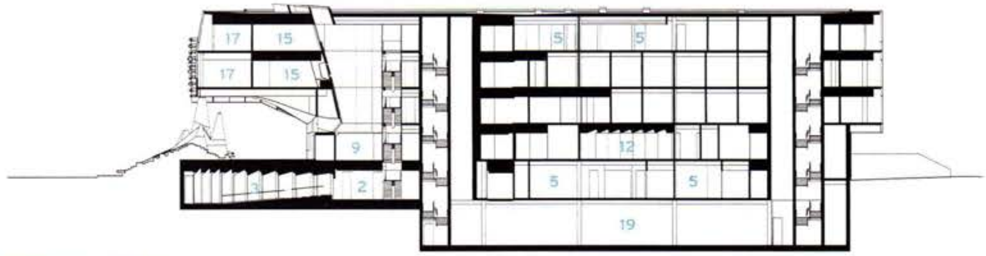
Although Gates is not energy-neutral, it is seeking LEED Gold status through the use of high-performance fritted and clear glazing, and the perforated metal feathers, which help reduce solar loads on the elongated south elevation in particular. In addition, Gates relies on radiant floors and a chilled-beam passive convection system, not to mention recycled and renewable building materials. But the design also was shaped by the constricted lot and the desire to give drama and an identity to this rather dead part of the Cornell campus—and with a tight construction budget ($425 a square foot).

While Cornell has a number of commendable 19th- and early 20th-century buildings, including Gothic Revival, Richardsonian Romanesque, and Collegiate Gothic styles, the postwar modernist period—which went on too long—left the campus with a slew of mediocre buildings, the engineering quad included. Gates Hall easily sparks up its dreary hodgepodge setting. There it sits, an economical, muscular, yet strangely elegant structure, like an abstract bird of prey with gleaming feathers, a radiantly colored neck, staunch legs, and very scary claws. ■



PHOTOGRAPHY: © TEX JERNIGAN (TOP)

THE SHINING
As visitors approach Gates Hall along the north face of the building (opposite, top), they find that the fluttery stainless-steel panels are attached to the glass facade by means of steel tabs, which create a thick architectonic wall. Inside, a daylit atrium has orange fritted glass on the north wall as well as the east one by the staircase (opposite, bottom). The entrance lobby in the atrium (left) is defined by a bulging metal wall, while ample glazing permits views of the various spaces above.



SECTION A - A

THIRD FLOOR

SECTION B - B

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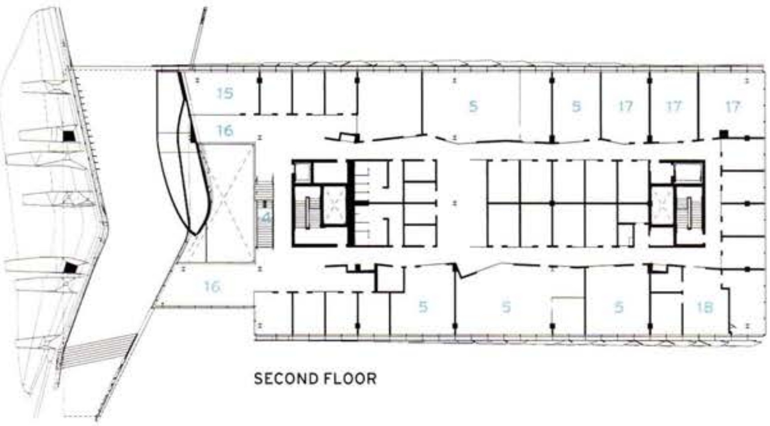

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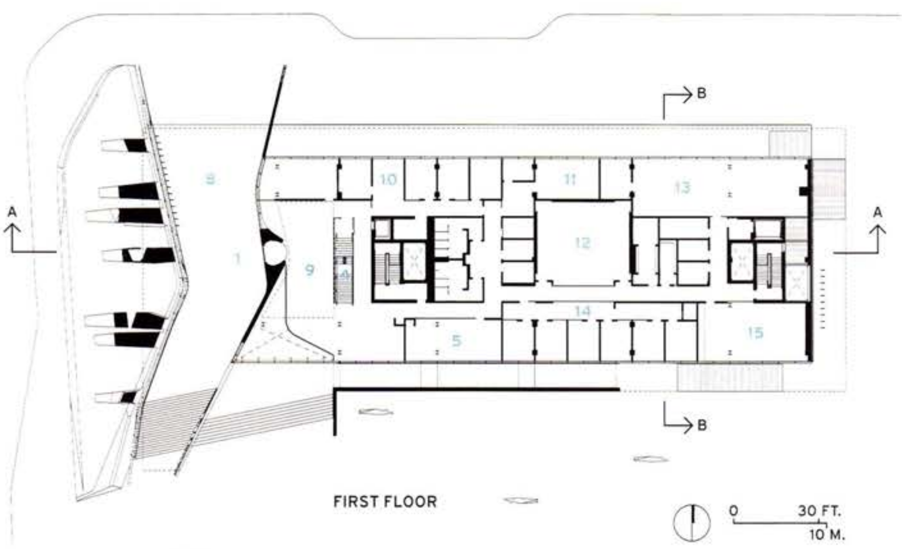


FIRST FLOOR

0 30 FT. 10 M.

1 MAIN ENTRANCE
2 FOYER (LOWER LEVEL)
3 LECTURE HALL
4 OPEN STAIR
5 LAB
6 LOUNGE
7 SERVER ROOM
8 ENTRY PLAZA
9 MAIN LOBBY
10 DEAN'S SUITE
11 FINANCE SUITE
12 SEMINAR ROOM
13 I.T. SUITE
14 STUDENT SERVICES
15 CONFERENCE ROOM
16 COLLABORATION SPACE
17 PH.D. SUITE
18 ADMINISTRATION SUITE
19 MECHANICAL

credits

ARCHITECT: Morphosis Architects – Thom Mayne, design director; Ung-Joo Scott Lee, project principal and manager; Ted Kane, project architect; Jean Oei, project designer

ENGINEERS: Thornton Tomasetti (structural); Syska Hennessy Group (m/e/p/fp); Barton & Loguidice (civil)

CONSULTANTS: Barton & Loguidice with Morphosis Architects (landscape); Davis Langdon (sustainability); Thornton Tomasetti (facade)

GENERAL CONTRACTOR AND CONSTRUCTION MANAGER: Welliver

CLIENT: Cornell University

SIZE: 101,500 gross square feet

CONSTRUCTION COST: $42 million

PROJECT COST: $60 million

COMPLETION DATE: January 2014

SOURCES

STAINLESS-STEEL PANELS: Zahner

METAL/GLASS CURTAIN WALL: YKK Architectural Products

GLASS: Viracon

STRUCTURAL STEEL: Schenectady Steel

SYMPHONY IN WHITE A 151-seat lecture hall (left) on the lower level, underneath the main entrance plaza, is treated very simply, with white pleated walls of perforated wood. A student lounge occupies the cantilevered end of the third floor behind the steel truss on the west facade (below). An etched glass floor brings indirect natural light into the space that juts out over the entrance plaza.

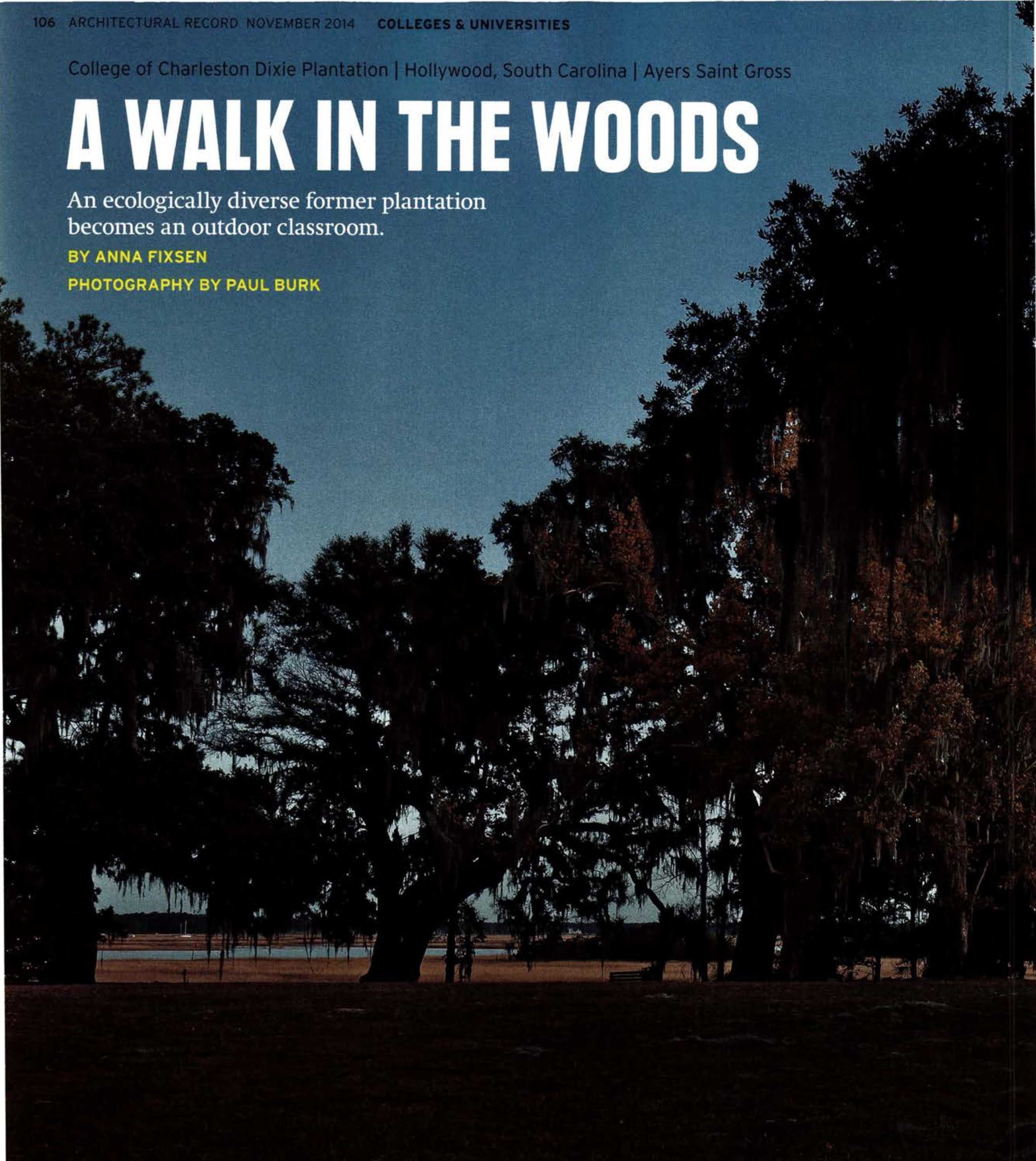
College of Charleston Dixie Plantation | Hollywood, South Carolina | Ayers Saint Gross

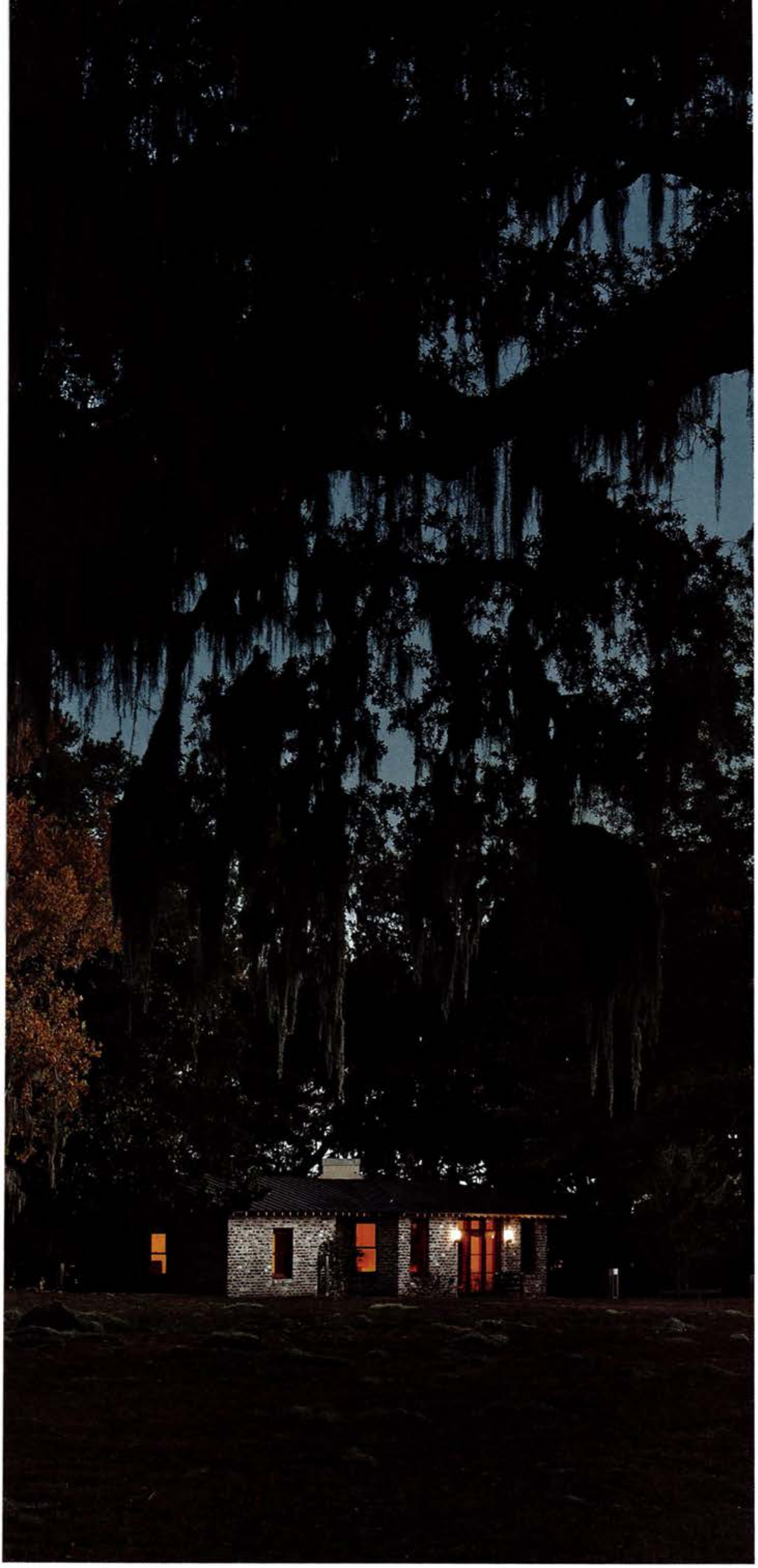
A WALK IN THE WOODS

An ecologically diverse former plantation becomes an outdoor classroom.

BY ANNA FIXSEN

PHOTOGRAPHY BY PAUL BURK





In 1962, John Henry Dick underwent what some call a hunter's conversion. That year, Dick–a product of New York high society, with a proclivity for ornithology, big game, and porkpie hats–found himself on a safari face-to-face with a Bengal tiger. As he trained his weapon on the beast, he did something unusual: he hesitated. "A sense of confused shame engulfed me," he later wrote. He pulled the trigger nonetheless, but, from that point onward, Dick quit hunting and devoted the remainder of his days to wildlife illustration and environmentalism. The tiger became a rug for his South Carolina estate known as Dixie Plantation and, as he wrote, a memento of "how long it sometimes takes to grow up."

The anecdote is the unlikely backstory for a new addition to the College of Charleston's campus. After Dick's death in 1995, he bequeathed the 881-acre former rice plantation 19 miles outside of Charleston, South Carolina, to the institution as a "conservationist's classroom." The college hired Baltimore-based Ayers Saint Gross Architects and Planners to convert the property, a wooded marshland along the Stono River, into a nature preserve and research facility. The firm designed a master plan and a series of outbuildings for the site, the first phase of which was completed last July.

"The idea is for the whole master plan to be didactic," says firm principal Adam Gross. "The property itself teaches about the importance of conservation and sustainability."

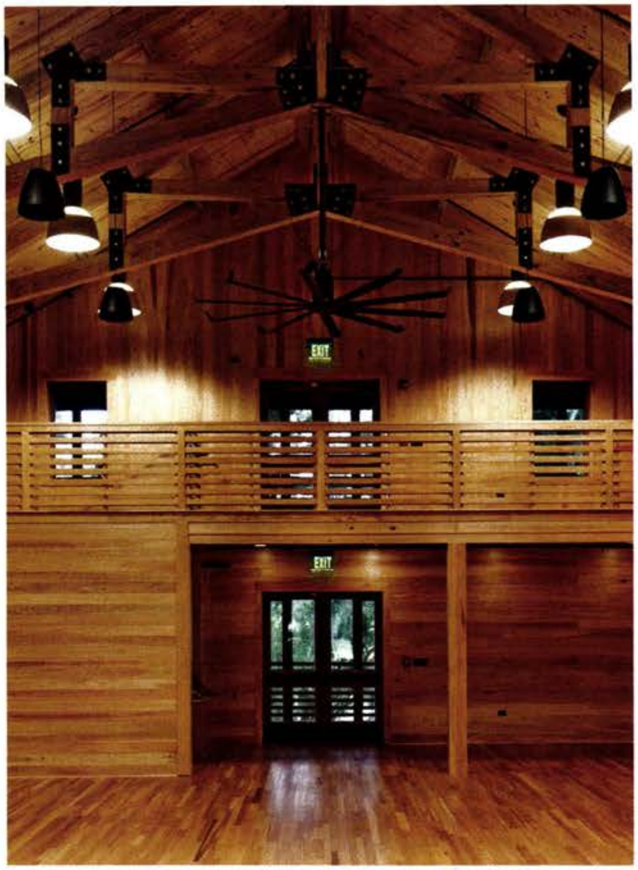
The initial challenge of Dick's gift was in resolving how to utilize it. When the college approached Ayers Saint Gross to discuss options for programming, the site had sat fallow for decades, choked by invasive plants and plagued by illegal hunting–and worse: in 2002, a corpse was discovered in the woods alongside its gravel road.

After discussions with the college and environmental experts, Ayers Saint Gross conceived a three-phase plan to rehabilitate the overgrown property by adding a 4.3-mile nature trail, educational facilities, and water service. When it came to planning classrooms and research spaces, the designers exercised restraint, reserving only 2 percent of the property for building. "It was ultimately modeled on a rustic camp," says Gross.

On a recent drizzly morning, Gross and several faculty members strolled along a segment of the wooded walkway. Near the trailhead they came to Dixie's primary structure–a large meeting hall facing the river. The two-story gabled hall has a timber frame and truss roof, echoing a barn that once stood on the site. "Context, proportion, and scale all mattered," says Gross, "so we took the dimensions and proportions of the original barn and developed this new building." The western elevation is covered by a generous overhang, while the eastern side has a two-level screened porch complete with rocking chairs and tranquil views of the wetlands and river. Inside, a vestibule leads into a full-height open space with a mezzanine level. Its walls are paneled in honey-colored cypress, the floor covered in reclaimed pine, and the windows and doors framed in mahogany.

TREE HOUSE Shrouded by the branches of live oaks and Spanish moss, former owner John Henry Dick's painting studio overlooks tidal marshes and the Stono River. Ayers Saint Gross renovated the modest one-story masonry building (left) as a multipurpose space and gallery for Dick's lush wildlife illustrations.

1 ENTRY PORCH
2 FOYER
3 MECHANICAL
4 GREAT ROOM
5 KITCHEN
6 STORAGE
7 HALL
8 RESTROOM
9 MEZZANINE
10 BACK PORCH
11 OPEN TO BELOW



SOUTHERN COMFORT The firm took cues from a demolished barn to build a meeting and events space (below), which features an open central gathering area (right). Throughout, the designers used warm-colored wood, including cypress, southern pine, and mahogany. A double Southern-style back porch (above) is accessible from the ground level or a mezzanine. For added atmosphere, the architects maintained an old corncrib, visible from the double-height porch (opposite).

A short distance from the meeting barn is Dick's former painting studio—a low brick building that the firm also renovated with vernacular materials—which functions as a gallery for Dick's wildlife illustrations, among its other purposes.

The firm planned the meandering trails to wind through a maximum number of ecosystems, with as little impact on the site as possible. (The designers worked closely with conservation and planning firm Biohabitats.) A boardwalk, made from southern pine planks supported by pine timbers on a compacted stone-aggregate base, takes visitors through connected saltwater, brackish, and freshwater ponds. Egrets and blue herons frequently fly up from the marsh amid reeds and cypress trees. Signage and way-finding elements, also designed by Ayers Saint Gross, differentiate the five different zones: meadow, wetland, river, woodland, and an allée of moss-laden oaks that were part of the original plantation design. Other markers provide historical information, including the history of slaves that farmed the plantation in the antebellum era, and point out specific ecological features, such as habitats for wading birds. "The thing that is so cool is how the path unfolds," Gross says. "It's like a beautiful street along which there are a series of piazzas."

The trails, barn, and studio are just the start of the transformation: forest remediation tactics, including prescribed burning; the removal of invasive plants; and reforestation (including the planting of 73,000 Longleaf pine seedlings) are under way. This January, two new research stations included in Ayers Saint Gross's master plan, but designed by Johnston Design Group, will be completed to host classes in subjects ranging from archaeology to zoology. Eventually, the campus will also include housing.

Along the trail, two students stooped in a garden, weeding and mulching at the edge of the new path. Carmen Ketron, who is working toward a double master's in environmental studies and public administration at the college, gestured to a pair of plastic kiddie pools filled with a grasslike plant—an experiment in growing Carolina Gold and Charleston Gold rice, varieties once cultivated at the plantation. "It's really great to have this resource," she said. "The students want to get their hands dirty." ■

credits

ARCHITECT: Ayers Saint Gross – Adam Gross, design principal; Robert Claiborne, project manager; Jessica Leonard, master planner; Jonathan Ceci, landscape architect; Jamie Barnett, signage and graphic design

ENGINEERS: DWG Engineering (m/e/p); GEL Civil Engineering & Environmental (civil); ADC Engineering (structural)

CONSULTANTS: Biohabitats (environmental); Ayers Saint Gross (landscape)

GENERAL CONTRACTOR: Schuchart

CLIENT: College of Charleston

SIZE: 881 acres; 3,900 square feet (meeting barn); 1,125 square feet (studio)

PROJECT COST: $4.1 million

COMPLETION DATE: July 2013

SOURCES

TIMBER ROOF TRUSSES AND PURLINS: Atlantic Specialty Truss

ROOFING: Hussey Copper

EXTERIOR DOORS: Marvin Windows and Doors

ACOUSTICAL CEILING: USG Interiors

PHOTOGRAPHY: © VANESSA KAUFFMANN COURTESY COLLEGE OF CHARLESTON FOUNDATION

TRAILBLAZER
The first portion of the Dixie Plantation master plan to be executed was a trail system, which features a pine boardwalk that winds through an array of ecosystems including a saltwater pond (below). A bird's-eye view from the northeast shows the pond and the Stono River with its sinuous network of marshes (opposite). When completed, the plan will include multiple research centers and housing facilities (right). Two field stations will be completed in January.

1 STONO RIVER
2 MEETING BARN
3 JOHN HENRY DICK STUDIO
4 SALTWATER POND
5 FUTURE ACADEMIC RESEARCH CENTER

UNITED FRONT Technology-intensive neuroscience research occupies a low wing, connected to the psychology department in a taller, curved slab.

Princeton Neuroscience Institute & Peretsman-Scully Hall | Princeton, New Jersey | Rafael Moneo Architects

BRAIN TRUST

At Princeton University, an architect unites two disciplines with splashes of daylight and easy sociability.

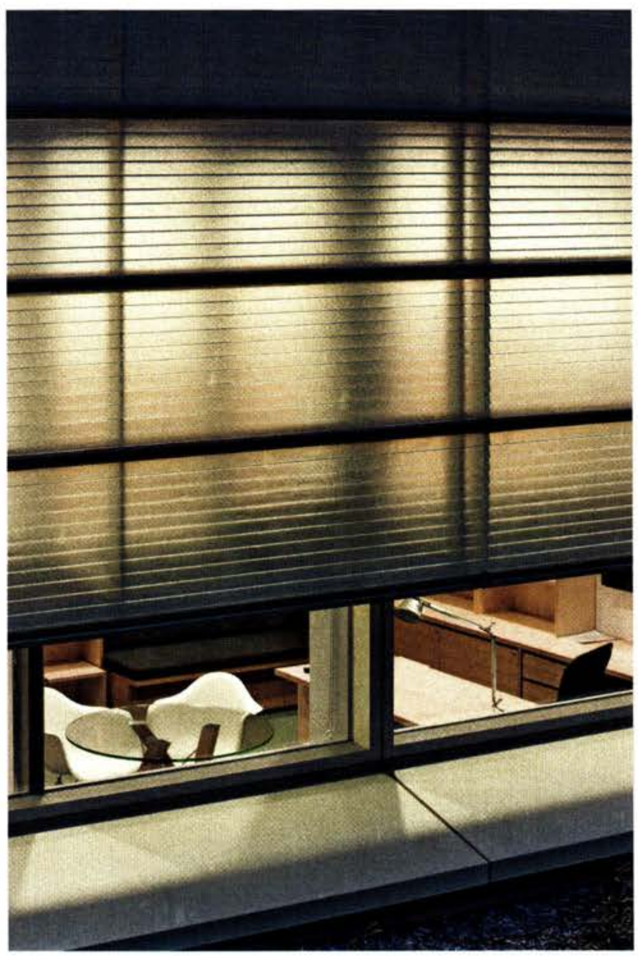
BY JAMES S. RUSSELL

PHOTOGRAPHY BY DUCCIO MALAGAMBA

Princeton University's new neuroscience and psychology building hunkers calmly, even hermetically, tucked into a slope amid a burgeoning science-research quarter. Across a lawn, the building faces the flamboyant sunshades and monumental gathering space of a genomics laboratory designed by Rafael Viñoly (RECORD, November 2003, page 180). The neuroscience entry curves toward an elegant bridge crossing Washington Road, where Hopkins Architects built a nave of ecclesiastic grandeur within a chemistry building that puts the research on display. Such are the architectural gymnastics required to engage the quandaries of scientific investigation: How do researchers collaborate across disciplines while retaining a core professional identity? How do you unite diverse expertise and find a common analytical language to answer critical questions?

At first glance, the Madrid architect Rafael Moneo's 248,000-square-foot steel-framed design looks like a throwback to postwar lab buildings erected under the spell of Walter Gropius. A broad, low wing counterpoints a taller, curved slab, both horizontally striped in ribbed translucent glass, vision glass, and white glass spandrel panels. Landscape architect Michael Van Valkenburgh wrapped the building in a meadow dotted with trees to make a gentle transition from the edge of a small forest to the tidy lawn.

The building's massing makes programmatic sense. The four-story horizontal volume accommodates technology-intense neuroscience labs, while the five-story slab is devoted to psychology, where faculty offices and seminar rooms predominate. The two departments meet not in a grand atrium but in a modest lobby spanned by a bridge overhead.



HEART OF GLASS
The sloping site partially buries two levels (above, right), which are revealed from the south (top, left). A rainscreen of molded glass panels casts diffuse light through tall clear-glass windows (left), leaving desk-level views unobstructed.

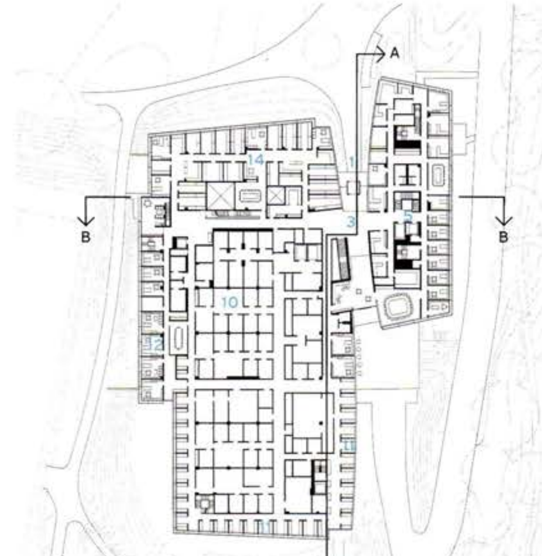
Such distinct realms for neuroscience and psychology look ambivalent, but Moneo and senior associate Valeria Mazarakis "captured extraordinarily well our need to remain two independent entities while having a strong connection," explains Deborah Prentice, professor of psychology and public affairs. (Hence, the bidisciplinary official name: Princeton Neuroscience Institute and Peretsman-Scully Hall.)

The psychologist's focus on behavior and the neuroscientist's study of the brain have long been united at Princeton, she adds, though the purpose of the building was to consolidate scattered neuroscience facilities (where research teams include physicists, biophysicists, and molecular biologists, among others) in order to retain an idea of "two overlapping circles" of psychology and neuroscience.

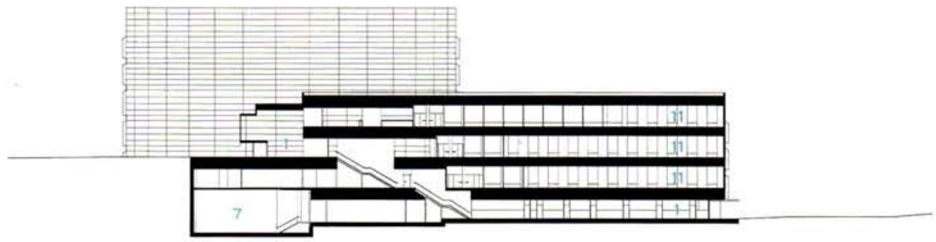
The building begins to reveal its unique approach to mixing disciplines at the lobby. An alcove paneled in shingled oak strips and furnished with glass-topped Moneo-designed tables invites gathering. It's visible from an elegant stair that jogs at landings to make room for conversation as it descends two levels. A massive neuroscience lab core takes up much of the four-story wing's floor plates. Behind closed doors (and red-painted walls) are the labs that demand the greatest control over environmental conditions. Since only limited daylight is allowed, Moneo has ringed the core with a corridor lined by windowed offices for faculty, post-doctoral researchers, and students.

These perimeter offices use the full 10-foot-6-inch ceiling height and reveal the true purpose of the exterior design. Above the vision-glass strips, Moneo hung custom-made ribbed-glass panels (which act as a rainscreen), held beyond the exterior wall on a painted-steel frame. The glass, custom molded and prototyped to achieve precisely the effect Moneo wanted, suffuses the offices with soft, controlled daylight. The light gains dimension by passing through clerestories that separate each office and then flowing into the corridor through the tall lites of custom, full-height sliding doors framed in stainless steel. "The light and views are important, and beautiful," Prentice notes. "People like them."

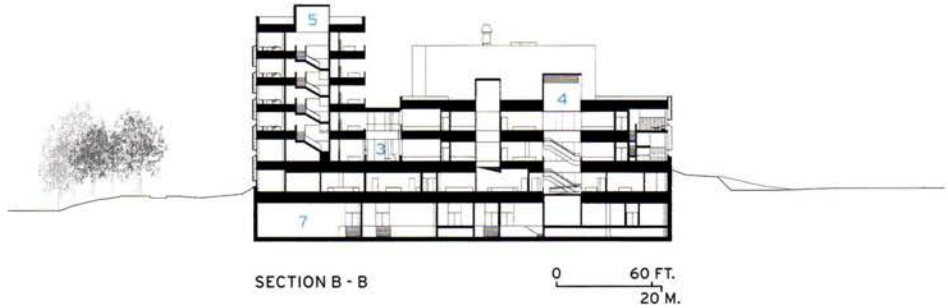
Outside the core, in the Human Neuroscience area, Moneo carved out "patios" deep within the building for a lounge and a classroom, lighting them from above with a clerestory-topped shaft that plunges four floors, sending diffuse light through floor-to-ceiling glass into labs, offices, and meeting rooms along the way. Clerestories also illuminate open stairs that interrupt the long lines of offices outside the lab core, making the trek from floor to floor alluring, and increasing opportunities for casual meetings. Numerous small lounges and shared workspaces (called "episodes" by Moneo) open along corridors. A Neuro Lounge is an intimate tour de force,



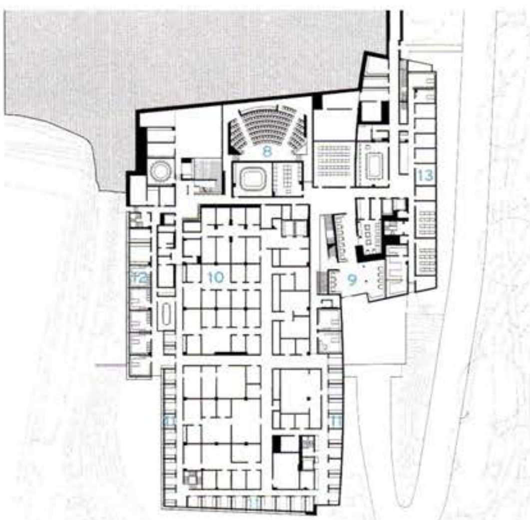
LEVEL 1



SECTION A - A

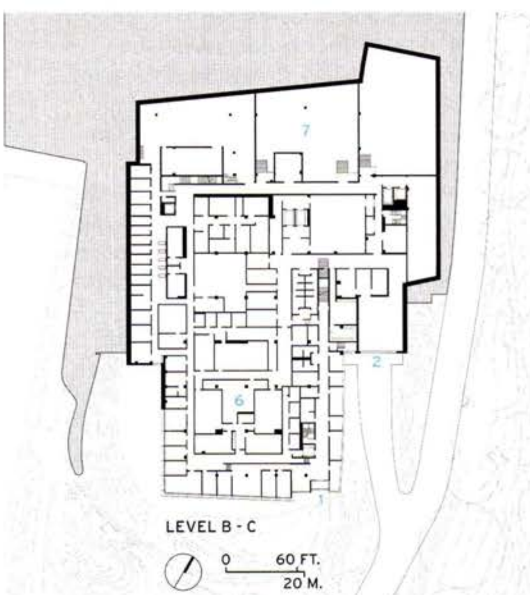


SECTION B - B



LEVEL A

1 ENTRY
2 LOADING DOCK
3 LOBBY
4 NEUROSCIENCE INSTITUTE
5 PSYCHOLOGY DEPARTMENT
6 IMAGING LAB
7 MECHANICAL
8 LECTURE HALL
9 STUDY ROOM
10 NEUROSCIENCE LABS
11 STUDENT OFFICES
12 FACULTY OFFICES
13 ADMINISTRATION
14 HUMAN NEUROSCIENCE



LEVEL B - C

credits

ARCHITECT: Rafael Moneo Architects – Valeria Mazarakis, project manager; Valerio Canals, Clara Moneo, Alberto Montesinos, Ignacio Senra, project team

EXECUTIVE ARCHITECT: Davis Brody Bond Aedas – Will Paxson, partner in charge; Anthony Sieverding, project manager

CONSULTANTS: Arup (structural, m/e/p/fp); Van Note-Harvey (site, civil); Michael Van Valkenburgh (landscape); Israel Bergman (glass); Jacobs Consultancy (laboratory programming and planning); Shen Milsom & Wilke (acoustic/vibration/security); Fisher Marantz Stone (lighting)

CLIENT: Princeton University

SIZE: 248,000 square feet

PROJECT COST: withheld

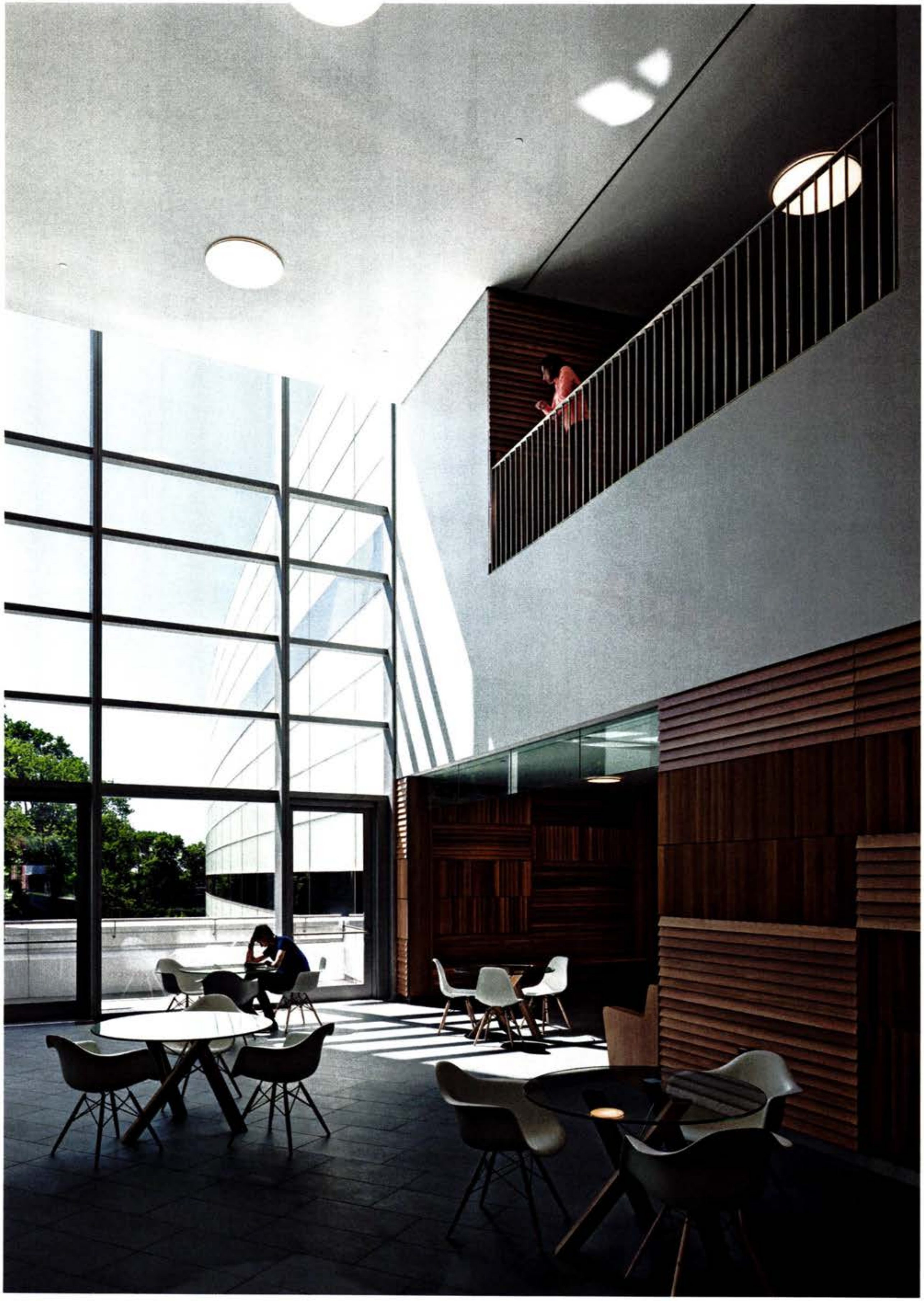
COMPLETION DATE: June 2014

SOURCES

CURTAIN WALL: Permasteelisa

MOLDED EXTERIOR GLASS: Cricursa

FIXED AUDITORIUM SEATING: Poltrona Frau



CLOSE ENCOUNTERS
Neuroscience and psychology meet in the two-story lobby (left), where a lounge and wood-paneled alcoves (the pattern echoing that of the exterior molded glass) offer a variety of formal and intimate meeting spaces. The glass-topped tables were designed by Moneo.

