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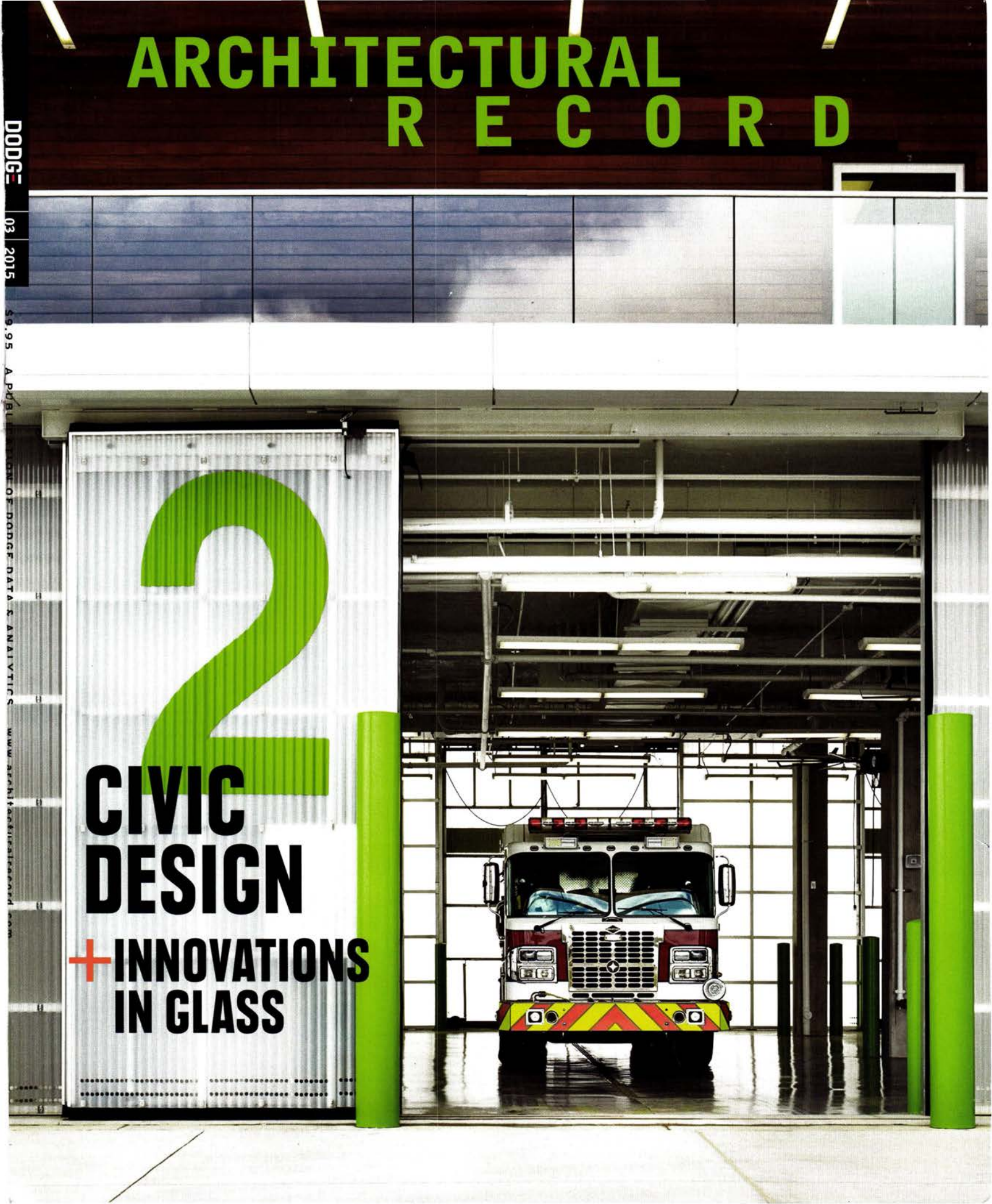

2 CIVIC DESIGN

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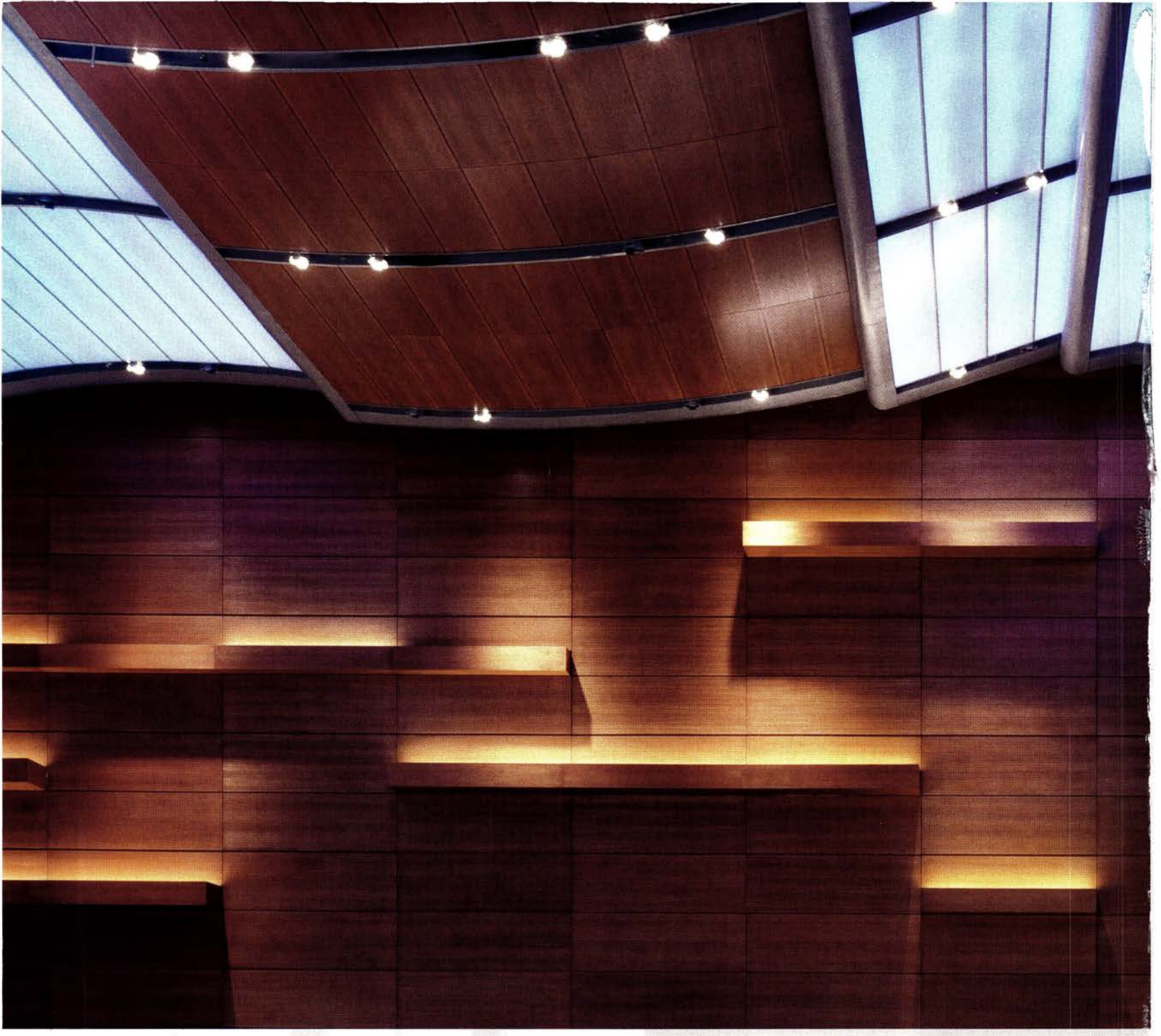

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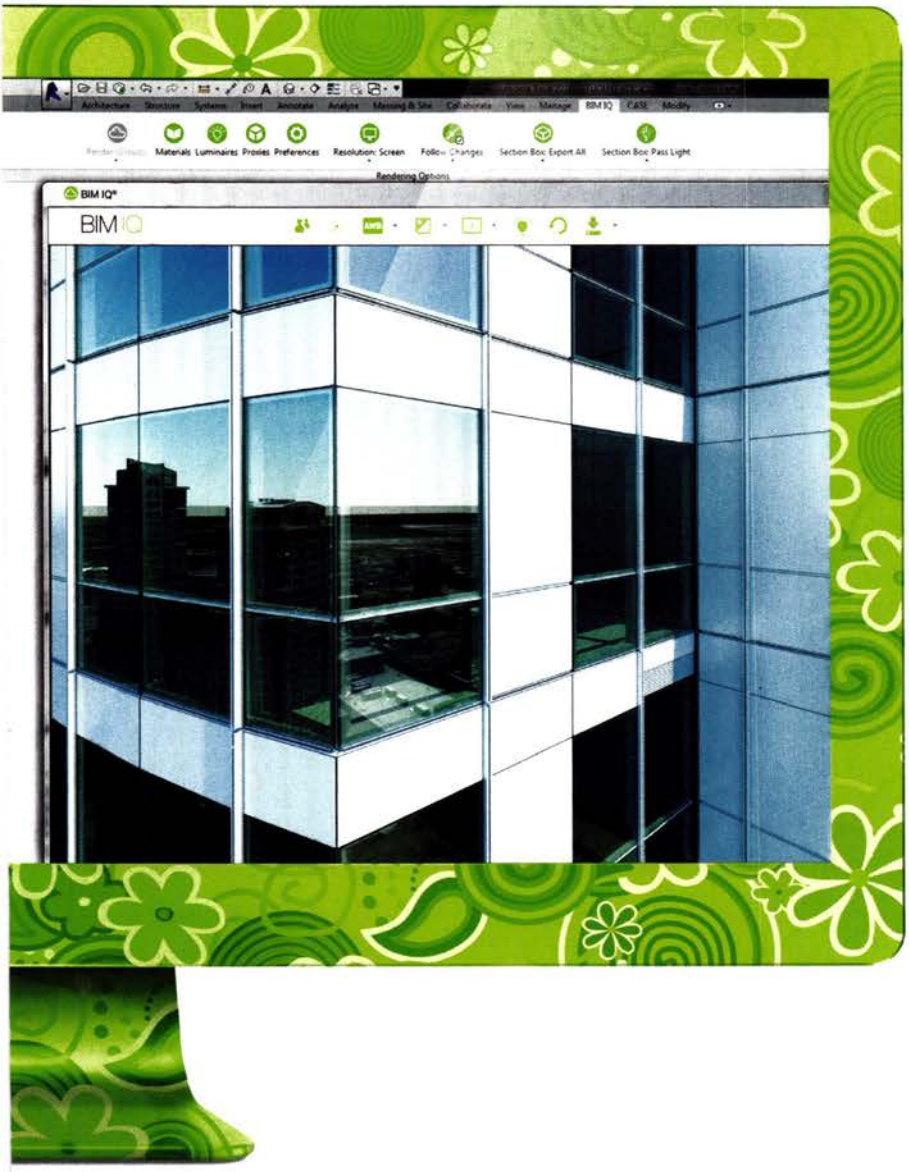

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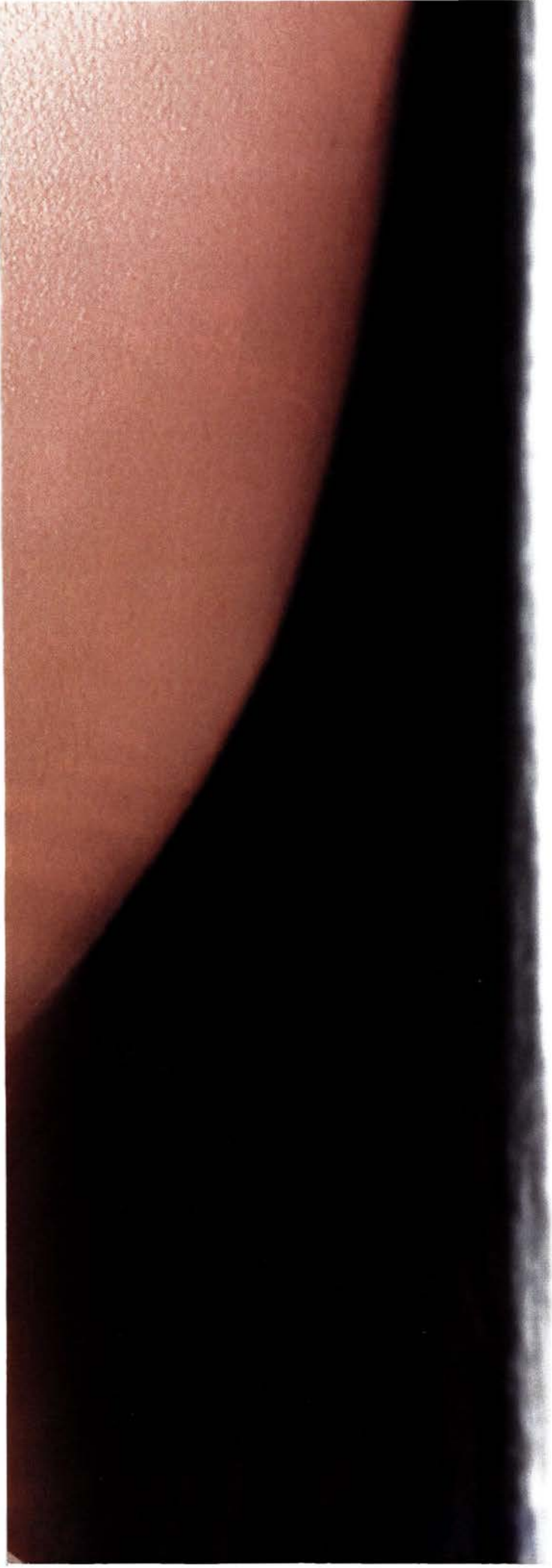

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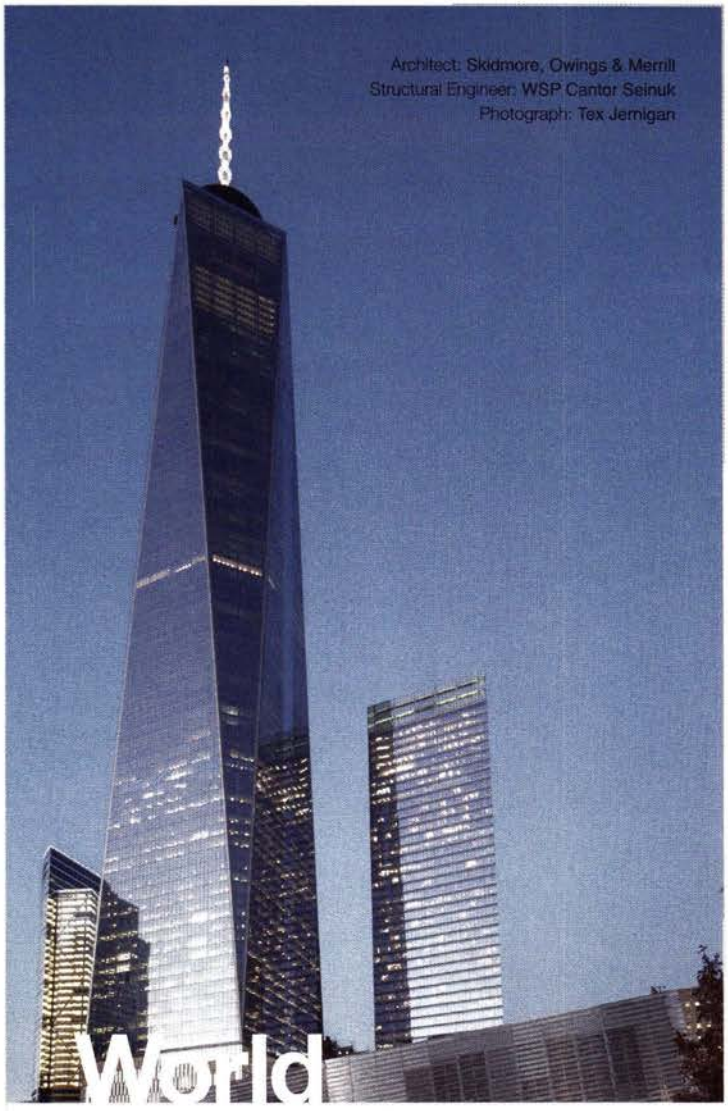

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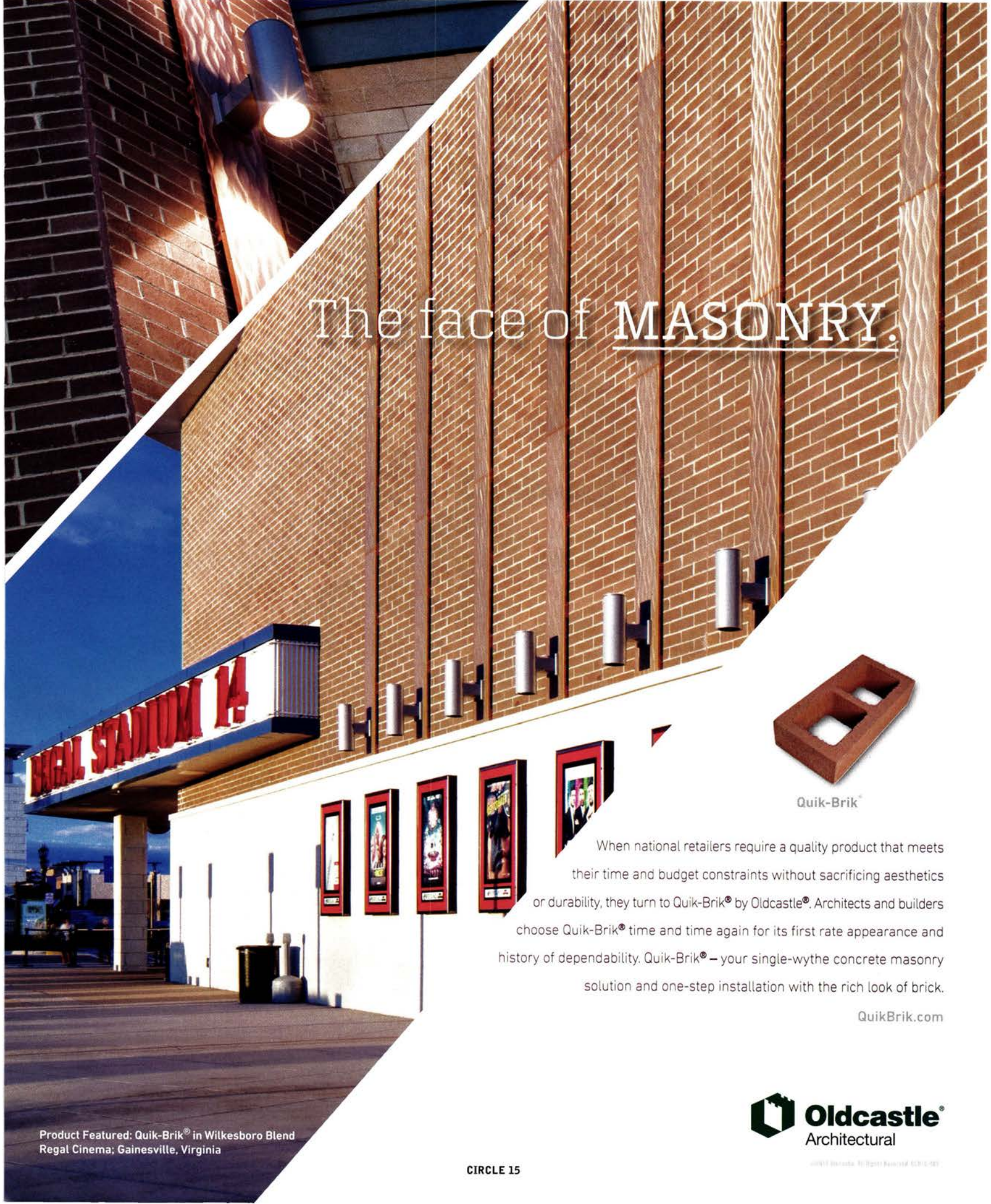

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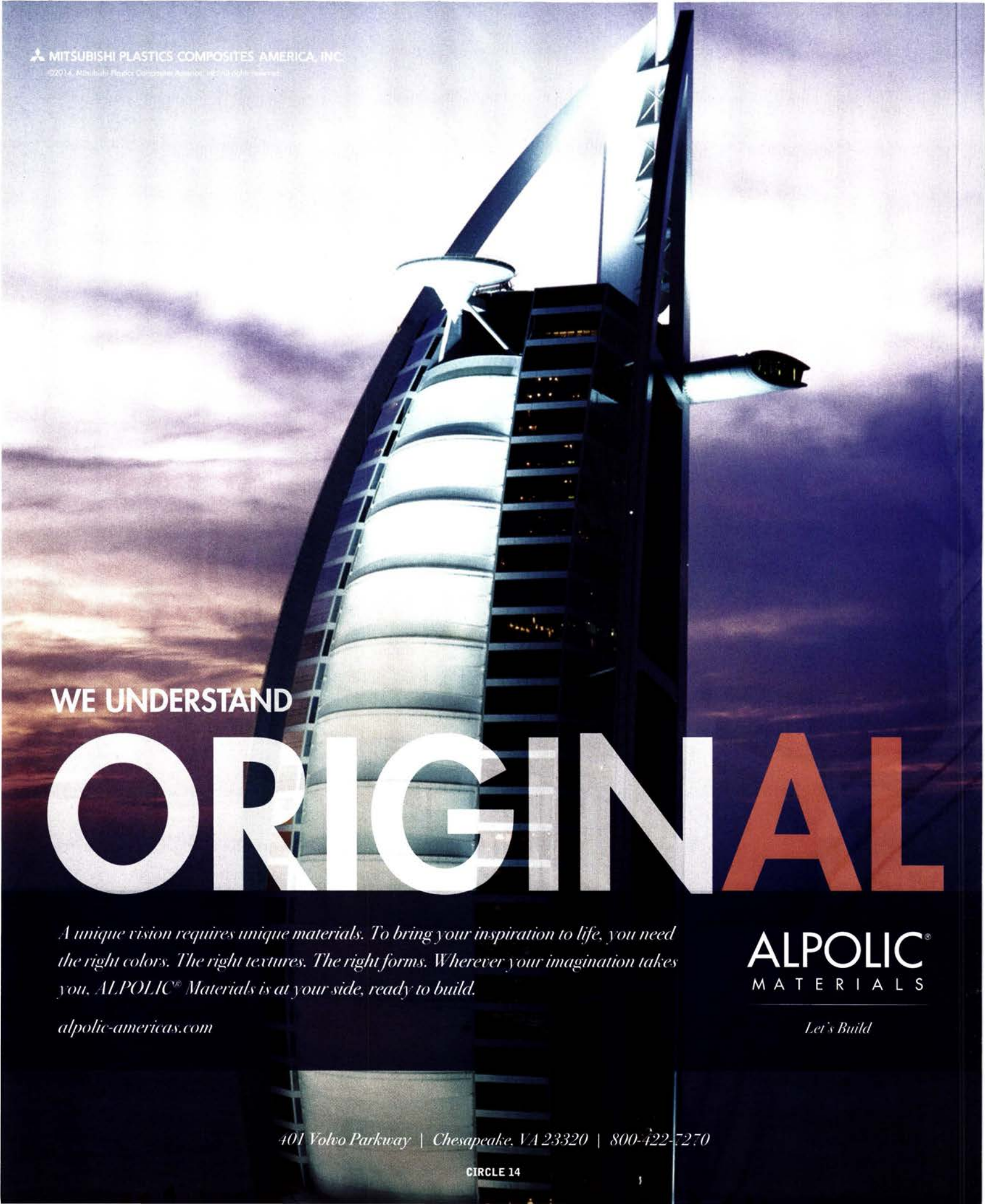
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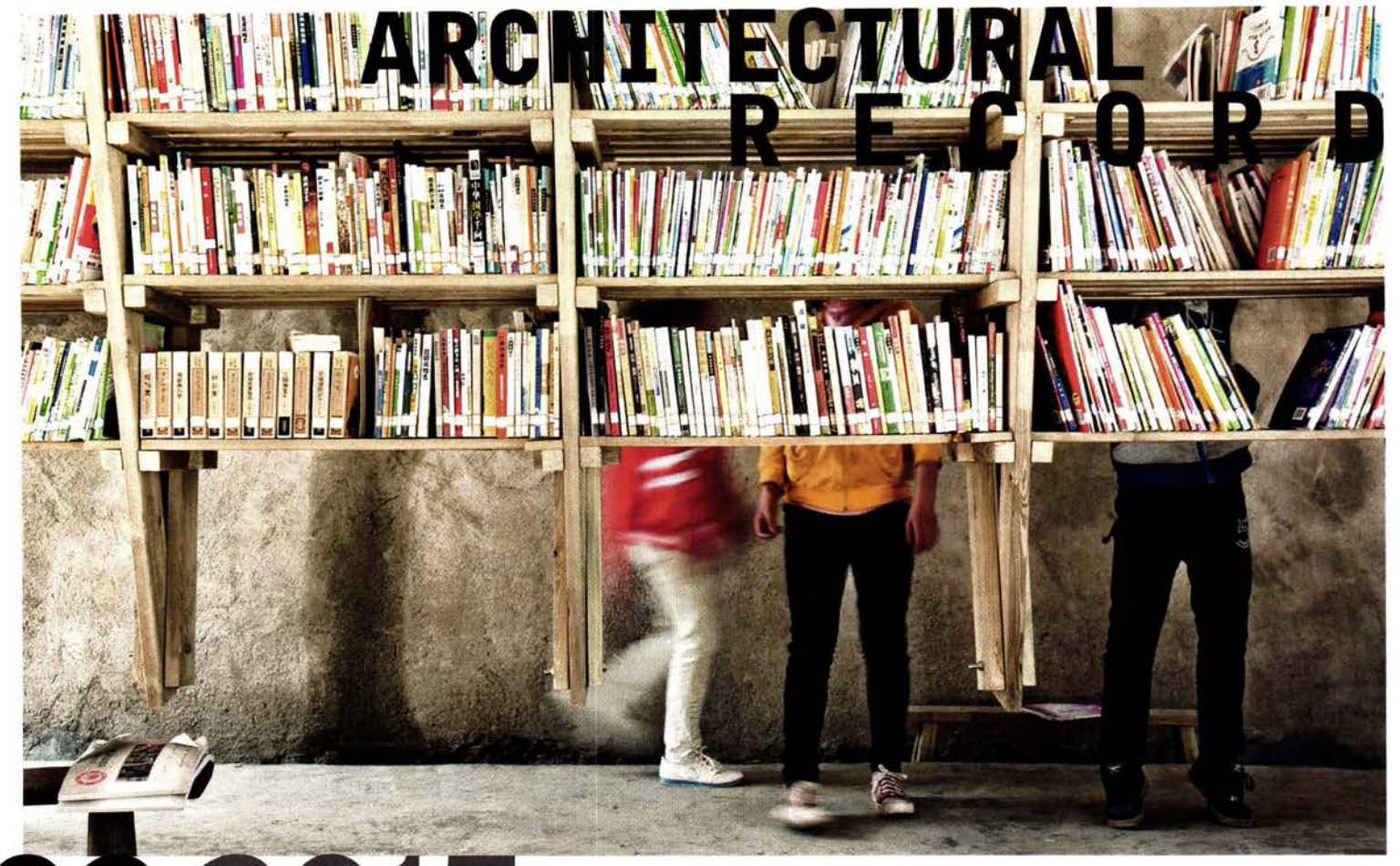

03 2015

NEWS

DEPARTMENTS

FEATURE: LIBRARIES

BUILDING TYPE STUDY 956 CIVIC DESIGN

INNOVATIONS IN GLASS

THIS PAGE: THE PINCH, BY OLIVIER OTTEVAERE & JOHN LIN.

ON THE COVER: GALVESTON FIRE STATION #4, BY HDR. PHOTO BY ANDREW POGUE.

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Civic Architecture Comes Down to Earth

Exemplary, if modest, design in the public realm is directly engaging communities

WHAT IS CIVIC architecture today? Some of the best examples are surprisingly modest. The sense of majesty once expressed by public buildings—a grand, domed courthouse overlooking a town square; a temple-front city hall dominating an urban core—is part of the distant past. Public architecture has come down off its podium to engage cities and citizens.

In looking at new civic architecture for this issue, RECORD's editors came across a remarkable number of innovative libraries. Not so long ago, the public library was a passive repository of books headed toward obsolescence—along with the book itself. Yet books are still with us, and libraries have broadened their mission: as everyone knows, they have been retooled as providers of digital access, and, increasingly, they are venues for community programs. Both functions are especially vital in rural and poor urban areas, with limited Internet access, and where fewer households have personal computers. The most visible example of this big shift is the amazingly vibrant Seattle Central Library, designed by Rem Koolhaas of OMA and Joshua Prince-Ramus, now of REX, which opened in 2004 (RECORD, July 2004, page 88).

There are 16,415 public libraries and branches in the U.S., and surveys show that attendance for their programs has been growing every year over the past decade. In a report issued by the Pew Research Center's Internet & American Life Project in December 2013, an astonishing 95 percent of those surveyed said that public libraries play an important role in their communities. "Libraries are serving as conveners, bringing community members together to articulate their aspirations," said Keith Michael Fiels, executive director of the American Library Association, and they are becoming "active partners and a driving force in community development and community change."

Take, for example, the Pico Branch Library in Santa Monica, California (page 72), designed by Koning Eizenberg. Set in the midst of a park in an underserved area, it is a magnet for the various ethnic populations in the surrounding neighborhoods. With a greenmarket next to the library, families are drawn by a host of activities—visiting the library, playing in the park, shopping for fresh produce. In East Boston, the new branch library by William Rawn Associates (page 102), serves a large community of new immigrants, many of them Spanish speakers. Like the Pico library, the building features lots of glass, making it transparent and inviting. No longer do stern, bespectacled librarians glare and hiss "shush"—libraries today are friendly and active, which means designers must carefully incorporate acoustic controls to keep noise levels down to a pleasant murmur.