BRIGHT SPOTS
Moneo uses daylight in a variety of ways. In the Human Neuroscience area, offices borrow light from a clerestory-lit shaft that includes an inviting stair (left). The Neuro Lab offers lounge spaces on three levels (opposite, bottom). High windows in offices (opposite, top right) capture light diffused by the exterior molded-glass panels (though the pulled shade obscures this in photo), which passes through glazed sliding doors. Daylight enlivens the corridor outside the neuroscience-lab core (opposite, top left), which is interrupted by an open stair lit by clerestories.

offering varied light and views outside to break-takers as it climbs three levels.

It took three years to resolve the labs' diverse demanding technical requirements and then knit them together, according to Mazarakis. That process produced the idea of scattering social spaces throughout the building and enabled the extraordinary attention to detail throughout. (Moneo flew to Princeton some 40 times over the seven-year design and construction period.) "I would like the spaces to be felt and understood as both student- and faculty-owned," he explains, "giving them a certain sense of privacy, even a sense of domesticity, in order to make their work experience more comfortable."

Researchers have definitely taken ownership, since just about any glass expanse has become a handy writing surface, even though whiteboards are everywhere. (Inevitably, some seek solitude by covering portions of the glass doors and windows.) It is surprising that a building that reads at first as handsomely institutional, even anonymous, gradually reveals an easy informality in the intimate shared spaces made appealing by unexpected splashes of daylight that invite conversation and collaboration.

With so much research taking place in sterile, evenly lit labs cut off from the world, the high stakes–individual consciousness and identity–can seem abstract. Moneo has used primal amenities–sociability and light–to subtly insist on the humanity of the research enterprise. ■

James S. Russell is author of The Agile City: Building Well-Being and Wealth in an Era of Climate Change. *He blogs at jamessrussell.net/blog.*

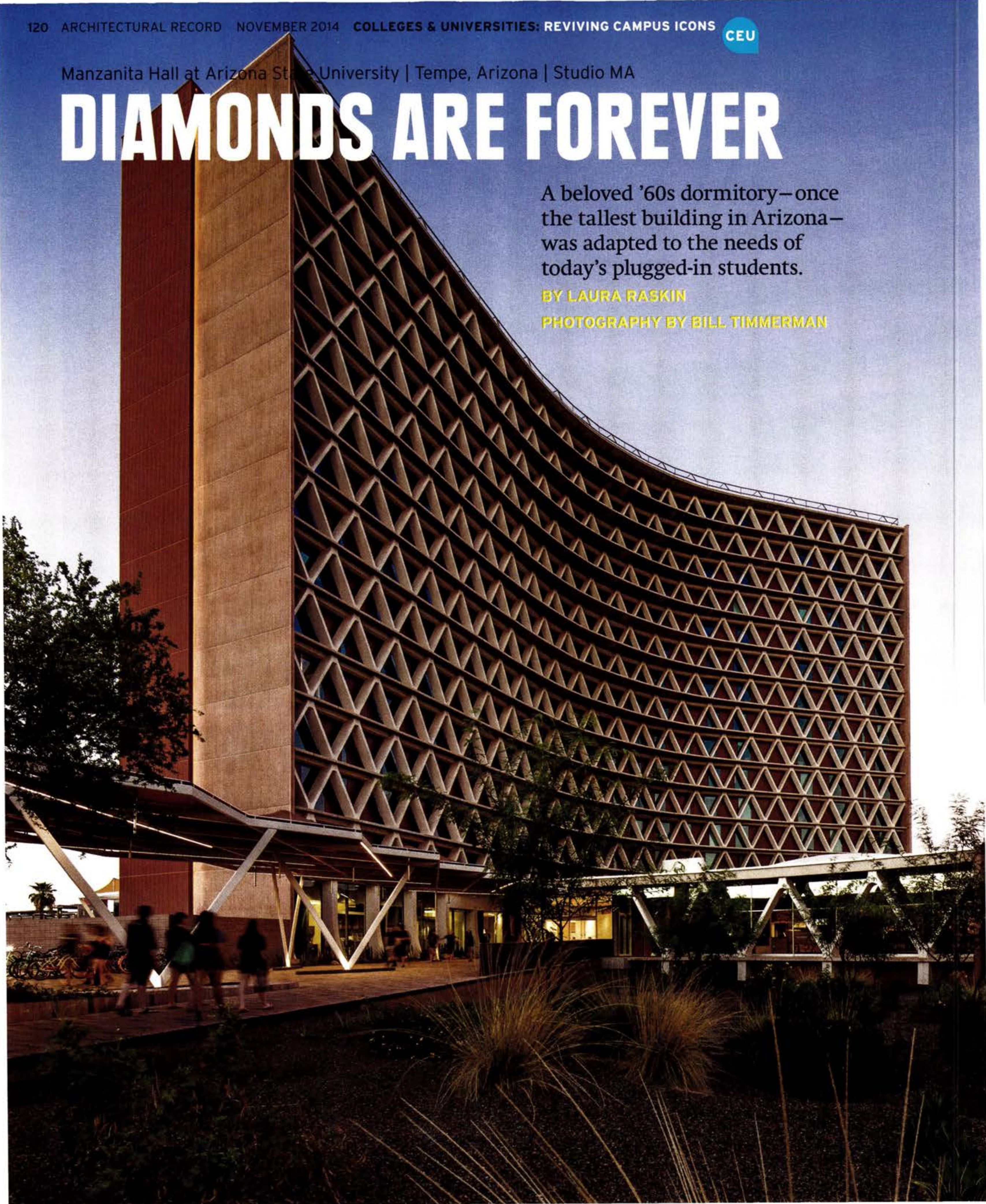
Manzanita Hall at Arizona State University | Tempe, Arizona | Studio MA

DIAMONDS ARE FOREVER

A beloved '60s dormitory—once the tallest building in Arizona—was adapted to the needs of today's plugged-in students.

BY LAURA RASKIN

PHOTOGRAPHY BY BILL TIMMERMAN



DESERT MODERN
The architects freed Manzanita's lattice from its original frame walls and inserted a panelized window wall system, set back 6-12 inches. A welcoming shade canopy funnels students into the lobby or the dining hall, which extends into the landscaped site (left). Two-story lounges (below, through windows) were added to create areas where students can socialize, study, eat, and enjoy views out to the city.

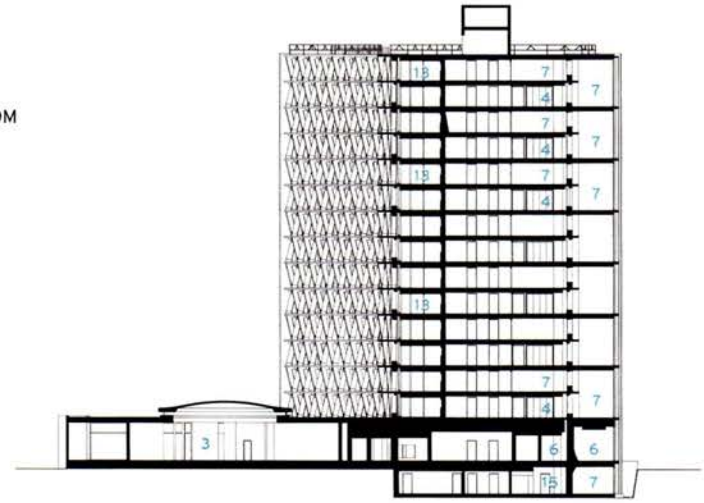
Manzanita Hall makes a striking statement on the northern edge of the Arizona State University, Tempe, campus, across from the Sun Devil Stadium and blocks from the downtown. Climbing up the 15-story dormitory's curved facades is a precast structural diamond-shaped lattice that was innovative for its time–Cartmell and Rossman designed the 1967 building–and still looks radically cool. If Sally Draper, Don Draper's daughter on *Mad Men*, went to ASU, she probably would have lived in Manzanita, originally a women's dorm.

Though Manzanita ("Manzy") was a beloved campus icon, with its groovy Y-shaped plan, by the time Solomon Cordwell Buenz (SCB) conducted a feasibility study in 2007 to determine whether the building could or even should be renovated, it had badly deteriorated and was not up to code or serving the needs of students. Jim Curtin, SCB principal, gathered university engineers who worked in the building to talk about which of the mechanical systems could be salvaged. "My focus group, scheduled for 45 minutes, turned out to be five minutes. They basically said nothing could be preserved," he says.

But the building had sentimental value and good bones–it featured the first use of post-tension concrete in Arizona when it was constructed. Initially, Manzanita's developer-manager, American Campus Communities (ACC), wanted to raze Manzanita and build new dormitories, but ASU was able to negotiate a financial scenario with ACC to support the renovation. The project's architect of record, Phoenix-based Studio MA, has had a long-standing presence on campus. Principal in charge Christiana Moss worked on ASU buildings at other firms, and

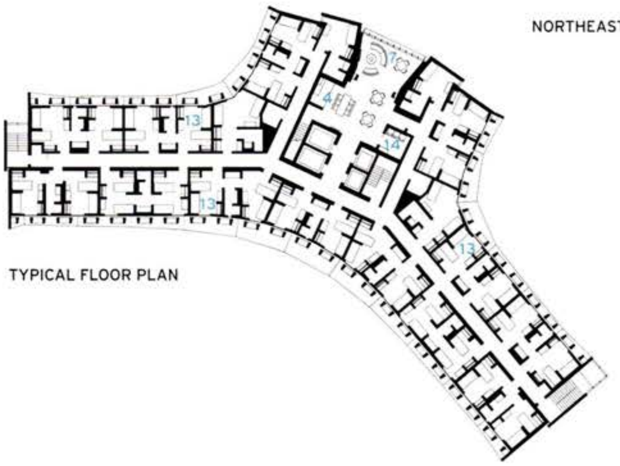
Watch a video at architecturalrecord.com.

1 ENTRY
2 LOBBY
3 DINING ROOM
4 KITCHEN
5 APARTMENT
6 FITNESS ROOM
7 LOUNGE
8 BUSINESS CENTER
9 MULTI-USE CLASSROOM
10 OFFICE
11 PATIO
12 ENTRANCE CANOPY
13 DORM ROOM
14 LAUNDRY
15 RECREATION ROOM

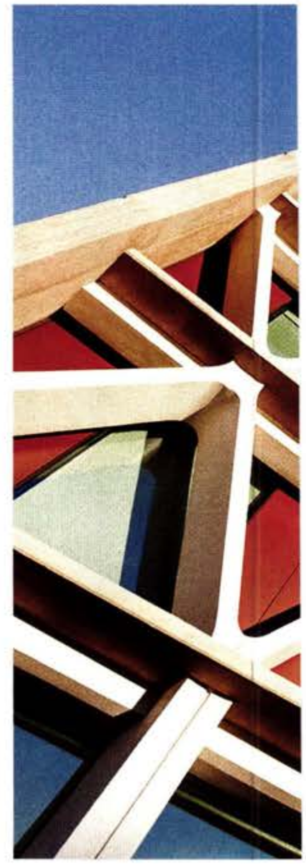


NORTHEAST - SOUTHEAST SECTION

0 32 FT. 10 M.



TYPICAL FLOOR PLAN



A DELICATE WEB
Staggered metal panels help with thermal performance (right).

GROUND FLOOR PLAN

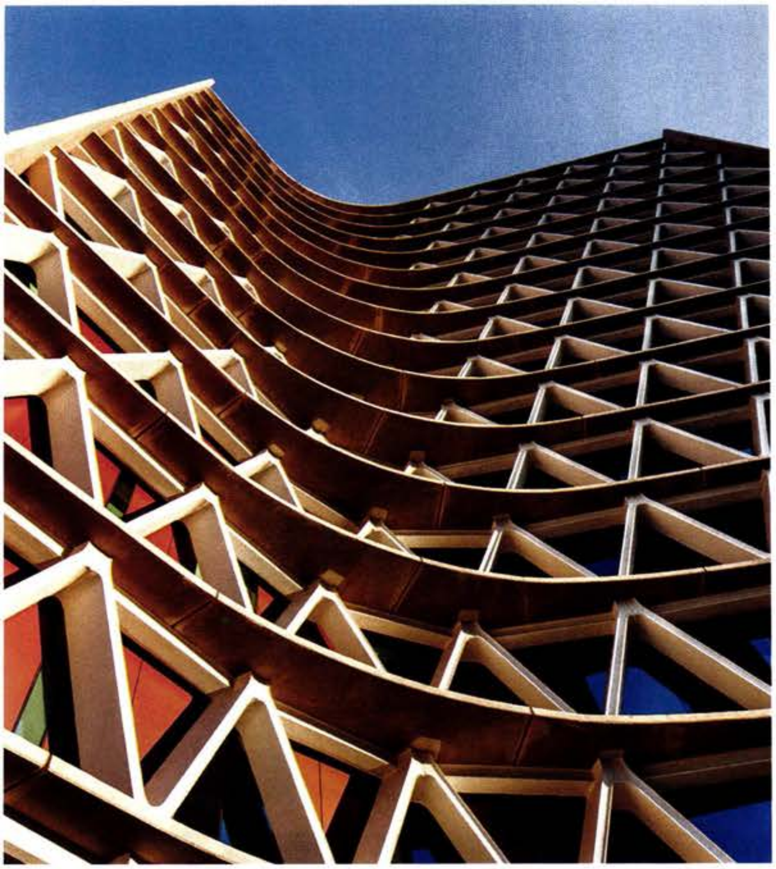
0 32 FT. 10 M.

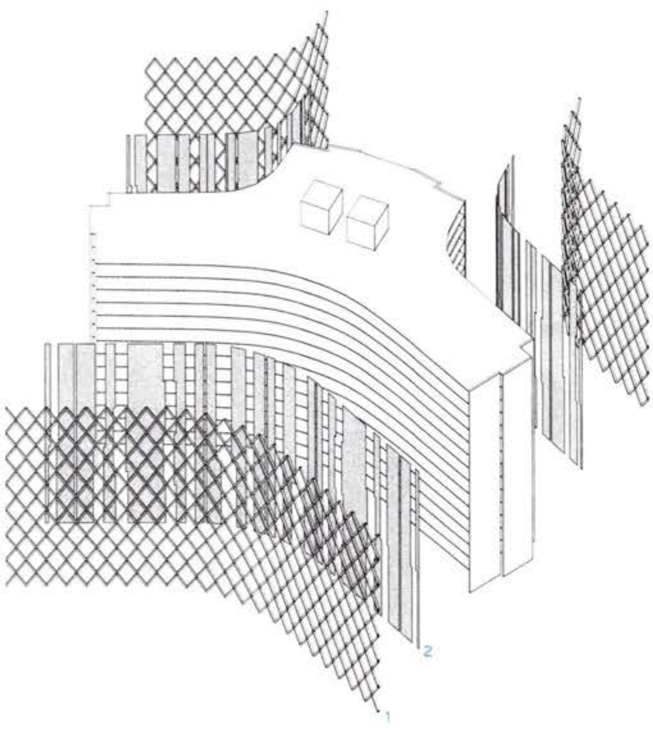
Studio MA principals Dan Hoffman and Christopher Alt both taught at ASU. (For Manzanita, Studio MA worked with SCB as associate architect and Sixthriver Architects on interior design.) The dormitory reopened in the fall of 2013 to house freshmen in the College of Liberal Arts and Sciences.

To bring the building into the 21st century, Moss and her colleagues felt they had to first redo the skin, relieving the precast lattice of infill. Originally, the dorm's windows and frame walls were set into the lattice. Today, a system with alternating glass and copper-toned vertical metal panels is set back 6–12 inches from the lattice (mimicking the reddish color of the indigenous Manzanita tree's new growth). The panels help with thermal performance, and also make the pale frame pop. "To accentuate the lattice and really articulate it was part of making the building modern again," says Moss.

This signature move almost didn't happen. When work began, the architects didn't realize that a chamfer surrounding the original windows—making them look like Superman's insignia—had also been cast into the lattice. "There was a moment [when the contractor began demolishing the first window bay], we were standing there like, 'I can't believe this,'" says Moss. "We had to literally cut out, grind out, every single 'fillet.'"

That was a defining moment for Moss, and one that set the tone for the rest of the project. "Midcentury modern buildings should be kept modern, but how do you do that?" she asks. "You can't be timid. You can't have a preservationist view, necessarily, because it keeps them in the past. Ultimately we said, 'Let's just get in there and grind the suckers out!'"





1 EXISTING PRECAST-CONCRETE STRUCTURE

2 NEW VERTICAL METAL PANELS

While Manzanita remains a residence hall, its program might as well be brand-new—student housing has changed so completely since it was built. "It's far more of a destination as opposed to a necessity," says Curtin, of dorm life. Students want flexibility and personal space, but, most importantly, they want connection and community. In the "old" Manzanita, students complained about never encountering classmates who lived on the same hall, recalls Curtin. The architects remedied this by creating two-story lounges in the northeast leg of the Y. Each lounge serves two floors of dorm rooms. To create space for the lounges, the architects pushed out the original northeast exterior wall, just shy of two L-shaped shear walls, adding floor-to-ceiling glazing. The original muscular X-bracing of the lattice is now part of the interior, demarcating the lounge mezzanines. Kitchenettes and laundry rooms are on the lounges' lower floors, connected by a stair to the mezzanine levels, where students can watch television and relax.

To accommodate the new floor plan, which also has larger room suites lining the perimeter walls (the bed count went down in number, from 1,000 to 814), the architects had to gut the interior, including all systems. Before new plumbing risers and mechanical chases could be inserted, every penetration in the post-tensioned slabs had to be x-rayed, on every floor, says Moss. Because the post-tensioning cables were not laid out consistently on each floor, they did not align, and flexible plumbing risers were installed to account for the irregularity.

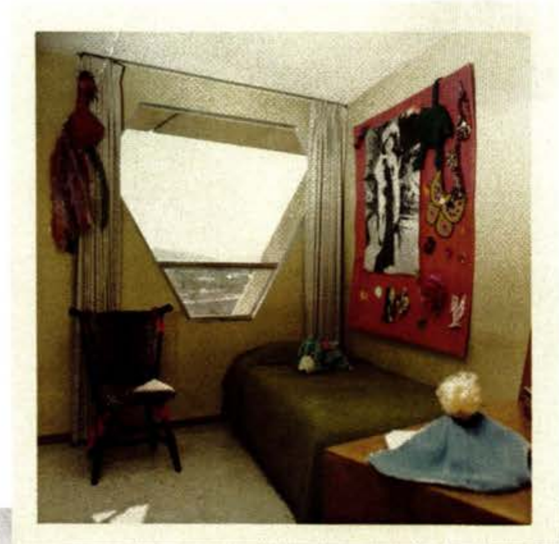
In addition to the replacement of the frame wall, the other big structural move at Manzanita was to demolish one of the four 12-inch-thick, 15-story, cast-in-place shear walls. This allowed the architects to insert two new code-compliant elevators. (Robotic demolition machines removed the walls after the building's exterior skin had been removed, in order to avoid full wind loading.) A new shear wall was then installed, 4 inches back from its original location. Studio MA and SCB also enclosed two sets of open-air stairs on the east and west sides of the building, glazing the shafts and mechanically ventilating them for required smoke evacuation.

Manzanita's lobby—just like its original dormitory floors—was isolating, dark, and uninviting, entered through a long, narrow, cast-in-place Corbusian ramp. "It was so depressing," says Moss. She and her colleagues raised the entire surrounding plaza and created a shade canopy, whose lattice mimics the facade. To flood the lobby with daylight, they removed stucco fasciae from exterior window walls and added skylights. Inside, they exposed original terrazzo that had been buried under vinyl tile, and inserted offices, a multifunctional classroom, and a computer center, giving the lobby an airy, cheerful atmosphere.

Restoring Manzanita is in line with two of ASU's major goals, says university architect Edmundo Soltero: providing the infrastructure for a desired 100,000 students by 2020 across all campuses, and changing what had traditionally been a commuter campus into one that students call home. To do that, the campus and its buildings "have to speak to a harsh desert environment," says Soltero. Moss agrees, noting that there is something disturbing about all-glass buildings—not an uncommon sight in Tempe—for a place where temperatures often reach 120 degrees Fahrenheit in the summer. At Manzanita, though the architects increased glazing by 15 percent, simulations showed that they are able to achieve a 12–18 percent performance increase simply by pushing the skin back from the lattice. "The R value of the original wall—we analyzed each layer—came out to 3.5. It was a real energy hog," says Moss. Now the opaque walls have an R value of about 22.

On a recent tour of Manzanita on a 100-degree fall day, a student sat on the comfortable north-facing shade terrace, next to a sand court for volleyball and a barbeque lawn. He talked on his cell phone while music bounced softly from a sound system. The pop star Pink sang her hit "Just Give Me a Reason," whose words seemed particularly apt for Manzanita's rebirth—"... We're not broken, just bent, and we can learn to love again." ■

STUDENTS FOR LIFE
Double-height lounges connect with two floors of dorm rooms. The architects pushed out an exterior northeast wall to accommodate the lounges, and removed a center V of the lattice on even floors (right). Original terrazzo was exposed in the bright, inviting lobby (below). The new dorm rooms (opposite, bottom) typically sleep two. Beds are separated by a privacy wall. The old "Superman" windows made the rooms seem gloomy (inset).



credits

ARCHITECT: Studio MA – Christiana Moss, principal in charge; Christopher Alt, principal project architect, designer; Dan Hoffman, planning principal; Timothy Keil, project manager; Zubin Shroff, job captain

ASSOCIATE ARCHITECT: Solomon Cordwell Buenz

ENGINEERS: GLHN (m/e/p); Woodward Associates (electrical); PK Associates, Buro Happold (structural)

CONSULTANTS: Sixthriver Architects (interior design); Floor Associates (landscape); Roger Smith Lighting Design (lighting); Heitmann & Associates (building enclosure)

GENERAL CONTRACTOR: Hardison Downey Construction

OWNER: Arizona State University

CLIENT: American Campus Communities

SIZE: 216,250 square feet

CONSTRUCTION COST: $34.1 million

PROJECT COST: $46.5 million

COMPLETION DATE: August 2013

SOURCES

MASONRY: Oldcastle BuildingEnvelope

METAL PANELS: Kovabond

CURTAIN WALL: Kovach

GLASS: Viracon

PHOTOGRAPHY: COURTESY STUDIO MA (INSET)

Oberlin College, Bibbins Hall | Oberlin, Ohio | Westlake Reed Leskosky

AMERICAN GOTHIC

ALL AGLOW
Cutting open a section of the roof at one end of Minoru Yamasaki's three-story Bibbins Hall allowed Westlake Reed Leskosky to insert a glass-topped volume for musical performances within the building's original load-bearing precast-panel shell (opposite). After dark, the room's new clerestory functions as a lantern (left).

Westlake Reed Leskosky raises the roof in its overhaul of a music building by Minoru Yamasaki.

BY JOSEPHINE MINUTILLO

PHOTOGRAPHY BY KEVIN G. REEVES

Visitors to Oberlin College in rural northern Ohio might be surprised by the caliber of architecture that graces its nearly 500-acre campus. While architectural tourists have long flocked to another heartland town—Columbus, Indiana—to see its array of built works by modern masters, fewer are familiar with Oberlin's own extensive collection of buildings by leading architects. Designs range from 19th-century Richardsonian Romanesque gems and Cass Gilbert's numerous early-20th-century campus contributions, to innovative and sometimes controversial buildings by Wallace Harrison, Hugh Stubbins, and Robert Venturi from the 1950s through the '70s. One of the more recent additions is William McDonough's Center for Environmental Studies, considered a leading example of green architecture.

Among the most striking of all is a suite of structures designed by Minoru Yamasaki in the 1960s. The stark white facades stand out against the muted masonry of their neighbors. Bibbins Hall, the three-story main teaching building of the college's renowned Conservatory of Music, features load-bearing exterior walls with narrow windows and an oddly vertical emphasis that resembles that of Yamasaki's design for New York's Twin Towers.

Housing music studios and faculty offices, Bibbins's design was structurally

SOUND STAGE Within the new performance space (this image), which was made by combining two typical classrooms (opposite, right), a delicate veil of maple dowels visually reinforces the diagonals of the steel trusses supporting the raised roof.

and acoustically advanced for its time. But the 50-year-old building, whose exterior walls lacked vapor barriers and suffered from failing joints and deteriorated window caulking, was in need of an overhaul that included full systems and lighting upgrades. Cleveland-based Westlake Reed Leskosky (WRL), the same architecture and engineering firm that completed the adjacent Kohl Building for the conservatory's programs in jazz, music history, and theory in 2010, is overseeing the Bibbins renovation.

A key aspect of the ongoing project, which includes the replacement of all windows and interior perimeter walls, was the creation of a much-needed recital space. The school's initial plans called for combining two classrooms, but the 10-foot ceilings were not high enough to avoid excessive loudness, realize proper sound distribution, or create reverberation (the persistence of sound after it is produced). WRL, together with Oak Park, Illinois–based acousticians Talaske Sound Thinking, quickly realized they would need to locate the space on the third floor and raise the roof.

The design team grappled with a number of aesthetic and structural issues as a result of cutting open a large section of the roof. "The biggest challenge—and this is true for any existing building—is that you never know what you're going to find in the existing structure," says Stephanie Banfield, senior structural engineer at WRL. "This building was definitely a structural system I had never seen before."

The 52-foot-wide, 225-foot-long Bibbins features limited interior columns. Instead, the exterior walls, composed of diamond-shaped precast-concrete panels up to 10½ inches thick, with exposed aggregate, serve as the main vertical load-carrying elements. WRL determined that the best way to insert a pop-up while maintaining the roof diaphragm was to use steel trusses that would not require additional vertical supports. "We didn't want a building trying to do the same thing as Yamasaki," says WRL principal Jonathan Kurtz. "Steel allowed us to do it in a light way that was a counterpoint to the rugged three-dimensional structure."

Just as Yamasaki's structural system determined the aesthetics of the building, so did the truss within the 24-foot-high, 1,300-square-foot recital space located at the west end of Bibbins. Wood dowels, ⅝ inch in diameter and spaced between 1¼ and 1½ inches apart, were arranged to visually

credits

ARCHITECT: Westlake Reed Leskosky – Paul E. Westlake Jr., principal in charge; Jonathan Kurtz, lead designer; Matt Janiak, project director; Katie Ritzmann, project architect

ENGINEERS: Westlake Reed Leskosky

CONSULTANTS: Talaske Sound Thinking (acoustics)

GENERAL CONTRACTOR: Panzica Construction

CLIENT: Oberlin College

SIZE: 46,800 square feet

CONSTRUCTION COST: withheld

COMPLETION DATE: in progress

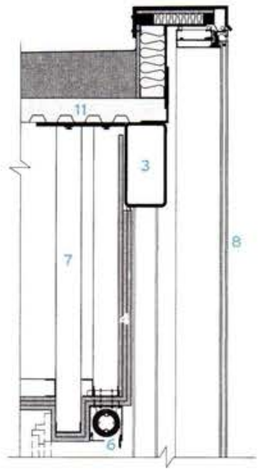
SOURCES

CURTAIN WALL: Lakeland Glass, Guardian, Kawneer

ACOUSTICAL CEILINGS: MJS Interiors, Armstrong

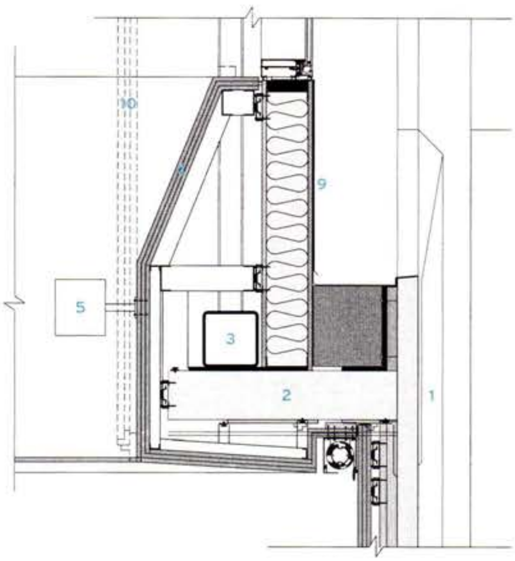
CUSTOM WOODWORK: Nagele Manufacturing

LIGHTING: Selux, Juno Lighting Group, Amerlux, Lumenpulse, Ardee

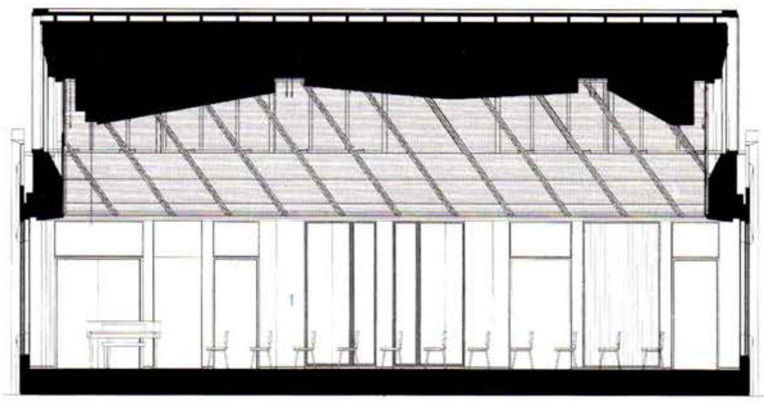


1 EXISTING CONCRETE WALL PANEL
2 EXISTING CONCRETE ROOF DECK
3 STEEL TRUSS
4 GYPSUM BOARD
5 SPEAKER
6 ROLLER SHADE
7 METAL STUD
8 CURTAIN WALL
9 CEMENT BOARD
10 WOOD DOWEL PANEL
11 NEW CONCRETE ROOF DECK

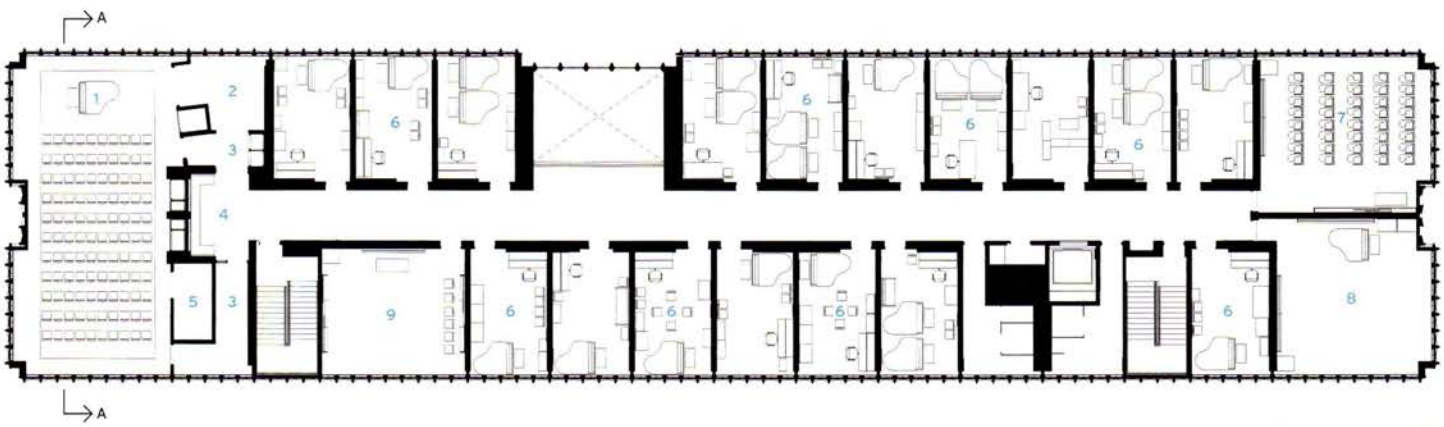
1 RECITAL HALL
2 GREEN ROOM
3 SOUND LOCK
4 LOBBY
5 CHAIR STORAGE
6 TEACHING STUDIO
7 CLASSROOM
8 PIANO LAB
9 ENSEMBLE ROOM



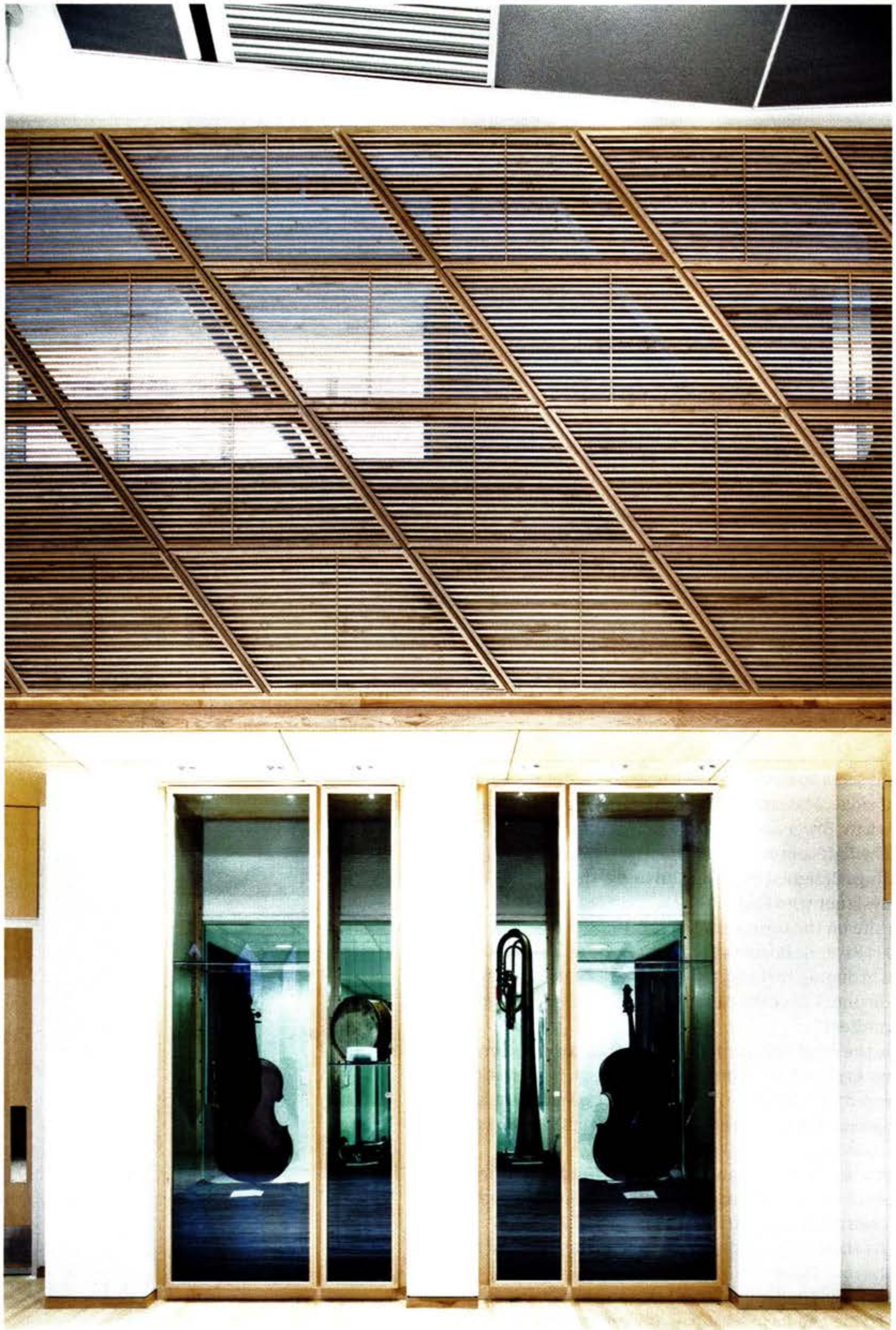
CLERESTORY SECTION DETAIL 0 1 FT. 0.5 M.



SECTION A - A 0 6 FT. 2 M.



THIRD FLOOR PLAN 0 16 FT. 5 M.



SHOW TUNES The renovation of Bibbins Hall includes the addition of display cases, within the new recital space and along corridors, to exhibit the conservatory's large collection of musical memorabilia and instruments.

reinforce the diagonals of the trusses. The composition creates a delicate veil on the interior that lets in filtered sunlight during the day through the new clerestory's insulated glazing units. After dark, the transparent box becomes a lantern, with the area below in use at all hours of the night, as both an informal rehearsal area and a recording room.

The maple dowels, however, were not ideal from an acoustic standpoint. In WLR's initial design, these elements were all the same length, which would have caused them to resonate and absorb sound at the same pitch. In extreme cases, this phenomenon would color the sound. "By introducing vertical elements between the diagonals, we basically took dozens of dowels that were the same length and made them different lengths," says acoustician Rick Talaske. "It avoided a pitch-selective sound absorption and keeps the timbre of instrumental sound natural."

Elsewhere in the room, sound absorptive and sound diffusive materials—the former to control reverberation and the latter to spread sound out in many directions and produce a pleasant timbre—were integrated behind sound-"transparent" perforated metal panels. Elsewhere in the building, there were a number of good acoustic solutions implemented as part of Yamasaki's original design. Most notably, resiliently supported concrete floor slabs in most of the faculty studios and other sensitive rooms avoid sound transfer vertically and horizontally. "While acoustically isolated construction is standard now, many music buildings of this era were not built that way," Talaske explains. "Bibbins is exceptional in that regard."

A rigid connection of the exterior wall and the window frame to the interior construction could cause sound transfer, or flanking, between rooms. To avoid that, new windows are now being resiliently mounted throughout Bibbins. The new interior wall system is similarly isolated from the exterior concrete walls, something that was not included in Yamasaki's design.

Those types of shortcomings add to the complexity of accommodating today's performance standards within a '60s building. While not grand, WRL's intervention succeeds in sensitively inserting contemporary infrastructure into an iconic envelope. ■

Boston University Law School Renovation & Expansion | Boston | Bruner/Cott & Associates

BUILDING AT THE BASE
The most conspicuous piece of a five-building complex by Josep Lluís Sert on Boston University's campus is the 265-foot-tall Law Tower, which is especially visible from across the Charles River (above). Bruner/Cott is now renovating the tower and has just completed a five-story limestone-clad and glass addition at its base (right).

Preservation and Modernism might seem to have contradictory goals, but not for architects Bruner/Cott. The Cambridge, Massachusetts–based firm is renovating and restoring Boston University's Law Tower and has just completed a 93,000-square-foot addition at its base. The half-century-old 18-story tower is a key element in a collection of five 1960s buildings designed by Josep Lluís Sert, the Corbusier-influenced architect and urban designer who fled to the United States from fascist Spain in the 1939. They occupy a site on the university's central campus between busy Commonwealth Avenue and the Charles River in Boston's Fenway-Kenmore section. In addition to the tower, the Brutalist concrete grouping includes two libraries, a student union, and a central boiler plant, making up what Bruner/Cott calls "a rare grouping of significant works by a single, internationally known architect."

The tower, which at a height of 265 feet is the most conspicuous piece of the assemblage, is noteworthy for its "sculptural presence," says Bruner/Cott principal Henry Moss. Its elevations are composed of highly articulated cantilevered volumes that form the armature for windows, scuppers, and precast spandrel panels. The projecting compositions "are not applied; they are part of the structure of the building," adds founding principal Leland Cott.

Although Moss and Cott–students of Sert when he was dean of Harvard's Graduate School of Design (1953 to 1969)–are ardent admirers of the tower's assertive aesthetic, its users have long criticized the building, which housed classrooms and offices, for its functional drawbacks. For instance, chronic traffic jams at its six small and slow elevators meant it would take students as much as 20 minutes to move between classes.

In addition, the building's envelope posed other challenges, primarily due to age and deferred maintenance: both its cast-in-place frame and its precast panels were spalling, exposing rebar, and its steel-framed, single-glazed windows were drafty and leak-prone. On top of that, the tower had been built without mechanical cooling (Sert's idea was that the narrow floor plate–only 60 feet wide by 120 feet long–would facilitate cross ventilation through clerestory windows and brightly colored metal panels). Although two separate air-conditioning systems were added in the 1970s and 1980s, both were outmoded and ineffective by the time Bruner/Cott was asked by the university to develop a preservation and development plan for this part of campus in 2007.

SERT RE-ASSERTED

A renovation and expansion of a midcentury academic tower restores a master's legacy.

BY JOANN GONCHAR, AIA

PHOTOGRAPHY BY RICHARD MANDELKORN

GROUPTHINK
A major aspect of the addition project was creating spaces for students to socialize and study together—an amenity that was lacking in the Sert tower. These gathering spaces, enclosed in glass, include a second-floor café that overlooks the river (above) and a double-story winter garden that serves as an entry lobby (opposite) for both the tower and the new building. The lobby opens directly to a main pedestrian axis for this part of campus (left).

The tower was outdated in other ways—it had almost no space where students could gather to socialize or work in groups, making it out of step with the collaborative nature of 21st-century legal education.

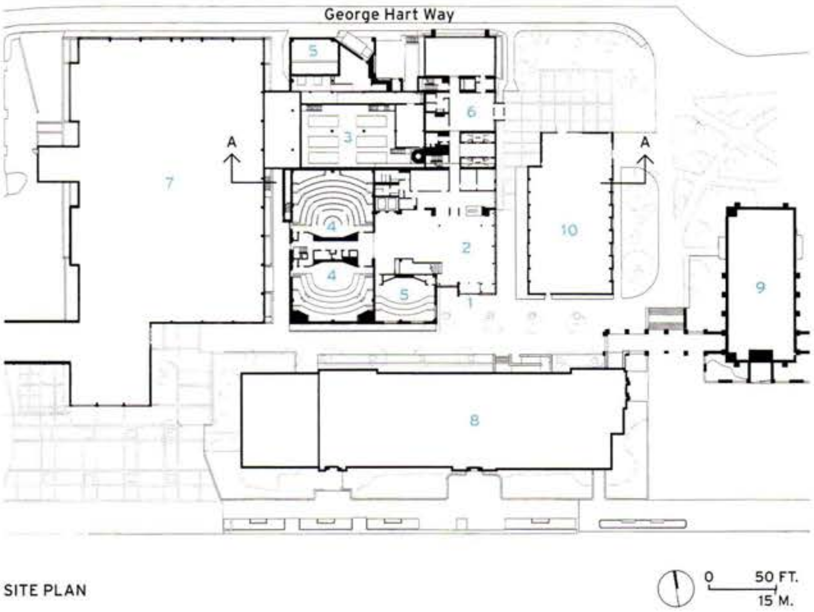
Given all the tower's limitations, it is not surprising that the law school's leadership had long wanted to build a new facility on another site. Its dean, Maureen O'Rourke, says that the law school's relocation had been a consideration for at least the two decades that she has been a faculty member. Nevertheless, Bruner/Cott was able to convince the university and the school to move forward instead with a renovation and to build a glass and limestone-clad five-story addition, now known as the Sumner Redstone Building, over the one-story boiler plant. The scheme made compelling economic sense: the $184 million project (a sum that includes the expansion and the renovation, as well as soft costs like financing and design fees) is 40 percent less expensive than an entirely new facility, according to Gary Nicksa, the university's senior vice president for operations.

Cott says the project also makes sense for its users. He points to the project's "simple diagram," which entails moving classrooms out of the upper reaches of the tower and placing them, along with new spaces for group study and socializing, in Redstone or on the lower levels of the Sert building. The tower's upper floors would be given over completely to administrative functions and faculty offices, where their occupants will enjoy views over Boston and Cambridge once the renovation is complete. The strategy is intended to reduce the crush at the elevators, and it locates the programmatic elements where structural logic dictates: the largest rooms are in the addition, which has a steel frame, and therefore longer spans, and the smaller spaces are within the tower's constrained waffle-slab floor plates.

One drawback to the approach is that Redstone's placement sacrifices some of the outdoor space that was part of Sert's composition. But Bruner/Cott maintains that the plazas were windswept and often in shadow, suggesting that Sert was applying a solution more appropriate to the climate of his native Barcelona than that of New England.

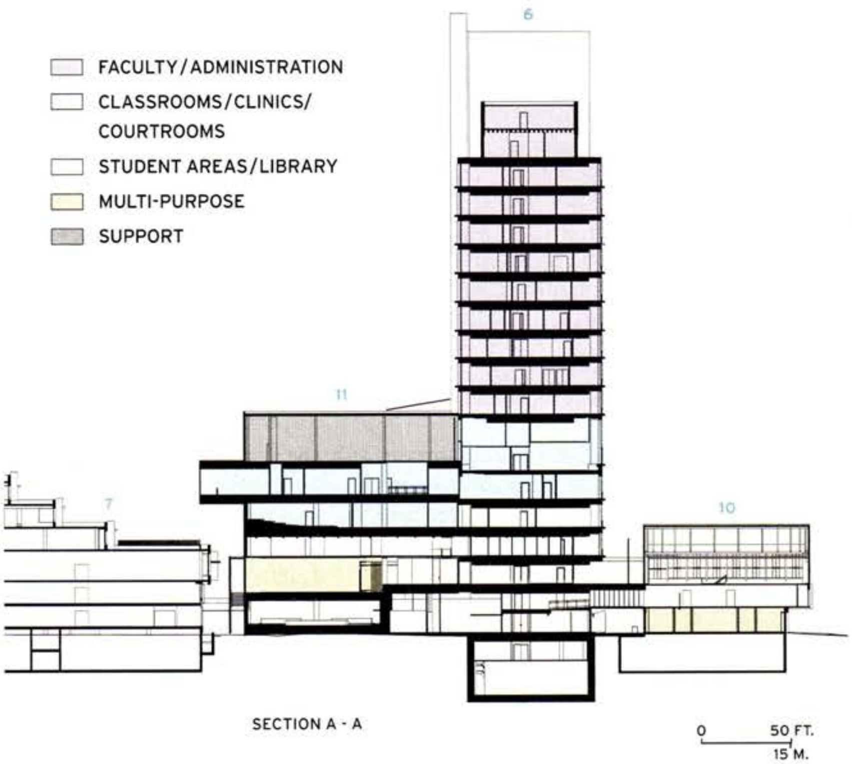
What the law school gets in exchange for the inhospitable outdoor spaces are indoor counterparts open to the whole university community. Expressed as glazed volumes that project from the smooth limestone skin of Redstone in a way that refers to Sert's cantilevers, the new gathering places include a café overlooking the river and a double-story winter garden that serves as an entry lobby. In the latter space,

1 ENTRY
2 WINTER GARDEN
3 BOILER PLANT
4 CLASSROOM
5 RECEIVING
6 LAW TOWER
7 MUGAR LIBRARY
8 SCHOOL OF THEOLOGY
9 MARSH CHAPEL
10 PAPPAS LIBRARY
11 SUMNER REDSTONE BUILDING



SITE PLAN

FACULTY/ADMINISTRATION
CLASSROOMS/CLINICS/COURTROOMS
STUDENT AREAS/LIBRARY
MULTI-PURPOSE
SUPPORT



SECTION A - A

old and new are clearly distinguished from each other: muscular concrete stands out against a relatively delicate curtain wall. The contrast is reinforced by details such as the 10-inch-wide reveal where the winter garden's ceiling meets Sert's tower (the gap also hides an expansion joint).

As part of the tower's restoration, which is now in full swing, the single-glazed steel windows are being replaced with double-glazed versions in thermally broken aluminum. The new windows' mullions and transoms will match the profile and rhythm of the originals and re-create their shadows.

One particularly tricky aspect of the project is the repair of the spalling concrete, especially that of its cast-in-place structure, says Moss, since the appearance of the material is different in different parts of the tower. What's more, contractors must wait three to four weeks for samples to cure to see how well they match the existing surfaces. "Patching stone is a piece of cake by comparison," he says.

The renovation also includes the removal of all partitions and the installation of completely new building systems, such as active chilled beams in perimeter offices, which will cool efficiently but work within the structure's tight floor-to-floor heights. Cott says that he hopes the project will redeem the tower in the eyes of the Law School's faculty and students. Once the restoration is completed in the fall of 2015, he says, "it will be better than it has ever been." ■

Continuing Education

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Learning Objectives

1 Explain the strategies deployed to bring mid-20th-century buildings at Oberlin College, Arizona State University, and Boston University into compliance with current codes and performance expectations.

2 Describe the structural modifications and other changes made to these buildings to meet their owners' programmatic needs.

3 Discuss the acoustical challenges posed by the project at Oberlin College and describe the design team's solutions.

4 Discuss how the buildings were adapted without sacrificing their character-defining midcentury features.

AIA/CES Course #1411A

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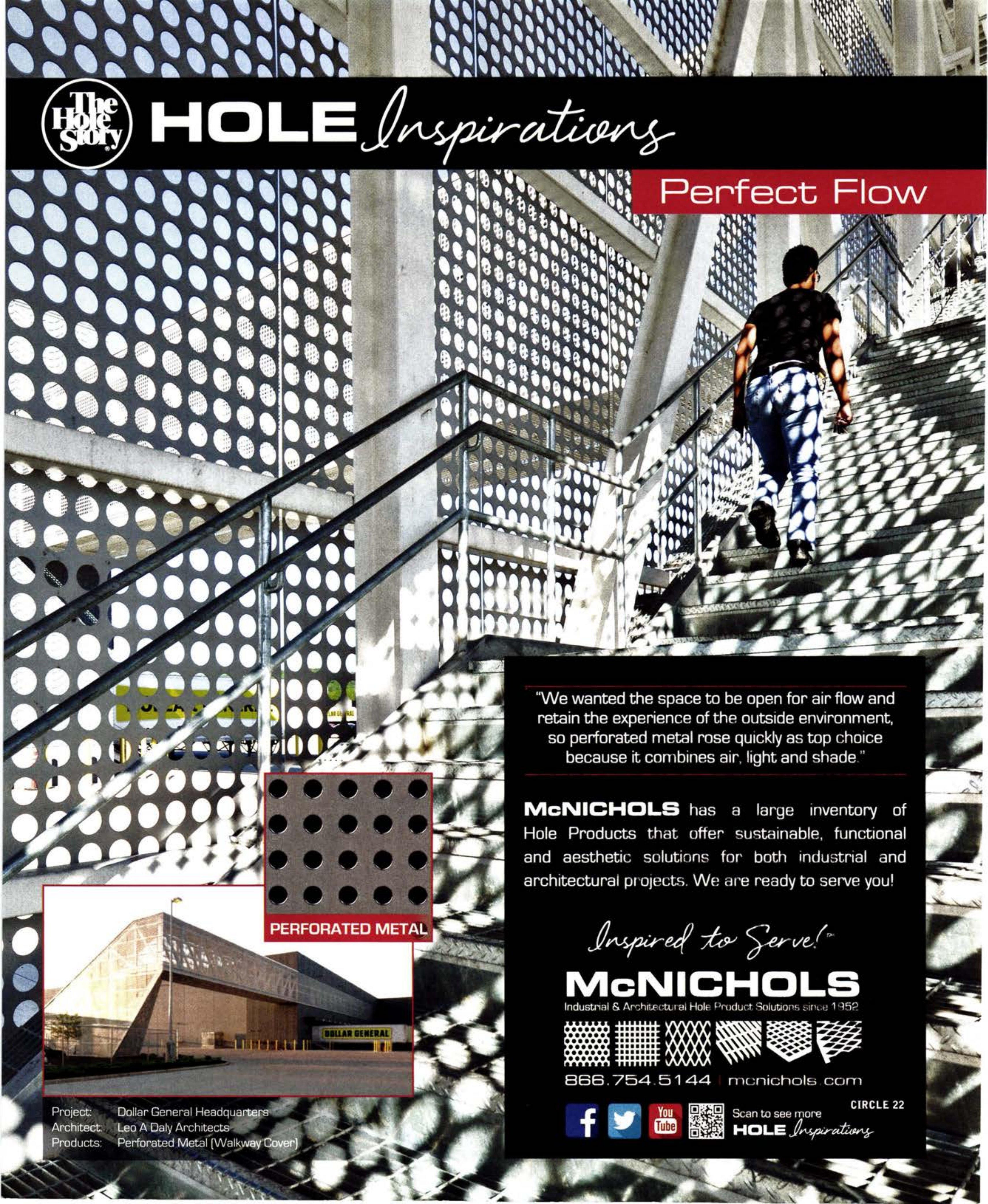

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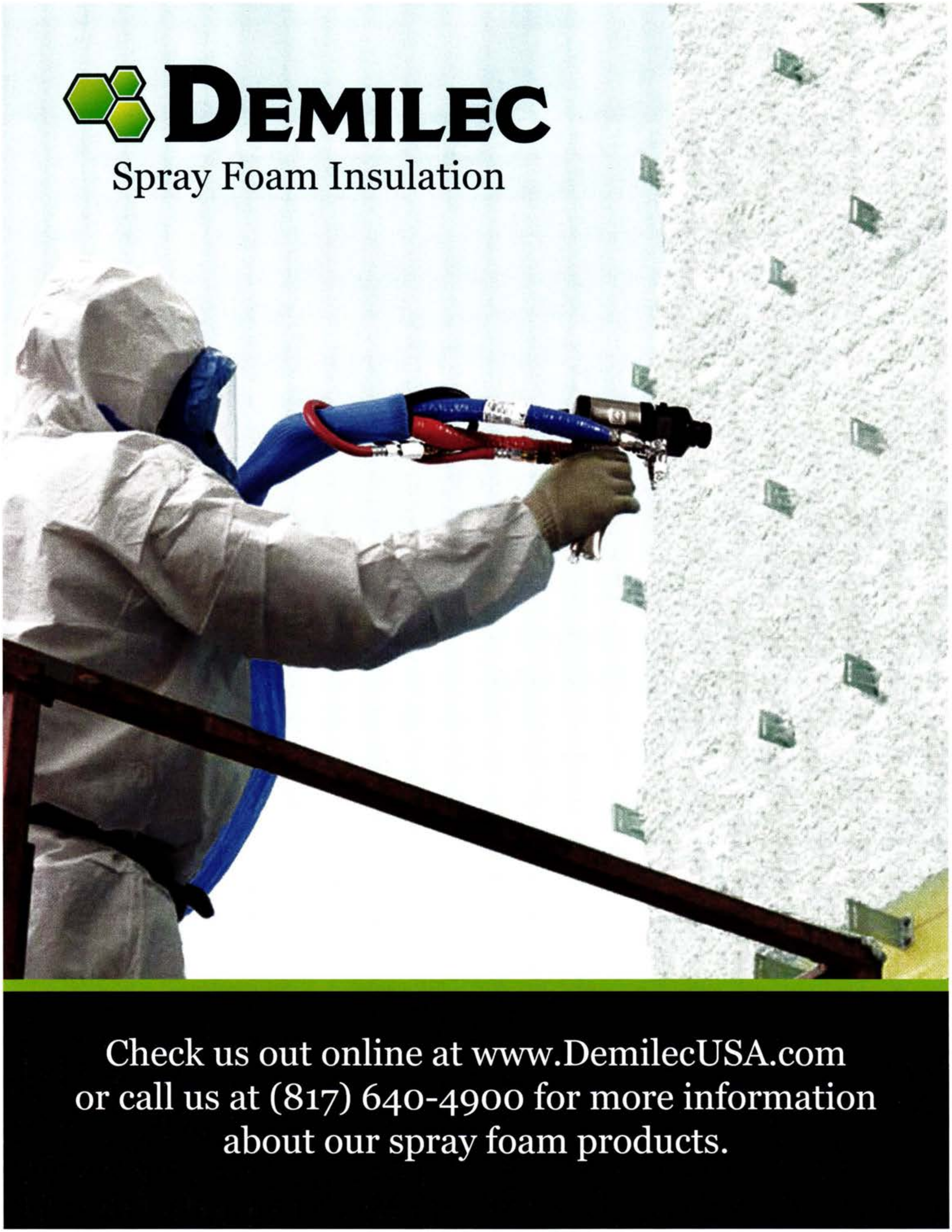
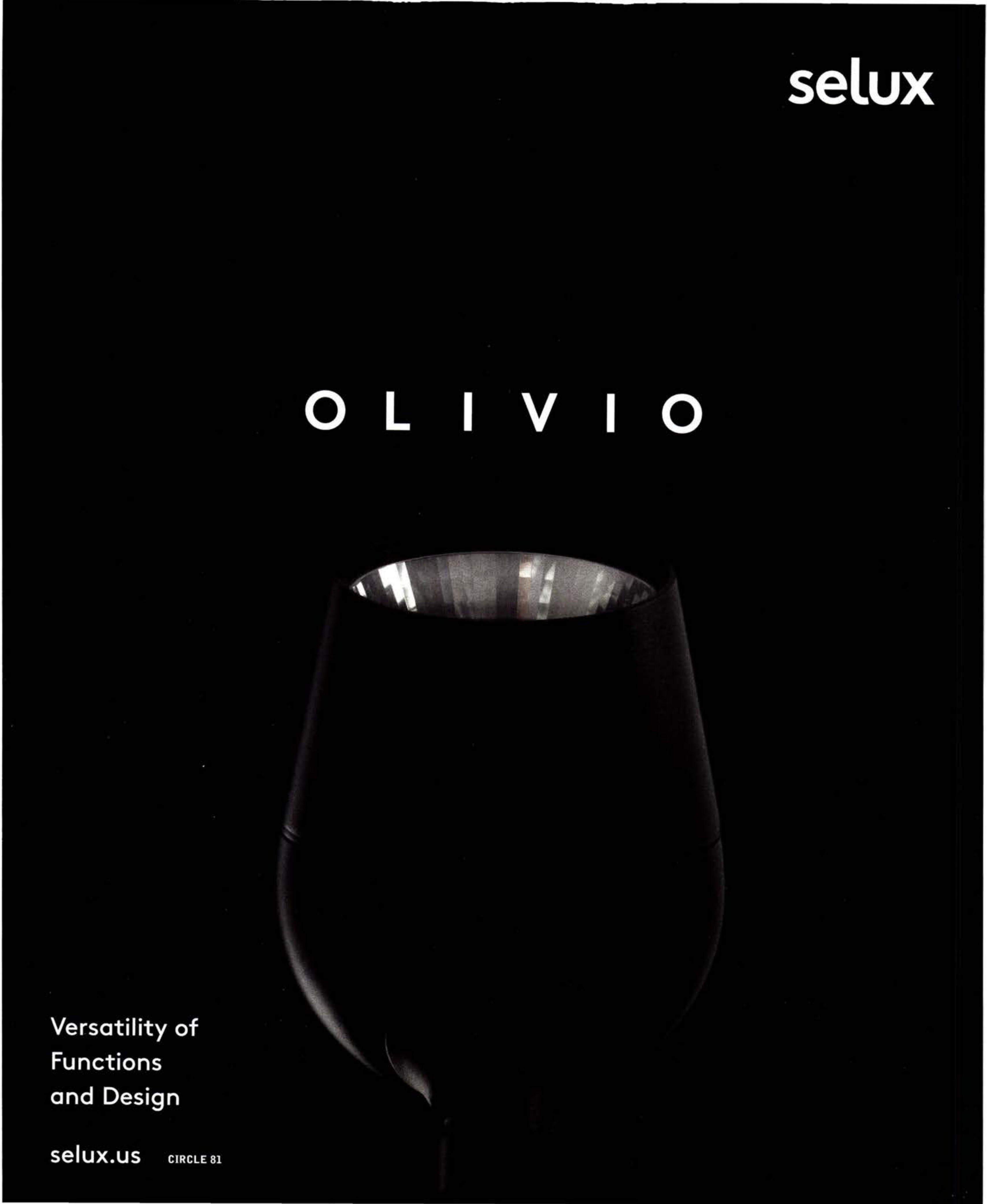


CIRCLE 74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OLIVIO
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CIRCLE 81

Brand New

The creative use of light helps shape the identity and architectural design of three innovative—and surprising—retail locations: a glowing Louis Vuitton store in Tokyo's Ginza district, a pioneering headquarters/factory/shop hybrid in New York, and an eyeglass boutique-cum-office for an optometry practice in Laval, Quebec.

PHOTOGRAPHY: © DAICI ANO

LOUIS VUITTON MATSUYA GINZA FACADE RENOVATION BY JUN AOKI & ASSOCIATES

Louis Vuitton Matsuya Ginza Facade

Tokyo
Jun Aoki & Associates

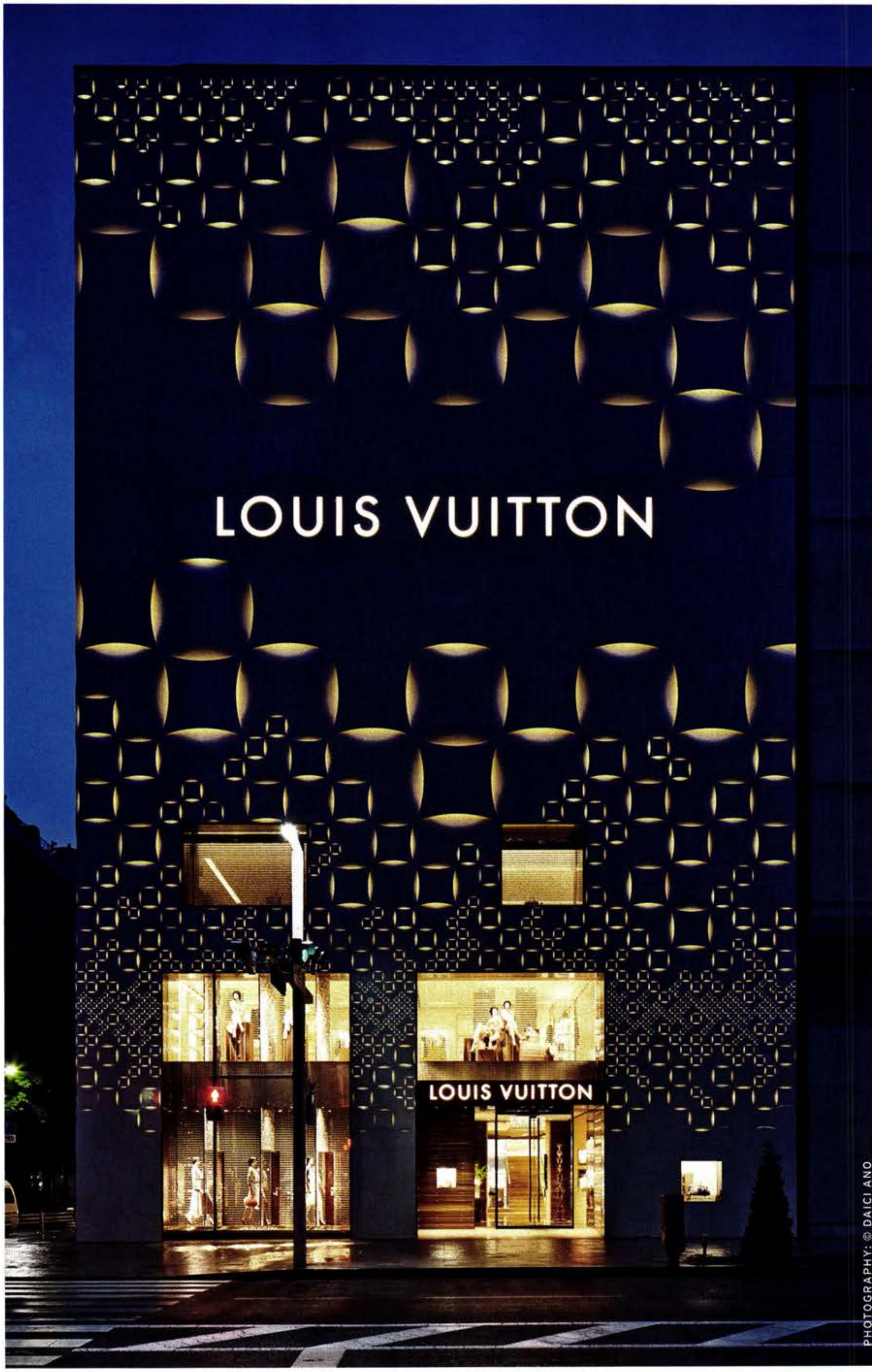
By Naomi R. Pollock, AIA

DESPITE JAPAN'S energy belt-tightening, triggered by the Great Eastern Japan Earthquake of 2011, dazzling lighting effects still bedeck most luxury boutiques in Tokyo's Ginza shopping district. But a new Louis Vuitton facade designed by Jun Aoki trumps them all, with understated, energy-conscious elegance. The eight-story aluminum skin wrapping a corner of the existing Matsuya Department Store building is illuminated by a subtle light grid, realized not by using more electricity but by using less.

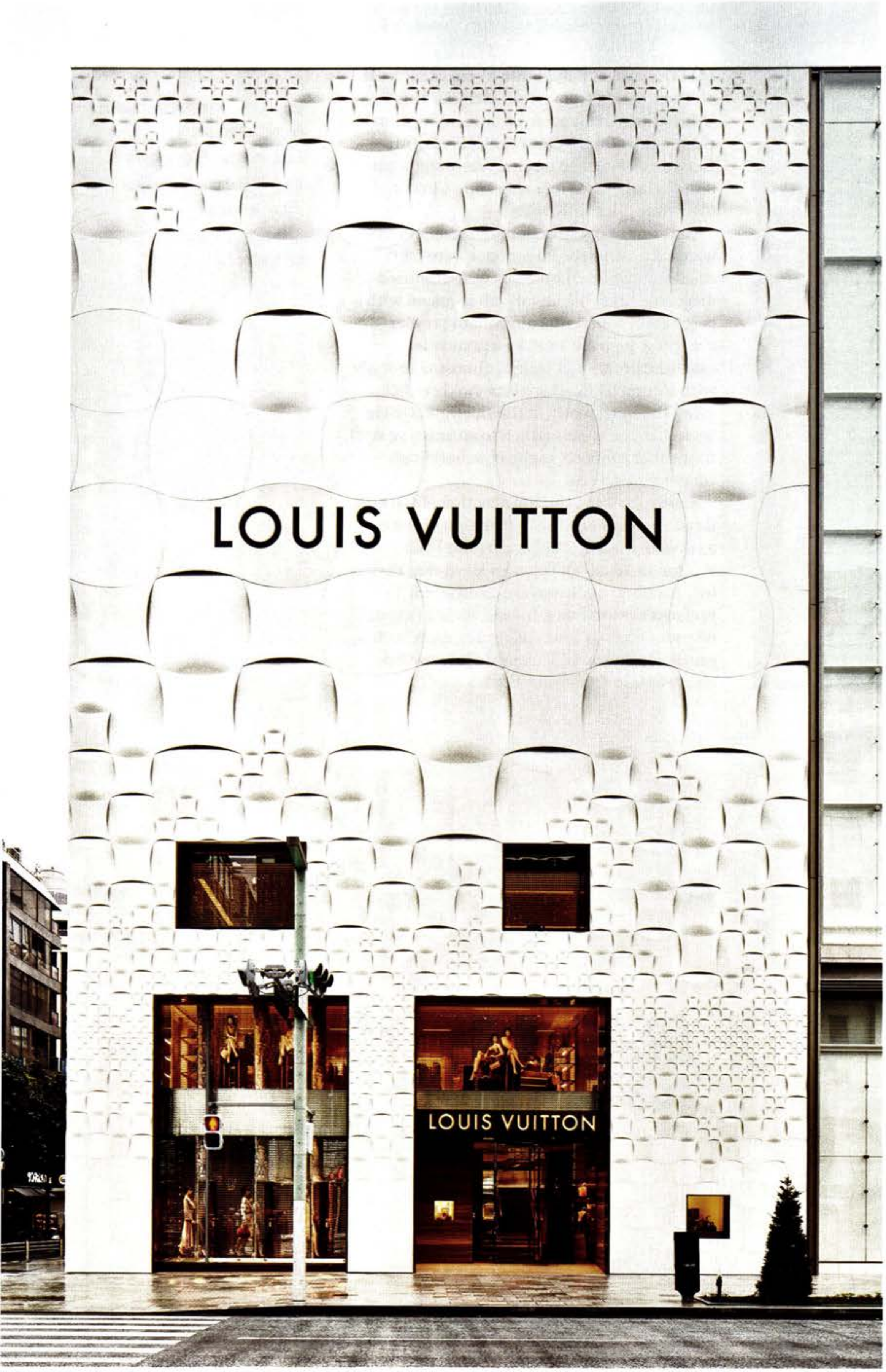
The Tokyo-based architect was commissioned to create the facade—his 10th for the French fashion brand—at a time when Japan was still reeling from the colossal damage caused by the catastrophic series of events: immediately following the failure of the Fukushima power plant, the nation halted nuclear energy generation and quickly cut its electricity consumption by dimming lights. Though illumination levels gradually returned to near normal over the following months, Japan had proven its ability to make do with less. Maintaining this standard while providing a facade that stands out from the pack became Aoki's primary objective.

In addition to this self-imposed limit on light usage, Aoki had to cope with stringent construction restrictions. He could not exceed a depth of 18 centimeters (about 7 inches) or a weight of 40 kilograms per square meter (8.2 pounds per square foot). The architect also wanted to distinguish the unique identity of the boutique, which occupies a berth on the department store's bottom three floors. In response, Aoki devised a stylized checkered pattern in lightweight aluminum, based on the Louis Vuitton signature *damier*, or check pattern. Extending up the department store's full height, the punctuated opalescent surface appears to be the facade of a separate building.

By day, the corner shop is distinct



PHOTOGRAPHY: © DAICI ANO



from its surroundings, with a solid presence among the attention-grabbing storefronts nearby. But the potency of Aoki's design is at its most compelling when the sun goes down, and the gradated layout of his textural wrapping transforms the building into a light box that enlivens the corner with a uniform intensity. To achieve this effect, the architect took advantage of his overall motif and punched the metal wrapping with circular indentations, concealing each one with a slightly curved, square overlay. Connecting the two layers at each juncture, metal cylinders ringed with LEDs are the facade's only light source. Selected for their overall efficiency, the LEDs emit a glare-free glow that leaks delicately from behind the overlays, illuminating and exaggerating the abstract design of the ornamentation.

As with the moiré patterns Aoki used for his previous Louis Vuitton projects, the overall scheme creates a strong optical effect. Close up, the walls' individual components are easily discerned. But from afar they meld together into a single, soft-looking surface, especially at night, when the solids recede and the light-filled voids pop. This impact is compounded by a control system with various programs that enable the lights to pulsate at different cadences appropriate to a given mood or occasion.

The concavities have five different diameters, ranging from about 6 inches near the elevation's top and bottom to more than 78 inches toward the middle, where perforations in the panels spell out the brand name. Because of such size and proportion differences (the big basins are shallow, while the small ones are deep), Aoki had to carefully calibrate the number

NIGHT & DAY Echoing the client's signature checkered motif, Aoki's facade wraps the corner of an existing department store with a textured opalescent surface (left) that transforms into an elegant light box after dark (opposite).

UNDERGLOW Thin overlays affixed to the aluminum skin's back panel conceal rings of LEDs behind them.

of LEDs needed to maintain a consistent level of illumination from circle to circle. This painstaking trial-and-error process began at the manufacturer's rural Chiba Prefecture facility and finished on-site, where the team tested a large-scale mock-up amid Ginza's nighttime glitz.

In terms of construction, the smaller circles were cast, while the larger ones were fabricated from sheets. Linked by well-disguised diagonal joints, the metal wall is coated with a beige paint containing aluminum powder–a metallic pigment used by automobile manufacturers–and blends, almost seamlessly, with a durable limestone base Aoki created, using the same motif, at the sidewalk. On the back side, the panels attach to an existing steel frame that connects to the base building's concrete structure.