Much more ambitious than these branch libraries is the Halifax Central Library in Nova Scotia, by the Danish firm Schmidt Hammer Lassen and local firm Fowler, Bauld & Mitchell (page 84). Halifax wanted a downtown civic landmark, which this building provides, with its dramatically stacked and cantilevered volumes, revealing the bustle of multi-levels of activity through a glass curtain wall. Free public libraries are an expression of democracy, and, in Halifax, as with many other such projects, the community was deeply engaged in the design process. As another sign of democratic openness, the Halifax library actively seeks out and shelters some of the city's homeless population when winter temperatures drop dangerously low.

But it's not just in North America or Europe that the library is a significant civic building type. We also look elsewhere at two small libraries that have made a big impact, one in a remote Chinese village leveled by an earthquake in 2012, the other in rural Burundi (page 60). Both demonstrate wonderful design ingenuity on miniscule budgets, using local materials and labor.

Fifteen years ago, the scholar Robert Putnam argued in his best-selling book, *Bowling Alone*, that people were increasingly isolated from one another, citing such factors as suburbanization and the growth of the Internet. But the popularity of libraries points to a new kind of social engagement, one in which communities—made of those who are alike and very different—actively seek and share inventive and inviting places in the public realm, created by some of our most thoughtful architects. ■

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief

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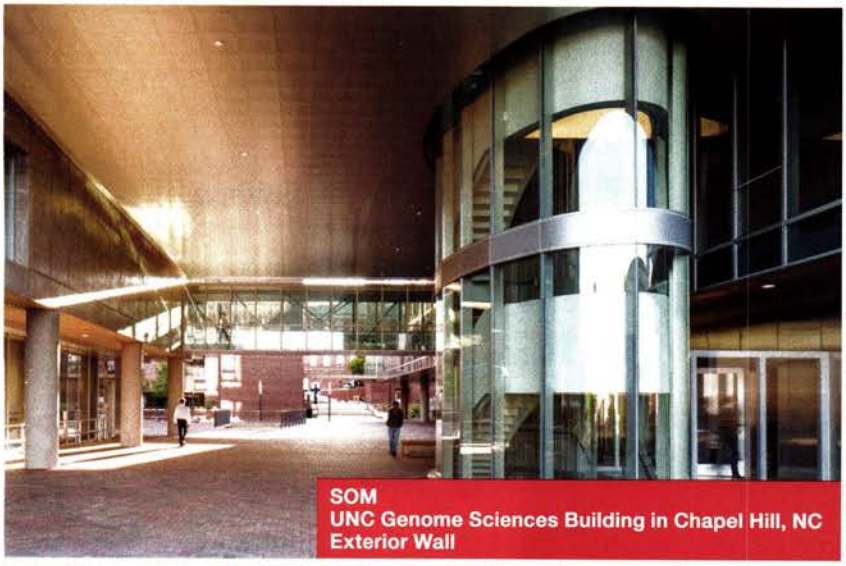

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perspective

Koolhaas wanted to build a masterpiece in Beijing. But for Beijing, it was a tragedy. Old cities have to be respected more. –*Wu Liangyong, influential Chinese architect and urban planner, on OMA's CCTV headquarters,* New York Times, *February 6, 2015*

Architecture for Humanity Closes; Chapters Vow to Go On

BY LAURA RASKIN

Cameron Sinclair, the cofounder and former executive director of Architecture for Humanity, which closed on January 1.

ON JANUARY 1, the San Francisco-based nonprofit Architecture for Humanity (AFH) quietly closed. The news sent shockwaves through the profession. "It's a travesty that the No. 1 organization that everyone believed in just evaporates," says one person familiar with AFH who would not speak on the record.

The groundbreaking organization, founded in 1999 by the dynamic husband and wife team of Cameron Sinclair and Kate Stohr, put public service architecture on the map, with roughly 60 chapters in the U.S. and abroad. AFH also swooped in to rebuild communities after disaster struck. On January 22, AFH announced it was filing for Chapter 7 bankruptcy.

A board member, chapter leader, and others close to the organization say AFH was struggling financially for at least five years. Yet even the U.S. chapters—which operated independently from the headquarters, had their own volunteers, did their own fundraising, and ran their own projects—were surprised. "We knew something was up. We didn't know this meant bankruptcy," says Rachel Starobinsky, managing director of AFH's New York chapter. The U.S. chapters may be named as creditors.

While it remains unclear exactly what led to AFH's closure, several people involved in the organization point to more than one factor, including an unsustainable business model, increased competition for financing, and founders protective of their original vision (AFH did everything from community interfacing to design and construction). Sinclair, who was executive director, and Stohr left AFH in 2013. In May 2014, Eric Cesal, who was the director of AFH's Disaster Reconstruction and Resiliency Studio, became executive director.

Cesal says AFH was in financial and organizational distress when he stepped in: "We were $2.1 million in debt–it was an unrestricted net asset deficit, meaning the organization was borrowing against restricted program dollars to fund unrestricted projects." He says the financial problems appeared in 2011–12 and the debt ballooned to an average of $100,000 per month between 2012 and 2013. (On ARCHITECTURAL RECORD contributor Fred Bernstein's Facebook page, on January 19, Sinclair wrote: "At the time of [my] departure there was an operating deficit but a +$3M positive cash flow from the overall mid-year budget." Sinclair declined to be interviewed for this story.) Says Cesal, "Boldness was responsible for AFH's greatness and viral spread. As we got bigger, those qualities, in some cases, worked against the organization."

Cesal says that he thought turning the organization around was going to be a difficult process, but worth trying. Under his leadership, staff was halved at the headquarters. The building that AFH owned, in the South of Market area, was sold for around $3.3 million in June 2014, says Cesal. The deficit dropped to $1 million, but the board decided in December to close. "The decision was made inevitable by a lot of other decisions. Once an organization gets into a hairy spot, people are reluctant to bring their resources or name to it. Support is harder to come by," he says.

The U.S. chapters, meanwhile, vow to continue the work they had been doing, if not under the AFH name. An "independent congress" was held on February 7 in New York, led by Starobinsky and Garrett Jacobs, a former AFH chapter leader who is serving as acting chair. Most of the chapters were represented, either in person or virtually. "We will be forming a transitional steering committee with representatives from every region of the network," Jacobs wrote in an e-mail. The steering committee will form an advisory board and set the stage for self-governance and strategic partnerships. Starobinsky added: "We are excited for the future."

Cesal wishes that what led to AFH's closure would be made more transparent. "The closure has a bunch of lessons that the field could benefit from," he says. "AFH's greatest legacy will be the other groups that it inspired, including our chapters, and they have much to learn from our experience." ■

Visit our online section at architecturalrecord.com/news.

PHOTOGRAPHY: © NEIL MACBETH

ON THE BOARDS

Austin
Size: 2,715 square feet
Ellsworth Kelly

Ellsworth Kelly has been collaborating with architects since the 1950s; his first public commission and architectural collaboration, *Sculpture for a Large Wall* (1957), made the May 1957 cover of ARCHITECTURAL RECORD. More recently he has collaborated with Renzo Piano, Tadao Ando, and Los Angeles architect Peter Zellner.

Now the only freestanding building that the artist has ever conceived will be realized at the Blanton Museum of Art in Austin, Texas. The museum is going to acquire the design for and construct *Austin*, a stone building, on its grounds. Originally planned in 1986 for a private collector, with its colored-glass windows, a wood sculpture, and 14 black-and-white marble panels, the work was never realized. San Antonio–based Overland Partners is the architect for the project, for which the museum is raising $15 million.

Kelly's design was inspired by Romanesque and Byzantine art and architecture.

Beijing New Airport Terminal Building
Size: 7.5 million square feet
Zaha Hadid Architects

The airport is slated for completion in 2018.

In 2014, Beijing's Capital International Airport was ranked the second-busiest in the world, as measured by passenger traffic. If it is realized, a new airport—designed to be the largest in the world in terms of surface area, according to its architects—could help take some of the pressure off Capital. Zaha Hadid Architects and French airport consultant ADP Ingeniérie released a scheme for the Beijing New Airport Terminal Building, which would be located in the city's Daxing district. Hadid's terminal would accommodate 45 million passengers per year and connect to local and national rail services. In renderings, the scheme features six elongated wings radiating out of a central volume, like the spokes of a wheel or a UFO come to land.

IMAGES: © 2015 ELLSWORTH KELLY, COURTESY THE BLANTON MUSEUM OF ART (LEFT, 2); COURTESY ZAHA HADID ARCHITECTS (RIGHT)

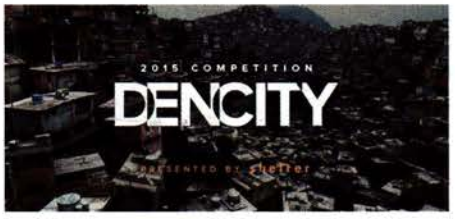
Competition for 2 billion Clients

BY ZACH EDELSON

BY 2030, 2 billion of the earth's inhabitants may be living in improvised buildings, neighborhoods, or even cities, without services or planning—a fact that the Museum of Modern Art's (MoMA) exhibition *Uneven Growth: Tactical Urbanisms for Expanding Megacities* (through May 10) addresses. While MoMA's exhibition polls top architecture and planning firms to propose solutions to the problems related to rapid global urbanization, a new competition launched by Chicago-based nonprofit Shelter Global hopes to implement a few of the best schemes it receives through crowdfunding and other sources.

Titled Dencity, the competition invites applicants to submit proposals that are tailored to specific slums or can operate as flexible concepts. Scale, program, and scope are wholly determined by designers, and teams are encouraged to be interdisciplinary. Patrick McLoughlin, the founding director of Shelter Global and the competition organizer, has assembled a diverse collection of architects, activists, planners, and academics for the jury. Three winners will be announced in June and will receive cash prizes. While the monetary reward and publicity are incentives, the challenge is equally tangible: how to actively and intelligently intervene in cities built with poor materials and little architectural and urban foresight.

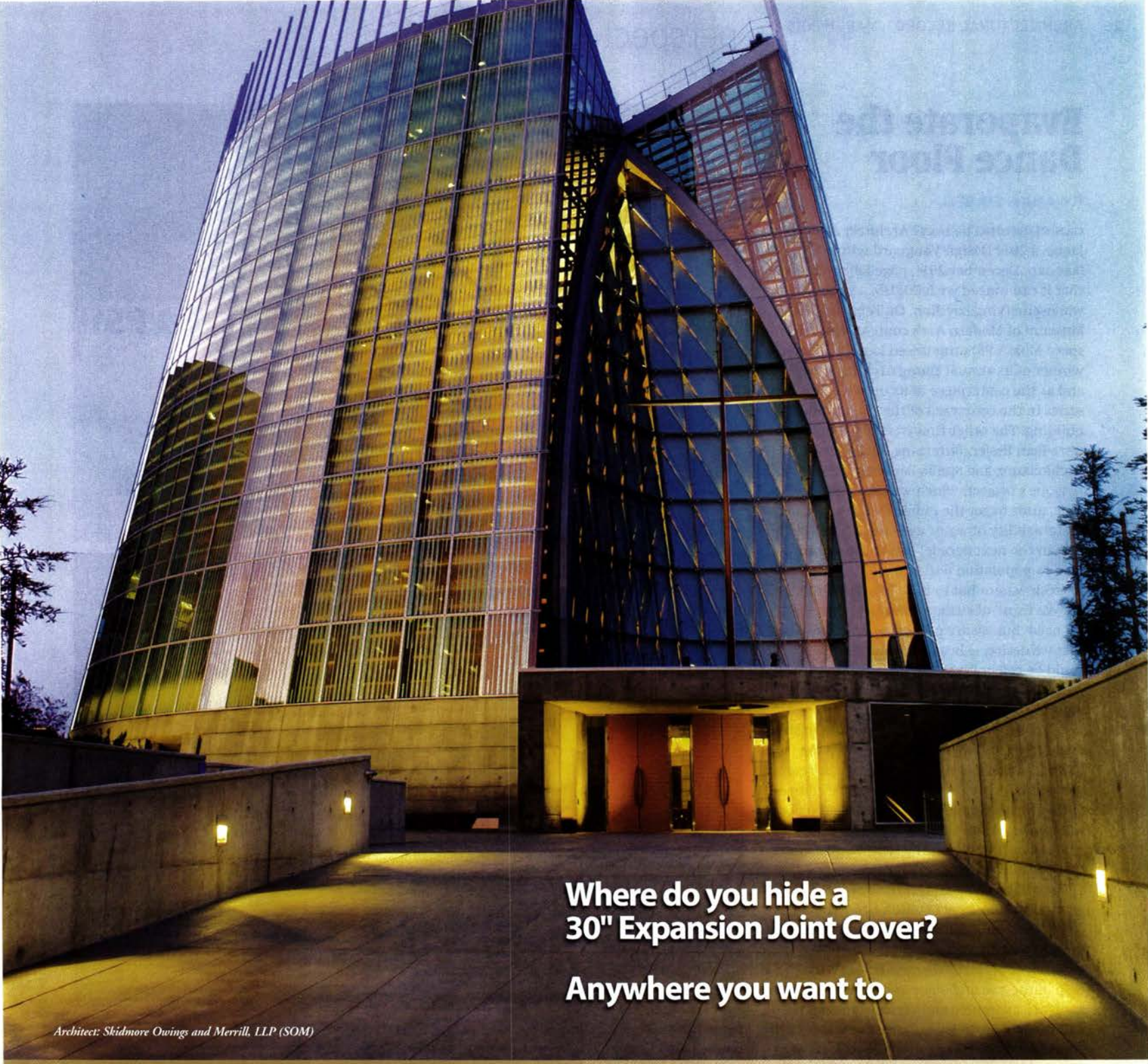
Nate Cherry, vice president and director of planning and urban design at RTKL, is one of the Dencity jurors. As a planner, he cites the incremental growth of slum settlements as critical to understanding their detrimental conditions, which frequently leave residents without amenities and services as they expand. "Affordable and flexible expansion are also at the heart of the challenge," Cherry says, making the designer's responsibilities range from the city at large to materials and construction techniques. "Building compactly with traditional and modern technology, such as modular construction," along with better siting and the inclusion of open space, are equally critical tasks, he says.



The competition has already received dozens of entries. "We expected a North American phenomenon, but the submissions have been very global," Cherry adds. He hopes for "all kinds of unanticipated, brilliant ideas that will turn into funded studies down the road." April 20 is the deadline for late registration and submission. "These settlements will be around for the foreseeable future," says Cherry, "and we need to make them as good as they can be."

Shelter Global was founded in 2014 by McLoughlin and Chad Johnson, both Miami University architecture graduates. "After researching what areas needed our services the most, we decided to focus on urban communities, since we are experiencing a shift to cities worldwide," says McLoughlin. "We wanted to change the world through design and construction." Dencity is the organization's first project. The founders hope to make it an annual competition. ■

View additional images at architecturalrecord.com.