Unsurprisingly, the construction of the new facade necessitated the destruction of the old, a two-story facade Aoki created for Louis Vuitton in 2000. "Of course, I loved that design too, but now conditions are so different," remarks the architect. Indeed, in Aoki's timely restraint there is tremendous strength. As his gentle scheme attests, energy conservation need not be a compromise. ■

credits

ARCHITECT: Jun Aoki & Associates – Jun Aoki, principal; Mirei Uchibe, design team

ENGINEERS: TAISEI Corporation; Permasteelisa Japan

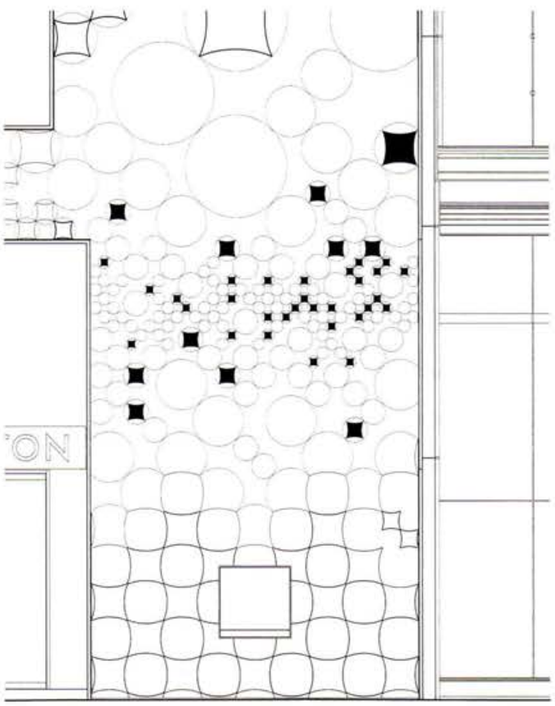
CLIENT: Louis Vuitton Japan

SIZE: 15,900 square feet (wall area)

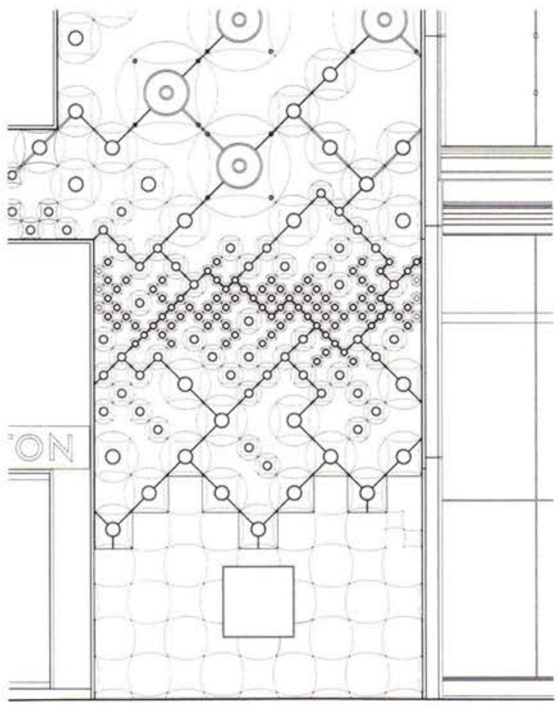
COST: withheld

COMPLETION DATE: September 2013

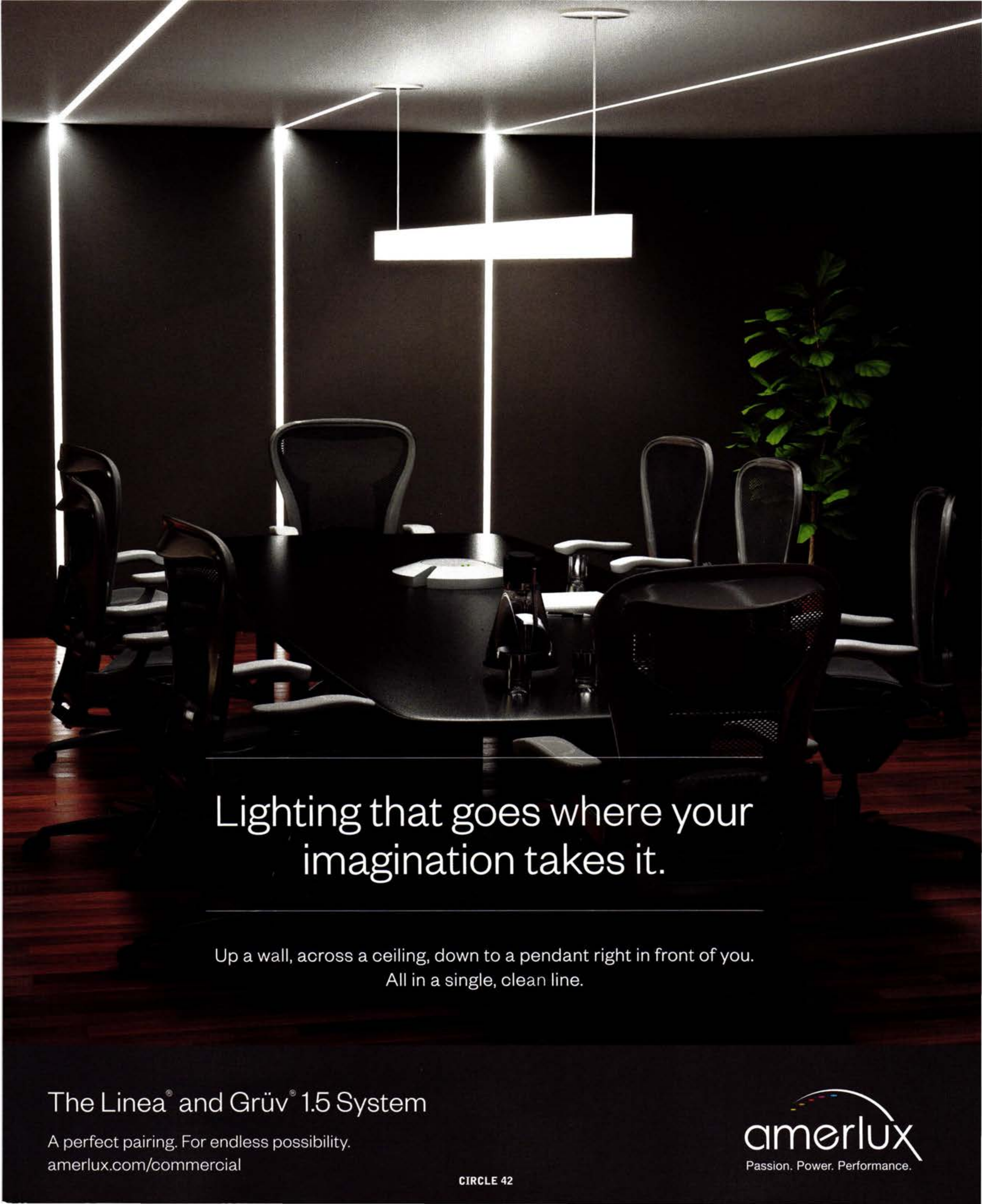
LIGHT LEVELS The elevation details illustrate the placement of the facade's light wells before they are covered by the curved-square overlays (far right), and the completed facade with the overlays in place (right).



ELEVATION WITH OVERLAYS



ELEVATION WITH BACK PANEL DETAIL



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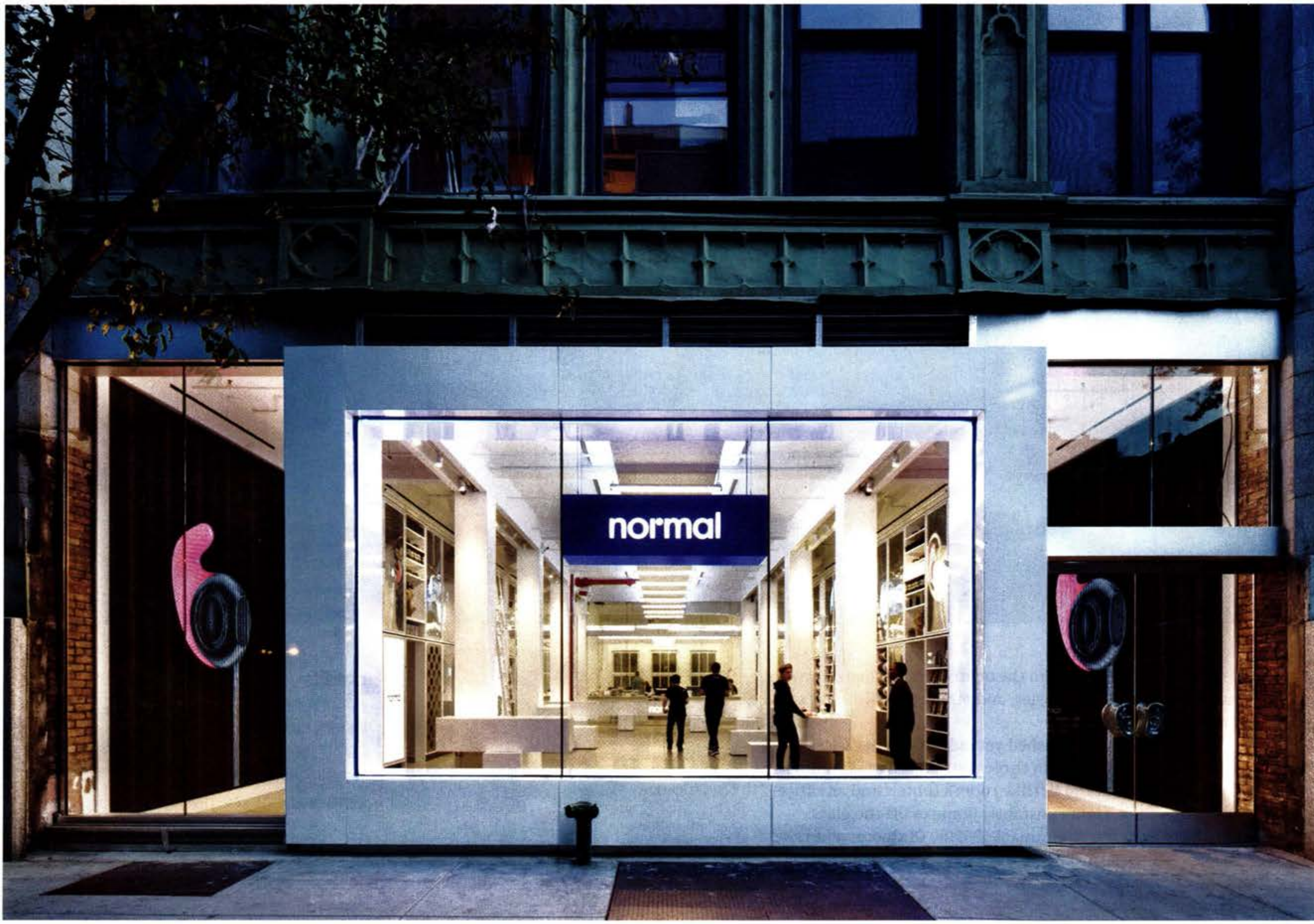
Normal

New York City
HWKN (Hollwich Kushner)

By Laura Mirviss



PHOTOGRAPHY: © JAMES EWING

A BRIGHT new shop on Manhattan's West 22nd street is turning the idea of retail on its head. Normal is a custom earphones outlet where helpful staff ("ear fitters") guide customers through a process that tailors the popular devices to individual ears, then produces them–in as little as 48 hours–with 3-D printers. Designed by New York–based HWKN (Hollwich Kushner), the 5,000-square-foot space serves as the base of operations for the budding company.

Normal hopes to lure passersby with a slightly futuristic aura not unlike a Kubrick film set. To catch their attention on the street, the design team installed a glazed window wall, framed in white and lined with a continuous band of color-changing RGB lights (typically set to blue)–like "an aperture that lets you peer into the space," says lighting designer Steven Espinoza of Brooklyn-based Lighting Workshop. They crafted silvery ear-shaped door handles to greet visitors and, just inside, giant LED screens, picturing supersize illustrations of the merchandise, face each other across the room. "The space really triggers curiosity," says HWKN principal Matthias Hollwich. "It doesn't immediately give away what it is. You have to walk in and actually experience it. The trend in retail is consumption as an experience."

Located at the base of a hefty 12-story French Gothic–inspired factory building dating back to 1910, the slick store-

PICTURE WINDOW
Designed by HWKN, Normal's glass storefront is framed in a white powder-coated aluminum frame and wrapped in a continuous band of color-changing LEDs.

front is in stark contrast to the quatrefoils, arched doorways, snarling limestone gargoyles, and other embellishments on the surrounding facade.

The interior has a polished yet industrial vibe. Glass partitions divide the space into three distinct areas: sales is up front; assembly, at the loftlike room's center; and an office across the back. Light constantly bounces off the glass, thanks to a parade of dimmable 3500K T8 fluorescent tubes suspended beneath a mechanical duct running through the middle of the ceiling in front. "It's like a runway of lights bringing you into the space," says Hollwich. "It's the layering of glass and reflections that makes the design not so sterile. That's where the playfulness comes in."

The lighting also unites the dramatic showroom with the more utilitarian factory and office space, with the same linear tubes strung in four neat rows across the back. "The lighting drives your perspective deep into the showroom, and then to the office beyond," says Espinoza.

The walls of the retail area are lined with modular cabinets containing 3-D printers, giant spools of earphone cord, backlit signage depicting the merchandise, and quirky memorabilia from an antiques store down the street (a glass jar filled with plastic ears sits on one shelf). Stacks of glossy white blocks—essentially 3-D Tetris pieces that double as seating and tables—match the dimensions of the structural

SALES TOOLS
Normal's 5,000-square-foot main space, located in a former woodworking shop, plays triple duty as retail outlet, factory, and office. Bare fluorescent tubes, the most visible lighting element, have 3500K lamps. The lighting designers opted for a cooler color temperature to give the space a clean, laboratory-like ambience.

credits

ARCHITECT: HWKN (Hollwich Kushner) – Matthias Hollwich, Alda Ly, Nicole Huang, Daniel Selensky, Jamie Abrego, Jason Vereschak, Yuval Borochov

LIGHTING DESIGNER: Lighting Workshop

ENGINEER: JMV Consulting Engineering

GENERAL CONTRACTOR: Reidy Contracting Group

CLIENT: Normal

SIZE: 8,500 square feet (ground floor and basement)

COMPLETION DATE: August 2014

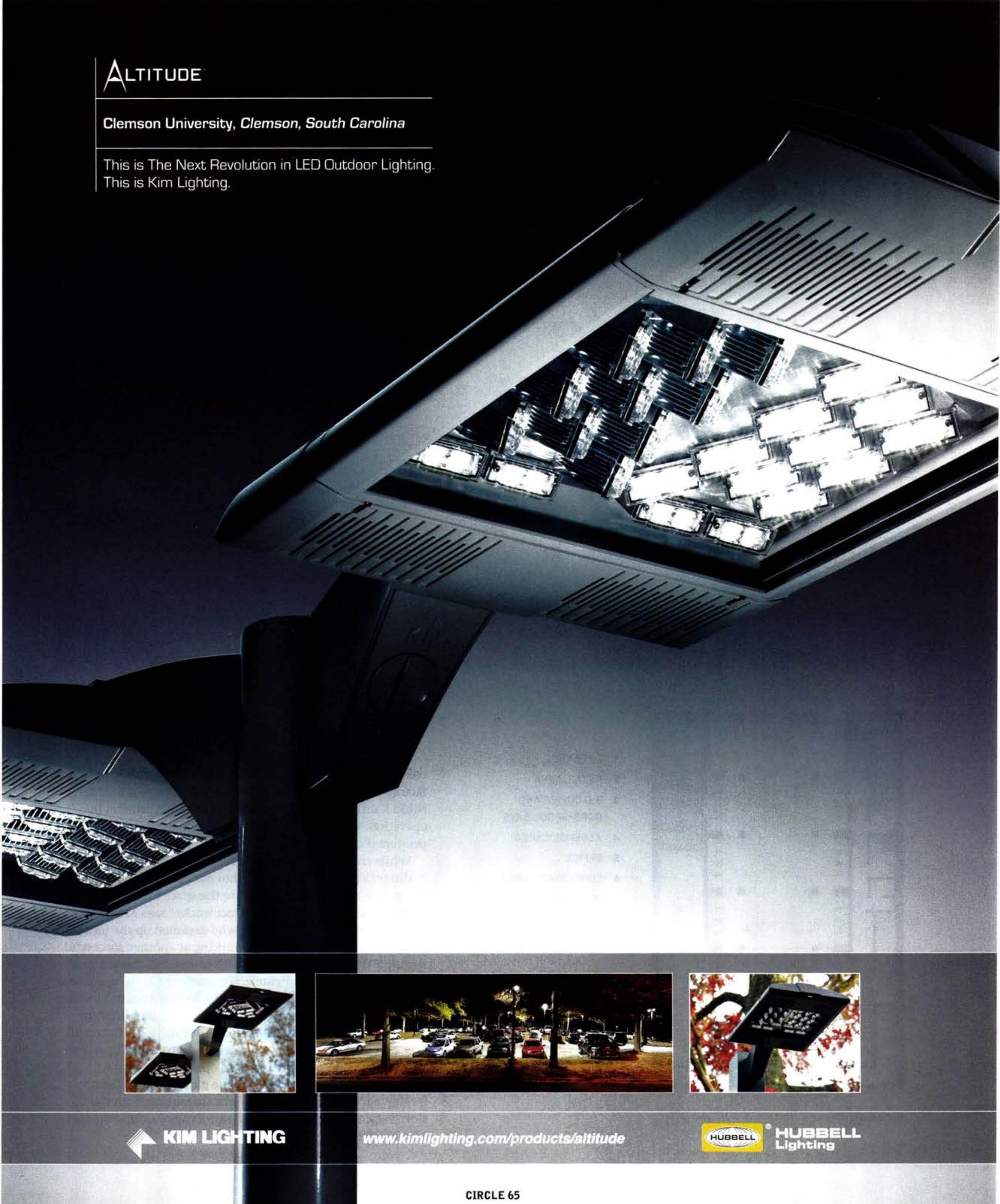
SOURCES

GLASS: Metro Glass Corp (storefront); Oldcastle BuildingEnvelope (exterior); C.R. Laurence (interior)

METAL PANELS: S&J Sheet Metal

LIGHTING: Aion (exterior); Bartco (downlights); Solais (spot lighting); Color Kinetics (RGB); PixelFlex (LED walls)

CHAIRS: Herman Miller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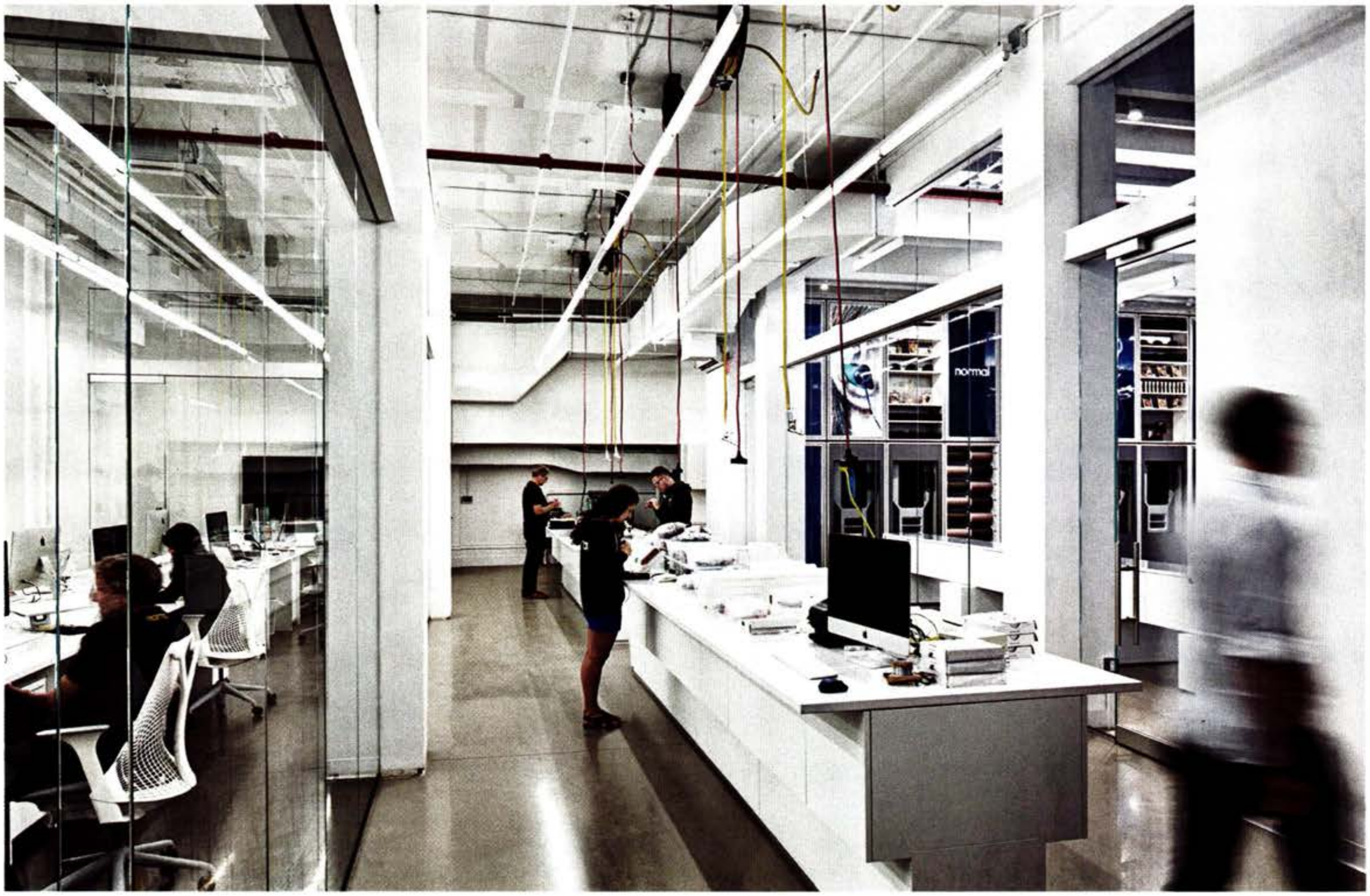
CIRCLE 65



OPEN WORKPLACE Normal's factory and business operations are tucked in back of the ground floor, with additional space in the basement for a paint booth, laser cutting, 3-D printers, and storage. Work benches were custom-designed to match the dimensions of structural columns.

GROUND FLOOR 0 12 FT. 4 M.

1 ENTRANCE
2 RETAIL AREA
3 3-D COPIER AND CORD-SPOOL BAYS
4 ASSEMBLY AREA
5 OFFICE
6 CONFERENCE AREA
7 MEETING ROOMS
8 WORK STATIONS
9 PANTRY

columns they rest against. "You wouldn't know this was a factory in the middle of Manhattan," says Normal founder Nikki Kaufman. Normal currently has 10 3-D printers in operation, with plenty of space on the shelves for additional printers if demand grows.

While transparency is ideal for encouraging foot traffic, it also reflects the company's ethos of openness and accessibility. "We want to draw people to the space because we are proud to show how the product works," says Kaufman, an entrepreneur in her late 20s who dreamed up the idea of 3-D printed headphones while working at another successful startup. "We tell you everything. It's completely transparent."

To attract a diverse clientele, the ambience of the space can change at the push of the button after hours. A Color Kinetics RGB lighting system embedded in the ceiling has different programs to set the mood for a range of functions that could take place in the space, from yoga classes to cocktail parties. (Both have happened since Normal opened in August.)

After dark, the store's bright blue glow is visible from far down the street. "The blue light emanating from the store very, very slowly pulsates," says Espinoza. "It looks like a breathing robot in sleep mode." ■


Seriously, isn't it about time somebody got controls under control?

L'Aire Visuelle

Laval, Québec
la SHED architecture

By David Sokol

IN 2012, the Laval, Quebec–based optical practice Duquette & Turgeon decided to recraft its image. Sporting a new moniker L'Aire Visuelle, the eye-care provider ditched its original coke-bottle branding for a logo and website with streamlined designer flair. A move to a sleek street-front clinic, completed by Montreal's la SHED architecture in March 2013, announced the revision: The shop's major organizing element is a boxlike structure inserted through the interior's long axis. Dubbed "the loop" by SHED, this orthogonal three-sided enclosure features a dropped ceiling plane, within walls at opposite ends, that demarcates the primary areas for performing optometry and optical services as it glows brightly against swaths of black.

L'Aire Visuelle occupies 3,100 square feet inside a medical-arts building in Laval's central Vimont neighborhood. The interior's narrow north end meets the sidewalk in a wall of windows, and white vitrines filled with glasses queue up within sight of the facade. Knowing that the articles on display, small as they are, would not be visible to passersby, SHED conceived the loop as a billboard-scale attempt to elicit their interest. The loop abuts the window wall and wraps over this sales floor.

"The white loop serves as a signal on the street," explains Yannick Laurin, who founded SHED with Renée Mailhot and Sébastien Parent in 2009. The ceiling of the 9-foot-high insertion comprises white-painted wood lath interspersed with T5 tubes. Laurin says that the fluorescent lamps are concentrated toward the north in order to grab more attention by maximizing brightness nearest pedestrians. He adds that the glare of the T5s on the vitrines, "accentuates the sales area from the sidewalk, but does not disturb the view of the merchandise once you're inside." Underfoot, ceramic tiles are laid in an equally dynamic running-bond pattern.

The loop runs the entire length of the new clinic, down

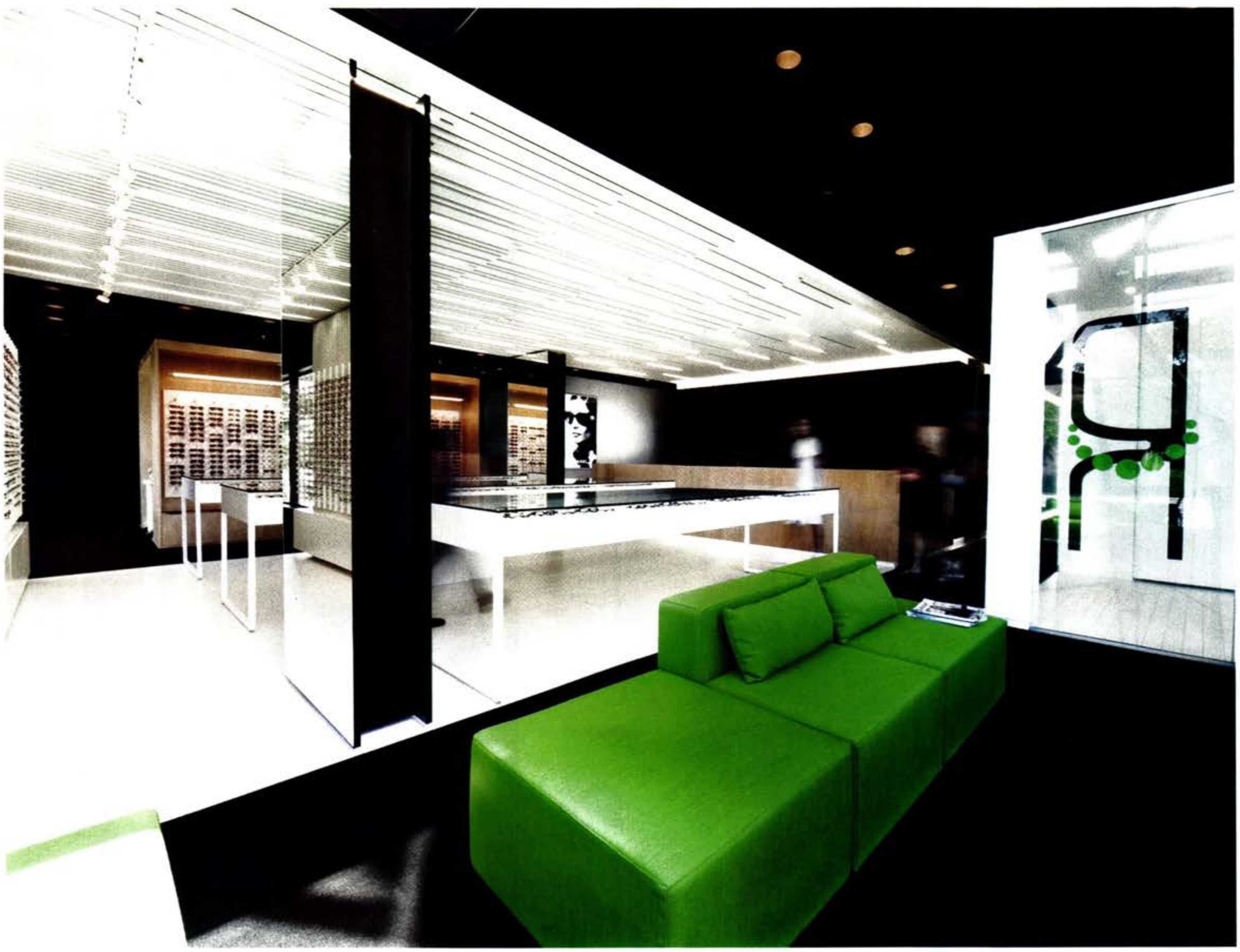
CENTER LINE
Illuminated with rows of T5 fluorescent tubes, a white structural loop runs through the middle of the new clinic and showcases the merchandise in wall and table displays—all visible from the street (above and opposite).

its center. A maple reception desk overlooks the showroom; behind it, a halogen-lit stockroom and two exam rooms seem to float under the dropped ceiling plane. The design team effected this appearance by sandwiching 3500K LED light strips behind black-painted gypsum board that clads these two back areas. The color choice represents the darkness in which patients undergo some optometric testing. And placing that cladding in illuminated relief suggests that the volumes, as Laurin says, "are inserted inside the loop, and that you can slide them from front to back."

The design team hatched the trick partly out of necessity, because a riot of structural bracing and mechanical systems crowned the raw tenant space. With the loop concept, SHED did not have to reconcile interior partitions with the mess 12 feet overhead. Instead, it painted the ceiling in flaw-hiding black and suspended PAR 30s to provide ambient light. The architects similarly nested other enclosed rooms—such as the maple-clad optical fitting studio anchoring the northeast corner—within the interior.

In SHED's hands, the volume-within-a-volume strategy became not only a style statement but also a means of controlling circulation. Running the loop down the middle of the long axis, for example, allowed the young architects to flank it with aisles. By placing the entrance alongside the showroom, they could guarantee that every visitor would interact with the glasses-filled vitrines: both patients waiting for optometry services lining one aisle, or customers needing a quick eyeglass adjustment inside a maple cube in the aisle beyond, would have to stroll past or through the boutique.

Indeed, the layout and its slick surface treatments were motivated by product sales. The client chose to move to a new space precisely because it could accommodate more inventory; patients of Duquette & Turgeon had previously sought other opticians to fill their prescriptions. At L'Aire Visuelle, good design assures that longtime patients experience the new breadth of offerings, and it captivates the interest of bespectacled prospects that include Laurin himself. While awaiting a recent checkup, the SHED partner found himself wandering the sales floor and purchased a pair of L.A. Eyeworks Sousa specs—before the appointment. Perhaps influenced by the setting, he chose frames in a largely black-white colorway. ■



PHOTOGRAPHY: © MAXIME BROUILLET

TUNNEL VISION A black carpet and black-painted walls, framed by a halo of recessed LED lighting, enclose storage and examination rooms and provide a dramatic contrast to the pristine white sales and reception area.

credits

ARCHITECT: la SHED architecture

GENERAL CONTRACTOR: Dorbec Construction

CLIENT: L'Aire Visuelle

SIZE: 3,100 gross square feet

COST: withheld

COMPLETION DATE: May 2013

SOURCES

LIGHTING: Progress Lighting (ambient); Canlyte (downlights)

CEILING: Armstrong (acoustical)

CERAMIC TILE: Ceragres

CARPET: Tandus

CUSTOM WOODWORK: L'Atelier Ebénisterie Architecturale

FURNITURE: Hay (seating)

1 ENTRANCE
2 WAITING ROOM
3 RECEPTION
4 CONTACT LENS ROOM
5 CONSULTATION
6 EYEGLASS DISPLAY AREA
7 LABORATORY
8 PRE-SCREENING ROOM
9 OFFICE
10 RESTROOM
11 EXAM ROOM
12 STORAGE
13 KITCHENETTE
14 MECHANICAL ROOM

FLOOR PLAN

0 16 FT. 5 M.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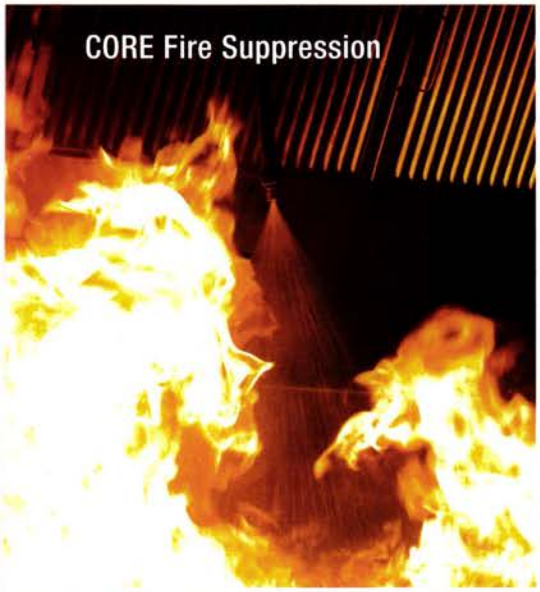
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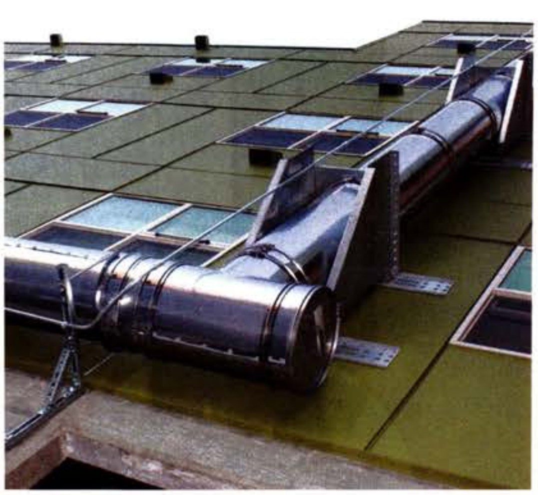
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CIRCLE 60

products lighting

THE LATEST CROP OF FIXTURES DRAWS ON SHAPELY FORMS AND CLEAN, LINEAR STYLING. BY SHEILA KIM

Asfodelo

This series by Nahoor consists of elegant stick compositions ranging from tripod-style table lamps to three-arm chandeliers. The single-arm floor lamp is offered straight or bent with a 30° angle (left), and is fitted with a 6W LED. Constructed of brass, all are available in polished or satin chrome; burnished or brushed brass; and matte or glossy white or black lacquer. Available through Michael Dawkins Home. nahoor.com

CIRCLE 206

Cirrus Channel Suspension R1

Crisp lines define the long and lean Cirrus Channel LED luminaire from Edge Lighting. Featuring a 1"-wide flat lens that provides a 100° beam spread, it can be specified in 1' to 17' lengths in 3", 5", 8", or 10" increments. (Lengths greater than 10' are shipped as two connecting parts.) Finishes include satin nickel, chrome, antique bronze, satin aluminum, white, and satin black. edgelighting.com **CIRCLE 207**

Santorini

Traditional fishing-boat lanterns inspired the design of Santorini (above), a new indoor/outdoor luminaire from Marset. The playful fixtures can be hung individually or grouped with additional units, and can be converted into a sconce or floor lamp with optional wall brackets and floor stands. Its blown, pressed-glass diffuser is paired with a polycarbonate shade finished in mustard, white, or gray. marset.com **CIRCLE 210**

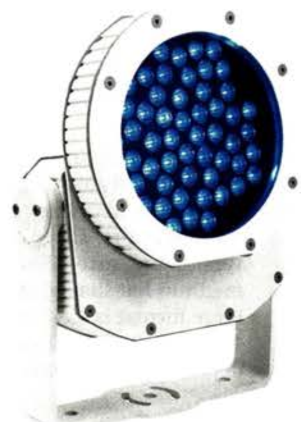
String Lights

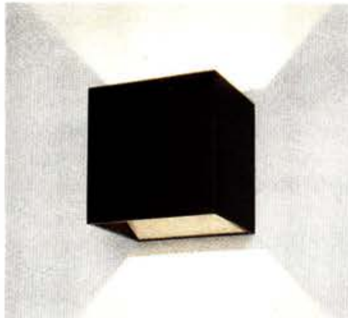
Created by Michael Anastassiades for Flos, String Lights (above) makes the LED fixture's connecting cord—a black Kevlar-reinforced cable—a central part of the design. Its body is available in two different styles: a sphere with a matte-black varnished die-cast aluminum top half and opal polycarbonate bottom half, or a matte-black conical shade with opal diffuser. The cable is available in 39' or 72' lengths, and the switch base is offered as a wall-mount or floor-standing cylinder. flosusa.com **CIRCLE 209**

Exterior 400

Martin Professional's Exterior 400 (below) uniformly and powerfully washes exterior walls and columns in color or white light. Providing 5,300 lumens and an RGBW color palette, it can produce beam angles of 7.5, 14.5, 31, and 57°. The rugged housing is specifiable in white, black, or aluminum finish. martinpro.com

CIRCLE 208





QB

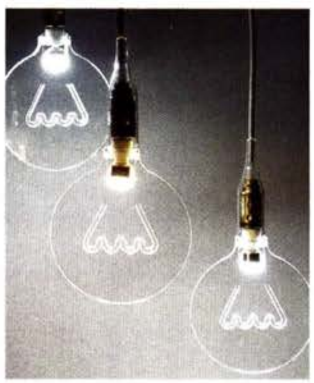
Bruck Lighting's simple box-shaped QB provides indirect illumination from both ends using an LED source and an interior reflector. Made of extruded aluminum, the fixture is offered in three housing finishes–black, brushed chrome, or white–all with white reflectors. It measures 4⅜" wide and high, and 3¾" deep, and can be mounted vertically or horizontally. brucklighting.com **CIRCLE 211**

Gask

A new Diesel Living collaboration, Foscarini's Gask suspension light evokes ancient Mesopotamian temples and Art Deco motifs with its stepped-form body made of black varnished steel. The pendant's screws become accents, and its diffuser is glass, specifiable in opaque white or smoky gray. It measures 6½" in diameter by 10½" high and takes dimmable candelabra-sized incandescent bulbs or fluorescent lamping. foscarini.com **CIRCLE 212**

Koord

The sculptural Koord pendant from El Torrent features a nickel-wire frame embellished with braided acrylic cord that comes in orange, pink, gray, aqua, or any of 120 custom colors. Three sizes are available: the elongated version measures 15¾" in diameter by 31½" high; the medium hat-shaped style is 27⅝" x 13⅞" high; and the large format is 39⅜" x 19¾" high. The fixtures take 17W LED, 26W LED, or compact fluorescent lamping, depending on the size selected. eltorrent.com **CIRCLE 215**

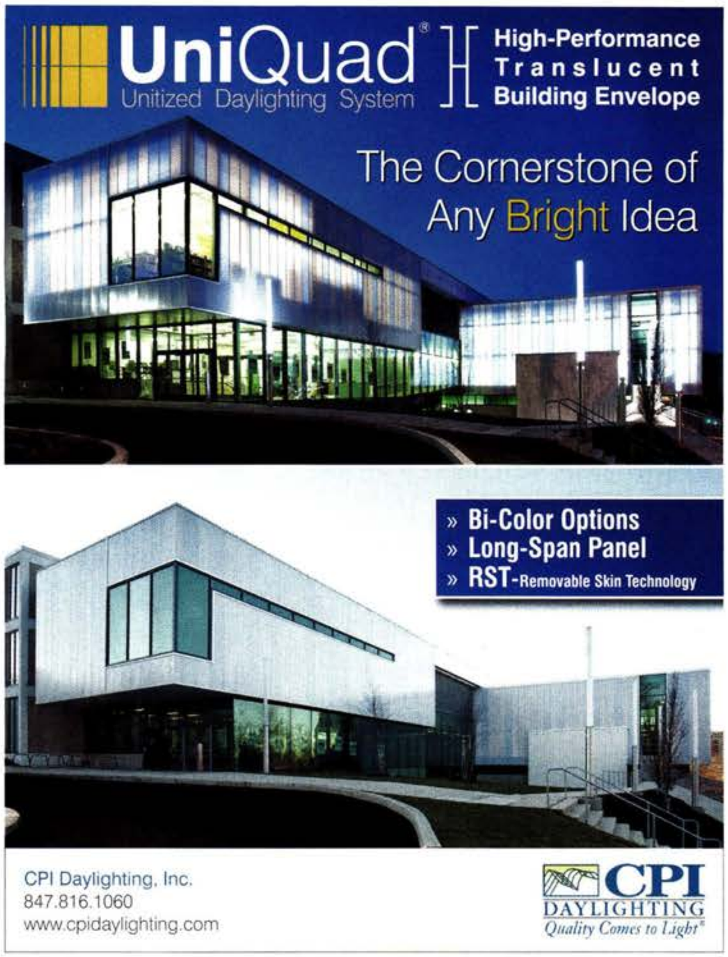


Light in the Bubble

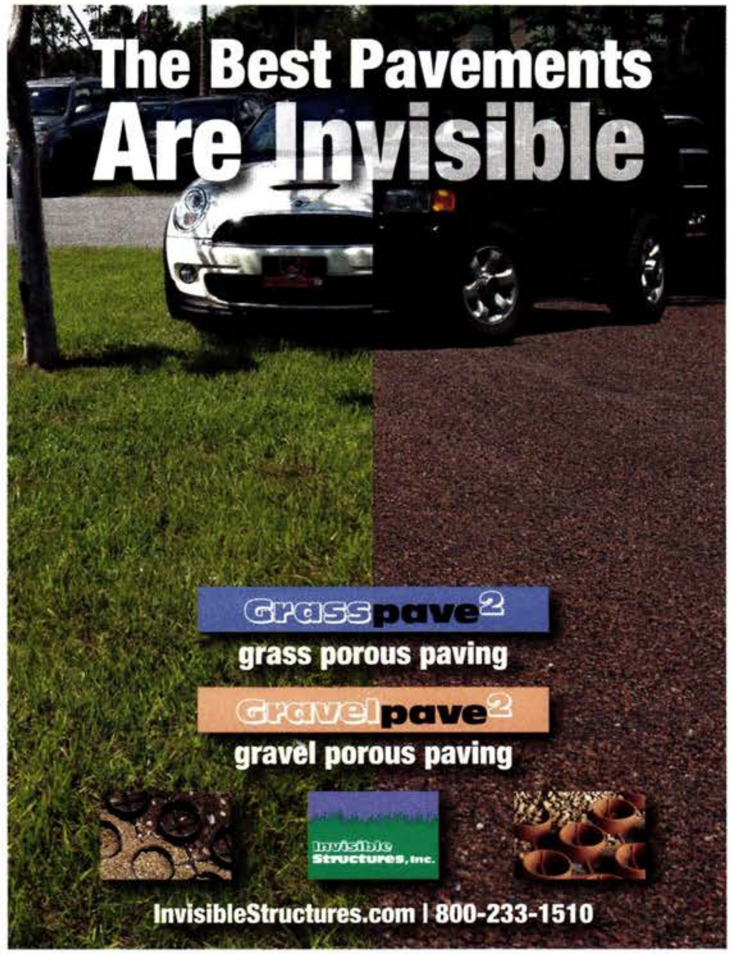
Italian product designer Andrea Ciappesoni offers a whimsical take on the Edison bulb. A single LED source illuminates a flat acrylic disc that features an A-bulb silhouette with a squiggly filament pattern carved in the disc's center. The bulb comes with both E14- and E27-terminal ceramic adapters for fitting into a range of hanging or standing fixtures, and can be specified in color temperatures of 6,400K or 3,000K. The cord is not included, but a color-cord kit can be ordered separately through the studio. ciappesoni.it/en/shop **CIRCLE 213**

Fresco Touchscreen

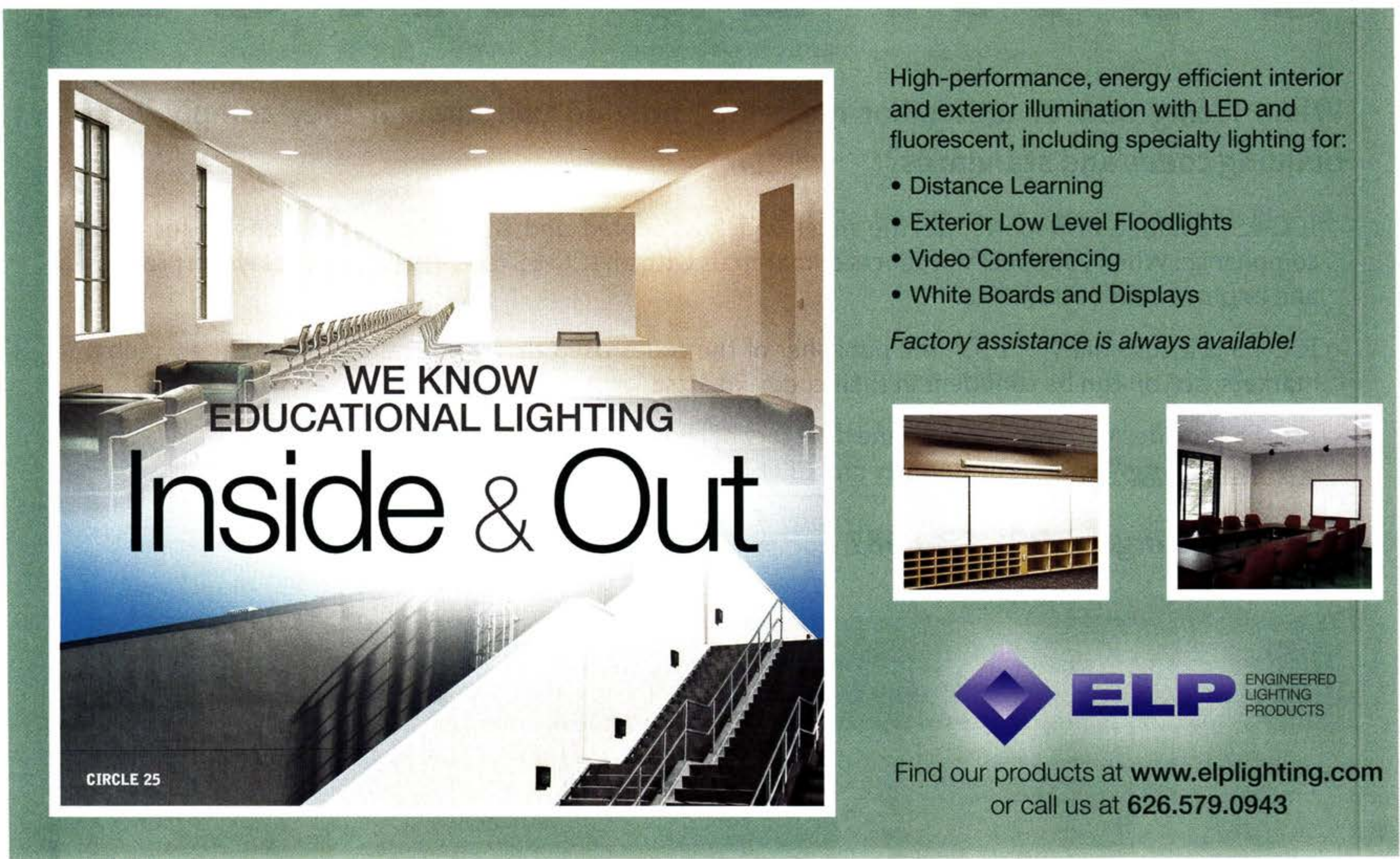
With touch screen controls becoming a norm, Acuity has been developing its own systems for lighting. But the company's latest version, called Fresco, goes beyond the standard power on/off and dimming. The screen, which also connects with mobile devices via Bluetooth, can manage up to 36 zones or can be wirelessly ganged with up to seven additional stations, to control as many as 288 zones. It can accommodate preset scenes, control movable fixtures, and manage intensity, color, and white-color temperature, among other settings. acuitybrands.com **CIRCLE 214**



CIRCLE 66



CIRCLE 44

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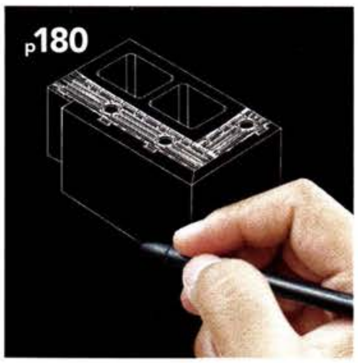

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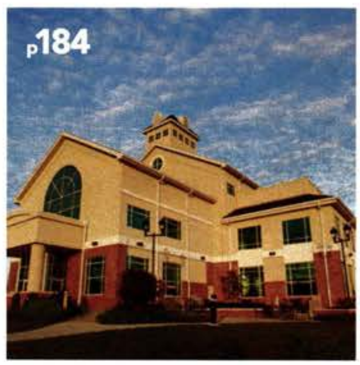

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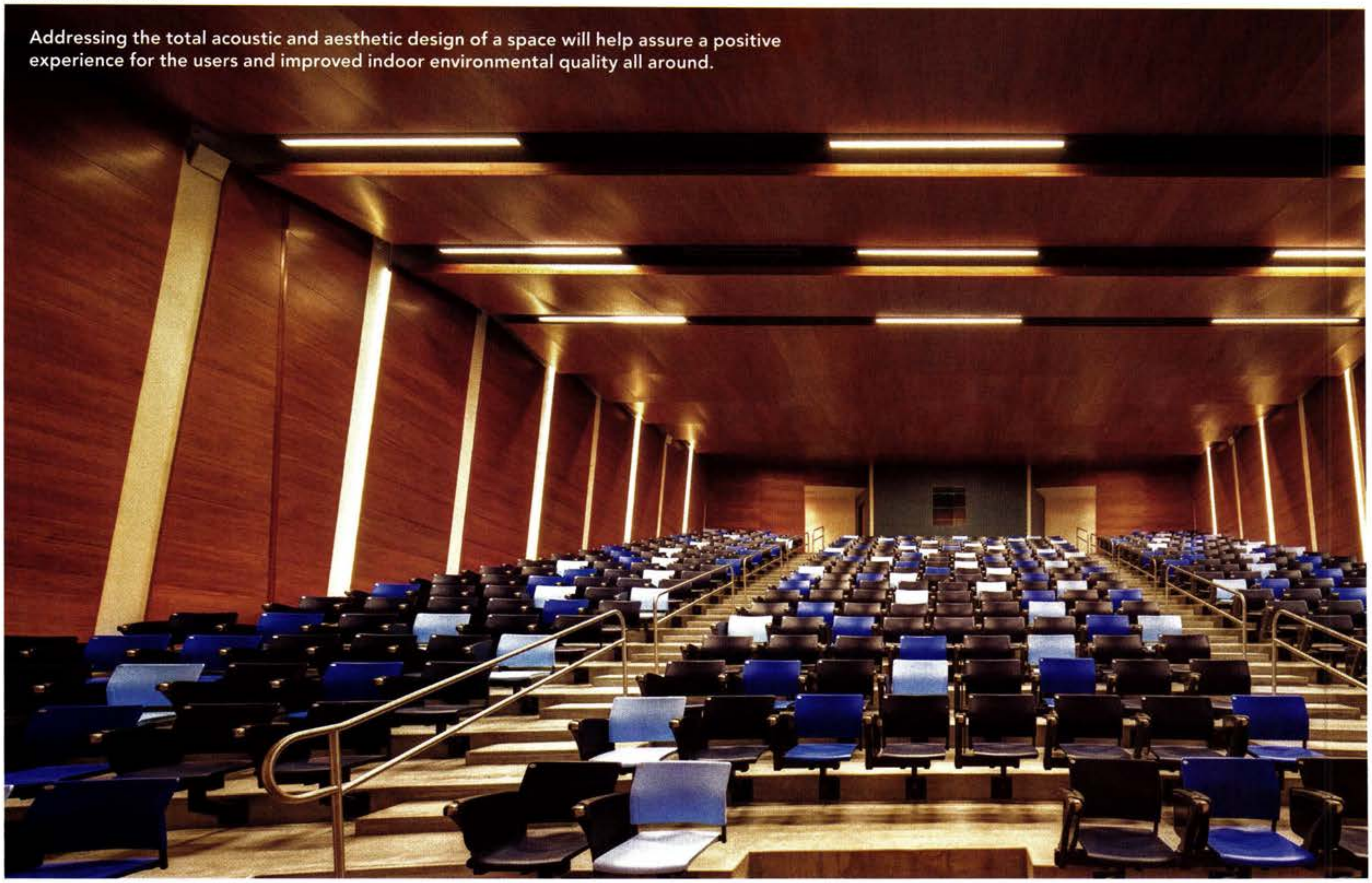


Total Acoustical Design

Taking a holistic approach to controlling sound in spaces yields the best results

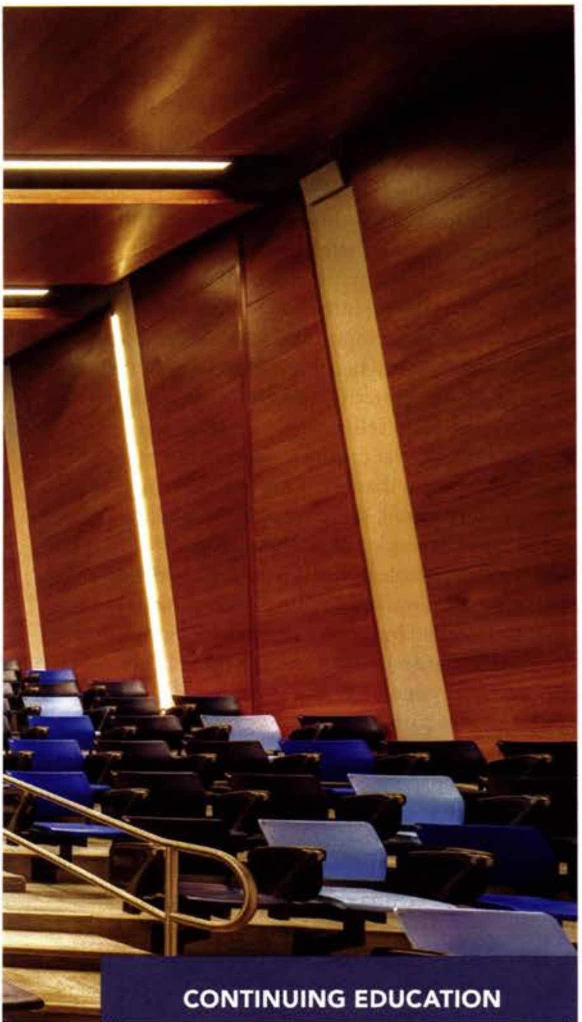
Sponsored by Ceilings Plus®, Owens Corning, and Rulon International | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

Good acoustical design encompasses controlling all aspects of sound entering, leaving, or being generated within a space. Desirable sounds, such as speech, music, or other communication, are best received if the spaces where they originate are designed to help them resonate clearly. Unwanted sound from outside of a building can be distracting or even harmful to people inside. Sound flowing between rooms or spaces in a building in all directions (i.e. through walls, floors, ceilings, etc.) can create similar negative indoor experiences. All of these aspects of sound in a building are important to a successful design much the same way designing a building to use desirable light while controlling undesirable glare is important. By taking a holistic approach to acoustical design as an integral part of architectural and interior design, a comprehensive, successful result can be achieved.

SOUND PRINCIPLES: ACOUSTIC BASICS

Sound is energy that radiates from a source. It moves through the air just like other energy does (i.e. heat energy or light energy) which means that it can move through air-filled openings in buildings too. Sound energy can also penetrate a wall, ceiling, or floor similar to the way heat does. Professionals, specialists, and scientists have studied sound in terms of its generation, its transmission through space (airborne sound) and objects (structure-borne sound), and its reception by people. As such, a significant body of knowledge is available on how to deal with sound in human environments as part of the field we know as acoustics or acoustical design.

Sound is typically characterized both by loudness and frequency. Loudness is measured in decibels (dB) such that the higher the dB rating, the louder the sound. The commonly referenced range is 0 dB (threshold of hearing) to around 130 dB (threshold of pain) with human speech being in the middle at around 50 to 65 dB. Sound frequency, meaning the time frequency of the radiating waves of sound, is measured in Hertz (Hz). One Hz is equal to a frequency of one cycle per second. The human ear can typically hear frequencies or sound "pitch" between about 20 Hz (very low-pitched, bass sounds) up to around 20,000 Hz (very high-pitched, piercing sounds) if the person is fairly young—older adults may hear frequencies



Project Name: Admiral's Club
Use: American Airlines Flagship Lounge
Location: Los Angeles International Airport, Los Angeles, California
Architect: Rivers & Christian
Contractor: Performance Contracting
Acoustical System: A concave, canted, and curved wood finished ceiling is used to provide acoustical control and aesthetic appeal in this large, upscale airport lounge. The ceiling grid is a curved formed steel tee, holding panels with a white maple finish. The panels contain 1/8-inch x 1-1/16-inch rectangular slots at 1/2-inch x 1-1/2-inch straight centers, producing an 18 percent open surface. Behind the panels, a black acoustical backing absorbs sound that passes through the openings while the wood surface smoothly reflects the rest.

Photo courtesy of Ceilings Plus®

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Learning Objectives
After reading this article, you should be able to:

1. Analyze and explore the fundamentals of interior acoustical design treatment and their relationship to overall building design.
2. Examine traditional and emerging acoustical system options available to provide sound control treatments that enhance interior design schemes.
3. Assess the contribution that good acoustical design makes toward improved indoor environmental quality in green and sustainable building design.
4. Recognize and identify the elements that make up a holistic approach toward acoustical design and beneficial sound control.

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up to about 15,000 Hz. Sound exists above and below this range, but our ears don't hear it, unlike some animals such as dogs or bats that do indeed hear very high-pitched sounds (over 20,000 Hz) or elephants that can hear lower sounds (below 20 Hz).

Sound originates from a source such as a person talking at one basic frequency or music playing across multiple frequencies. When the sound travels to the ears of a listener, its loudness will be determined first by its original dB level then by things that can diminish it such as distance or surroundings. Whatever the makeup, it is first heard as direct sound traveling straight from the source to the listener. However, since sound radiates in all directions, it can also be affected by anything else nearby that it might reach, such as walls, floors, ceilings, etc.

Hence the full sound heard by a person within a space will be a combination of direct sound from the sources and sound reflected off the various surfaces within the space. Surfaces that are highly reflective of sound will cause it to reverberate or "bounce" back and can create an echo effect or a perception of a "very noisy" space. By contrast, surfaces that are highly sound absorptive will diminish the reflected sound waves, reduce loudness, reverberation and echoes, and help create a "quieter space." Finding the right combination of sound absorption versus reflection for a given space is a matter of using several well-developed tools to balance the preferred acoustic characteristics within that space.

Noise Reduction Coefficient (NRC)

Individual materials can be formally tested according to ASTM C423 to measure the sound absorption rate of those materials on a scale of zero to one. Since the test determines sound absorption rates at four specific sound frequencies (250, 500, 1,000 and 2,000 Hz), the NRC rating number is actually an average of the results across those four frequencies which are generally in the range of human speech. Hence, a material with an NRC of 0.0 can be presumed to reflect back all of the sound striking it in this range (i.e. not absorb any) while a material with an NRC of 1.0 is represented to absorb all of the sound that strikes it in this range. The NRC is useful for determining the sound-absorbing characteristics of materials in many general building applications, but not for special applications where sound at other frequencies needs to be addressed.

Reverberation Time (RT)

Moving from materials to a space or room, RT is used as a measure of the persistence of sound after it originates within a room. It is measured as the time in seconds that it takes for the sound level to decay by 60 dBs. Controlling or minimizing RT is particularly important in rooms where people are listening to someone speaking since it directly affects the ability to understand the spoken word, which is referred to as "speech intelligibility." Long reverberation times mean that the listener will be subjected to reflected sound with long delay times relative to the direct sound from the talker, and these late reflections will result in "overlaps" of spoken words, making it more difficult to understand. Note that RT is also frequency specific, meaning that different frequencies can have longer or shorter signatures within the same space.

Sabin

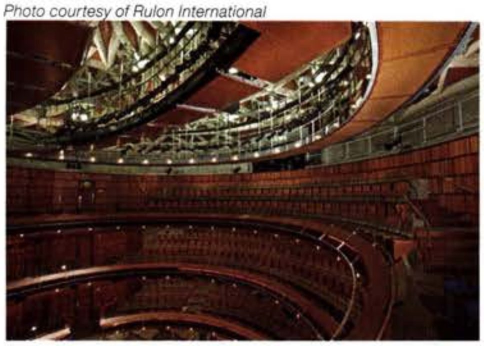
This is the measure of the total sound absorption provided by an individual sound absorber such as a ceiling baffle when installed within an architectural space. Absorption in Sabin is measured according to ASTM C423. The number of Sabin per unit is approximately equal to the total surface area of the unit (in square feet) that is exposed to sound, multiplied by the absorption coefficient of the material.

SOUND MANAGEMENT: CONTROLLING SOUND WITHIN A SPACE

Recognizing that sound will react not only to the room size and shape but also to the materials used in a room or space then we can also recognize our ability to control that reaction by design. The details of how to optimize that design will vary by use of course (e.g. a small classroom has different needs than a large auditorium or concert hall) but the basic principles and tools will be the same. First of all, it will be critically important to pay attention to the sound qualities of all materials exposed in the space such as ceiling treatments, wall coverings, and floor surfaces. All of these will have a range of sound absorption properties (whether tested or not) and will contribute to the overall RT of the room.

When addressing interior design, it is often the case that designers and acoustical consultants struggle with trade-offs between aesthetic preferences and acoustical performance. But that no longer needs to be the case. Innovators in the ceiling and wall panel industry have brought many new material options to suit the demands of architects, interior designers, and acousticians alike. Further, by offering custom solutions with variable acoustical options, product manufacturers are making it easier for architects to work together with their acoustic consultants in a more comprehensive approach. Some of these choices and innovations are discussed further as follows.

Photo courtesy of Rulon International



Sound radiates throughout a space and will be influenced by the size and shape of the space as well as the materials it encounters before it is heard by listeners.

Sound Absorbers

Spaces that need to control reverberation times in rooms are typically in need of sound-absorptive materials with high NRC ratings. Toward that end, manufacturers offer a full range of high-performance, high-style acoustical wall and ceiling solutions for commercial interiors. These can include standard and custom acoustical wall panels made of fabric, fibrous materials, mineral tile, or acoustically treated wood products. They are available in a full range of sizes, shapes, and colors and can significantly reduce echoes and reverberation in a room while still enhancing an overall interior design scheme.

Sound absorption can also be applied to ceilings in the form of absorptive panels that can similarly be configured a variety of ways. Rather than being limited to suspended acoustic ceiling tile, there are many more options available to a designer today. These include free floating panel sections referred to as "clouds" that can be sized to suit the acoustic needs of the space while adding a visual focal point to the space. It is also possible to add a three-dimensional aspect to the ceiling with undulating or sculpted sections of sound-absorptive material. In tall spaces, hanging vertically oriented baffles that are designed to soak up sound and stop echoes is an option. They too can become design focal points by adding color, patterns, and visual interest to an otherwise plain ceiling space. In situations where a smooth, flat ceiling is desired, but more sound absorption than a gypsum board ceiling provides is required, there are some specialty options. For example, a European product that is also available in the U.S. offers a wide-span acoustical wall and ceiling system that is custom-installed by certified professionals and conceals its hardware for a smooth monolithic appearance. Systems like this provide the appearance of painted plaster or gypsum, yet offer superior sound absorption control.

Reflectors

In some rooms, it is desirable to help direct and channel the sound toward the listeners. In those cases, wall and ceiling surfaces need to act as large-format reflectors in a pattern appropriate to the room configuration and use. This is particularly true in performance venues with larger spaces containing a fixed stage and fixed seating. In this application, carefully placed

Project Name:
Las Vegas New City Hall
Use: Public meeting place
Location: Las Vegas, Nevada
Architect: JMA Architecture Studios
Contractor: ISEC
Acoustical System: In order to help disperse sound and control reverberation, a combination of beech faced wood panels were used in the ceiling and on the walls. Solid faced ceiling panels were strategically located to help reflect and direct sound toward the listeners. Curving, grooved wood panels use sound absorptive material behind them to reduce reverberation time and improve speech intelligibility.

Photos courtesy of Rulon International


Now You See It...
Now You Don't!
Aluratone NEW
Micro Groove
Acoustical Wood Veneered Panels
Manufacturing the finest suspended wood ceilings, acoustical wood wall systems, suspended uPVC ceiling and canopy systems
University of Portland, Franz Hall
Architect: Mark Wuthrich Architect
Subcontractor: Cascade Acoustics
Products: Aluratone Micro Groove 850, Flat Veneered Panels
Rulon International introduces Aluratone Micro Groove! Aluratone Micro Groove panels are designed to minimize the appearance of grooves on the face of the wood veneered panels while maintaining very high NRC ratings. Aluratone Micro Groove has NRC ratings from .65 to .85 with higher ratings available utilizing acoustical blankets behind the panels.
• Smooth wood veneer appearance with "ultra-thin" micro grooves
• NRC rating as high as .85 and greater with the addition of acoustical blankets
• Available with tongue and groove edge, monolithic or custom sized panels with edge banding
• Comes in 11 standard wood species
• Custom stains available
FSC
The mark of responsible forestry
FSC® C103284
RULON INTERNATIONAL
CIRCLE 68
1-800-227-8566 • 904-584-1400
www.rulonco.com

Photo © Tim Griffith, courtesy of Owens Corning

The San Francisco Jazz Center includes sound-absorbing duct liner in HVAC ductwork to eliminate unwanted background noise.

Project Name: Heinz Field
Use: Sports arena with portions heated and cooled
Location: Pittsburgh, Pennsylvania
Architect: HOK Sports Facilities Group
Contractor: G.V. Hamilton, for duct insulation
Acoustical System: The Pittsburgh Steelers and the University of Pittsburgh Panthers are the primary teams that use the new $200-million, 65,000-seat Heinz Field. Fans and spectators get to enjoy many creature comforts due to the stadium's more than 219,000 square feet of insulated air handling ductwork, enough to cover nearly five football fields. Key to sound control from all of this ductwork is a fiberglass-based acoustical duct liner. The insulation contractor automatically installed the 69,026 square feet of insulation onto the inside surface of the ductwork sections. This factory assembly saved the extra step of having to install the liner on the jobsite. The acoustic duct liner provides great performance by reducing noise transmission through a smooth, acrylic-coated sound-deadening airstream.

Photo courtesy of Owens Corning

reflectors can very effectively direct the sound coming off the stage to every seat in the house, making for a better listener experience. In order to maintain the aesthetic design requirements for this type of performance space, the reflectors can be made from a variety of materials including real wood or wood veneer over a reflective aluminum core, sometimes with an extra backer for mass. This allows for the proper mix of aesthetic and acoustic properties that can become part of the overall visual and sound qualities of the space. Since most of these installations are custom designed, complex geometries using different panel types can be provided by manufacturers as a complete system that also includes lighting trims and utility troughs. From an operations standpoint, these reflectors can sometimes be fabricated using torsion springs to allow accessibility behind them for maintenance, repairs, etc.

Random Diffusers

Not all spaces require pure sound absorption or pure reflection. Rather, many require a mix to achieve the best acoustical properties. In these situations, sound diffusion may be the best approach such that sound is dispersed somewhat randomly throughout a space. Portions of the wall and ceiling treatments are treated to be sound absorptive while other portions are reflective, all with the same or varied finishes. There are many choices available, including some manufactured modules using the same finish material that can be micro perforated and filled with sound-absorptive material in some areas or left whole in others in order to be more reflective. These modules can be arranged in a multitude of different patterns to give the designers and acousticians complete control of both the aesthetic and acoustical intent. In this way modules can be spaced in an arrangement that creates random sound diffusion with a pleasing scattering of sound reflections and still create a beautiful visual aesthetic.

Broad Band

Some spaces need to pay particular attention to the range of sound that is being controlled. Busy, active places may find that sound frequencies are being generated across a broad band—from very low-frequency background noise through mid-range conversation and operational sounds, up to very high-range music or equipment sounds. In this case, different treatments may be appropriate for different frequencies, but the aesthetic demands may require a more uniform appearance. Products are available that can achieve the needed sound control beautifully by sometimes using complex curves and undulating shapes. These systems can achieve NRC values that range from .75 to .95 making them very effective for broadband noise control in large spaces, adding to the speech intelligibility and luxury of the interior.

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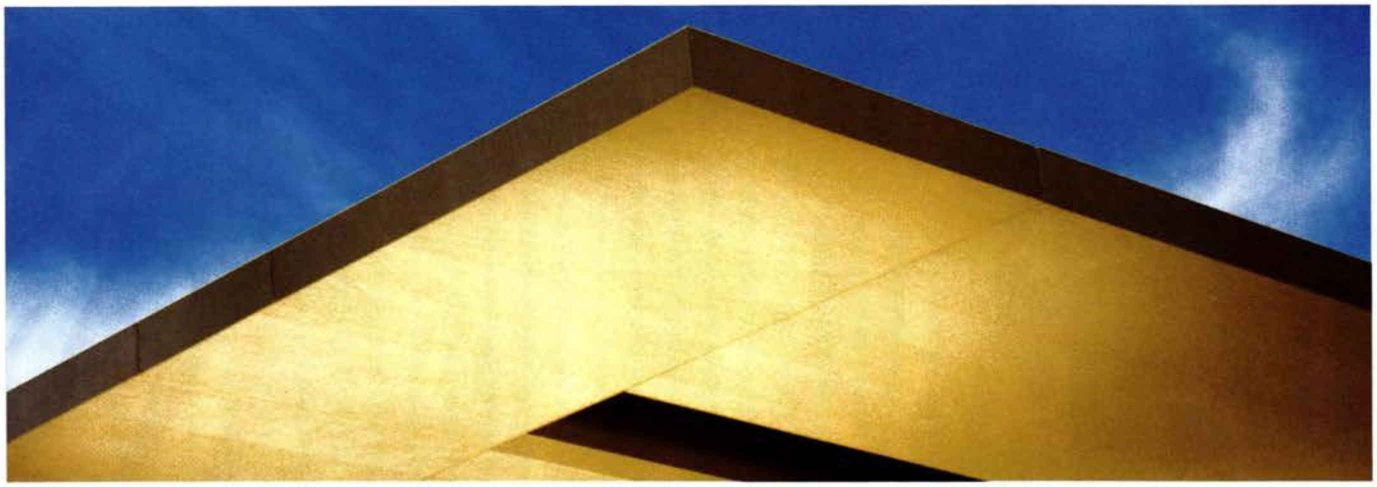
Peter J. Arsenault, FAIA, NCARB, LEED AP, *is a nationally known architect, sustainability consultant, technical writer, and continuing education presenter. www.linkedin.com/in/pjaarch*

PRODUCT REVIEW

Total Acoustical Design

Ceilings Plus®



Sustainable Ceiling Panels

Deep Integral return (edge design) panels floating without view of suspension for butcher block effect, without the weight. Arboreal made from recycled aluminum with real wood veneer micro perforated for acoustics.

www.ceilingsplus.com *Circle 1*

Owens Corning

Rotary Duct Liner

Get outstanding thermal and acoustical performance with proven fire resistance from Owens Corning™ QuietR® Rotary Duct Liner. The strong, dark veil helps resist tears during installation and provides a durable, cleanable airstream surface. Tested at air speeds of 15,000 FPM (170 MPH). A Category 5 hurricane is 157 MPH or more, so you can be confident the material will hold up. And, it's GREENGUARD Gold Certified for indoor air quality, to meet standards for sensitive individuals, such as in schools and healthcare facilities.

www.OCBuildingSpec.com *Circle 2*

Rulon International

Function and Beauty Combined

Rulon's Curvatone is the ultimate combination of Rulon's sound-controlling Aluratone acoustical panels and the unique curving shapes of Curvalon custom-shaped panels. The panel faces can either be grooved or have perforations in the form of holes or slots. Curvatone panels are designed to fit perfectly in place in the field without the need for field cutting. Curvatone panels are designed for high-end building projects where acoustical performance and high aesthetics are required.

www.rulonco.com *Circle 3*

Photo courtesy of Sunbrella

"Twisty," an innovative and flexible shading system, won a 2013 competition on the future of shade. An installation of Twisty was brought to life at The James Royal Palm in Miami Beach.

The Future of Shade

Fabric components in sustainable architecture design

Sponsored by Sunbrella® | *By Kathy Price-Robinson*

Shade is arguably one of the vital elements in modern life, though not something that typically takes center stage in the design dialogue. Until recently, fabric shade structures were an appendage to a building, an afterthought, an accessory.

Increasingly though, shade structures begin the design conversation. This is particularly so in commercial buildings, those in sunny climates, those which will inhabit a warming planet (this one), and by architects looking for new ways to create built environments in harmony with nature's forces. The future includes a conscious intention toward shade structures.

"I think architects are interested in the future of shade because it's a natural phenomenon that we can control. It's predictable," says Marc Kushner, a practicing architect with Hollwich Kushner (HWKN) in Manhattan and CEO of Architizer. "And in a world where a lot of nature is becoming increasingly unpredictable, the sun follows the same path year after year, day after day. And we can respond to that and start to sculpt that to create the right environments."

WHAT IS THE FUTURE OF SHADE?

In a globally announced design competition called the "Future of Shade," architects were asked to submit innovative ideas for using fabric in shade designs. Of the more than 140 entries submitted on the Architizer platform, three judges selected three standout concepts and a number of notable designs. The winners all reflected what the judges saw as the intersection between stylish design and benefits for humankind.

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EARN ONE GBCI CE HOUR FOR LEED CREDENTIAL MAINTENANCE

Learning Objectives

After reading this article, you should be able to:

1. Discuss innovations and futuristic objectives for using shade structures constructed with fabric in commercial architecture.
2. Explain how shade structures made of fabric can add both appealing design and functionality to building structures.
3. Define the benefits of shade structures for personal health and UV protection.
4. Discuss how the use of textiles in shade structures can positively impact thermal performance and energy efficiency.
5. List LEED credits to which awnings and solar shades can contribute directly.

To receive credit, you are required to read the entire article and pass the test. Go to **ce.architecturalrecord.com** for complete text and to take the test for free.

AIA/CES COURSE #K1411K
GBCI COURSE #920001564

Fred Bernstein, an architecture writer and critic and one of the judges, says of a project: "It's much more than just beauty. It's beautiful in the way it looks, but it's also beautiful in the way it behaves, in the way it helps people's lives."

Submissions included shade concepts from small shade structures for bus stops and bridges, to massive installations for train stations and beaches, and designs with multiple purposes: shade and water collection, art installation, and protection from the elements.

"I love seeing architects and designers connect with a topic like shade and push themselves to come up with new designs and solutions for shade," says Kushner.

For Kushner, the most important criteria was innovation: "How can we take this topic of protection from the sun and explore it, expand it and see what the potential of the built environment in shade is? I was also looking at other topics as we were judging. I was interested in how the softness of the materials could be exploited by architects and designers."

The third judge for the competition was Scott Campbell, president of Rainier Industries, whose experience leaned toward the practicality of manufacturing potential winning entries.

"The winning entries all have an element of simplicity," Campbell notes. "Even though they may have looked complex, they were easy to fabricate, or to be fabricated. Some of them required a little more engineering and weren't fully fleshed out, but all of them had a core simplicity that made them eminently practical."

And for Bernstein as well, innovation was the key winning element.

"I was looking for something much more architectural, something that used shading fabric in a novel way, in a way we hadn't seen before, in a way that curves, maybe twists, that really creates architecture, that enhances some of the trends I'm seeing in contemporary architecture, but using fabric rather than hard materials."

How the World of Shade Structures Is Changing

As these and other entries into the Future of Shade competition demonstrate, shade is not just an afterthought, but is increasingly informing architecture.

"Fabric lets architects push the envelope on shade design because it takes a bunch of things out of the equation," Kushner explains. "It's cost-effective. It's highly durable. It comes in a million colors. So, those are all things that we worry about. Now that that's out of the way, we can concentrate on the good, fun stuff, which is how we can start to manipulate it and shape it to do things that we couldn't normally do with solid and rigid architecture."

XAFARI: FUTURE OF SHADE 2014 GRAND PRIZE WINNER

Architect: Tony Leung, Architect, Hong Kong

Description: Inverted umbrella shapes that provide shade and collect water. Noting the way that water beads and rolls off of the shading fabric's moisture-resistant surfaces, Leung conceived a design with a humanitarian goal: to collect water, the world's most precious natural resource. The resulting series of inverted, retractable "umbrellas" catch rainwater and funnel it through bamboo or steel pipes into buried storage bottles that can later be drawn by a lever pump. Thirty-three modules can cover a 6-foot by 6-foot area and also provide shelter.

Scott Campbell: "Xafari is really an interesting design. It's colorful, it's practical, it has the ability to provide shade and collect rainwater. I thought that was really clever of the designer to come up with that."

Fred Bernstein: "Xafari is really amazing because the idea is so simple. Xafari provides shade and a lot of other things. Mainly, it collects drinking water, which obviously will help rural communities in poor countries. It's rather remarkable that we haven't seen this idea before. Maybe somebody else has thought of it, but the idea of inverting an umbrella so that it catches water and then funnels the rainwater into a jug so the water can be used by villagers seems very simple, but it's brilliant. It's really a lovely idea that can make a difference in people's lives using this material."

Marc Kushner: "By flipping the umbrella, it starts to be able to collect rainwater, which the stem can then push out into collection vessels. It slots together with neighboring umbrellas, and it does that through a really ingenious pattern that can be infinitely replicated. And then, they even started to think about what colors they could use in the spectrum of shading fabric materials. And they presented a really beautiful, muted palette of browns and grays that just brought the whole thing together.

"Xafari can be used in a multitude of instances, and that's something that all of the judges really responded to. It can be used for a fancy party on the lawn. Or it can also be used to create a shelter in, say, a natural disaster. My sister runs an organization in Malawi that works with orphans and orphanages. These children learn outdoors, and they typically learn under trees. And there aren't actually that many trees. So, this would be a perfect application for a setting that doesn't need a ton of shelter. So, it can be open on the sides, but it creates shade and can collect rainwater at the same time."

Image courtesy of Sunbrella

Photo courtesy of Sunbrella

The use of shading fabric as a branding strategy spans history.

Photo © Gerber Architekten: Christian Richters

In Riyadh, Saudi Arabia, a glass-enclosed expansion to the King Fahd National Library was complemented by a woven glass-fiber membrane made of 1,000 twisted square awnings that block 93 percent of the incoming sunlight.

Bernstein agrees: "Architecture provides shade, but it generally provides shade using hard or rigid materials. Using soft materials, you can provide shade in ways that are flexible so that everyone can have the amount of shade they want. Shade can be personalized or customized."