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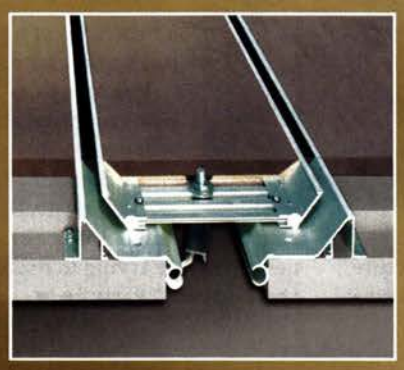

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CIRCLE 32

Evaporate the Dance Floor

BY ANNA FIXSEN

CAN PLUMBING be sexy? Architect Andrés Jaque, a 2014 Design Vanguard winner (RECORD, December 2014, page 68) proposes that it can indeed with *COSMO*, a gargantuan water-purifying pavilion. On February 5, the Museum of Modern Art's contemporary-art space MoMA PS1 announced Jaque's design as winner of its annual Young Architects Program and as the centerpiece of its outdoor music series in the courtyard of the Long Island City building. The other finalists for the program were Erin Besler, Bittertang, Brillhart Architecture, and Studio Benjamin Dillenburger.

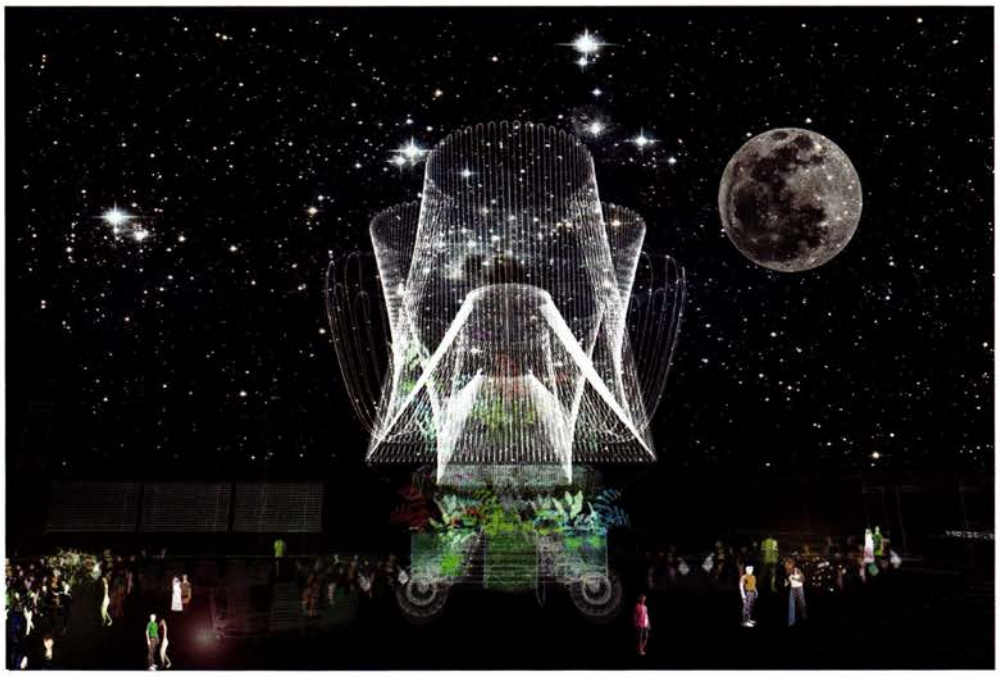
Jaque's project, which will be completed in June, aims to get the public thinking about the sustainability of water use—the UN estimates that in the next decade, two-thirds of the world's population will lack sufficient access to fresh water—but to have fun doing it.

"We think of sustainability as something we need, but we are proposing it is something that we desire, is beautiful, and somehow could be celebratory," says the architect, whose firm, Office for Political Innovation, is based in New York and Madrid.

In renderings, *COSMO* is a structure of sinuous steel pipes and cables sitting atop the chassis of a crop-irrigation machine; it resembles a chandelier on wheels. Over the course of the summer, it will purify 3,000 gallons of water—the equivalent of about 60 bathtubs-full—every four days. (The semi-treated water will come from New York treatment plants.)

First the water will rest inside four transparent tanks at *COSMO*'s base, within controlled ecosystems. It will then be pumped upward and circulate through a complex network of pipes, tanks, and hoses. With the help of the sun and algae and various microorganisms, anaerobic and aerobic digestion will remove particles, balance the water's PH, eliminate nitrates, and increase its level of dissolved oxygen, making the water increasingly pure over the course of the summer, with other natural processes aiding. The architect estimates that the environment in and around the pavilion will be 6 degrees cooler.

The design is familiar territory for Jaque. In 2012, he designed *Escaravox*, a mobile party pavilion for a Madrid square. The work, equal parts building and machine, also consisted of a repurposed crop irrigator, but was topped with a striped canopy and equipped with a sound system for performances. In fact, *COSMO* represents an omnibus of many of the ideas Jaque has explored, including public participation, lending visibility to the unseen, and building with ready-made, off-the-shelf components.



COSMO (top), the winner of MoMA PS1's Young Architects Program, by Andrés Jaque (left), will naturally purify water. At night, the pavilion will glow from bioluminescent microbes (above).

COSMO, however, is *Escaravox* on steroids. The structure expands, like a gigantic piece of origami, and will be motorized to move to wherever the courtyard programming dictates. Because irrigation systems are available almost everywhere, Jaque hopes this design can be replicated. Jaque calls it "Living Architecture": "For us, *COSMO* is a great opportunity to create a manifesto of what architecture can do now for society," he says.

The best part? The design team plans to introduce microbes that will become phosphorescent when the water reaches an optimal level of purity, illuminating the courtyard at night. Basically, says Jaque, the designers "are trying to make a disco ball about nature." Party on. ■

IMAGES: © ANDRÉS JAQUE/OFFICE FOR POLITICAL INNOVATION

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CIRCLE 36

[NEWSMAKER]

Carl Krebs

BY FRED A. BERNSTEIN

AT THE NATIONAL September 11 Memorial & Museum at the World Trade Center site, beneath the fountains conceived by Michael Arad and an entry pavilion by Snøhetta, Manhattan architects Davis Brody Bond created a series of inspiring spaces, set between the slurry wall of the original World Trade Center and equally powerful elements of their own devising. In January, the museum was recognized by the AIA with an award for interior architecture. Carl Krebs, a Davis Brody Bond partner who devoted more than 10 years to the project, said he is proud that his team, in creating the vast underground museum, "found ways to share our own emotional connection to the site."

Krebs, 55, is one of five partners at the firm, founded in 1952 by Lew Davis and Sam Brody. Now Krebs is making his own mark on the city, following the September 11 museum with two other high-profile projects: a 900,000-square-foot mixed-use building for New York University, with design partner KieranTimberlake, on a superblock north of Houston Street, and a 42,000-square-foot addition to the Frick Collection, which occupies a Carrère and Hastings mansion on Fifth Avenue at 70th Street. Opponents of the NYU plan say Greenwich Village is sacrificing its character to NYU's growth. Opponents of the Frick project say a midblock garden by Russell Page deserves the same protection as the museum's neoclassical buildings, and that the museum ought not to expand at all.

Do you understand the concerns of people who say the city is getting too dense?

I think that density is what makes New York exciting and distinctive. I live in Lower Manhattan, near City Hall. When the Frank Gehry tower [at 8 Spruce Street] went up, I lost my view of Brooklyn, but I gained a view of an iconic building. The tower was built on a parking lot, so I was not unrealistic about what might happen.

But the Frick garden isn't a parking lot.

Yes, but it was created in the 1970s. And it was unknown to Henry Clay Frick or the architects Carrère and Hastings and John Russell Pope [who altered and enlarged it in the 1930s].

How did that garden come to be?

The Frick Collection bought three townhouses between 1939 and 1970 while planning a sizable addition on 70th Street. But, because of financial pressures, they ended up building a much smaller addition and converting about two-thirds of the site into a garden.

You're not proposing to build on the garden that faces Fifth Avenue?

I'm constantly being told that the Frick is going to be building on the Fifth Avenue garden; it's a common misperception. Touching that garden is the last thing they would do.

Will the addition damage the ensemble of buildings?

Right now there is a stucco party wall with double-hung windows overlooking the garden. The new building will be an improvement.

And will it look like the existing buildings?

It's going to utilize the same Indiana limestone as the Carrère and Hastings building, and it will have a similar compositional order. This may seem odd to some people, but the Frick today has a remarkable sense of cohesion and unity. You can't take that lightly. It's not one of the museums that has become a collage of styles.

Regardless of style, I think some New Yorkers are fed up with museum expansions.

I understand that. We've worked with the Frick for almost a decade, exploring every option. Without going into the garden, the spaces wouldn't be big enough, or in the right places, to meet its needs.

But why does the Frick have to expand at all?

As an architect, you get to understand an institution and the enormous effort that goes on behind the scenes. It's much easier for the public to say nothing should change, because they don't see the burdens on the institution.

Were you stung by the criticism when the plan was first announced?

We made a conscious decision to go public early in the process to give people an opportunity to comment. And now we're getting ready to release a design that takes many of the comments into account.

The original scheme does not have Landmarks Preservation Commission approval. What will you do if you don't get it?

This is an important and beloved building, so we're expecting a high level of scrutiny. Our past experience with Landmarks has always involved a dialogue, and we'll have a better sense of their priorities when we present later this year. We're optimistic that we can respond to their concerns. ■

noted

Aaron Betsky Named Dean of FLW School of Architecture

Author, curator, and teacher Betsky succeeds Victor Sidy, who has led the Scottsdale, Arizona, school since 2005. In 2008, Betsky directed the 11th International Architecture Biennale Venice. He was director of the Cincinnati Art Museum from 2006 to 2014.

AIA Elevates 147 Members to College of Fellows

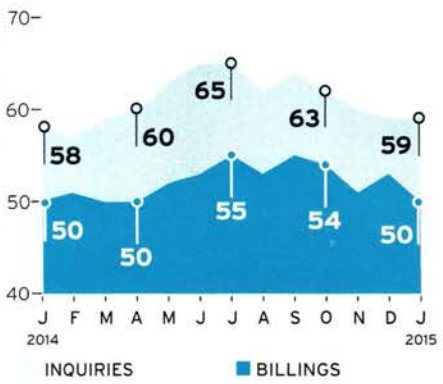
Julie Eizenberg, Rick Joy, Sheila Kennedy, Scott Erdy, Wendell Burnette, Clifford Curry, and Neil Denari are among those who "have made a significant contribution to architecture and society and who have achieved a standard of excellence in the profession," according to the AIA.

Design Leaders Gruzen, 80, and Jerde, 75, Die

Jordan L. Gruzen died in New York on January 27. Gruzen, with his partner, Peter Samton, upheld the principles of modernist architecture in schools, civic buildings, and more. Jon Jerde, known for shopping malls and communal spaces, died on February 9.

Zaha Hadid Withdraws NYRB, Martin Filler Lawsuit

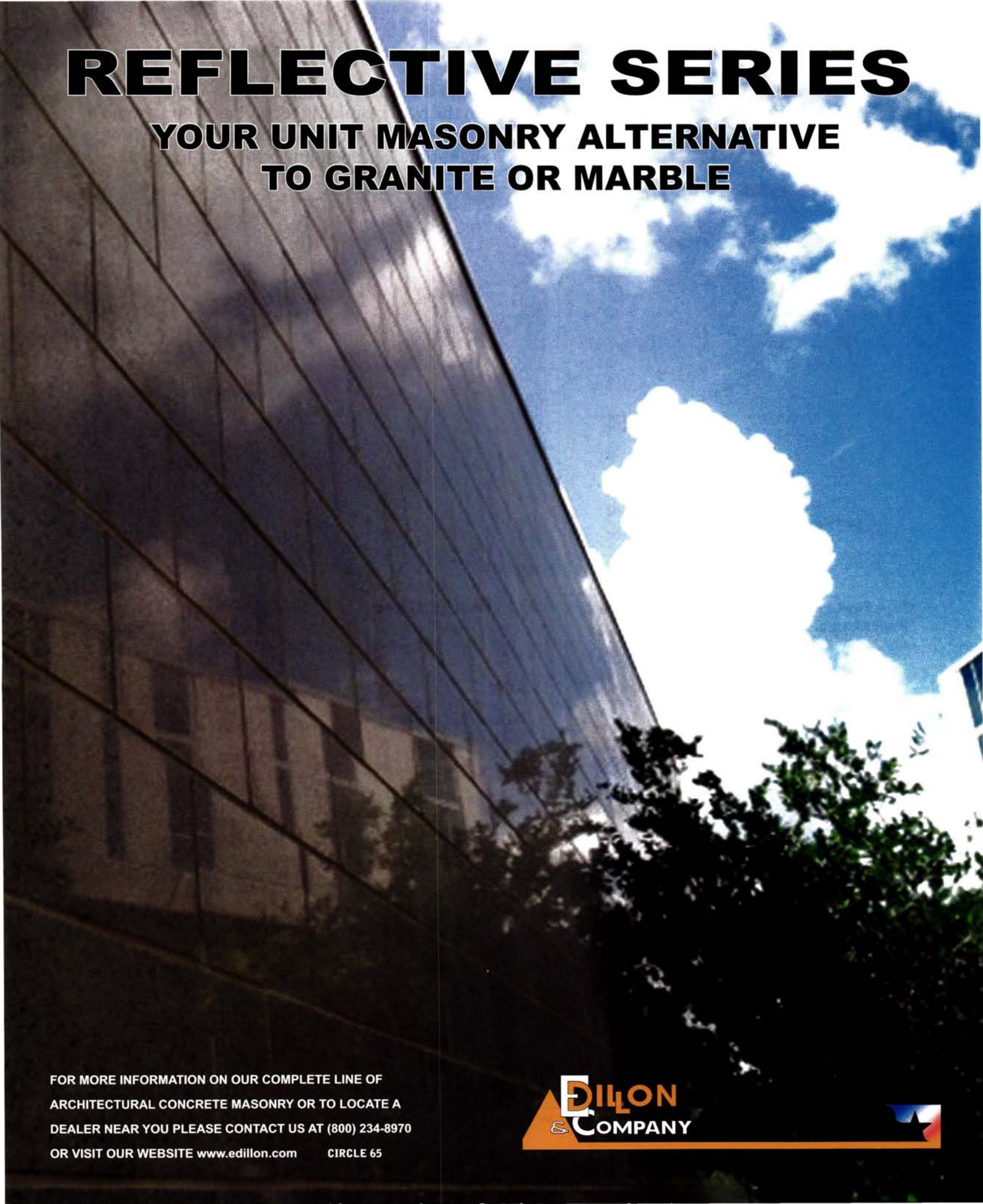
On January 23, ARCHITECTURAL RECORD was the first to report that Hadid had withdrawn her lawsuit against *The New York Review of Books* and architecture critic Martin Filler. Her complaint alleged "false and defamatory statements" made by Filler in a review.