THE DESIGN BENEFITS OF USING A PLIABLE MATERIAL LIKE FABRIC

For architects, and particularly the younger breed of designers born into a world changing at perhaps the fastest pace ever, switching from a strict reliance on traditional building materials to a fabric-infused language should be smooth.

"We usually use hard stuff, like stone and wood," Kushner says. "So, with fabric, you can crinkle it; you can fold it; you can crease it. You can do fun things with it that you can't do with the other stuff we usually use."

"There's something so incredibly beautiful and intriguing and compelling about translucent materials," Bernstein adds.

Design and Function with Shade Structures

In 2013, the inaugural Future of Shade competition brought in dozens of innovative ideas from architects inspired by the shading fabric itself.

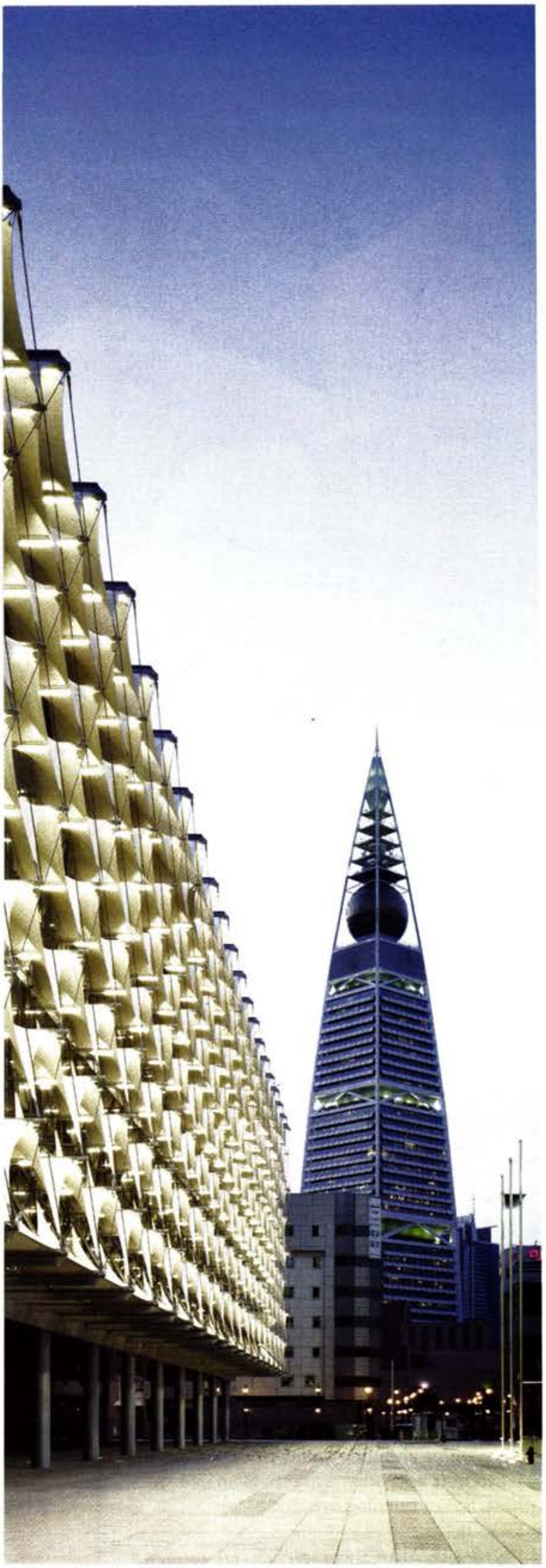
Bernstein explains the appeal: "Fabric is light, so you can certainly do things with fabric that you can't do with other materials."

As these design competitions affirm, shade and shading fabrics excite and inspire architects' imaginations all over the world.

In order to appreciate the future of shade and position oneself on the leading edge of this movement, it helps to review the past, the long history of using fabrics as architectural add-ons, and how the practice has evolved in the past century.

The Evolution of Shading Fabrics

Prior to the 1960s, most awnings and shading fabrics were made of cotton canvas, which the sun broke down quickly. In 1961, the owners of one of the oldest, most respected fabric



brands decided to change the nature of shading materials the company had been making since the 1880s. They replaced cotton with acrylic fibers and pre-extrusion pigments and offered an unheard-of warranty of five years. They were dubbed "performance fabrics."

In the 1970s, performance fabrics got the attention of boaters, and the outdoor furnishings industry exploded with these new, long-lasting yet pliable fabrics. In 1988, BMW became the first car brand to adopt this company's fabrics for its convertible models.

By the early 2000s, as the green building movement gained momentum with the U.S. Green Building Council's LEED rating program, more attention was paid to the sustainable nature of performance fabrics. As high-performing shade fabrics last longer, people use less fabric and thus generate less waste as compared to other fabrics that might fade, lose strength, or give in to mildew and atmospheric chemicals. In fact, some fabrics can be recycled through manufacturer recycling programs, reducing impact on landfills. This is in addition to the energy benefits of building shading that will be discussed later in the course.

The cleanability of outdoor shading fabrics is among the latest topics to interest industry and end users alike. Because of the sturdy makeup of high-performance shading fabrics, they can be cleaned with a variety of common cleaning products, such as dishwashing liquid, vinegar, ammonia, acetone, paint remover, turpentine, and even bleach. (See manufacturer's recommendations for specific amounts and mixtures.) Of course, brushing off dirt and dust at regular intervals is a good deterrent to staining. While advanced shading fabrics do not promote mildew growth, mildew may grow on dirt and other foreign substances that are not removed from the fabric. Some manufacturers recommend specific spray-on fabric-guard products to strengthen or restore a fabric's water repellency.

Signage and Branding with Fabrics

As the use of shading fabric continues its trajectory in modern architecture, its use as a business branding strategy spans the decades. Historically, a print canvas canopy over a cigar shop or beauty parlor signaled the establishment's presence to passersby.

While that design practice continues today, modern corporate branding with fabric is often spectacular, with enormous printed banners moving in the breeze. They are a signal to passersby and even passing aircraft that business or cultural events are happening there. The colors of the shading fabric convey their own branding message, tying into the corporate, company, educational, or non-profit organization's identity.

Expanding Space

Shading strategies in corporate, cultural, and residential settings create copious amounts of added space for meetings, gatherings, meals, and leisure. While the cost of walls and a roof could be prohibitive, and most likely exceeding a particular lot's allowable square footage of structure, the addition of shaded "rooms" becomes a possible way to expand the amount of usable space. Fabric enclosures in commercial spaces such as restaurants can help boost profits by increasing the amount of outdoor seating available year round.

Although the early history of awnings and shade structures was driven by many factors—business branding, shelter from rain and sun, expanding space—only recently has sun protection taken on dire significance concerning skin cancer prevention. That and other less deadly but equally impactful consequences of the sun/shade paradigm will be discussed next.

Shade Structures for Personal Health and UV Protection

Why is shade important to humanity?

In iconic portrayals of early humans struggling to survive harsh environments, shade of some sort will likely be depicted: from caves to animal-skin tents to families on the savanna huddled beneath the shade of a tree. Protection from the sun has always been important to humanity, but never so much as it is in modern times, with holes in the ozone layer and the unprecedented speed at which our planet is warming. Whereas natural climate change occurs gradually, giving organisms the opportunity to evolve their own protections, the speed of this man-induced climate change requires man-made protections.

There are, of course, positive and negative aspects of sunlight. Photosynthesis, which transforms minerals and water into plant matter, relies on sunlight, and we rely on the food produced by sunlight. The very fuels we dig increasingly deeper to harvest, originated from microscopic plants and animals absorbing energy from the sun, which was stored as carbon molecules and later as oil or gas. In some countries, the sun is increasingly harnessed to create solar power.

Continues at ce.architecturalrecord.com

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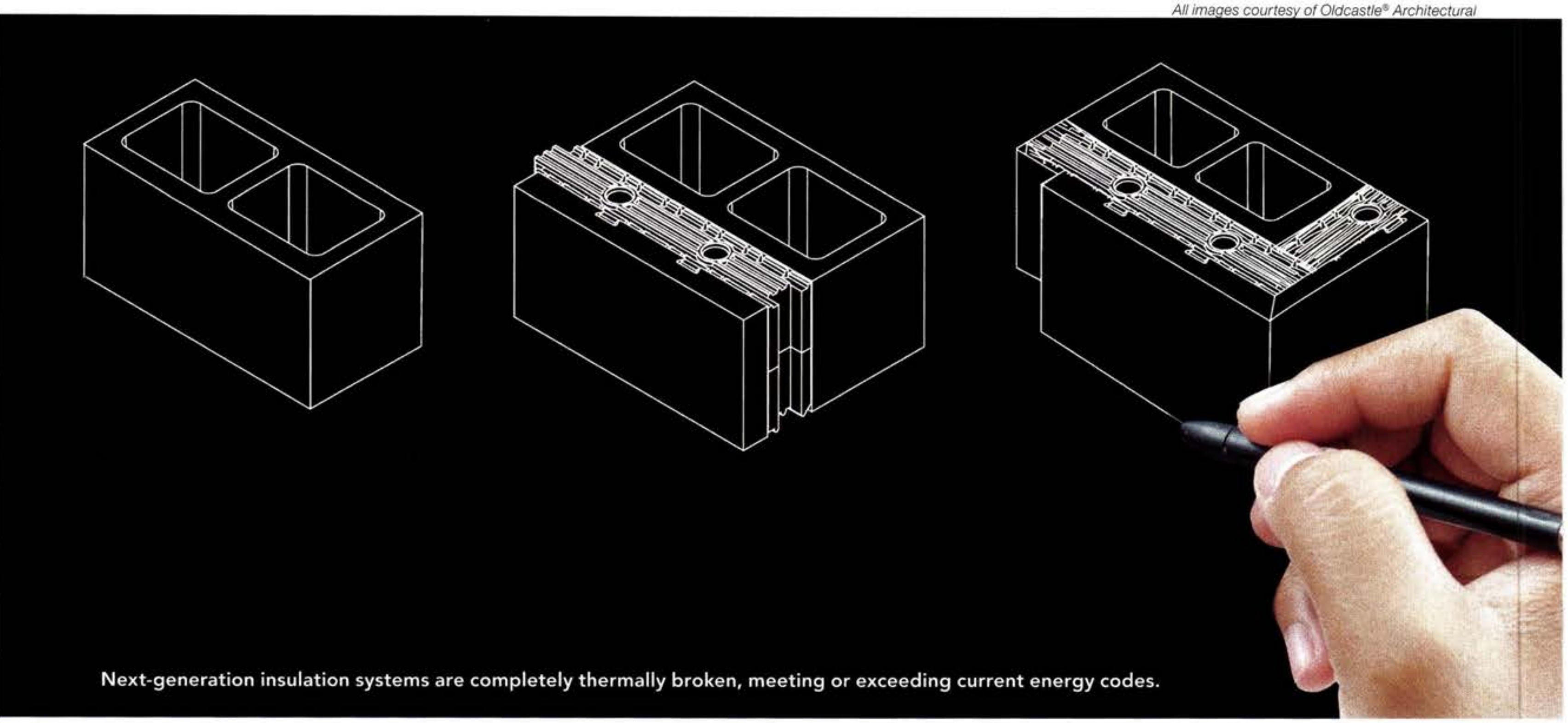

Next-generation insulation systems are completely thermally broken, meeting or exceeding current energy codes.

Insulation Gets More Effective

Continuous insulation and the next generation of high-performance masonry walls

Sponsored by Oldcastle® Architectural

As a material or combination of materials, insulation of the building envelope helps keep cold air out and heat in during the winter, while keeping warm air out and cool air in during the summer to improve comfort and save energy. Insulation is widely considered the most effective way to improve the energy efficiency of a building, and can save significantly on heating and cooling costs. However, any time the insulating layer is interrupted, the effective R-value, or efficiency of the insulation, decreases. In view of this, national energy codes have moved beyond cavity insulation, encouraging the use of continuous insulation (CI) systems, which provide an uninterrupted insulation layer over an entire wall, not just in the wall cavities. Faced with code compliance and the pressing need to design for green building goals and save on energy costs, architects are turning to CI as an effective approach to eliminating segmented insulation with open gaps, blocking thermal bridging, and helping to improve thermal performance of the wall assembly. This article will discuss the requirements of the prevailing energy code in terms of continuous insulation and offer a comparative discussion on various options for achieving it in masonry construction.

ENERGY CODES—WHERE WE STAND NOW

According to the U.S. Energy Information Administration, the amount of energy used by buildings is nearly 40 percent of the total U.S. energy consumption, totaling some 40 quadrillion BTUs. In response to these numbers, the building industry has been adopting sustainable, resource-efficient practices that can drive more energy-efficient structures. In addition, various codes have emerged in an effort to decrease these energy usage figures, requiring designers to reconsider traditional systems and examine new approaches for their ability to meet ever-increasing energy performance goals.

The primary baseline energy code for private sector building is the International Energy Conservation Code (IECC). The primary energy-efficiency standard for buildings other than low-rise residential is ANSI/ASHRAE/IESNA Standard 90.1. The IECC is written by the International Code Council, a member-focused association dedicated to helping the building safety

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Learning Objectives
After reading this article, you should be able to:

1. Discuss the prevailing energy codes and how they treat insulation as a means of achieving energy efficiency in order to improve the integrity of a building.
2. Explain the differences between cavity insulation and continuous insulation in terms of thermal bridging and contributing to overall energy conservation of a building.
3. Describe the goals of an insulation material with regard to R-value, moisture management, air tightness, wind and fire resistance, aesthetic versatility, and other characteristics that protect the building users.
4. Compare the characteristics of foam panel and insulated concrete masonry block systems and their ability to meet R-value targets and other aspects of an energy-efficient building envelope.

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community and construction industry provide safe, sustainable, and affordable construction through the development of codes and standards used in the design, build, and compliance process. Most U.S. communities and many global markets choose the International Codes. The International Codes, or I-Codes, published by ICC, provide minimum safeguards for people at home, at school, and in the workplace and constitute a complete set of comprehensive, coordinated building safety and fire prevention codes. The IECC references several ASHRAE Standards, in particular the ASHRAE 90.1 for commercial building construction.

The IECC may be only a model energy code, but it is written in mandatory, enforceable language, so that state and local jurisdictions can easily adopt it. When adopting and enforcing the code, states and local governments often make changes to reflect regional building practices, or state-specific energy-efficiency goals. This is important to consider as IECC codes and changes to the code are only enforceable when they are adopted at the state or local level. That is not to say that all states and localities adopt the codes immediately. As of 2014, the ICC reports that the IECC 2012 is in use or adopted in 47 states, the District of Columbia, the U.S. Virgin Islands, NYC, and Puerto Rico.

Every three years, the ICC publishes a new version of the IECC, upping the required energy efficiency of buildings by a substantial percentage, and heading toward a pronounced emphasis on building insulation and building envelope construction. In terms of meeting the IECC, there are three methods: the Prescriptive, Trade-off or System Performance, and Total Building Performance, with each subsequent method offering increased design flexibility and complexity. The prescriptive path, which requires building components to meet R-values listed in the tables, offers little flexibility. The performance path uses established software to measure compliance, providing less stringent requirements and more flexibility to trade off requirements. The whole building path requires even more complex software, allowing tradeoffs among envelope components, HVAC systems, and lighting. As this path analyzes a building's total energy use as opposed to requiring code-complaint individual components, it may become the most popular method as time goes on.

Continuous Insulation

Though not currently defined specifically in the ICC family of International Building Codes, CI is defined in ASHRAE 90.1 as: "Insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings."

The definition of fasteners is meant to include screws, bolts, nails, etc. Furring strips, clip angles, lintels, and other large connection details are excluded from the term "fasteners." Many designers, contractors, and building officials are still not informed about this important aspect of CI. For example, masonry veneer wall construction typically employs steel relieving angles and steel lintels at window and door heads. These steel angles are usually fastened directly to the building structure, providing a significant thermal bridge from the interior of the building to the exterior. There are a number of solutions to this issue including welding the angles to standoffs at +/-4-feet-0-inch centers, which allows the CI to be installed behind the angles to minimize the effects of thermal bridging. There are also proprietary clip systems being marketed to perform this same function.

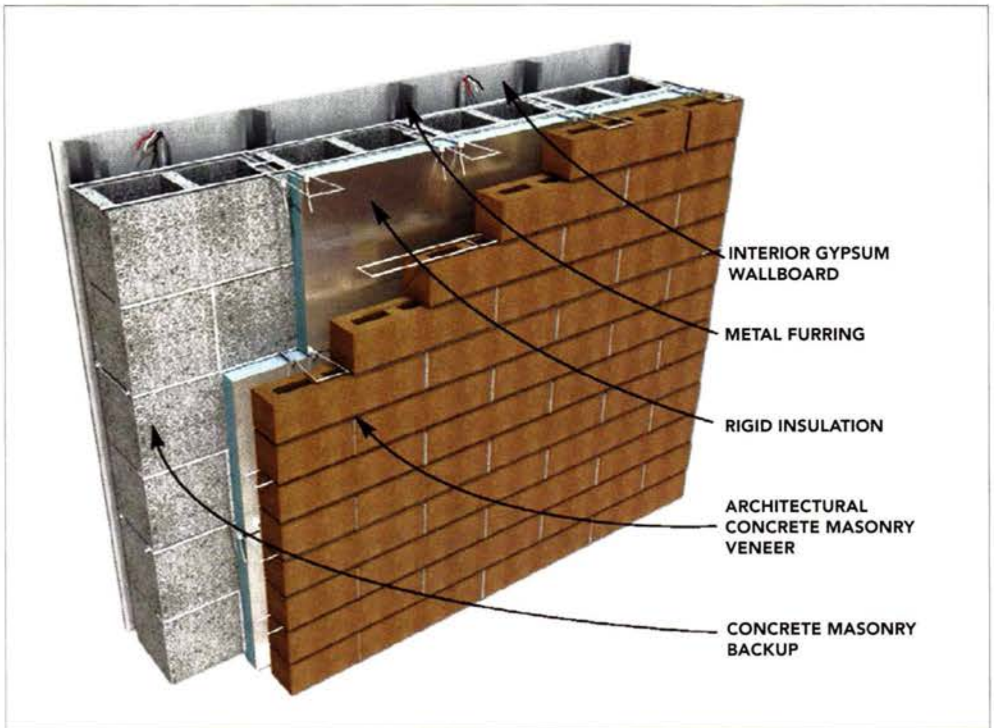
CI is found in various places in the 2012 IECC. Table C 402.2, for example, is a prescriptive table that lists all opaque (non-window) wall R-value requirements. Where CI is listed in this table, it is mandatory.

WHY CI—CI VS. CAVITY INSULATION

The main purpose of insulation is to minimize the amount of heat which escapes or enters a building, a goal that is ever more important in the face of today's spiraling energy costs. Before discussing the comparative benefits of insulation, it is important to understand R-value. Generally, R-value, or resistance value, means the ability to withstand heat flow, and the higher the R-value, the more effective the insulation. For illustrative purposes, consider the fact that heat flows through an R-10 insulation twice as fast as that of an R-20 material. However, these are nominal R-values, the rated/labeled values of insulation products determined in laboratory testing. The R-value standard was developed exclusively to test small samples of insulation materials, and it constitutes insufficient information to rate the thermal performance of a wall, the reason being that these values do not take into account the effectiveness of the insulation in conjunction with framing members and other parts of the wall.

Effective R-values, on the other hand, represent the total resistance of the entire wall assembly—and the difference between nominal and effective R-values can be surprising. The discrepancy is due to the fact that R-value doesn't measure thermal bridges in the structural elements, which virtually channel heat flow through the wall; nor does it measure air movement, thermal mass, or moisture content, all of which can drive thermal performance. Thermal bridging is a particularly important factor in the equation. Beyond the potentially significant heat loss/heat gain that can occur, thermal bridging may also create condensation problems that jeopardize the wall assembly not only by reducing the R-value, but by permitting mold and compromising the service life of the entire wall assembly.

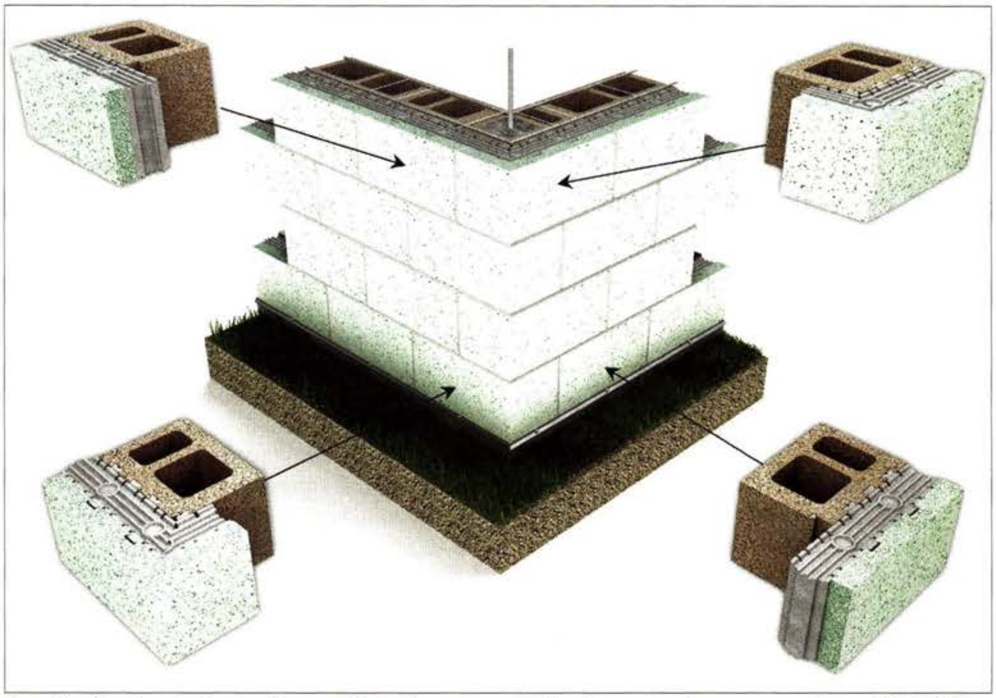
As can be seen in the illustration below, a typical insulated cavity wall may have the following elements: an interior gypsum wallboard, metal furring, concrete masonry backup, rigid insulation, and architectural concrete masonry veneer.



Insulated cavity wall

But because the cavity insulation is installed between the studs, there will be gaps in the insulation that result in thermal bridges and potential moisture condensation. Many building experts have long considered cavity wall insulation to be inefficient. Limiting the thermal bridging will improve the thermal performance picture. A 1-inch sheet of rigid foam sheathing, for example, can nearly double the wall's effective R-value, improving thermal performance and decreasing associated heating costs.

That is the premise of CI, which runs continuously over structural members and is free of significant thermal bridging. It can be installed on the interior, exterior, or integral to any opaque surface of the building envelope. CI provides one of the most effective—some say, the only—way to comply with increasingly stringent energy codes, as it is able to block thermal bridging. Wrapping the exterior wall in a continuous layer of rigid foam improves high R-value in several ways. To begin with, it reduces the difference in temperature between the cavity and the stud, cutting heat loss and increasing the wall system's effective R-value. Further, CI has the effect of moving the dew point from the inner cavity to the outside wall, decreasing the potential of mold and mildew to grow inside the wall. If a drainage plain and a moisture barrier are added, CI can better forestall moisture intrusion and keep the wall system effective over a longer service life.



An effective insulation option consists of a pre-assembled structural masonry unit, molded EPS insulation insert, and thin veneer face that is installed as a complete assembly.

INSULATION OPTIONS IN A WALL ASSEMBLY

In addition to continuous thermal insulation, an effective wall assembly will provide moisture vapor control, water-resistive barrier, and air barrier, and be resistant to fire and extreme wind conditions. Insulation can play a role in all these characteristics. From interior furring and insulated cavities to foamed panel systems and next-generation insulated concrete masonry block systems, masonry construction offers diverse insulation options for energy-efficient wall systems. The relative performance of each insulation system should be examined not only in terms of its R-value, but in relation to the aforementioned goals of efficient wall assemblies as well as its potential for aesthetic effect, and the specific needs of the project.

Single Wythe Walls

A single wythe wall is a stone, brick, or concrete wall that is one masonry unit thick. Considered the most economical wall type, the single layer provides the structure, exterior surface finish, and, in some designs, interior surface finish. Single wythe walls are durable and inherently fire-proof with fire ratings up to 4 hours. Although the thermal mass and inherent R-values may be sufficient to meet code requirements, particularly in warmer climates, additional insulation may still be required. Rigid insulation inserts, foamed-in-place or loose-fill insulation can be applied to the interior or exterior of the unit. Furring strips can be added to the interior and allow for the addition of a finish material and accommodate additional insulation.

Alternatively, an exterior insulation and finishing system (EIF) can be added to the exterior. According to the definitions of the International Building Code and ASTM International, an EIFS is a non-load-bearing, exterior wall cladding system that consists of an insulation board attached either adhesively or mechanically, or both, to the substrate; an integrally reinforced base coat; and a textured protective finish coat. According to *Building Science Digests BSD-146: EIFS*, EIFS became very popular in the 1980s and experienced a significant number of serious failures, almost all related to rain penetration.

Early EIFS used a face-sealed approach. Drained EIFS are significantly different from face-sealed systems in that, by definition, they have a provision for drainage. Unlike face-sealed perfect barrier systems, such systems can be successfully used as an exterior cladding system in essentially all climates and exposures. Drainable EIFS are not subject to the same limitations of use as face-sealed or barrier systems. In fact, drainable EIFS are among the most robust and advanced moisture control assemblies available. EIFs comply with building codes that reference energy conservation through the CI.

In single wythe walls, R-values will depend on the density of the concrete, the number and height of the of webs, the depth of CMU as well as the type of insulation calculation method used. With the variety of concrete masonry units and insulation types and thicknesses, R-values from 5 to over 20 are possible. Rigid foam inserts will yield an R-value of 3 to 10, and injected foam or loose fill will boost the R-value from 4 to 20.

While single wythe walls can be a cost-effective solution when building goals include permanence and economy, it is important to note that single wythe walls do not have the redundancy of a traditional cavity wall, and water penetration is sometimes a concern. To achieve the weather resistance of a cavity wall, the single wythe wall must be very carefully detailed and built, with particular attention paid to flashing, base condition, joints, and coatings.

Foam Panel Systems

Far preferable in a number of respects are foam panel wall systems. Rigid foam has been a key driver of energy-efficient construction over the last few decades as it gives a significant boost to R-values of walls and roofs with minimal increases in thickness. Further, it covers the framing elements, decreasing and sometimes eliminating the thermal bridging that is characteristic of cavity insulation. Rigid foam insulation can be airtight if properly sealed and taped at seams; air can go around but not through this insulation,

Types of Foam

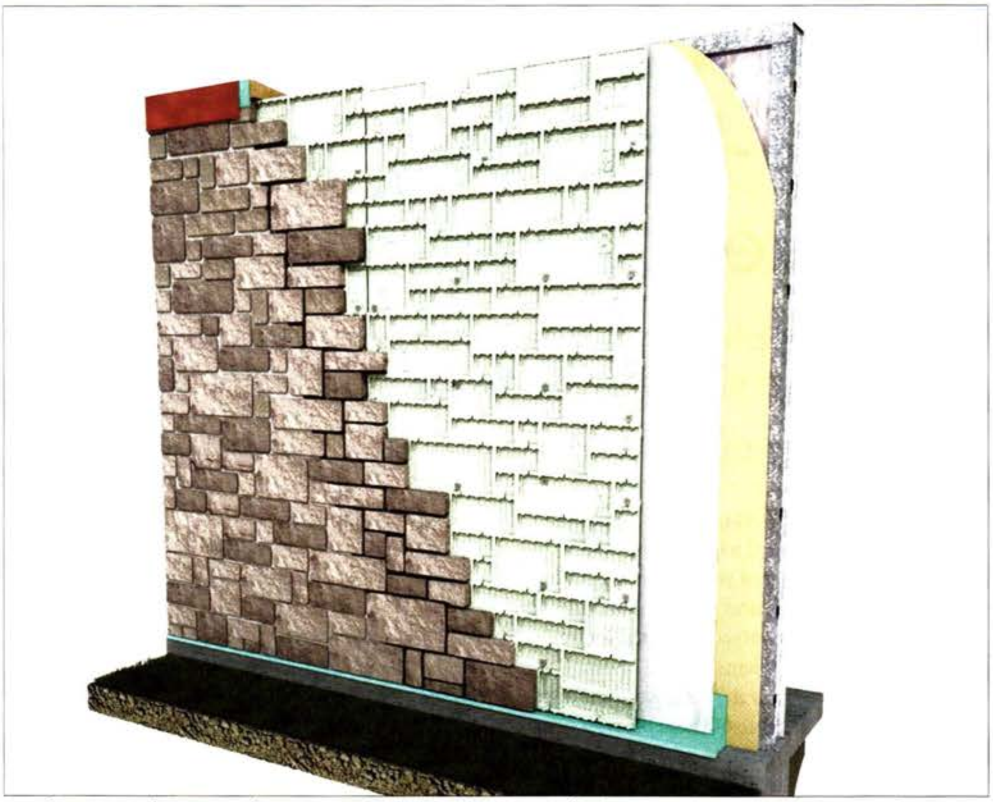
Code- and ASTM-compliant foam plastic CI sheathing materials are available with various characteristics and profiles, to meet specific project requirements, the main types being expanded polystyrene (EPS), extruded polystyrene (XPS), and polyisocyanurate (polyiso) foam, all produced under various trade names. Each type of product has different thermal properties and associated influence on required thickness and costs.

Expanded polystyrene (EPS) ASTM C578 is the most economical type of rigid foam and has an R-value of about R-4.0 per inch. Similar to the foam used for impact protective packaging, soil subgrade load-bearing blocks, and floation augmentation for boating and floating, EPS is one of the most widely used types of rigid foam. In successful use for many years in areas where moisture is a concern, EPS "breathes" so that moisture is diffused. It has been found to resist the growth of fungi and bacteria, and to maintain performance properties when exposed to moisture and/or water. EPS insulation is available in a variety of densities to suit project needs, and is frequently used in commercial buildings for roof and wall panel insulation. ASTM C578 provides performance properties on this type of foam insulation.

Extruded polystyrene (XPS) rigid foam is usually blue or pink in color, with a smooth plastic surface, and available in a wide range of thicknesses and edge profiles. The R-value is about 5 per inch. Used widely in residential construction, this type of rigid foam will not absorb water like polyiso and is stronger and more durable than expanded polystyrene, making it a versatile type of rigid foam. XPS falls between polyiso and expanded polystyrene in price.

Polyisocyanurate, or polyiso, foam has the highest R-value per inch (R-6.5 to R-6.8) of any rigid insulation, and is the most expensive. This type of rigid foam usually comes with a reflective foil facing on both sides, so it can also serve as a radiant barrier in some applications. It is used widely in commercial applications and increasingly in residential structures.

Foams themselves can be one of two types: open- or closed-cell. In general, the key difference between the two types is density, which has implications when used in insulation. As closed-cell foam is the denser of the two materials, it offers increased R-value per volume, increased resistance of water vapor transmission, and increased rigidity, providing superior structural integrity. A 1-inch layer of closed-cell foam provides roughly the equivalent insulation factor as a 2-inch layer of open-cell foam, making the former particularly advantageous in tight spaces as thinner layers of insulation can be used. Closed-cell foams are superior insulators: They are strong and act as structural reinforcement for the insulated surface whereas open-cell foams have little structural strength. Open-cell foams typically have R-values of 3 to 4 per inch vs. closed-cell foams' R-values of 5 to 8 per inch. Another key difference is porosity. Open-cell foam is porous, which means moisture, both water vapor and liquid water, can penetrate the insulation. Closed-cell foam, on the other hand, is non-porous, and thus not moisture-penetrable.



In a foam panel system, foam is applied over sheathing, flashing, and one to two layers of a weather-resistant barrier. Foam panels offer the advantage of CI, water control, and multiple patterns of face material.

Foam Masonry Panel System

Relatively new to the market, the foam masonry panel systems provide CI; they consist of foam panels, stainless steel screws or anchors, masonry units, and mortar. Type S mortar can be used, which has the advantage of additives to achieve easier pumping, better bonding, flexibility, and dimensional stability. A variety of masonry units are available including durable stone, clay, and concrete brick with others under development. Masonry units are friction fit in the foam, with different types of units having different foam panels.

The foam is the key to the efficacy of the unit, adding good water management with drainage on both sides to take away any water that may infiltrate the wall and protect the structure from damage over its service life of high moisture exposure. R-values are high as well—9.1 Steady State and 13.6 including Thermal Mass. An STC of 51 and an NCMA TEK 13-1B sound transmission rating for concrete masonry walls means loud sounds are only faintly heard and occupants can enjoy their space in peace and quiet. Some foam systems have been proven to resist wind speeds of more than 110 mph according to ASTM E330 with no lasting deformation, which essentially eliminates the structural risk of damage experienced with lighter-weight veneers. Fire resistance criteria notably NFPA 285 and ASTM E119 assures that tested foam walls have successfully withstood one hour of exposure to temperatures of more than 1,700°F. Foam panel systems should meet the aforementioned criteria.

Continues at ce.architecturalrecord.com

Combination Air and Water-Resistive Barriers in Exterior Walls

Thin fluid-applied membranes can have the same or better performance than other options

Sponsored by Dryvit Systems, Inc. | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

The design and performance of exterior walls has received a lot of deserved attention in recent years. Building science research, code updates, and sustainable building design innovation have all contributed to greater understanding and implementation of best practices related to air, water, and vapor barriers in exterior walls. All three of these barriers are important to not only control energy usage in buildings but also to assure the longevity and durability of a wall system across its life cycle. Nonetheless, the growth in available information can cause confusion on what really works in a particular wall assembly in a particular climate. Worse, in a rapidly changing industry, building and design professionals sometimes rely on outdated information and fail to recognize the benefits of the latest, well-tested and proven products or systems.

INTERNATIONAL BUILDING CODE—LEADING THE WAY ON WALL PERFORMANCE

During the past few decades, the International Building Code (IBC) has been regularly updated to be much more specific regarding requirements for exterior wall construction. Some of these are prescriptive requirements meaning that compliance is based on following a prescribed level of performance that may vary by location or situation. For example, if we were discussing fire egress requirements in a commercial building, we would see that the number of exit doors required by the IBC is calculated based on prescriptive requirements related to occupancy, area, and use. By contrast other code requirements are simply mandatory regardless of situation, meaning that they must be present and they must meet minimum standards of performance. In our egress example, the presence of opening protectives (automatic door closers) is a mandatory code requirement on every exit door regardless of other factors. When it comes to exterior walls, air, water, and vapor barriers fall into the mandatory category—all are required in virtually all cases with only one variable for vapor barriers based on location.

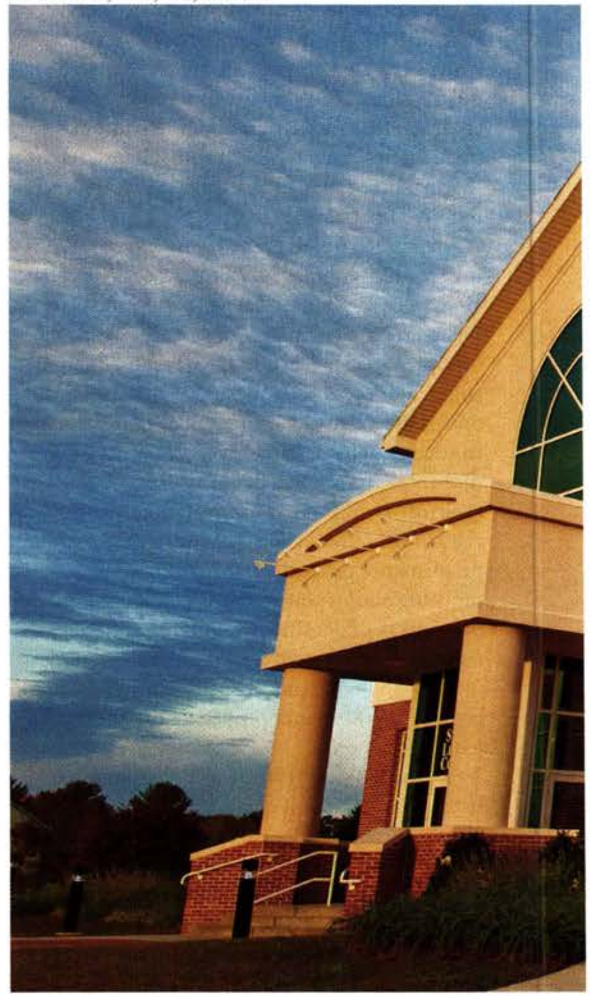
IBC Definitions

Recognizing that there has been some confusion on the role and function of air, water, and vapor barriers as related to wall construction, the committee of professionals involved in writing and updating the codes spend considerable time and effort on establishing appropriate definitions for code-mandated elements. Specifically, the latest (2012) version of the *International Building Code* includes in Chapter 2, Section 202 a number of relevant definitions as part of the list of standard definitions used in the code. These include specific definitions for exterior walls, vapor barriers (as contrasted with a vapor permeable membrane), and water-resistant barriers (WRBs). For the sake of consistency, we will use the same terms with the same meanings throughout this article. (See sidebar on p. 186.)