Slower ABI Kicks Off 2015

The American Institute of Architects reports that the January ABI score was 49.9, down from December's score of 52.2 (any score above 50 indicates an increase in billing), marking the first time since March 2014 that the ABI has dipped below 50. The inquiries index was 58.7, down from the December mark of 59.1.

PHOTOGRAPHY: COURTESY DAVIS BRODY BOND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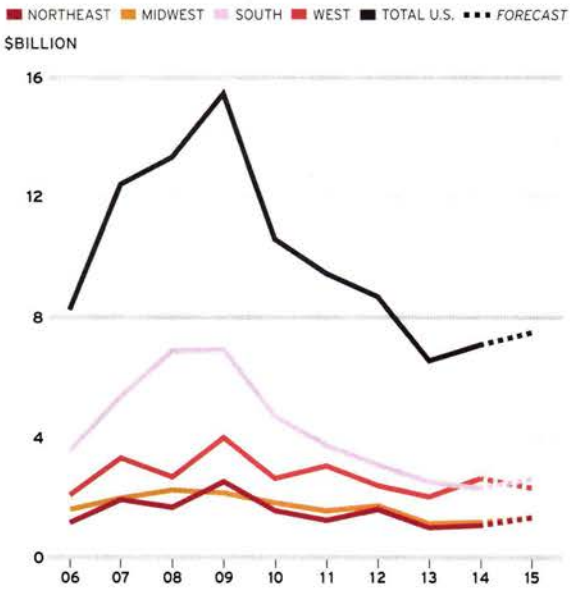
Even though the U.S. economy is steadily improving, growth in the public-building sector has been stymied by the fiscal condition of federal, state, and local governments. Only a slight uptick in spending is forecast for 2015.

Government-Building Starts by Region
In addition to U.S. total and 2015 forecast figures

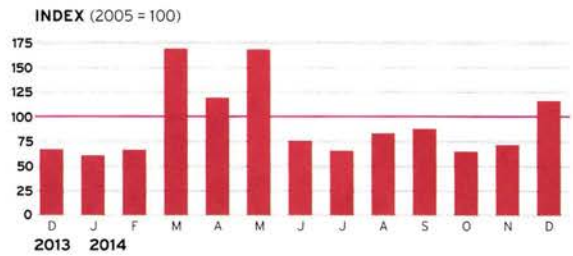


Top Metro-Area Markets
Ranked by total government-building starts 1/2013 through 12/2014

	REGION	$MILLIONS
1	SAN DIEGO	1,009
2	NEW YORK	565
3	WASHINGTON, D.C.	415
4	LOS ANGELES	412
5	MINNEAPOLIS	288

Thurgood Marshall U.S. Courthouse Renovation, New York; Beyer Blinder Belle Architects & Planners (ARCHITECTURAL RECORD, Feb.

The Dodge Index for Government-Building Construction
12/2013–12/2014



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

Top 5 Design Firms
Ranked by government-building construction starts 1/2011 through 12/2014

1. **HOK**
2. **Skidmore, Owings & Merrill**
3. **Heery International**
4. **KMD Architects**
5. **DLR Group**

Top 5 Projects
Ranked by government-building construction starts 1/2013 through 12/2014

$396 MILLION
PROJECT: San Diego Central Courthouse
ARCHITECT: Skidmore, Owings & Merrill
LOCATION: San Diego

$330 MILLION
PROJECT: Mule Creek State Prison Infill Project
ARCHITECTS: HOK, Dewberry
LOCATION: Ione, CA

$317 MILLION
PROJECT: New Los Angeles U.S. Courthouse
ARCHITECTS: Skidmore, Owings & Merrill, AECOM
LOCATION: Los Angeles

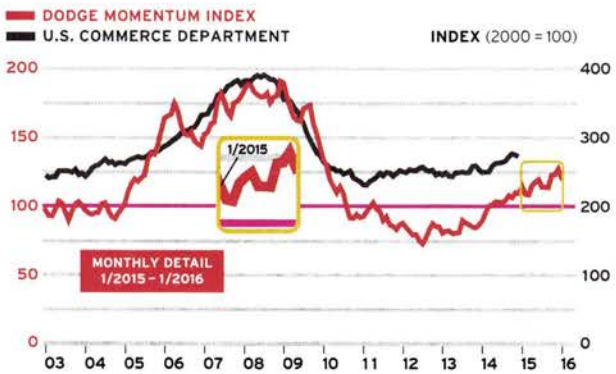
$222 MILLION
PROJECT: Las Colinas Detention and Reentry Facility, Phase II
ARCHITECTS: KMD Architects, HMC Architects
LOCATION: Santee, CA

$200 MILLION
PROJECT: New Stockton Courthouse, Superior Court of California, County of San Joaquin
ARCHITECT: NBBJ
LOCATION: Stockton, CA

MOMENTUM INDEX HESITATES

In January, the Dodge Momentum Index fell 4.8% to 121.1. Despite the drop, due to a strong end to 2014, the index is still up 5.8% compared to its level 12 months earlier.

The Dodge Momentum Index is a leading indicator of construction spending. The information is derived from first-issued planning reports in the Dodge Data & Analytics 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: © TIMOTHY SCHENCK

Dodge Data & Analytics tracks projects from predesign through construction to capture hard construction costs, square footage, and other key statistical information.

exterior

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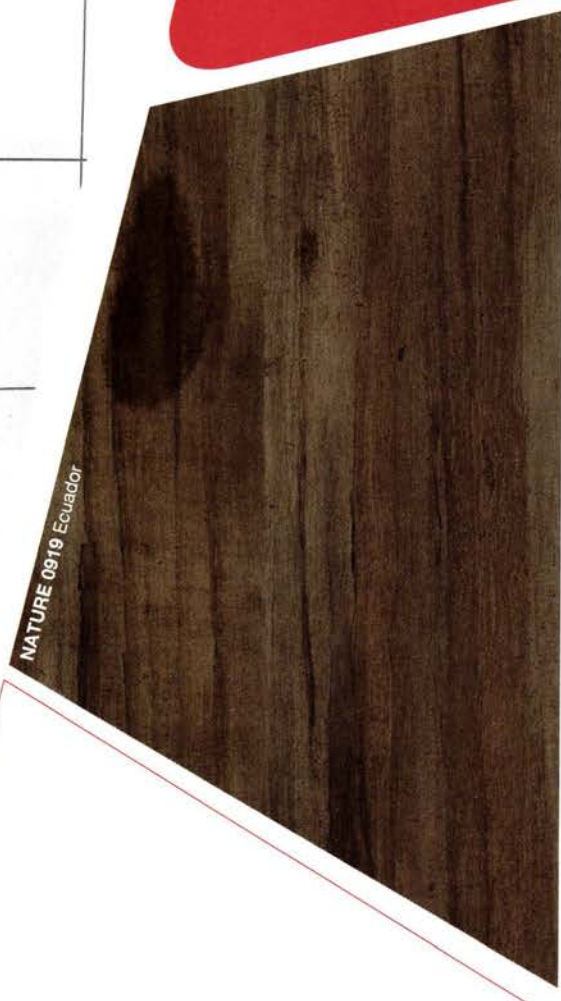

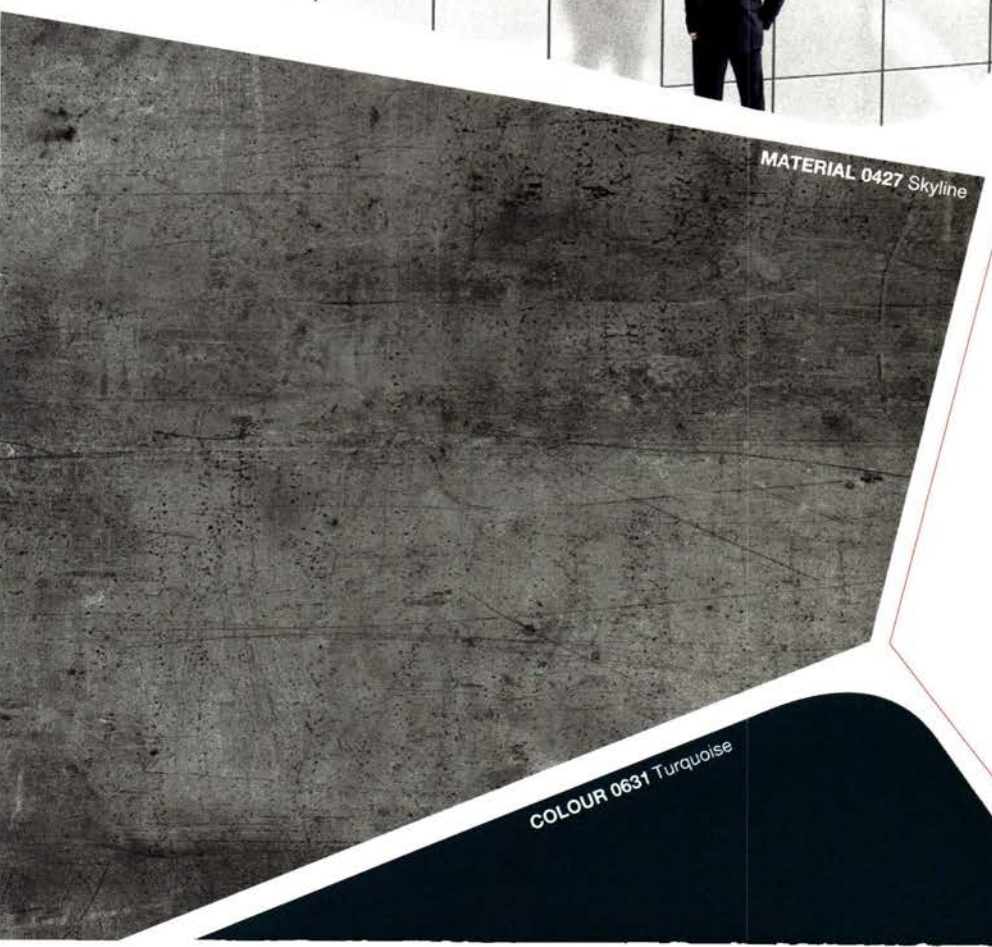

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CIRCLE 49

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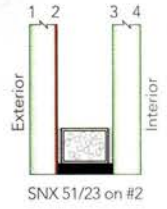

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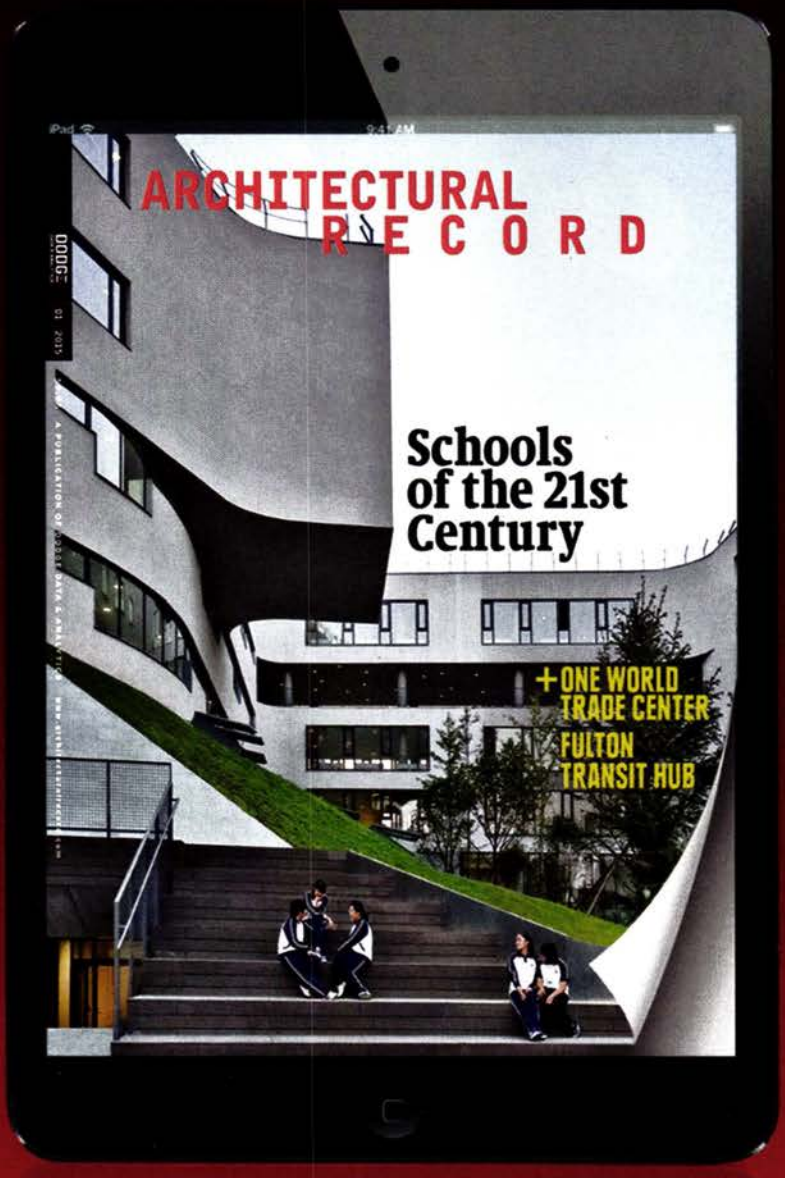

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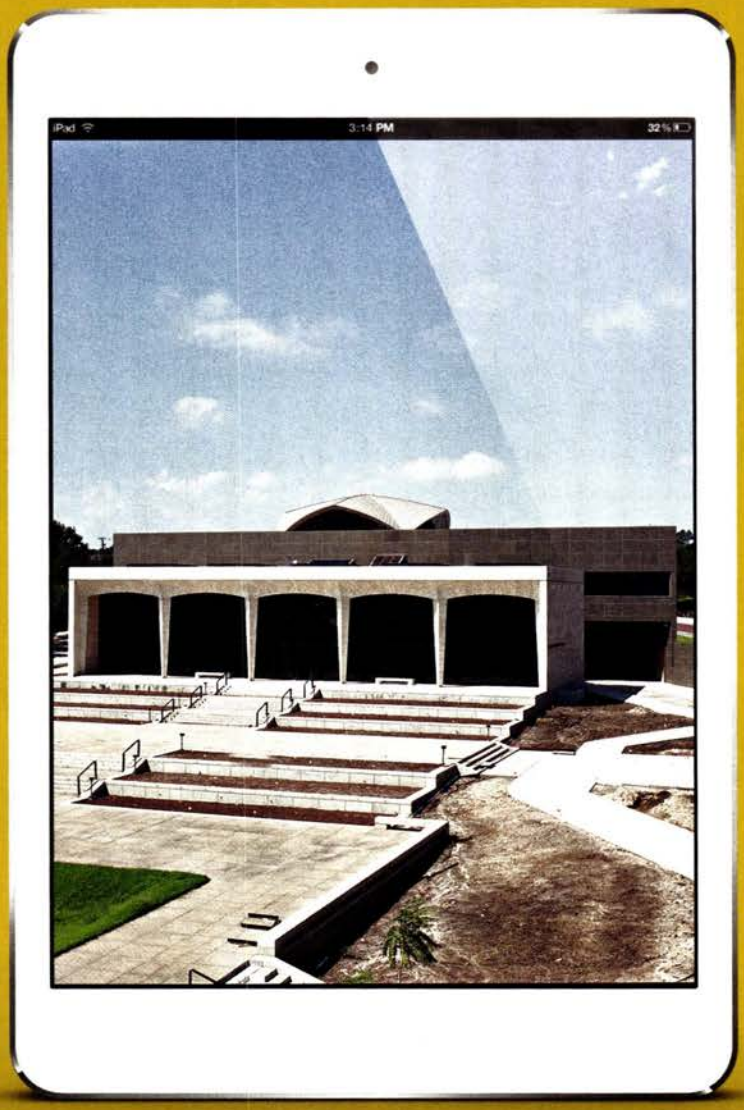

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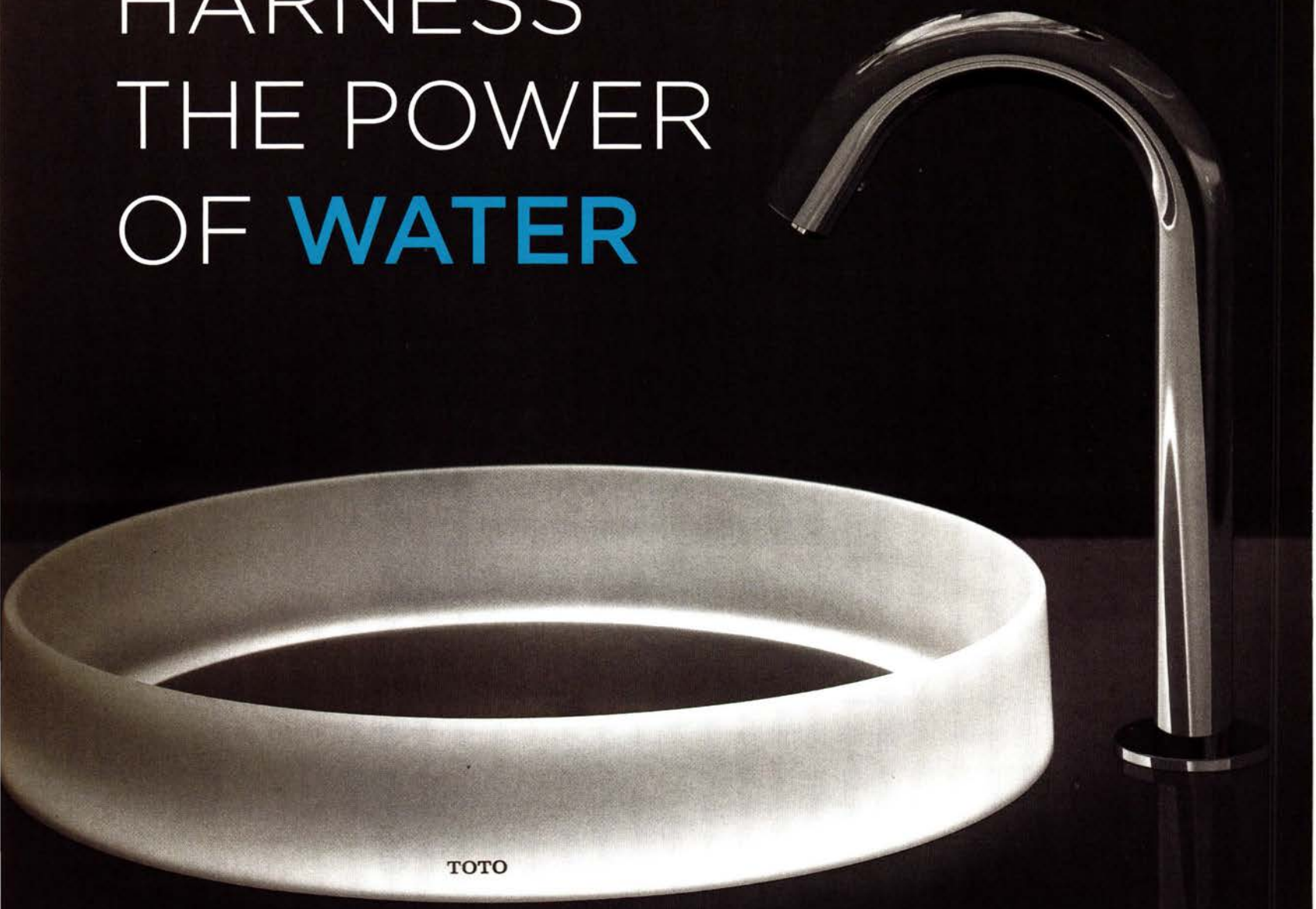

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CIRCLE 50

perspective **house of the month**

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BY **DEBORAH SNOONIAN GLENN**

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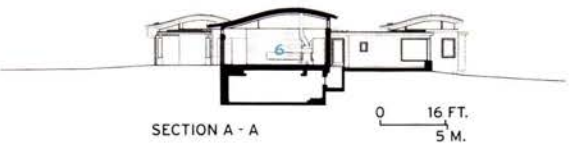
4 STUDIO
5 DINING ROOM
6 LIVING ROOM
7 LIBRARY
8 MASTER BATH
9 MASTER BEDROOM
10 BEDROOM

GROUND FLOOR

0 16 FT. 5 M.



SECTION A - A

0 16 FT. 5 M.

FOR SUSTAINABILITY guru William A. McDonough, FAIA, buildings aren't vampires sucking up natural resources, but regenerative systems that should improve the environment. "The idea of 'getting to zero' for water or energy use is ridiculous. Is that the best we can do?" he says. This ethos, the guiding principle of his design career, is clearly embodied by the Meadow Farm House, completed in 2013 for a family whose values align closely with his own.

The building site, a secluded three-acre perch in northern California, sits close to but not directly overlooking the Pacific Ocean. "You sense the water's presence through the coastal breezes that sweep across the land here in waves," says McDonough. The LEED Platinum project, a collaboration with interior designer Carla Carstens and landscape architect Bernard Trainor + Associates, evolved into an organic farm, with a 6,120-square-foot house and outbuildings nestled in a landscape of orchards, gardens, and native trees.

In form and materials, the house reflects and celebrates its rarefied location. Gently undulating portions of the zinc roof nod to the ocean and help to redirect and slow constant winds. Structural walls of rammed earth were made from site soils—"It's as though a chunk of the earth was lifted straight up from below," says McDonough—while ventilated wood-framed walls, clad in reclaimed redwood, let the envelope breathe. Its horizontal low-slung massing and warm, spare interiors complement the dramatic yet serene surroundings.

"This house is in repose, almost supine on the landscape," says McDonough. But the calm belies an essential productivity: solar and PV systems provide nearly all of the house's energy, and extensive gray-water recycling and rainwater harvesting fulfill its irrigation needs, a footprint that leaves no dent. ■

PHOTOGRAPHY: © EMILY HAGOPIAN, COURTESY WILLIAM MCDONOUGH + PARTNERS

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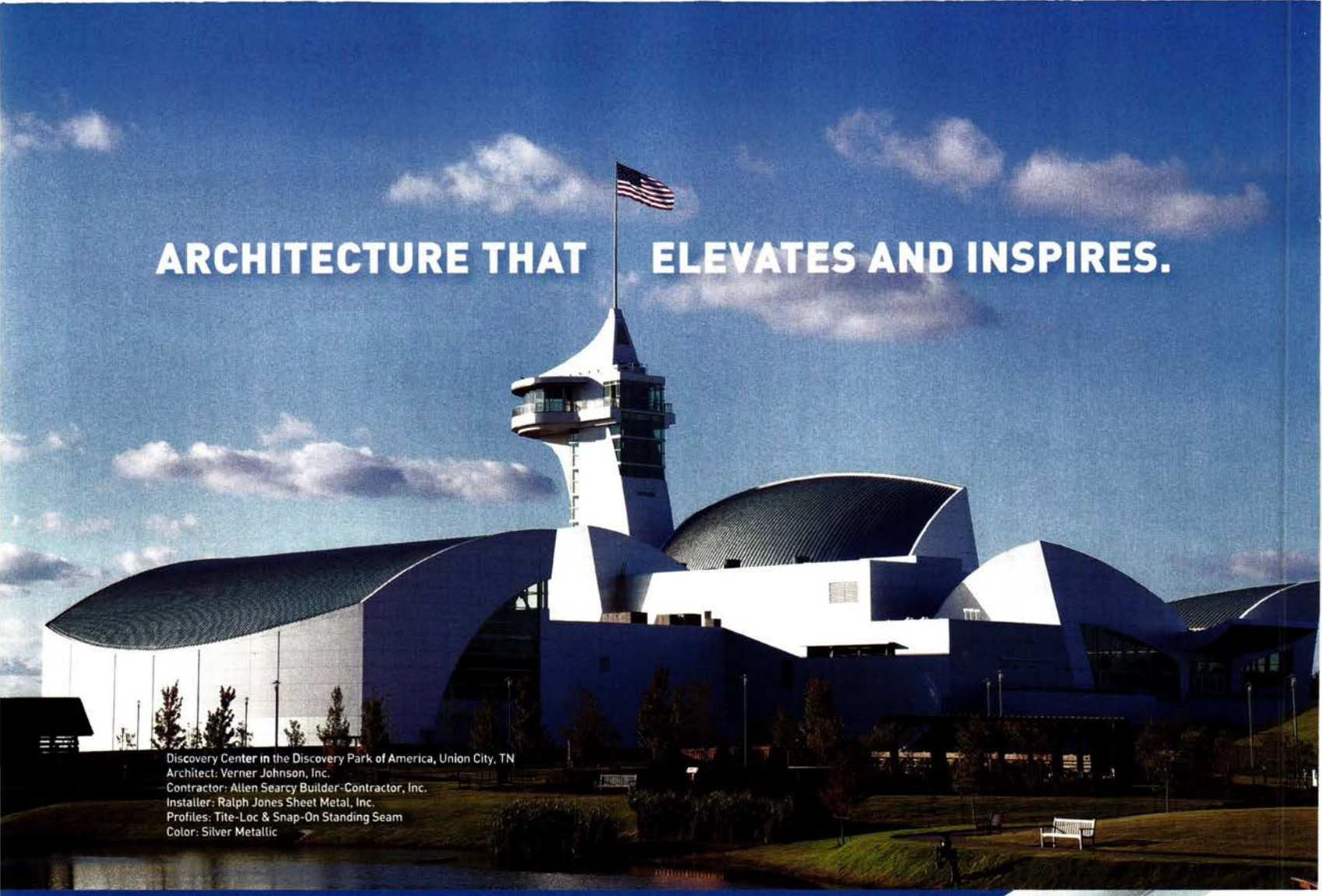

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CIRCLE 20

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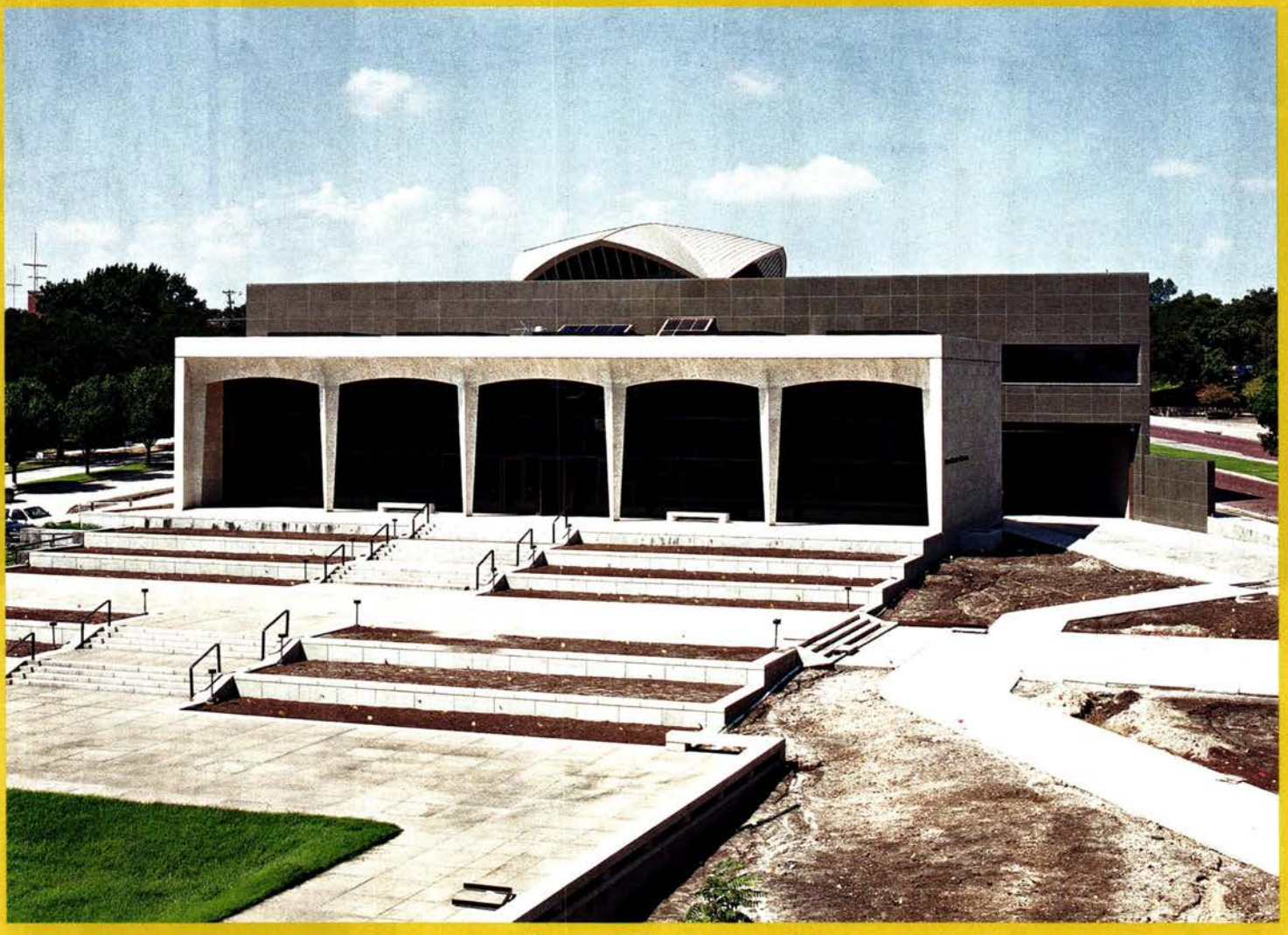

CLUE: A WELL-KNOWN FOLLOWER OF MIES VEERED TOWARD APOSTASY BY INCORPORATING SEMI-CLASSICAL MOTIFS INTO HIS WORK, AS AT THIS MUSEUM. FORTY YEARS LATER HE EXPANDED THE BUILDING IN A STRAIGHTFORWARD MODERNIST MANNER.