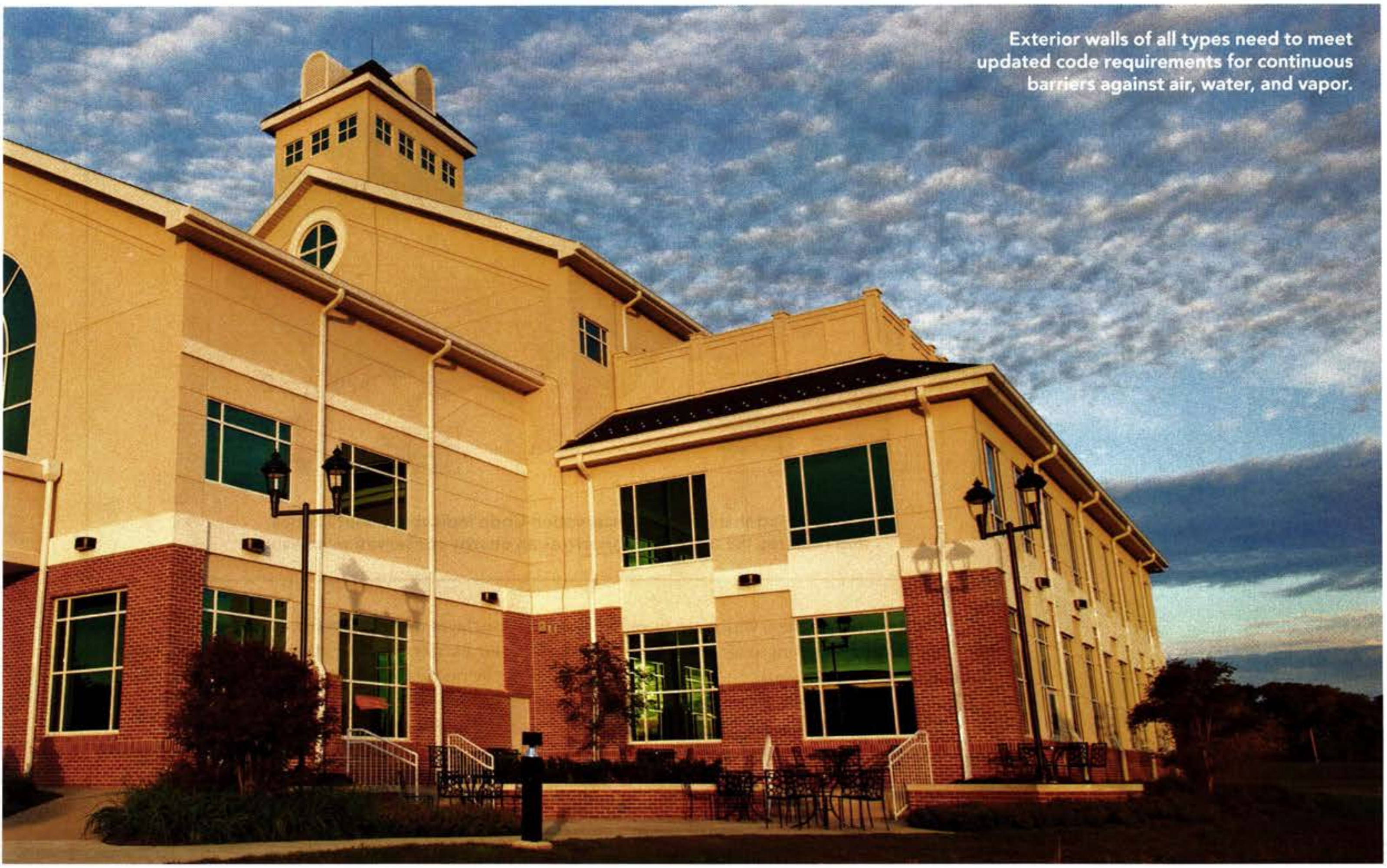
IBC Exterior Wall Requirements

Chapter 14 of the IBC describes the particulars for exterior walls including mandatory performance requirements (IBC 1403). In clear and certain terms, it states that "Exterior walls shall provide the building with a weather-resistant exterior wall envelope." It goes on to require that "The exterior wall envelope shall include flashing ... (and) shall be designed and constructed in such a manner as to prevent the accumulation of water within the wall assembly by providing a water-resistive barrier behind the exterior veneer ... and a means for draining water that enters the assembly to the exterior." Keeping in mind that this is all about the general integrity of the exterior wall, the clear intent is to avoid damage to the wall from water and weather by requiring the use of flashing, a water-resistive barrier, and drainage for any water that does penetrate. There are some exceptions listed for concrete or masonry walls or exterior insulation and finish systems (EIFS) provided other relevant portions of the IBC are followed. There is also an exception for showing compliance for drainage through testing as prescribed in the code (IBC 1403.2). Some details of these requirements are elaborated on as follows:

Photo courtesy of Dryvit Systems, Inc.



- **Flashing.** The mandatory and prescriptive details of flashing are specifically called out to "be installed in such a manner so as to prevent moisture from entering the wall or to redirect it to the exterior. Flashing shall be installed at the perimeters of exterior door and window assemblies, penetrations and terminations of exterior wall assemblies, exterior wall intersections with roofs, chimneys, porches, decks, balconies and similar projections, and at built-in gutters and similar locations where moisture could enter the wall." (IBC 1405.4) Properly detailed and installed flashing is clearly a must.
- **Fire testing of water-resistive barriers.** The code recognizes that the use of a water-resistive barrier cannot compromise the fire and flame propagation requirements of the rest of the code. Hence it states: "Exterior walls on buildings of Type I, II, III or IV construction that are greater than 40 feet (12,192 mm) in height above grade plane and contain a combustible water-resistive


Exterior walls of all types need to meet updated code requirements for continuous barriers against air, water, and vapor.

barrier shall be tested in accordance with and comply with the acceptance criteria of NFPA 285." (IBC 1403.5) The cited test is NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components. This test applies to an entire wall assembly that contains any combustible products. The intent is to determine if the entire assembly, not just any particular product, can be declared safe under specific fire conditions. As such, compliance is determined not by testing an individual material but a full assemw

► **Vapor barriers.** Looking at the total wall assembly, the code states "Protection against condensation in the exterior wall assembly shall be provided..." (IBC 1403.2) which recognizes the damage potential from vapor condensing in an exterior wall and deteriorating construction materials through rot, rust, or mold. Hence the code goes on to require, based on the IBC definitions, that "Class I or II vapor retarders shall be provided on the interior side of frame walls in Zones 5, 6, 7, 8 and Marine 4." (IBC 1405.3) Zones are determined by looking in the International Energy Conservation Code (IECC) but the requirement for its inclusion remains in the IBC. The IBC does allow for some cases where Class III vapor retarders can be used depending on the wall construction details (IBC 1405.3.1).

INTERNATIONAL ENERGY CONSERVATION CODE— RAISING THE BAR

While the IBC establishes the basic requirements for exterior walls from a general building construction sense, the 2012 International Energy Conservation Code (IECC) goes further to address energy use in buildings. The beauty of the family of codes prepared by the International Code Council (ICC) is the coordination between them, meaning that these two codes have been painstakingly reviewed to complement and not contradict each other among concurrent versions. Hence the IECC uses similar format and language to the IBC but also acknowledges the need to coordinate requirements.

IECC Definitions

The IECC uses the same general building definitions as the IBC but goes on to add a few that are specific to energy conservation. Among

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Learning Objectives

After reading this article, you should be able to:

1. Explore the latest code and design standards for development of continuous air barrier requirements for exterior wall assemblies.
2. Assess the various air barriers and water-resistive barriers (WRBs) on the market today.
3. Analyze the differences between the various product types for performance and installation characteristics.
4. Investigate the difference between thinner fluid-applied film, polymer-based combination air/WRBs and those that are thicker, asphalt-based air/WRBs.

To receive AIA/CES credit, you are required to read the entire article and pass the test. Go to **ce.architecturalrecord.com** for complete text and to take the test for free.

AIA/CES COURSE #K1411P

2012 INTERNATIONAL BUILDING CODE (IBC)
Section 202 Definitions

EXTERIOR WALL
A wall, bearing or nonbearing, that is used as an enclosing wall for a building, other than a fire wall, and that has a slope of 60 degrees (1.05 rad) or greater with the horizontal plane.

EXTERIOR WALL ENVELOPE
A system or assembly of exterior wall components, including exterior wall finish materials, that provides protection for the building structural members, including framing and sheathing materials, and conditioned interior space, from the detrimental effects of the exterior environment.

EXTERIOR SURFACES
Weather-exposed surfaces.

EXTERIOR WALL COVERING
A material or assembly of materials applied on the exterior side of exterior walls for the purpose of providing a weather-resisting barrier, insulation or for aesthetics, including but not limited to, veneers, siding, exterior insulation and finish systems, architectural trim and embellishments such as cornices, soffits, fascias, gutters, and leaders.

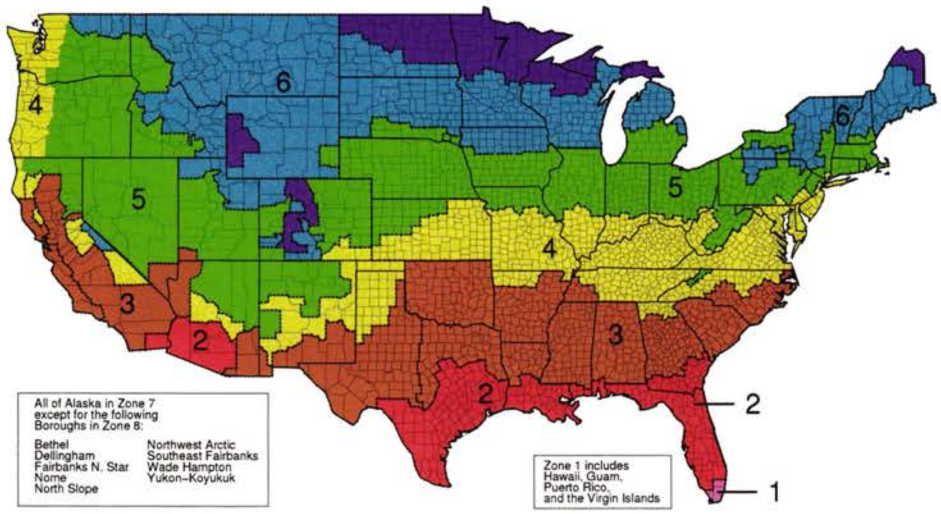
WATER-RESISTIVE BARRIER
A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

VAPOR PERMEABLE MEMBRANE
The property of having a moisture vapor permeance rating of 10 perms (5.7 x 10-10 kg/Pa x s x m^2) or greater, when tested in accordance with the desiccant method using Procedure A of ASTM E 96. A vapor permeable material permits the passage of moisture vapor.

VAPOR RETARDER CLASS
A measure of a material or assembly's ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class shall be defined using the desiccant method of ASTM E 96 as follows:

CLASS I: 0.1 perm or less.
CLASS II: 0.1 perm - ≤ 1.0 perm.
CLASS III: 1.0 perm - ≤ 10 perm.

Image courtesy of International Code Council



The International Energy Conservation Code indicates climate zones and requires the use of air barriers as an energy conservation measure.

them are air barriers, which are recognized as a significant deterrent to air infiltration flowing through exterior wall systems. Such air flow is understood to alter the indoor air makeup of a building such that it will cause heating and cooling systems within a conditioned space to work harder and use more energy. It can also contribute to people inside the building being less comfortable and adjusting the thermostat set points to compensate but using more energy in the process. Note that the IECC clarifies that both above-grade and below-grade walls are part of its definition of exterior walls.

IECC Air Barrier Requirements

There are specific, mandatory requirements for air barriers that are addressed for both residential and commercial buildings in the IECC. The commercial building requirements are actually less stringent and detailed than the requirements for residential buildings but far reaching and thorough nonetheless in terms of the thermal envelope—including exterior walls. Also, it should be noted that compliance with the IECC can be demonstrated either by following the provisions of the code directly or by showing compliance with ANSI/ ASHRAE / IESNA Standard 90.1. While the overall energy performance of buildings is generally the same between the different compliance methods, there are differences in details, including differences in detailed requirements for air barriers. For this discussion, we will be focused on the IECC compliance path.

► **Air barrier location.** The IECC makes it very clear that "A continuous air barrier shall be provided throughout the building thermal envelope." (IECC C402.4.1) That means all surfaces including walls. It goes on to say "The air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope, or any combination thereof." Typically, air barriers are placed on the outside of the wall assembly to prevent air infiltration from entering the assembly. Placing the air barrier on the outside of the walls also makes it much easier to maintain continuity across floors, ceilings, demising walls, etc.

► **Air barrier continuity.** The IECC imposes several mandatory requirements for the construction and use of an air barrier, including that it "shall be continuous for all assemblies that are the thermal envelope of the building and across the joints and assemblies." (IECC C402.4.1.1) Further, recognizing the importance of joints and seams, the code requires "Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials." Similarly, at all penetrations, "the air barrier shall be caulked, gasketed, or otherwise sealed in a manner compatible with the construction materials and location." (IECC C402.4.2) In all cases, joints, seams, seals, and penetrations "shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen, or otherwise impair its ability to resist positive and negative pressure from wind, stack effect, and mechanical ventilation." Achieving this performance requires attention to detail not just in design but in construction as well.

► **Air permeability.** The IECC relies on ASTM testing for the determination of a material or assembly to be considered an air barrier.

Specifically ASTM E2178 Standard Test Method for Air Permeance of Building Materials establishes air permeability for a particular material to be no greater than 0.004 cfm/ft^2 (0.02 L/s • m^2) under a pressure differential of 0.3 inches water gauge (w.g.) (75 Pa). This threshold is based on historical requirements used in Canada and based on the amount of air that penetrates through a sheet of gypsum wallboard. Turning from a single material to an air barrier assembly, the threshold is not as strict but still a significant level to achieve. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies and ASTM E1677 Standard Specification for Air Barrier (AB) Material or System for Low-Rise Framed Building Walls are cited by the IECC for assembly compliance. In these cases, an average air leakage not to exceed 0.04 cfm/ft^2 (0.2 L/s • m^2) under a pressure differential of 0.3 inches of water gauge (w.g.) (75 Pa) is required. Going from 4 thousandths to 4 hundredths of a cubic foot per minute might seem to be a big difference but the net number is still very small. Its significance lies in the fact that all of the joints, seams, connections, etc. need to be included in the test to be sure that the total assembly does indeed perform as a complete, un-breached air barrier.

Photo courtesy of Dryvit Systems, Inc.

Fluid-applied membrane systems can be applied to an appropriate substrate by using a trowel, a roller, or a sprayer as field conditions may warrant.

AIR BARRIER ASSOCIATION OF AMERICA—OFFERING CLARITY

The Air Barrier Association of America (ABAA) is a not-for-profit trade organization dedicated to advancing knowledge about air barriers. Founded in 2001, it is a membership-based association with a diverse makeup of manufacturers, suppliers, distributors, architects, engineers, contractors, researchers, testing and audit agencies, consultants, and building owners. While their first focus has been on air barriers, they more recently have begun to address water-resistive barriers as well. The association seeks to raise the standard of proficiency and effectiveness of the industry through quality assurance programs, education, lobbying, and marketing of the industry to government, the professional community, building owners, utilities, and other industry stakeholders. Among the messages they have conveyed, they point out that the U.S. Department of Energy has stated that up to 40 percent of the energy used to heat and cool a building is due to uncontrolled air leakage.

Photo courtesy of Dryvit Systems, Inc.

Continuity of an air barrier (shown in blue under final cladding) is required across all floors, around all openings, and at all penetrations.

ABAA has become recognized as a go-to source for all things related to air barriers by the general design, construction, and manufacturing community. For design professionals, they provide technical information on air barriers, guide specifications, and accredited continuing education on relevant topics. For manufacturers they offer a product evaluation process whereby manufactured air barriers and/or water-resistive barriers and assemblies can be accredited and approved by the ABAA. In this regard they indicate that the performance of an air barrier assembly is of far greater importance than the air permeance of an individual material since a highly rated material won't matter much if the joints, seams, and penetrations are letting air through. For contractors and installers, they offer quality assurance training for field-installed systems including accreditation and certification for those who demonstrate proficiency. In short, they have become the recognized certification source for all aspects of designing, manufacturing, and installing air barriers and water-resistive barriers in thermal envelopes.

Conventional Barrier Materials

All of these criteria are important and establish the basis for performance and code compliance, but ultimately it comes down to selecting and using certain materials in a wall construction assembly. As might be expected, there are numerous choices that have been traditionally used and accepted for each of the barrier systems we are discussing. It is worth pointing out that different materials can provide a singular air barrier function, a vapor barrier function, or a water-resistive barrier function. There are also materials that can provide a combination of two or even all of these three functions.

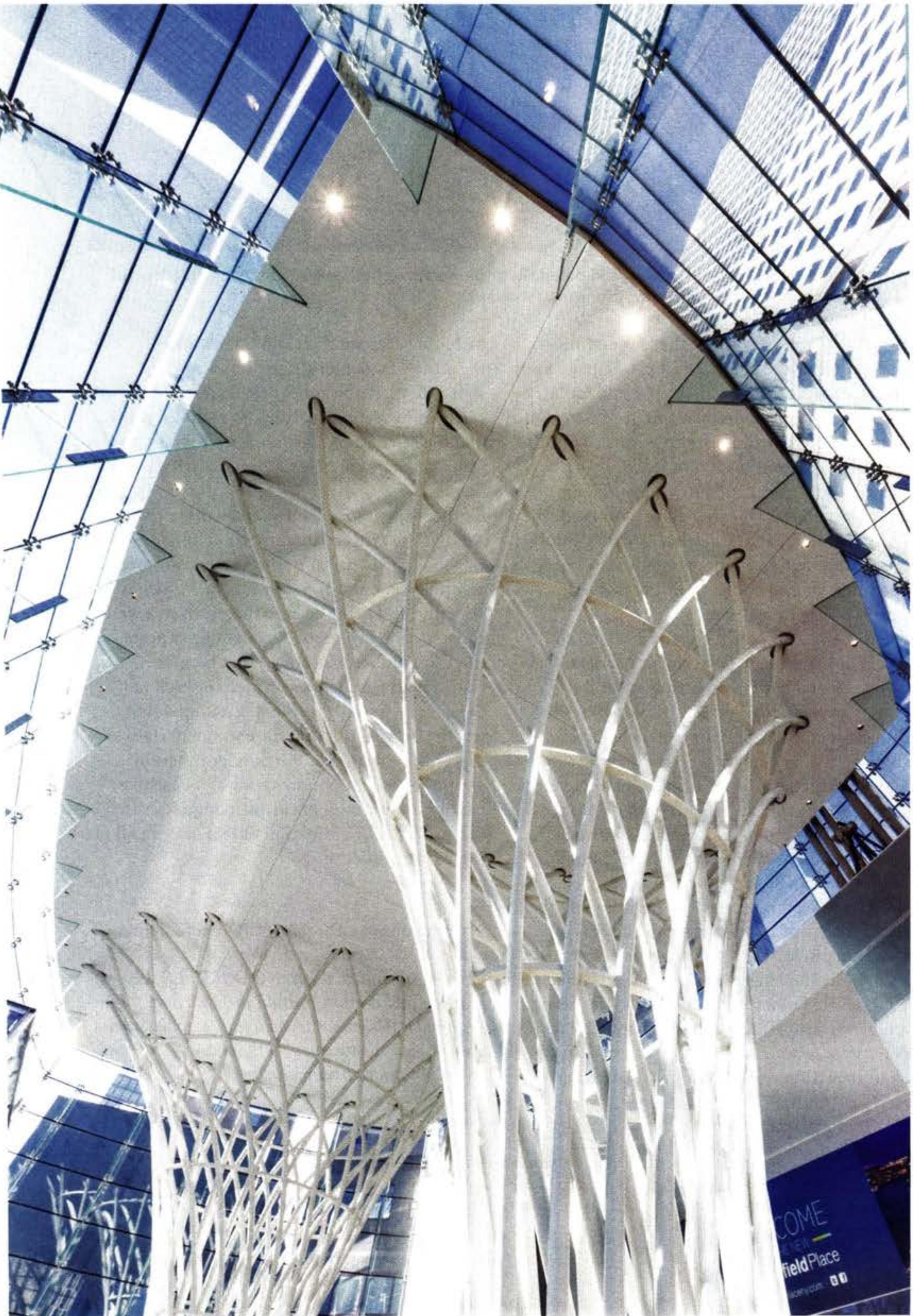
▶ Continues at ce.architecturalrecord.com

Peter J. Arsenault, FAIA, NCARB, LEED AP, *practices architecture, consults on green and sustainable design, writes on technical topics, and presents nationwide on all of the above. www.linkedin.com/in/pjaarch*

Structural Innovation—Weaving Successful Outcomes

Architects, owners, contractors, fabricators, and installers can change the way they work together to achieve more integrated project delivery

Sponsored by the Steel Institute of New York | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*



Around the country, architects are perfecting the art of effective collaboration to produce highly successful projects. Building design and construction are influenced by increasingly complex demands and user requirements, particularly in dense, urban settings. One such example is a highly visible and significant project in the area around the site of New York City's former Twin Towers at the World Trade Center in Lower Manhattan.

The project involved design and construction of an entry pavilion to the Winter Garden and World Financial Center, located across the street from the World Trade Center, which was heavily impacted by the attacks of 9/11. Perhaps no other project in the country illustrates more clearly the challenges and benefits of an architect-led, collaborative, project-delivery process, or integrated project delivery (IPD).

COLLABORATION THROUGH INTEGRATED PROJECT DELIVERY

The increasingly intricate and complex forces at work during a building's design and construction can be seen as an evolution. The use of advanced computing capabilities such as computer-aided design and documentation (CADD) or three-dimensional building information modeling (BIM)—used not just by designers but by constructors and fabricators as well—have greatly affected the field of construction. Some evolution has also occurred due to fluctuating economic conditions, which in turn have led owners to require greater efficiency, communication, and overall coordination across project teams. These elements have led everyone in the building industry to question traditional approaches to the processes used to create projects.

Recognizing these changes, the American Institute of Architects (AIA) has developed a member-approved position statement on

The new entry pavilion of Brookfield Place in New York City is an excellent example of structural innovation and professional collaboration to create a successful project responding to changing needs.

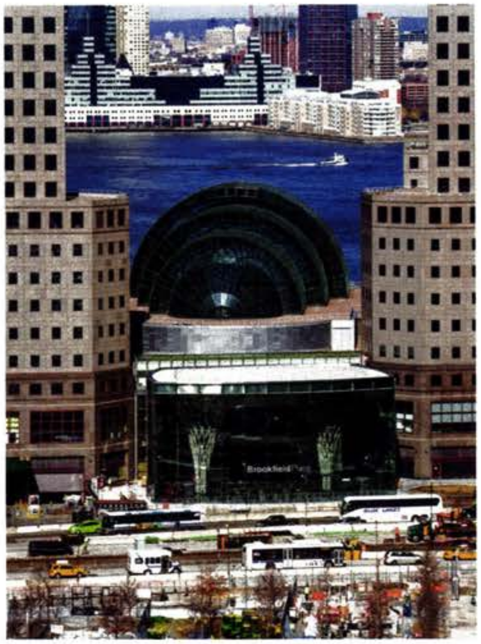
Left and right photos © Jeff Goldberg/Esto project delivery, which is simply defined as the process that a project follows from inception to completion. The concept of integrated project delivery has been articulated under the leadership of AIA National and AIA California Council. In many locations, the thinking surrounding IPD has gained ground and is becoming more commonplace—there are even formal AIA Contract templates built around collaborative multi-party agreements. In some locations, IPD still remains an ideal to strive for. We will focus here on the Brookfield Place project as a case study for the ways that unique project requirements and complex, sometimes competing demands can bring about greater collaboration among all involved to achieve very successful results.

CASE STUDY CONTEXT: THE WORLD FINANCIAL CENTER IN NEW YORK CITY PRIOR TO 9/11

Most people remember the terrorist attacks of September 11, 2001, as the destruction of the Twin Towers at the World Trade Center in New York City. The reality is that a large section of lower Manhattan was impacted on this day. Prior to 9/11, the Twin Towers were certainly the most visible on this part of the city's skyline, but they also existed as an integral part of a complex of other related buildings, transportation systems, and public spaces collectively referred to as the World Trade Center (WTC). Geographically, the towers and the WTC bordered the redeveloped and desirable Battery Park City neighborhood. Functionally, they were seen as part of the nearby financial district that includes Wall Street and the New York Stock Exchange.

Just to the west of the WTC, the World Financial Center (WFC) fills most of the land between West Street (a.k.a. the West Side Highway) and the Hudson River. This complex of award-winning buildings was designed by Cesar Pelli & Associates (now Pelli Clarke Pelli Architects) in 1988. The complex includes four mid-rise towers with distinctive geometric roofs and solid façades punched with iconic square window openings. The buildings are certainly lower than the Twin Towers, which were once tallest in the world, but with heights between 34 and 52 floors, they are easily seen along the Hudson River and from across the street at the World Trade Center site.

Equally visible and significant to the WFC complex is the inclusion of a large, glass-enclosed Winter Garden that serves as a combination public space and circulation area. In its public-use mode, the Winter Garden is a setting for special events, and, with its prominent palm trees and abundant daylight, is an everyday respite from the surrounding urban environment. As a circulation area, it serves as part of a series of pedestrian walkways between



A view of Brookfield Place looking across the WTC site. The curving glass enclosure of the Winter Garden sits behind the new entry pavilion but in front of the Hudson River and is flanked by two of the towers of the complex.

the different WFC towers as well as a connection to the Hudson River where a ferry dock and marina are located. Since the Winter Garden creates a visual break between the adjacent taller buildings and has an eastern façade facing West Street, it has become the de facto "front door" of the entire WFC complex.

Before 9/11, the appeal for tenants and employees in the World Financial Center was not only its location and proximity to other financial and business-focused buildings, but also its connectivity to them and other parts of the surrounding area. Public access routes connected the different portions of the World Financial Center to each other, to the World Trade Center across the street, and other nearby buildings. However they also connected to needed public transportation systems such as the New York City subway, the New Jersey PATH train, city buses and ferries. These transportation systems were all valued and relied upon daily by commuters or visitors. This connectivity was equally valued by the owners of the buildings, Brookfield Office Properties. Just as important, they valued fully enclosed connectivity to avoid inhospitable weather for this primarily pedestrian population. This was realized through the use of elevated, fully enclosed walkways that spanned above West Street to connect the WFC with other buildings and transportation systems. Of course, this meant that those connection points needed to be coordinated with the owners and operators of other buildings and transportation systems, the most prominent of which was the Port Authority of New York and New Jersey. Through this combination of spaces, connectivity, and cooperation, this area functioned quite well for a dense urban location with tens of thousands of people accessing it daily while still offering many desirable amenities.

IMPACT OF 9/11 AND INITIAL RESPONSE

During the immediate aftermath of the destruction of the Twin Towers at the WTC, transportation, access, businesses, and operations at the World Financial Center were shut down. Other surrounding WTC buildings were damaged and some needed intensive repair and restoration. Others were partially demolished and rebuilt due to structural damage. Across the street, the World Financial Center was mostly intact, but some of the key elements of connectivity with the surrounding neighborhood and the region were lost. Not only were the elevated walkways gone, some of the buildings they connected to were either gone or closed. Further, the transportation systems under the World Trade Center were shut down or re-routed. Hence, the building needed a new means of connectivity to the city, the most logical of which was a purely street-level main entry. Therefore, just four months

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Learning Objectives
After reading this article, you should be able to:

1. Identify and recognize the characteristics of integrated project delivery as identified by the American Institute of Architects and others.
2. Investigate the impact that site and contextual constraints can have on structural design and construction contributing to increased project complexity.
3. Assess, through the use of a detailed case study, the value of engaging design and construction professionals together to assure structural and construction integrity.
4. Incorporate collaborative, integrated project delivery principles that protect the safety of occupants while also creating enhanced design.

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AIA/CES COURSE #K1411M

Left photo courtesy of Pelli Clarke Pelli Architects; Right photo © Jeff Goldberg/Esto

The 2002 temporary entry is shown on the left and the new entry pavilion on the right; both came about because of the full collaboration of the design team, contractors, and owner.

after the September 11 attacks, Pelli Clarke Pelli Architects (PCPA) was called upon by the building owners, Brookfield Office Properties, to create a new entry on the east side of the complex facing West Street. They were the logical choice since the firm still had architects on staff who worked on the original 1980s building complex. The architects in turn invited back the same structural engineering firm, Thornton Tomasetti, to assist.

It became readily apparent that the owners wanted a quick solution and saw an opportunity to provide a psychologically significant milestone—they wanted the new entry and related work completed by the first anniversary of the attacks. In other words, design, construction, approvals, and hand-over in less than nine months. Despite the inherent challenge, the project team agreed to the exceptional timeframe. What followed was an understandably intense period of full collaboration between the architects, engineers, contractors, and the owner.

A new glass façade and canopy design was worked out to establish a new entry to the east of the Winter Garden area of the WFC complex. For continuity, some materials selected to match the existing building could only be fabricated in Europe and elsewhere. In spite of the deadline, those fabricators and installers rose to the occasion. Craig Copeland, the project design team leader for PCPA, recalls, "It was indicative of the project's importance that companies around the country and world dropped what they were doing to focus their attention on meeting the significant deadline."

The push was on. PCPA set up a field office so designers and contractors could hold daily meetings, sometimes several times a day, around the site to coordinate details, anticipate upcoming work, and keep all things flowing. It wasn't a typical project delivery process, but this wasn't a typical project. Through perseverance and a genuine spirit of cooperation and collaboration, the entire team successfully turned over a completed project on September 10, 2002—a day before the one-year anniversary. The resulting new entry and canopy provided the WFC complex with the needed connectivity to West Street, established a new circulation flow, and helped make the entire complex functional and operational again.

CHANGING BUILDING NEEDS

While the WFC was able to act quickly, such was not the case for the rest of the area. The loss of the Twin Towers and the residual impact to the immediate area meant the necessary exodus of numerous businesses from lower Manhattan. Further, plans began almost immediately to redevelop the WTC site—it would eventually include a memorial, a museum, a new underground PATH train station, and new or renovated buildings including the new 1,776-foot-tall One World Trade Center. All of this redevelopment was seen as positive overall, but changed the nature and makeup of the area surrounding the World Financial Center complex. Further, the directly adjacent Battery Park City was expanding in its redevelopment to include mixed-use residential, retail, outdoor space, and neighborhood amenities. It soon became apparent to Brookfield Office Properties that the demographics around their buildings were shifting from a predominantly financial office environment to a much more diverse working and living population.

The owners began to assess how best to respond to these changes. They first initiated some building renovations: Lower-level office areas were changed over to retail and mixed uses including restaurants, shopping, and other amenities. The Winter Garden played prominently in that change, serving as a focal point for some of this transformed activity and as an internal connection point to access many of them. Office spaces remained on the upper floors with an updated mix of tenants and businesses. Then, as both a symbolic and practical action, the owners decided to change the property's name from the World Financial Center to Brookfield Place. More than just a name change, their intent was to reframe the identity of the complex to reflect its increasingly diverse use and population.

Concurrent with all of this activity, a proposal emerged for the Port Authority to provide a set of escalators from the space east of the Winter Garden to a PATH station being designed by Santiago Calatrava at the WTC site. Along with the new escalators, and a fresh building identity, Brookfield wanted to restore the complex's ability to connect directly with its surroundings, namely the PATH and WTC. Hence, a single, multipurpose main entry in front of the Winter Garden that connected to the street, the escalators to the trains, and to the Brookfield Place complex seemed to suit the situation best.

COLLABORATING TO FULFILL THE CHANGE

Having experienced such a successful collaboration with the 2002 entrance and canopy projects, the owners once again called upon the architectural and engineering team of Pelli Clarke Pelli Architects, Flack + Kurtz (now WSP), and Thornton Tomasetti to devise a solution to reconnect with the WTC. Following an open bid process, Brookfield Properties selected Plaza Construction to provide overall construction management.

Site Conditions Influencing Design

The design team began assembling more detailed site information related to the entry area. The canopy was lightweight, affected only areas at or near grade, and was fairly easy to accommodate. But what was needed was a fully enclosed building with access to below-grade areas that would make more demands on the site, which already had many existing below-grade structures, utilities, and other items to consider.

Foremost of these existing items, the highly publicized "bathtub" foundation that surrounded the World Trade Center site below grade to hold back groundwater pressure, ran almost directly under the entry location. Obviously this important structure could not be breached or used to exert new structural loads. The nearby underground transportation provided part of the reason for a new enclosure, but also meant that the enclosure could not interfere or interrupt any of the tracks, tunnels, or related structures associated with it. The Port Authority had jurisdiction over these areas and needed to be consulted in order to understand and assess specific restrictions and opportunities for connection. Further, since these transportation systems were approximately 50 feet below street level, long escalators would be required to access them. That meant they would likely extend out under the street and would need to avoid any existing

Photo © Jeff Goldberg/Esto

The open, basket-weave columns became the most prominent design feature of the pavilion due to collaboration and cooperation among all.

utilities and other infrastructure located there.

After collecting all of the needed and relevant information about the existing site conditions, it became apparent that there were only two spots where any significant structural loads could be located. These points were on the left and right of the entry area but restricted as to their location between the street and the Winter Garden—meaning that they were in the center of the space, not the perimeter. While the assumption was always that the entry pavilion would be appropriately separated or isolated structurally from the Winter Garden, the extent of the site limitations was well beyond common or anticipated. Moving to a different location was not an option since the Winter Garden connection remained critical to the new complex's function. Further, it provided the most visible option for such an entry pavilion with the opportunity to make the best design impact. While structurally limited, it would need to create an appropriate visual statement that indeed looked properly connected to the newly named Brookfield Place, the street, and the transportation systems below.

Design Scheme

Despite the limitations and complexity of what might have been an otherwise straightforward design problem, the architects and engineers dove into it looking for options for innovation. By collaborating together from the very start, they accepted the challenge to create a design that was open, inviting, and fresh with only two points of support. The concept agreed upon early in the design was to extend the glassy, open feeling of the Winter Garden eastward towards West Street and to offset the otherwise massiveness of the buildings. In an era where security consciousness was elevated to new levels, this was a bold and optimistic decision suggesting a sense of overcoming, rather than being dominated by, the attacks. Further, the team recognized that in the interest of creating a place with proper scale and proportion to be visibly prominent, the pavilion would coincidentally need to be as tall as the train tracks were deep—around 50 feet above street level.

The structural options for the entry were assessed as much in terms of functionality as overall design impact. If two massive piers were selected to support a roof system, the appearance and the structure would likely be heavier than desired. Perimeter wall supports were not an option since there was no place to locate a proper perimeter foundation for them. Instead, the designers reasoned that an alternative based on the idea of hanging a curtain wall from a roof structure would be needed.

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Photo by Eckert & Eckert Photography

KILN APARTMENTS
Portland, OR • GBD Architects
Kiln Apartments is a five-story wood-frame building with 19 residential units and retail space on the ground floor. It is the first market-rate multi-family/mixed-use development in the U.S. designed to meet Passive House standards.

Meeting and Exceeding Energy Objectives in Wood Buildings

Sponsored by reThink Wood

Wood's favorable carbon footprint is one reason more North American architects are choosing wood-frame construction for mid-rise buildings up to six stories while closely following the rise of taller wood buildings made from mass timber and hybrid building systems. However, while it is fairly well known that wood products sequester carbon and typically require less energy to manufacture than other building materials, their performance related to operational energy efficiency is often overlooked.

From a thermal perspective, wood-frame building enclosures are inherently more efficient than steel-frame, concrete, or masonry construction[i]—because of the insulating qualities of the wood structural elements, including studs, columns, beams and floors, and because wood stud walls are easy to insulate. Options also exist for insulating wood-frame buildings that aren't available for other construction types. For example, while requirements for lighting systems or mechanical systems do not change based on structural material, wood's versatility related to building envelope configuration gives designers more insulation flexibility.

While wood-frame buildings have a history of cost-effectively achieving energy-efficiency objectives, new energy codes and standards have increased the minimum thermal requirements for building enclosure

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Learning Objectives
After reading this article, you should be able to:

1. Summarize a range of design considerations required to achieve energy-efficient building enclosures in multi-story wood-frame buildings.
2. Discuss thermal insulation strategies, which must be considered together with airtightness and vapor permeability in assemblies in order to achieve effective thermal efficiency.
3. Explain common methods for controlling heat and airflow in wood-frame buildings.
4. Identify how new energy codes such as the *International Energy Construction Code* have placed increased emphasis on the thermal performance of buildings.

To receive credit, you are required to read the entire article and pass the test. Go to **ce.architecturalrecord.com** for complete text and to take the test for free.

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assemblies, and many of the new requirements exceed the cost-effective thermal insulation limits of traditional wood-frame construction. This has prompted the need for alternative assemblies—e.g., with insulation outside the framing spaces or deeper wall cavities—as well as more thermally efficient detailing.

With proper attention to detail and the application of building science in design, wood buildings can meet or exceed the requirements of new energy codes and standards, as well as conservation programs and labeling systems such as Passive House, net-zero energy, and the Architecture 2030 Challenge. With an emphasis on building envelope design for mid-rise buildings, this course will focus on design strategies for air and thermal control, and energy-efficient assemblies. It will discuss wood-frame construction in the context of the *International Energy Construction Code* (IECC), and highlight expanding possibilities for the design of energy-efficient wood buildings using "mass timber" products.

A HISTORY OF HIGH PERFORMANCE

Wood framing has long been used to create energy-efficient buildings. For example, between 2004 and 2011, the Bethel School District (BSD) in Washington State reduced energy use by more than 7.6 million kilowatts and saved $4.3 million in utility costs—equivalent to the cost of electricity for 15 of the District's elementary schools for one year. BSD reports an 81 percent ENERGY STAR rating overall, and several of their 17 elementary and six junior high schools have a rating of between 95 and 98 percent. While size, configuration, and age of the 23 facilities vary, one thing remains constant: each is wood-frame.

According to architect Wayne Lerch, "Steel and concrete need separation between the structure and exterior envelope. This separation is not required with wood because of its inherent thermal properties." At the same time, the BSD strategy to over-insulate stud cavities with inexpensive batt insulation plays a significant role in meeting its energy objectives.

While this continuing education course focuses primarily on mid-rise buildings four-to-six stories, many of the principles hold true for other building types. Information on how to economically meet the residential requirements of the 2012 IECC for buildings under four stories can be found in the American Wood Council publication, DCA-7, *Meeting Residential Energy Requirements with Wood-Frame Construction*.