The answer to the February issue's Guess the Architect is **CARLO SCARPA**, who renovated the historic Castelvecchio for a museum in Verona, Italy, from 1957 to 1974. For more details, including the winner, go to architecturalrecord.com.

By entering, you have a chance to win an iPad mini.
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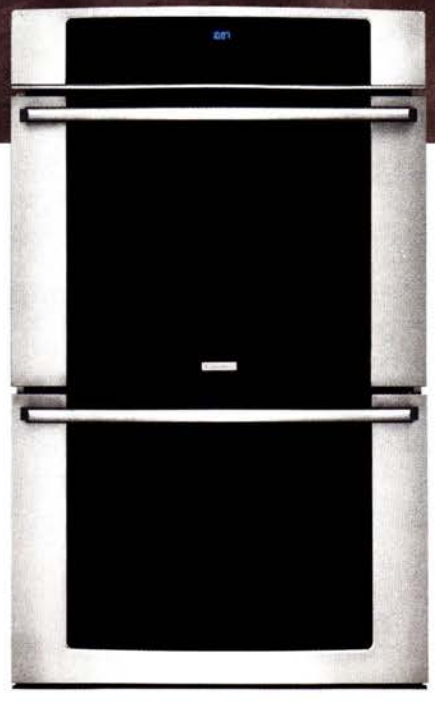

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CIRCLE 23

Wizards of Weather

New tools for predicting the effects of climate change promise better-performing and more adaptable buildings.

BY PETER FAIRLEY

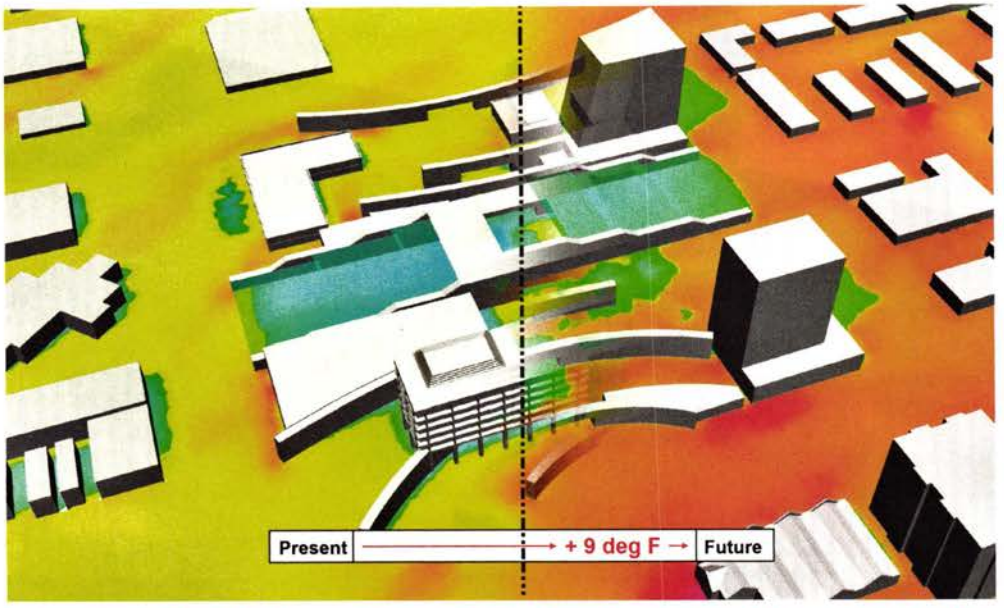
ARCHITECTS AND engineers must consider a building site's climate to create structures that efficiently keep occupants comfortable. There are, however, basic deficiencies in the weather data that they commonly plug into energy simulations. Some new tools are addressing this data gap—tools that could help buildings to perform as anticipated and gracefully adapt to a changing climate.

A tool expected to be released later this year by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) targets weather data's geographic limits. ASHRAE publishes standard design-year data sets for use in energy modeling. These represent natural variation in temperature, sunshine, and other meteorological conditions observed at weather stations. Most are at airports, where conditions can vary significantly from those found in urban centers just a few miles away. Dru Crawley, building-performance director for design software vendor Bentley Systems and chair of ASHRAE's technical committee for climatic data, says urban heat island effects elevate downtown temperatures 2 to 9 degrees Fahrenheit. As a result, says Crawley, a data set from the closest weather station may "mean absolutely nothing when you get to a particular building site."

His committee's solution: rewrite history. They commissioned a tool from Guelph, Ontario–based Novus Environmental to generate weather data for virtually any 6-square-mile block of territory in the continental U.S. The software uses a weather model, informed by topography and land-use data and calibrated by historic observations, to capture each block's local microclimate.

Another thrust of technology development targets historical data sets' inevitably backward vision—a growing liability in an era of global climate change. International engineering firm Arup collaborated with climate-data startup Argos Analytics to develop WeatherSHIFT, which Arup uses internally to predict future design-year data sets. Mathematical methods known as morphing superimpose changes predicted by climate modelers on observed weather data.

U.K.-based Arup climate expert Jacob Hacker and academic colleagues pioneered morphing a decade ago, using a climate model to produce future data sets for U.K. weather station sites in 2020, 2050, and 2080. ASHRAE's London-based sister organization, the Chartered Institution of Building Services Engineers (CIBSE), has distributed the morphed data sets and encouraged their use in U.K. projects.



Arup's WeatherSHIFT results for a proposed development in Mesa, Arizona, show an increase in average temperatures by up to 9 degrees Fahrenheit by the end of the century, resulting in a tenfold increase in heat stress.

IMAGE: COURTESY ARUP

Arup's Hacker and Cole Roberts, a San Francisco–based Arup principal, say WeatherSHIFT offers better morphing algorithms, relies on the latest climate models, can morph data sets from sites worldwide, and shows designers a broad range of climate-adjusted weather under different carbon-emissions scenarios.

An innovation from U.K. academics, meanwhile, is offering designers both climate perspective and the site-specificity expected from ASHRAE's software. The Prometheus tool created by Matthew Eames, a research fellow at the University of Exeter's Centre for Energy and the Environment, relies on an artificial weather generator to synthesize both historic and future weather data sets for every location in the U.K.

Eames says U.K. architects and engineers using future-weather data sets are already gaining broad insights about what climate change means for their designs—especially the present and growing threat of overheating in certain structures. The European heat wave of 2003 was considered a 1-in-1,000-year event, says Eames, but the design data sets show that such temperatures could be typical summer conditions by the 2040s.

Forecast data sets enable designers to think ahead. For example, they can oversize mechanical rooms to accommodate a future need for more equipment. "You don't build your building to cope with 2080 now. It's about making sure your building can adapt," says Eames.

Arup's Roberts says North American designers and clients are a step behind the U.K.'s, but he sees interest growing. He describes an eye-opening climate risk assessment that Arup recently completed for a client with a large real-estate portfolio in California. WeatherSHIFT predicted a 7-degree-Fahrenheit rise in average summer temperatures at the end of the century, which energy modeling showed would challenge naturally ventilated buildings. Often viewed as more resilient since they eschew mechanical systems, naturally ventilated buildings are also the most closely designed for the historical climate, explains Roberts. "As climate shifts even a few degrees, those buildings will suffer more," he says.

Roberts's hope is that anticipating future weather will become "a default for how work is being done on every project globally." He proposes one way to entice clients to buy in: convincing LEED and other green building-rating systems to award points for testing designs against predicted weather. He is also looking for partners to help make WeatherSHIFT available beyond Arup. ■

Journalist Peter Fairley covers energy and its environmental implications.

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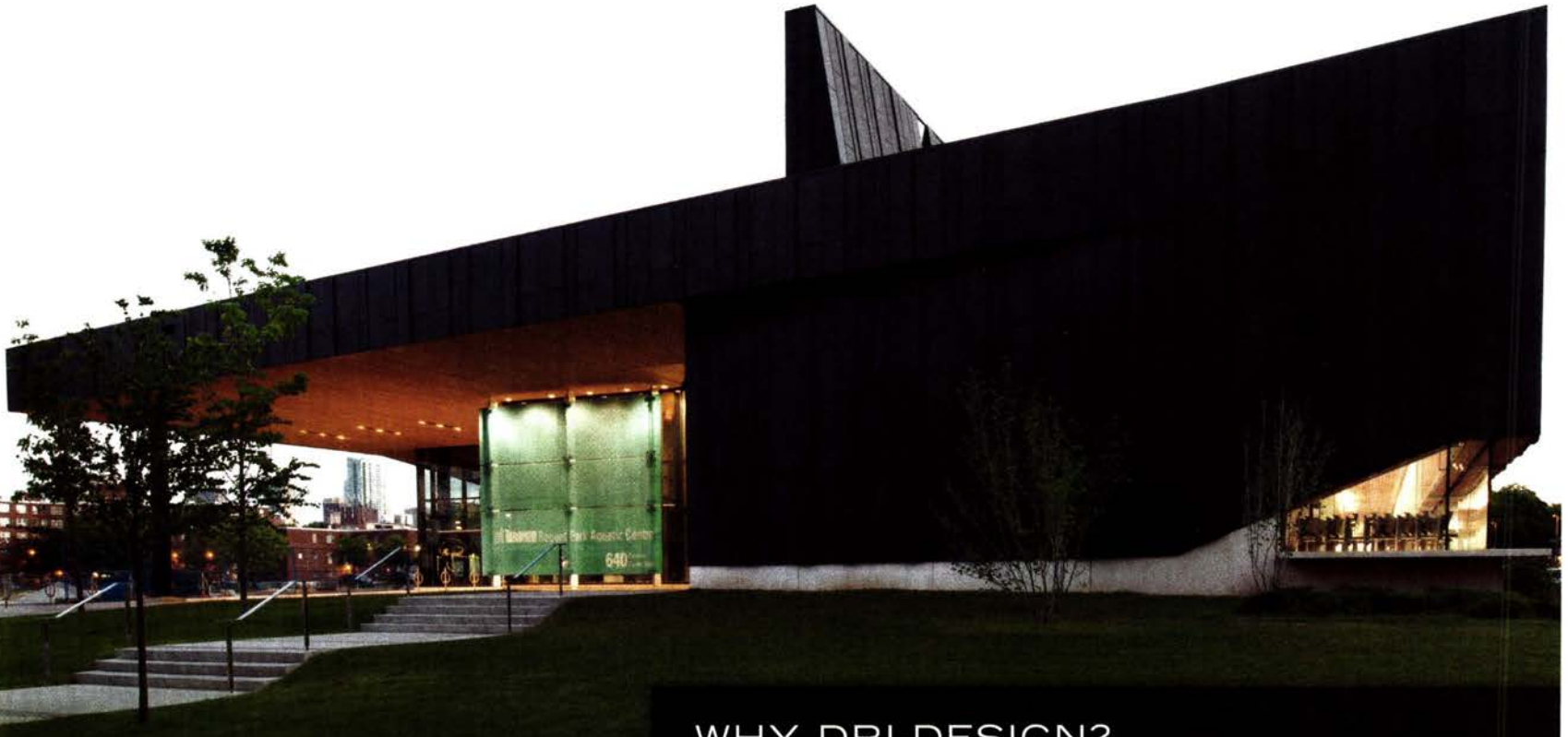

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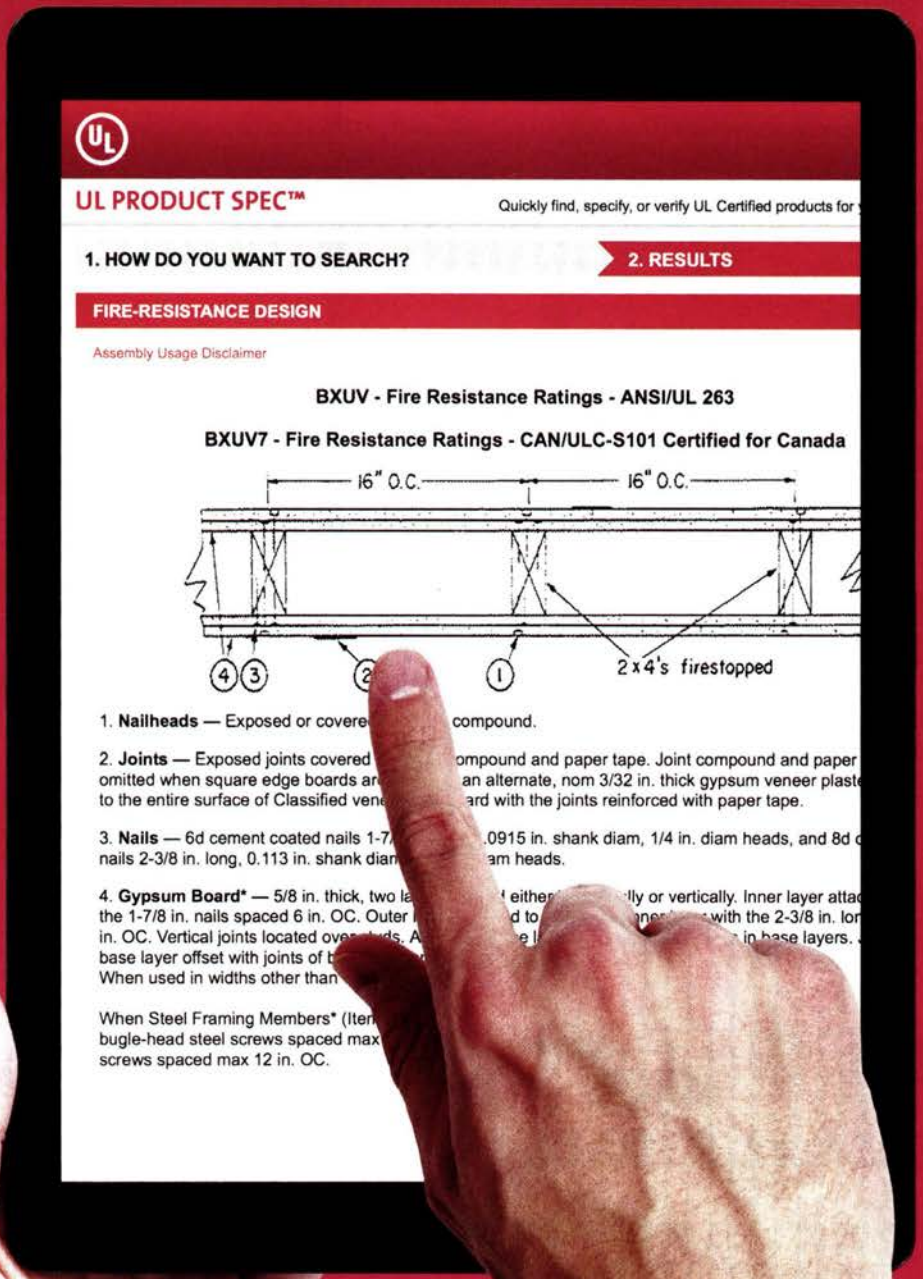

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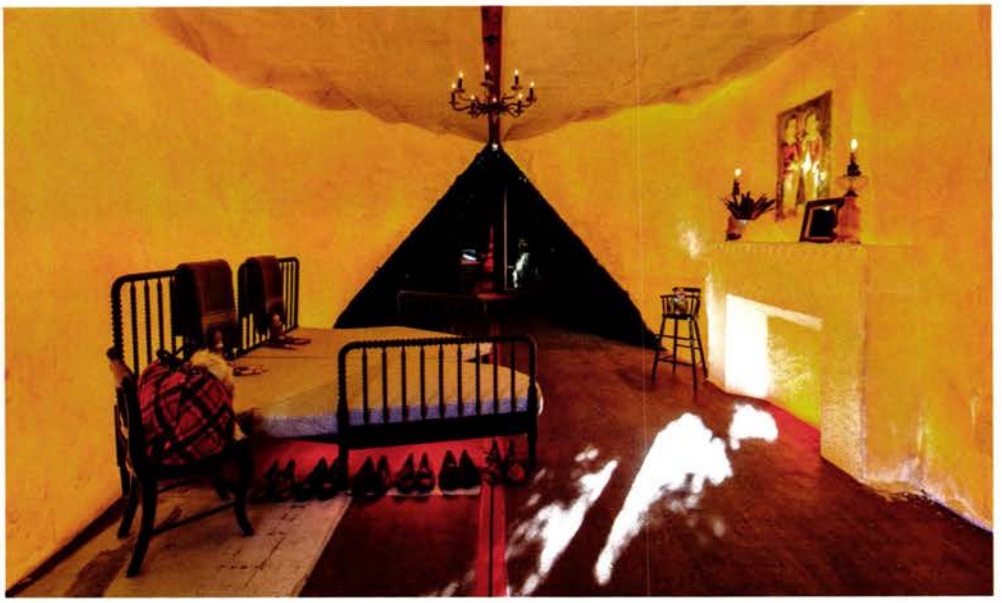
CIRCLE 67

Space Oddities

Bittertang cultivates an architecture that is anything but normal

BY ANNA FIXSEN



Bittertang, the brainchild of Antonio Torres and Michael Loverich (top), smothered the interior of a Michael Bastian store with beeswax (above) and draped an outdoor amphitheater with hay sausages (below).