EMBODIED VS. OPERATIONAL ENERGY

As buildings become more energy efficient, embodied energy—that is, the energy used in the process of building material production, transportation, construction, maintenance, and demolition/re-use—assumes greater relative importance. Studies vary in their numbers, but a 2012 literature review[2] noted that embodied energy for a conventional building may account for 2 to 38 percent of total life cycle energy, where embodied energy may account for up to 46 percent for a low-energy building. Another study found that embodied energy could account for up to 60 percent of a low-energy house compared to operational energy. Taken to its ultimate conclusion, embodied energy would account for 100 percent of life-cycle energy use in a net zero energy building, and operational energy for 0 percent.

DESIGN CONSIDERATIONS FOR ENERGY-EFFICIENT BUILDING ENCLOSURES

As a general rule, the most significant sources of building envelope energy loss are windows, doors, and air infiltration (leakage). Therefore, an important factor in reducing whole-building energy consumption is proper insulation and sealing.

It must be noted that well-insulated assemblies also require effective moisture, water vapor, and air movement control strategies. While these are beyond the scope of this course, information on moisture in the context of air and thermal control can be found in the *Guide for Designing Energy-Efficient Building Enclosures for Wood-Frame Multi-Unit Residential Buildings in Marine to Cold Climates in North America* (the Guide).[3]

Following are several considerations for architects seeking to design an energy-efficient multi-story building. They are meant as examples as opposed to a comprehensive list, and are explained in greater detail in the Guide.

Heat Flow

Minimizing space heating or cooling energy use is a primary function of the building enclosure. While heat flow through the building enclosure cannot be prevented, it can be controlled in order to reduce the total energy consumption and improve comfort. This is achieved by constructing a thermally insulated and airtight building enclosure.

There are three principal mechanisms of heat transfer through the materials, components, and assemblies that make up the building enclosure: conduction, radiation, and convection. The control of all three is critical in thermally efficient building enclosure assemblies.

Conduction. Thermal conductivity is a measure of the rate of heat flow through one unit thickness of a material subjected to a temperature gradient. The thermal conductivity of common structural wood products is much less than the conductivity of metals, but is about two to four times that of common insulating material. For example, the conductivity of structural softwood lumber at 12 percent moisture content is in the range of 0.7 to 1.0 Btu×in/(h×ft^2×°F) compared with 1,500 for aluminum, 310 for steel, 6 for

CRESCENT NINTH STREET

Durham, NC • Cline Design Associates

Photo courtesy of Crescent Communities

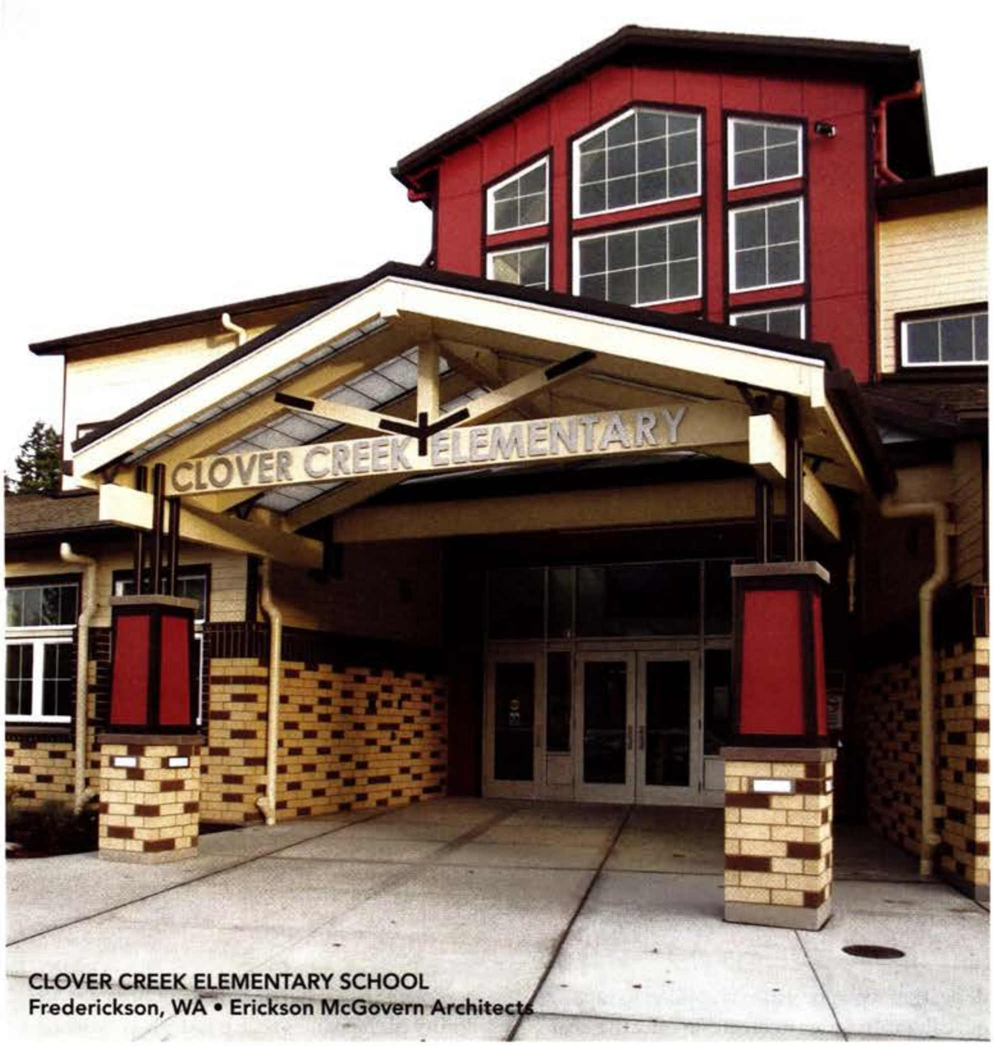
Located adjacent to the Ninth Street Commercial District and Duke University in Durham, North Carolina, this large mixed-use development by Crescent Communities includes 10 four-story wood-frame buildings, with a total of 270,656 square feet and 303 residential units over six acres.

Designed to achieve LEED certification, the development includes (among other things) high-efficiency heat pumps, motion sensors that reduce lighting energy consumption within amenity spaces, and ventilation ducts that provide outside air directly to the heat pump unit return ducts. Within these units external air dampers monitor outside conditions and limit the amount of humid air introduced to living spaces.

The development meets the requirements of the 2009 *North Carolina Building Code*, and follows the performance path of ASHRAE 90.1 – 2004. It includes 2x4 wood studs at 16 inches on center (o.c.). All interior walls between living units and all exterior walls are insulated with fiberglass batt insulation within the stud cavities.

The development features different air barriers based on a variety of cladding materials. Stucco was placed over a layer of building wrap and a layer of building felt. Siding or paneling was placed over a layer of building wrap. For areas with stone and brick, veneer was installed over continuous self-adhering membrane flashing, which was installed over primed wood sheathing. A combination of felt and paper backed with metal lath was also installed over the membrane flashing depending on the application.

Photo courtesy of Bethel School District



CLOVER CREEK ELEMENTARY SCHOOL
Frederickson, WA • Erickson McGovern Architects

concrete, 7 for glass, 5 for plaster, and 0.25 for mineral wool.

The thermal resistance, or effective insulating value, of building enclosure assemblies and components determines the magnitude of the conductive heat loss. All enclosure elements should be designed and detailed to maximize thermal resistance (within practical limits); detailing of often overlooked elements will reduce the amount of energy that is lost through conduction. For example, cladding supports, floors, balconies, fasteners, concrete slabs, and window frames can all be sources of energy loss. Energy standards and codes generally require thermal bridges to be accounted for in the code compliance of multi-unit residential buildings.

Radiation is the transfer of energy through a gas or vacuum in the form of electromagnetic waves. It is the process whereby a hot surface radiates heat to a colder surface and requires a clear line of sight between the surfaces involved. Both the temperature of the two surfaces and the emissivity of the materials affect the amount of heat loss.

Techniques for reducing heat loss due to radiation include employing low solar gain/low U-factor fenestration, cool roof technologies, and radiant barriers.

Convection is the transfer of energy by the movement of a fluid such as air. Convective heat transfer for building enclosures has two primary mechanisms: convective flow of air within assemblies or spaces, and convective flow through assemblies from interior to exterior or exterior to interior. The latter is referred to as air leakage.

The control of air leakage is important to conserve space heat and reduce air-conditioning loads. In multi-story buildings, air leakage may account for up to half of the space-heat loss, depending on the air-leakage rate, building height and wind exposure, occupant behavior, mechanical penetrations, and several other factors including the effective enclosure thermal performance. Air leakage in multi-story buildings is typically higher than in smaller, single-family dwellings due to increased wind exposure, the stack effect, and mechanical systems, all of which contribute to higher and more sustained differential pressures across the building enclosure.

INSULATION IN THE REAL WORLD

Designing a high-performance enclosure is more involved than simply selecting the R-value of the insulation and high-performance glazing. It requires an understanding of how the insulation performs in real-world scenarios, how it performs relative to the building system, and the impacts of other factors.

Thermal insulators work by trapping air; however, different products often perform differently in a building than during manufacturer testing. To determine its R-value (i.e., its ability to retard the flow of heat), insulation is evaluated under "guarded" hot box conditions in which there is no air flowing through the material. In reality, pressure differentials in buildings often cause air to flow through the insulation, significantly reducing its effective R-value and ability to trap air.

Modeling heat flow through an opaque wall section requires an understanding of the various methods presented in the ASHRAE User's Manual for ANSI/AHSRAE/IESNA Standard 90.1 – 2007. Wood walls are simple to model using the *parallel path* calculation method, which recognizes that wood behaves like an insulator, but with a U-value that is greater than the cavity insulation, or the *isothermal planes* method. Concrete or concrete masonry unit wall construction is most accurately modeled using the *isothermal planes* method, recognizing that highly conductive materials do little to prevent heat flow. Lastly, steel wall assemblies are most suitably modeled using the *modified zone* method, which recognizes the highly conductive nature of steel. This method accounts for the degrading effect to cavity insulation that is in close proximity to a steel stud and conduction through wall layers that are in contact with the flange of the steel stud. Overall, the parallel path method used for wood walls is far simpler than the methods associated with other materials.

Air Barriers

The control of air flow through the use of air-barrier systems is important to, among other things, minimize the loss of conditioned air through the building enclosures. Air-barrier systems are required for all multi-unit residential buildings in all climate zones.

The air barrier is the means of preventing air leakage through the building envelope. A building's air barrier should be continuous, integrating all the exterior envelope systems—

THERMAL INSULATION STRATEGIES AND MATERIALS

Energy codes target greater thermal insulation levels in building enclosures as one of the key means for achieving energy efficiency. In order to achieve effective heat flow control, the continuity of thermal insulation should be maintained through assemblies. The use of thermal insulation must be considered, together with airtightness and the vapor permeability of materials in the assemblies, in order to achieve effective thermal efficiency.

One differentiating factor is the location of the insulation:

Interior-insulated – Insulating layer is located on the interior side of the water-resistive barrier. For walls, this typically means the insulation is located within the stud space. For roofs, the interior insulation may be located above the sheathing but under the roof membrane or, alternatively, below the sheathing within the roof framing. Both are considered "interior-insulated."

Exterior-insulated – Insulating layer is located on the exterior of the water-resistive barrier—i.e., the likely wet zone. For walls, this means the insulation is located within the drained cavity space, while for roofs the insulation is located above the membrane (i.e., an inverted roof or protected membrane assembly). For mass timber systems (e.g., cross laminated timber walls), this is the preferred insulation strategy to protect the wood from moisture accumulation. Exterior insulation materials must be resistant to the effects of moisture.

Split-insulated – More than one insulating layer is provided, typically with one layer to the interior and one layer to the exterior of the water-resistive barrier.

In traditional wood-frame construction, heat flow has been controlled primarily by placing fiberglass batt insulation within stud cavities and attics. In some cases rigid and semi-rigid insulation boards are placed just to the exterior of the sheathing (exterior-insulated), or both are placed in the stud cavity and to the exterior of the sheathing (split insulation). Rigid insulation boards are also used below grade and in roofing applications. The use of spray-in-place polyurethane foams has also become more common in the past decade.

Continuous insulation (ci) is a term used in various energy codes and standards. It refers to the intended purpose of providing at least a minimum continuous layer of insulation that has an effective R-value equal to or very close to its nominal R-value (i.e., little to no thermal bridging). Continuous insulation is often specified as a stand-alone prescriptive requirement or, alternatively, in conjunction with nominal insulation (e.g., between wood studs) in order to achieve higher effective R-values. Common industry practice is to achieve the continuous insulation requirement with exterior rigid or semi-rigid insulation installed on the exterior of a framed assembly, but it may also be installed to the interior or within the middle of some assemblies, although it would be challenging to meet the requirement for continuity at floor levels in multi-story buildings.

Continuous insulation is necessary in structural systems using concrete and steel, which have high rates of thermal bridging, but is often avoidable in wood-frame envelopes. The selection of insulation type is based on a variety of factors including cost, availability, thermal performance, moisture retention and transmission performance, fire and acoustics. Table 3.2.1 of the Guide lists the most common insulation types used in wood-frame construction, including a range of typical R-values along with vapor and air permeability. Products with low vapor permeability can be considered vapor barriers in typical thicknesses, and those with low air permeability can be considered suitable as an air-barrier material.

Photo courtesy of FPInnovations

With five- and six-story wood-frame buildings, greater height creates a need for more structural framing, especially at lower floor levels. Stud packs of built-up stud columns may be utilized to meet seismic and gravity load-carrying requirements. In many of these walls, the use of exterior-insulated assemblies may be more efficient than insulating stud cavities.

e.g., the wall air barrier with the roof air barrier, etc. The air barrier can be installed on the interior or exterior of the building envelope. An efficient and cost-effective way to achieve an effective air barrier on walls is to incorporate a continuous, solid layer on the exterior of a building. The continuous solid material should be stiff enough to minimize the amount of deflection when pressure is applied to tape or sealants in order to create an effective seal when applied to panel joints and around wall penetrations. Panel joints need to be properly sealed to complete an air barrier assembly.

Continuous wood structural panel sheathing is commonly used as part of an air barrier system for exterior walls. The architect typically details how panel joints and openings are to be sealed—usually with tape or sealant specifically recommended for use on plywood or oriented strand board (OSB). Using continuous structural sheathing as part of the air barrier system also provides a solid support base for exterior cladding systems while increasing the structure's earthquake and wind resistance.

When using continuous wood structural panels as the air barrier:

- Panels should not be glued directly to framing. This approach is restricted in high Seismic Design Categories per the American Wood Council's *Special Design Provisions for Wind and Seismic* (SDPWS) Section 4.3.6.1. Gluing wall sheathing to framing also restricts wood panels from expanding as moisture is absorbed, which can contribute to out-of-plane buckling.
- Make sure that any sealant or tape used to complete the air barrier does not impede the ability of the panels to expand when exposed to increased humidity in the wall cavity or wetting due to construction delays. Anything that prevents panel expansion into the recommended 1/8-inch spacing between panels could result in buckling of the wall sheathing. Also, make sure the tape is rated to be used as part of an air barrier system.
- A water-resistive barrier, such as housewrap, should always be installed over wood structural panel wall sheathing in order to direct any moisture that penetrates the cladding away from the sheathing and wall cavity.

Unlike vapor barriers, there is little to no downside of redundancy in the air barrier provided the materials used do not negatively impact vapor flow. In fact, some designers incorporate more than one continuous air barrier—one on the building interior and one on the exterior.

ARCHITECTURAL FORM

Multi-story wood-frame architecture varies across the U.S., with designs based on the architect's response to the client brief, site conditions, and local environment.

Consideration of orientation, building form, and massing, as well as the ratios of enclosure area to volume, are essential factors in achieving energy-efficient designs. The use of building features to protect the enclosure is a fundamental architectural design principle. Roof overhangs, balconies, and other projections shelter walls, windows, and doors from driving rain, wind, snow, and ice, and provide solar shading.

Wood Construction and the IECC

While, historically, energy-efficiency strategies have tended to focus on HVAC systems, new energy codes such as the IECC have placed increasing emphasis on the thermal performance of building enclosures.

When designing a building, architects have three main paths for obtaining compliance with the 2012 IECC:

- IECC prescriptive path
- IECC performance path
- ASHRAE 90.1 path

For either IECC path, certain sections of the code are mandatory. These include requirements specific to air leakage in the thermal envelope (Section C402.4), space conditioning and ventilation (Section C403.2), service water heating (Section C404), and electrical power and lighting systems (five subsections of Section C405). Using the path outlined in the ASHRAE Standard 90.1-2010 (ASHRAE 90.1), developed jointly by the American National Standards Institute (ANSI), American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), and Illuminating Engineering Society of North America (IESNA), designers are not required to comply with the mandatory sections of the IECC; however, ASHRAE 90.1 has its own mandatory sections.

An above-code program, when deemed to meet or exceed code requirements by the code official, is a fourth compliance path. All mandatory sections of the IECC are still required to be met.

R-VALUE REQUIREMENTS FOR MULTI-UNIT RESIDENTIAL BUILDINGS

Minimum R-value requirements for above-grade wood-frame building enclosure assemblies in the 2012 IECC are provided for "commercial" buildings (including most multi-unit residential buildings) in IECC Table C402.2 (see the online version of this course). They are broken down by climate zone, as defined in the U.S. Department of Energy's climate zone map.

Photo courtesy of APA - The Engineered Wood Association

The exterior, sealed sheathing air barrier approach meets the key requirements of an effective air barrier system—i.e., that all elements (materials) be air-impermeable, that it be continuous throughout the building enclosure, structurally adequate and sufficiently rigid, and that it have a service life as long as that of the wall and roof assembly components.

CONTINUOUS INSULATION REQUIREMENTS

Under the prescriptive path of the IECC, walls, floors, and roofs have specific insulation requirements based on framing time and climate zone. For example, in IECC Table C402.2, above-grade metal-framed walls in Climate Zones 3 and 4 (except Marine) are required to have R-13 cavity insulation *and* R-7.5 continuous insulation (ci) applied to one face of the wall. The wood-framed walls at the same location are required to have R-13 cavity insulation and R-3.8 ci or have R-20 cavity insulation with no additional continuous insulation requirements. The option to forego continuous insulation requirements on wood-framed walls with R-20 cavity insulation is acknowledgement that metal studs have a significantly higher thermal conductance than wood studs. The R-20 cavity insulation option allows wood wall frames with 6-inch-deep studs to meet the prescriptive wall requirements with no continuous insulation in Climate Zones 1 through 5 except Group R occupancies in Marine Climate Zone 4. The R-20 wood-framed wall is the only option available in the IECC prescriptive wall path using prescribed R-values that does not require continuous insulation for above-grade walls.

Unlike the IECC, the prescriptive path of ASHRAE 90.1 does not contain the option to reduce or forego continuous insulation in wood-frame walls with the use of R-20 cavity insulation.

AIR LEAKAGE REQUIREMENTS

The requirements in the 2012 IECC for air-barrier assemblies and air-leakage control in residential buildings are different than those for commercial buildings. For commercial buildings (including most multi-family buildings), IECC Section C402.4 states that, in Climate Zones 4-8, "a continuous air barrier shall be provided throughout the building thermal envelope." The air barrier can be installed inside, outside, or within the building envelope, and must be continuous and sealed. In Climate Zones 1-3, the installation of air barriers is not required for buildings following the commercial requirements of the IECC. Materials must be air impermeable (<0.004 cfm/ft^2 @75 Pa), and assemblies must have an average air leakage rate not exceeding 0.04 cfm/ft^2 @75 Pa. The completed building must be tested and the air leakage rate of the building envelope cannot exceed 0.40 cfm/ft^2 of enclosure area at 75 Pa when tested in accordance to ASTM E779 or equivalent (e.g., the U.S. Army Corps of Engineers (USACE) Standard).

See endnotes in the online version of this article.

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Photo courtesy of Looney Ricks Kiss

For smaller firms as well as for larger firms, such as Looney Ricks Kiss, based in Memphis, best practices in firm financial management are essential to long-term success.

Effective Financial Management of Architectural Firms

Basic-practice management techniques, financial tools, and applied software can help ensure a financially healthy architecture business

Sponsored by BQE Software | *By C.C. Sullivan*

Managing a successful architectural practice relies on a number of immutable, longstanding truths. Yet there's an equal influence of new trends, techniques, and tools that separate the reasonably well-run firms from those that excel. In part, the more recent advances in firm financial management relate to macro trends in the field, according to the American Institute of Architects' (AIA) recent *Firm Survey Report*. For example, while about half of all U.S. firms were registered as sole proprietorships just 15 years ago, today that share is only about 20 percent.

Yet even the smallest firms—those with fewer than 10 employees—earn a large share of the national total of architectural billings, at about 20 percent of the total according to the AIA survey. Expand the sample to firms with up to 20 employees, and you have the lion's share of billings. That's millions and millions in revenue for these firms, and a key reason to keep careful tabs on firm financial operations.

"Providing great architectural services and running a financially successful firm are not mutually exclusive," says Steven Burns, FAIA, former principal of Burns + Beyerl Architects and now chief creative officer at BQE Software Inc. "It's quite the contrary. What separates the great-struggling designers from the great-successful designers isn't luck. The latter practitioners understand the rules of the game and wield them to the benefit of their firms, their projects, and their clients. And clients are attracted to winners, too."

Part of what makes great and successful design firms is purely organizational. These firms are able to quickly and efficiently provide principals, project managers, and entire staff essential information they need. They've reduced the amount of time needed to manage project tasks, billings, and documentation so that they have more energy and creativity for the core activity: design workflow.

Continues at ce.architecturalrecord.com

***Chris Sullivan** is an author and principal of C.C. Sullivan (www.ccsullivan.com), a marketing agency focused on architecture, construction, and building products.*

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Learning Objectives

After reading this article, you should be able to:

1. Identify the traits of healthy financial operations and basic management of an architectural firm, including the typical operations to have a fiscally/operationally sustainable practice.
2. Define basic financial management terms and firm management terminology, such as efficiency rate, billing rate, etc., and what they mean, and how to calculate them as part of a strategy to reach a profitability goal.
3. Explain how a firm values its work, and how one should determine what the most suitable rates are for billing project work to clients.
4. Describe some of the components of an operationally healthy firm (such as reimbursable expense), and some of the key tools needed for managing firm operations and finances, including software.
5. List types of specialized software and other accounting systems and their potential applications for architectural firms, such as time tracking, project management, billings, and their integration with other types of business software.

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New and Upcoming Exhibitions

The Architectural Image, 1920–1950: Prints, Drawings, and Paintings from a Private Collection
Washington, D.C.
November 8, 2014–May 3, 2015
Between 1920 and 1950, architecture changed more profoundly and more rapidly than during any similar timespan in history. The changing tastes, theories, and obsessions of that era were often documented by prominent artists who found architecture and construction to be compelling subject matter. The National Building Museum will present an exhibition of 70 prints, original drawings, and paintings from this fertile period in architectural history, all drawn from the collection of David M. Schwarz, a prominent Washington, D.C., architect. The works reveal an enduring fascination with architectural and engineering imagery and offer glimpses into the artists' personal impressions of the built environment. Included in the exhibition are works by artists Howard Cook, Louis Lozowick, and Charles Turzak. For more information, visit nbm.org.

Uneven Growth: Tactical Urbanisms for Expanding Megacities
New York City
November 22, 2014–May 10, 2015
As the world's population approaches 8 billion, city authorities, urban planners and designers, and many others will have to join forces to ensure that expanding megacities remain habitable. To engage this international debate, *Uneven Growth* at the Museum of Modern Art will present the work of six interdisciplinary teams examining new architectural possibilities for six global metropolises. The resulting proposals will show how emergent forms of tactical urbanism can respond to alterations in the nature of public space, housing, mobility, and other issues in near-future urban contexts. For more information, visit moma.org.

Ongoing Exhibitions

Hudson Yards: New York's Future is Rising
New York City
Through November 2014
New York's future is rising in the heart of Manhattan, where the High Line ends and midtown begins. Hudson Yards, the largest private real-estate development in U.S. history, will redefine the New York skyline. While more than 24 million people will visit Hudson Yards every year when it is completed, this interactive exhibition offers viewers a unique opportunity to learn about New York's newest neighborhood today. At the Time Warner Center. For more information, visit hudsonyardsnewyork.com.

Wet Horizons
Los Angeles
November 23, 2014
An installation and exhibition by architect Luis Callejas and his firm, LCLA, *Wet Horizons* articulates environmental connections between Callejas's landscape and architecture practice and the existing context of the Neutra-designed penthouse – complete with glazed walls, rooftop reflecting pools, and views of the Silver Lake Reservoir. Veiled textile drawings, reinserted into the domestic space of the house, were created in collaboration with textile artist Charlotte Hansson. Combined with digital projections and models, the installation merges the reading of landscapes from distant geographies with real L.A. views, as already curated by Neutra's design. For more information, visit lclaoffice.com.

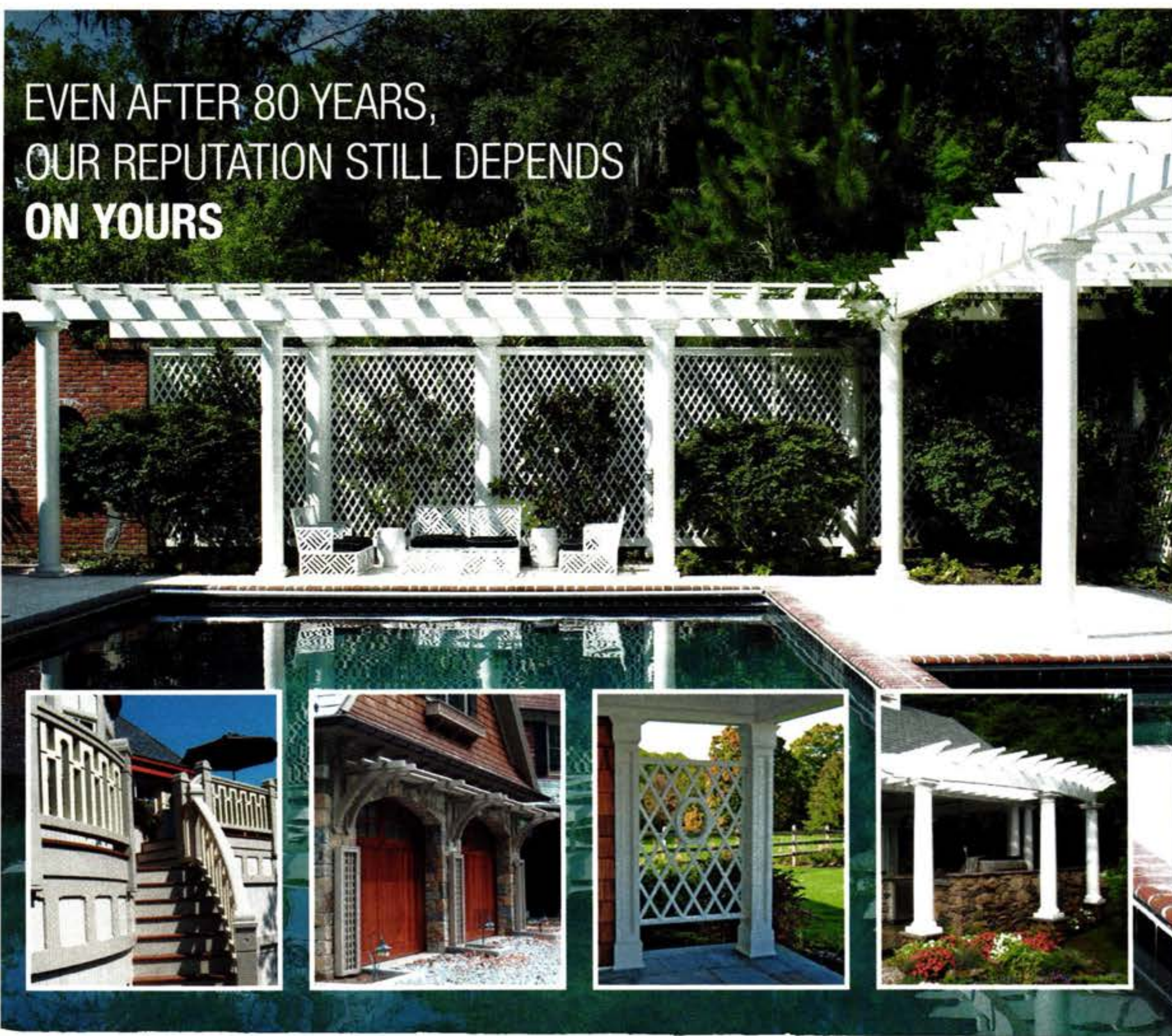
Cybernetic Serendipity
London
Through November 30, 2014
Cybernetic Serendipity, the landmark exhibition curated by Jasia Reichardt in 1968, is celebrated at the Institute of Contemporary Arts through a new presentation of rare installation photographs, press reviews, invitation cards, and printed material, such as the catalogue. Garnering the attention of the national and international press at the time, *Cybernetic Serendipity* was the first international exhibition in the UK devoted to the relationship between the creative arts and new technology. Nearly 50 years later, at a time when our relationship with computers permeates every aspect of visual culture, this exhibition highlights technology's continued relevance today. For more information, visit ica.org.uk.

IDEA Office: Thinking the Future of Auschwitz
Los Angeles
Through November 30, 2014
Thinking the Future of Auschwitz, at the SCI-Arc Gallery, is an architectural proposal for the future of the Nazi concentration camp in Poland. While the original concentration camp and Polish State Museum at Auschwitz continue to present a narrated, didactic experience, the proposal transforms the extermination camp at Auschwitz-Birkenau into a condemnatory Biblical concept. While the project is unique to Auschwitz, it tests architecture's own particular agency in the 21st century and contributes significantly to an expanded discourse on the conventions of catastrophe. For more information, visit sciarc.edu.

Fujiko Nakaya: Veil
New Canaan, Connecticut
Through November 30, 2014
The first site-specific work of art to engage the iconic Glass House itself, *Fujiko Nakaya: Veil* features the work of Nakaya, a Japanese artist who has produced fog sculptures and environments internationally. The exhibition wraps the Glass House in a veil of dense mist that comes and goes. For approximately 10 to 15 minutes each hour, the Glass House seems to vanish, only to return as the fog dissipates. Inside the structure, the sense of being outdoors is temporarily suspended during the misty spells. For more information, visit theglasshouse.org.

Infra Eco Logi Urbanism
New Haven, Connecticut
Through November 30, 2014
Opening at the Yale School of Architecture, this exhibition brings together research and design work by the experimental Canadian architecture practice RVTR to explore possible urban and architectural futures in a post-metropolitan world. *Infra Eco Logi Urbanisim* looks at the Great Lakes Megaregion of North America (GLM) to envision the kinds of systems that could best serve a cluster of cities in an age of renewable energy, new mobility, and urban growth. For more information, visit architecture.yale.edu.

Experiments in Environment: The Halprin Workshops, 1966–1971
Chicago
Through December 13, 2014
In the late 1960s, American landscape architect Lawrence Halprin and avant-garde dance pioneer Anna Halprin organized a series of experimental, cross-disciplinary workshops in San Francisco and along the coast of northern California that brought dancers, architects, environmental designers, artists, and others together to facilitate collaboration and group



creativity through new approaches to environmental awareness. Organized with the Architectural Archives of the University of Pennsylvania, this exhibition presents archival documentation of the workshops to the public for the first time, as well as plans, drawings, and original photographs of the architectural sites at Kentfield and at Sea Ranch, which celebrates its 50th anniversary this year. For more information, visit grahamfoundation.org.

Olson Kundig: Anthology
Omaha
Through January 3, 2015
This exhibition at Kaneko focuses on Olson Kundig Architects' creative process, showcasing the artistic, historic, and cultural influences and the explorations that have shaped its practice. *Olson Kundig: Anthology* provides a sampling of the design efforts of the firm's partners—Jim Olson, Tom Kundig, Kirsten Murray, and Alan Maskin—and highlights more than 50 years of production and the thinking behind the practice through displays that portray the values, methodologies, and attributes that characterize the firm's work. For more information, visit olsonkundig.com.

Drawing Ambience: Alvin Boyarsky and the Architectural Association
St. Louis
Through January 4, 2015
As longtime chair of the Architectural Association in London and one of the most influential figures in 20th-century design education, Alvin Boyarsky argued that architecture was not only a profession but also an artistic venture—an open, wide-ranging practice that comprises drawing and publication as much as it engages design and construction. The Mildred Lane Kemper Art Museum at Washington University presents the first public museum exhibition of drawings from Boyarsky's private collection. For more information, visit wustl.edu.

Mackintosh Architecture
Glasgow
Through January 4, 2015
The result of a four-year research project led by The Hunterian museum at the University of Glasgow, Mackintosh Architecture is the first major exhibition devoted to Mackintosh's architectural work, featuring more than 80 architectural drawings, films, models, and archival material from The Hunterian and collections across the UK. The exhibition features three displays that showcase Mackintosh's skills as a draftsman and designer, including his travel sketches and still-lifes. At The Hunterian. For more information, visit glasgow.ac.uk/hunterian.

"Make a Joyful Noise": Renaissance Art and Music at Florence Cathedral
Atlanta
Through January 11, 2015
Three marble panels from Italian sculptor Luca della Robbia's famed organ loft created for Florence Cathedral travel to the High Museum of Art, their first time in the U.S. The High's exhibition places these panels in an environment like that for which they were originally created by displaying them with other musical objects, including hand-decorated choir books from the cathedral and a lectern designed to hold them. For more information, visit high.org.

Assembled Realities: Jeff Chien-Hsing Liao's New York
New York City
Through February 15, 2015
A portrait of New York as seen through more than 40 large-scale panoramic photographs of the city's urban landscape, *Assembled Realities* features work by Taiwanese artist Jeff Chien-

Hsing Liao, who came to New York at age 18 to study photography. Pushing the boundaries of traditional documentary photography, Liao (born in 1977) creates large-scale panoramas by combining multiple exposures of the same location taken over the course of several hours. At the Museum of the City of New York. For more information, visit mcny.org.

Lectures, Conferences, and Symposia

The New York Festival of Light
Brooklyn, New York
November 6–8, 2014
The first annual New York Festival of Light celebrates light in all of its extraordinary incarnations. This festival features a curated collection of lighting installations created by local and internationally renowned lighting designers, visual and performing artists, and technologists who work with the medium of light. The spectacle takes place in the Archway under the Manhattan Bridge and in the surrounding plaza space. The festival is free and open to the public. For more information, visit nyfol.org.

DIEM: Design Intersects Everything Made
Los Angeles
November 14, 2014
DIEM: Design Intersects Everything Made is a design symposium presented by the West Hollywood Design District that offers discussions, panels, and keynote speeches from leaders in the fields of design, decorative arts, fashion, architecture, and fine arts. Now in its third year, DIEM is curated by design writer Mallery Roberts and Frances Anderton, her co-host of KCRW's DnA: Design and Architecture. Design leaders and enthusiasts are invited to engage with one another and cross-pollinate through a series of events intended to encourage integral design, including panel discussions on topics ranging from L.A.'s new era of warehouse galleries to art photography in the age of Instagram. For more information, visit westhollywooddesigndistrict.com.

Beatrice Galilee: Activating Architecture
New York City
December 2, 2014
Beatrice Galilee, the newly appointed associate curator of architecture and design at the Metropolitan Museum of Art, will speak at the School of Visual Art about the strategies and priorities of design and architecture curation today, focusing in particular on her curatorial leadership of the 2013 Lisbon Architecture Triennale and the 2011 Gwangju Design

Biennale. Galilee will also reflect on the differences between organizing exhibition and experimental performance projects for architecture biennales or festivals around the world and working as a curator within a venerable institution such as the Met. For more information, visit designresearch.sva.edu.

Competitions

Official U.S. Presentation at 2016 Venice Biennale of Architecture
Submission deadline: December 9, 2014
The Department of State's Bureau of Education and Cultural Affairs is sponsoring an open grant competition to organize the official U.S. representation at the 15th International Venice Architecture Biennale which will take place from June through November 2016, in Venice. The architecture exhibition is a showcase for leading ideas in contemporary architecture and planning through national representations. Proposals will be accepted from U.S.-based nonprofit organizations including museums, galleries, visual and design arts centers, and schools of design and architecture. For more information, visit grants.gov.

Breaking New Ground
Registration through November 2014
Breaking New Ground is an international design and ideas competition that addresses the urgent affordable-housing needs of farmworker and service-worker families in the Coachella Valley in southeastern California. Efforts to improve living conditions suffer from a lack of funding and coordination. The competition seeks to address this by harnessing design to envision new precedents, mechanisms, and policies for affordable-housing implementation and development, with implications for the rest of the nation as well. For more information, visit breaknewground.org.

Ceramics of Italy Tile Competition
Submission deadline: February 3, 2015
Now in its 22nd year, this contest is open to North American architects and designers who use Italian ceramic tiles in their institutional, residential, and commercial/hospitality spaces. Ceramics of Italy is looking for all types of inspiring projects featuring Italian ceramics. Winners will receive $4,000 and a five-day trip to Bologna to attend CERSAIE 2015, the world's largest exhibition of ceramic tile and bathroom furnishings. For more information, visit tilecompetition.com.

E-mail information two months in advance to recordevents@mcgraw-hill.

snapshot

PROJECT BOMBAY SAPPHIRE DISTILLERY
LOCATION LAVERSTOKE, UK
DESIGNERS HEATHERWICK STUDIO

AT THE CENTER of Thomas Heatherwick's adaptation of a historic five-acre paper mill in southern England as a production facility and visitor center for Bombay Sapphire gin, a pair of metal-and-glass structures erupt from the walls of what is now the main distillery hall and blossom into fluted domes. These surrealist greenhouses showcase the plants that give the gin its trademark 10 botanical notes while lending the brand a sense of heritage. "We wanted to take that Victorian history of glass construction forward into the 21st century," says project architect Eliot Postma. The framework of the oversize garden cloches is made of metal pipes that syphon heat from the gin-making process to warm the flora inside. Postma adds, "It's a juxtaposition of a serious place of production with a sense of amazement." *Janelle Zara*

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