IT WOULD be a flagrant understatement to say that Bittertang builds. More accurately, they inflate, stuff, and smother. The resulting hallucinatory environments resemble a delightful cross between a gastroenterologist's dream and a petting zoo. Oddness aside, Bittertang is pushing the conventions of architecture by creating forms that are at once tectonic, pliable, corporeal, and damn good fun.

"Everyone talks about immersive spaces and a sensorial, visceral approach to architecture, but it's not literal enough," says Antonio Torres, 33, one of the two founders. "We are interested in getting architecture to be interactive and tactile," adds his partner, Michael Loverich, 36.

The firm (they prefer to call it a "farm") is run between New York and Guadalajara, Mexico, where Loverich and Torres respectively reside. They met in 2004 at UCLA, where they both received their M.Arch degrees, and later became roommates in New York City.

The duo was fascinated by the mood of different spaces and the puzzle of making structure from soft materials. They began messing around with digital modeling and making mutant stuffed animals to test their hypotheses. While they both worked at "normal" firms—Loverich at Reiser-Umemoto; Torres at Johnston Marklee—the financial collapse in 2008 got them thinking seriously about turning these experiments into a business. "We felt like we were breeding creatures," says Loverich. Torres recalls musing, "Maybe it's not a firm, but something else." Their farm was born.

In 2010, the two entered the competition for the Architectural League's Prize for Young Architects. At this point, their portfolio consisted of the plush toys, an aquaponics project, and a garden. "We were like, 'Oh my gosh, we have nothing,' so we decided to put all of our ideas together," says Loverich. They won the prize with a proposal to design *Romulus and Remus*, a womb-like "succulent piñata," covered in undulating green fringe with a candy interior, festooned with small pink fetal forms. The piñata is now on view at the Graham Foundation in Chicago in an exhibition of young designers called *Treatise: Why Write Alone*.

Bittertang began to experiment with other materials including inflatables, wax, and organic matter. For a pop-up store for menswear-designer Michael Bastian in 2013, they transformed two shipping containers inside a pier shed along Manhattan's West Side Highway into an *American Gothic*-esque space, the walls covered in beeswax and the exterior concealed in a haystack. "They approach spaces in a different way from most people. It's more a mood for them," says Bastian.

The hay concept extended to an outdoor amphitheater they completed last summer in Lake Forest, Illinois. *Buru Buru*, as it is called, consists of a mesh membrane stuffed with hay supported by a steel frame, so that it resembles a teepee made of bratwurst. If left long enough, the pavilion would eventually degrade into compost.

When not preparing Bittertang works, Loverich teaches at the University of Pennsylvania, and Torres at the Monterrey Institute of Technology; both work on comparatively staid residential commissions. "We'd like to merge the experimental projects with traditional work to see how those can be bred," says Torres, but "we still haven't found a crazy client who wants to go all out." ■

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CIRCLE 27

It's a Big BIG World

A show documents Bjarke Ingels Group's rise.

BY AMANDA KOLSON HURLEY

HOW TO account for the unstoppable rise of Bjarke Ingels? In late January, the Danish architect launched *Hot to Cold*, a new exhibition of his firm's work (through August 30), at Washington, D.C.'s National Building Museum. Tousle-haired but dressed for Washington in a sober suit, Ingels led journalists on a fast-paced tour of the show, stopping briefly to point to a torqued tower or looping ramp as cameras snapped away. Videographers and photographers flitted around him, including one making a documentary about the Bjarke Ingels Group (BIG). But it would be a mistake to chalk the to-do up to starchitecture alone.

Ingels is without doubt the best communicator in architecture today. Many architects write themselves into a theoretical corner, but Ingels uses the language of comics and movies to appeal to an ever-wider audience. This spirit of populism, unusual in architecture's upper ranks, pervades his work. In his comic-book manifesto *Yes Is More* (2009), Ingels claimed that his superpower was consensus-building, the ability to get everyone to say yes. Right now, the yeses he wants are from the boards reviewing his master plan proposal for the Smithsonian Institution, clearly one reason he has chosen to showcase his work at a museum in D.C.

Models float in the National Building Museum's vast Great Hall, suspended along the second-floor balconies.

Hot to Cold takes us on an odyssey of BIG's work, from the deserts of Qatar to the ski slopes of Finland. Rather than use cramped side galleries, the models float in the museum's vast Great Hall, suspended along the second-floor balconies—one of the building's best features. It was an inspired choice.

Visitors can stroll the balconies or look up from below to see the color-coded undersides of the model bases that circle the hall in a gradient from red to blue. Some architecture shows never really spring into three dimensions; *Hot to Cold* does. Even so, the models get a bit lost in the cavernous space.

Climate is the organizing principle of the exhibition and the 700-page catalogue, designed as a flippable, hot-to-cold rainbow by Sagmeister & Walsh. Wherever in the world BIG goes, Ingels explains, the firm strives to create buildings that are sustainable by virtue of their design and not through mechanical add-ons. Ingels—who wrote all the text—calls this approach "engineering without engines" in a nod to Bernard Rudofsky. Wresting 60 very different projects into an overarching theme isn't easy, but engineering without engines works most of the time. When it doesn't, you've got to give Ingels credit for trying. (A condo in the Bahamas, where each unit has its own pool, is "a local vernacular of hedonistic modernism"? Well—okay.)

So what does *Hot to Cold* tell us about the BIG oeuvre? First, that not much of it has been built. (I reached page 82 of the book before seeing a project either finished or under construction.) Second, that the firm has a few regular moves in its repertoire: spirals, twists, peeled-up corners, and mountain massing. BIG has made the last of these distinctively its own, but you can catch glimpses elsewhere of OMA (where Ingels used to work), Steven Holl, Diller Scofidio + Renfro, and Studio Gang. What really stands out, though, is the simplicity and clarity of Ingels's concepts. It's why he is so good at aha moments. He gets us to say yes.

After the tour, Ingels—who originally wanted to be a cartoonist—told me that he instructs his staff to send him graphic narratives about their ongoing work. It is process and outcome at the same time. *Hot to Cold* spills over into one of the museum's galleries, where visitors can watch skillfully made short films about life inside Copenhagen's 8 House and the Danish Maritime Museum. Soon, more of BIG's projects will be realized, and you can bet Ingels will hire more film crews to document them—and that they will make great stories. ■

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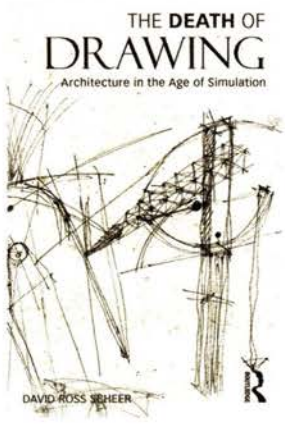
The Death of Drawing: Architecture in the Age of Simulation, *by David Ross Scheer. Routledge, August 2014, 258 pages, $40.*

Reviewed by Sophia A. Gruzdys

IN *THE DEATH OF DRAWING*, David Ross Scheer, an architect and teacher specializing in digital technologies, lays out the contemporary practices of design that have pushed aside architectural drawing as the dominant means of architectural expression. The author crafts his sentences precisely, illustrating ideas that explain concepts clearly. If one wants to know what is going on in the profession and schools of architecture, this book is a must read.



As a professor of architecture who teaches drawing, I was fascinated by this contemporary analysis of the act of creating. Scheer argues that architecture for the past 500 years has followed Alberti's paradigm of drawing's being distinct from building. The architect's domain lies in theory, and the why of architecture is more important than the how. As a result, the craft of drawing has served as the link between idea and the physical aspects of building.

Drawing connects architectural ideas to the representation of mental images by which we perceive reality. Scheer provides an engaging discussion of these points, but emphasizes the ambiguity involved in representation. He argues that drawings increasingly need to function as instruments of construction, because computational technology eliminates ambiguity and "collapses the distance" between reality and representation. Building information is packed into data, and simulations quickly and accurately manage information.

Scheer further argues that the creation of form now follows geometries native to the computer and therefore is no longer a product of the act of representation. In the profession, BIM has made the design process transparent and accessible to architects and builders alike, challenging architects' role as leaders. Design team members manage the production of information, putting an emphasis on collaboration. A new dynamic is at work.

So why continue to teach drawing? One reason is that the almost seamless relationship between eye, brain, and hand helps establish the body as "the center of experience," says Scheer.

While Scheer admits his love of drawing was an important reason he studied architecture, he proclaims that the future is brighter for young architects who can design within the new paradigm of digital technology. Citing Frank Gehry's 8 Spruce Street tower in New York, he notes that Gehry's firm parametrically adjusted the facade so it embodied the design idea, rather than let it result simply as an outcome of a computational process.

Scheer says we need to understand the myriad tools available to us, but be smart enough to lead with design rather than performance. Architects need to talk back to BIM and preside over the course of design. We need to ask the hard questions: What is design today? Is it more than performance and information? Drawing remains the key to synthesizing the vision of an architectural idea concisely. ■

Sophia A. Gruzdys is an architect and director of Catholic University's Rome program, and also teaches design at the University of Southern California's Barcelona program.

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B is for Bauhaus, Y is for YouTube: Designing the Modern World from A to Z, *by Deyan Sudjic. Rizzoli ex libris, February 2015, 488 pages, $25.*

Reviewed by Aleksandr Bierig

THIS BOOK begins, somewhat unpromisingly, with the author's disavowing the format he has chosen. About eight years ago, around the time he became the director of London's Design Museum, Deyan Sudjic agreed to write two books—*The Language of Things* (published in 2008), and this one, initially conceived as a "massive 250,000-word conventional dictionary of design." The task seemed daunting, and Sudjic had not made much progress when his publisher relieved him of the problem—in the age of Wikipedia, people had stopped buying dictionaries. He could keep his advance, but he might want to think of another project.

In the end, Sudjic kept the format of the dictionary but got rid of everything else. Dictionaries, of course, are large, all-encompassing volumes that convey information dispassionately. In contrast, this is a small book reflecting one man's preferences. And while true to its title (the book is organized alphabetically), the topics are scattered, skipping willfully to whatever strikes Sudjic's fancy. This occurs even within entries: "B is for Blueprint" begins as a reflection on Sujdic's role in founding the magazine of that name, but there is sadly little about the magazine, or print publications more broadly. Instead, he composes a 10-page paean to British architect David Chipperfield, who was featured on the cover of *Blueprint* as a young practitioner.

Like many entries here, the story about Chipperfield is part personal and part professional—he recalls first meeting the architect, picks out a few notable projects, and delivers a judgment that is amiable, equivocal, and polite. The same goes for his sections on other architects and designers, of which there are many—Ron Arad, Rem Koolhaas, Philippe Starck, Zaha Hadid. Much of the book follows suit as a history of personalities. These stories have the casual tone of someone telling you about his friend, except Sudjic's friend is listening in on the story too, so he isn't about to say anything controversial or damning.

Other personal anecdotes, however, make up some of the best entries. The opening essay, "A is for Authentic," explores the author's preferences in jackets and radios in an honest, unassuming way. He doesn't quite unravel the complexity of the cat-and-mouse game between the authenticity of "un-designed" objects and the designers who chase after such effortlessness, but it is interesting enough to consider the beguiling problem of the authentic, and hear about his idiosyncratic tastes. Another entry, "N is for National Identity," is a poignant meditation on growing up as the child of Yugoslavian immigrants in 1960s Britain, speaking his parents' native "Serbo-Croat" at home while learning the Queen's English from the BBC. Sudjic returned to a much-changed Belgrade in 2007 after a 25-year absence, prompting thoughts on how architecture is so often used to set a certain hopeful social vision into stone, steel, and glass. As solid as those materials might seem, humans often prove their fragility in the face of conflict, with buildings becoming so many ruins and reminders of what might have been.

Regrettably, such ruminations are a small part of this "A to Z" compilation. Still other entries try to stay current by addressing topics like YouTube. These essays are, unfortunately, exactly what one might expect from a 62-year-old man discussing video games and the Internet. His discussion of *Grand Theft Auto*, for instance, basically ignores its violence and misogyny, and sees "the most elaborate train set in the world." And then, a few pages later, one finds thinly researched reviews of canonical design heroes such as Pierre Chareau, Jean Prouvé, and William Morris.

The problem with this book stems from its subtitle, *Designing the Modern World*: Sudjic never decides what world he wants to tell us about. Is it our modern, globalized, digital world? Is it the Modern world imagined at the Bauhaus? Is it his personal experiences in the historical crucible of the 20th century? Placing them next to one another seems provocative—and that was undoubtedly his goal—but these kinds of discontinuities are everywhere today: on our computers, in our politics, in our built environment. The alphabetical format gives Sudjic license to try and follow the disjointed paths of the contemporary world, but it doesn't do much to help us make sense of them. ■

Aleksandr Bierig is a Ph.D. student at Harvard's Graduate School of Design and a former editorial assistant at ARCHITECTURAL RECORD.

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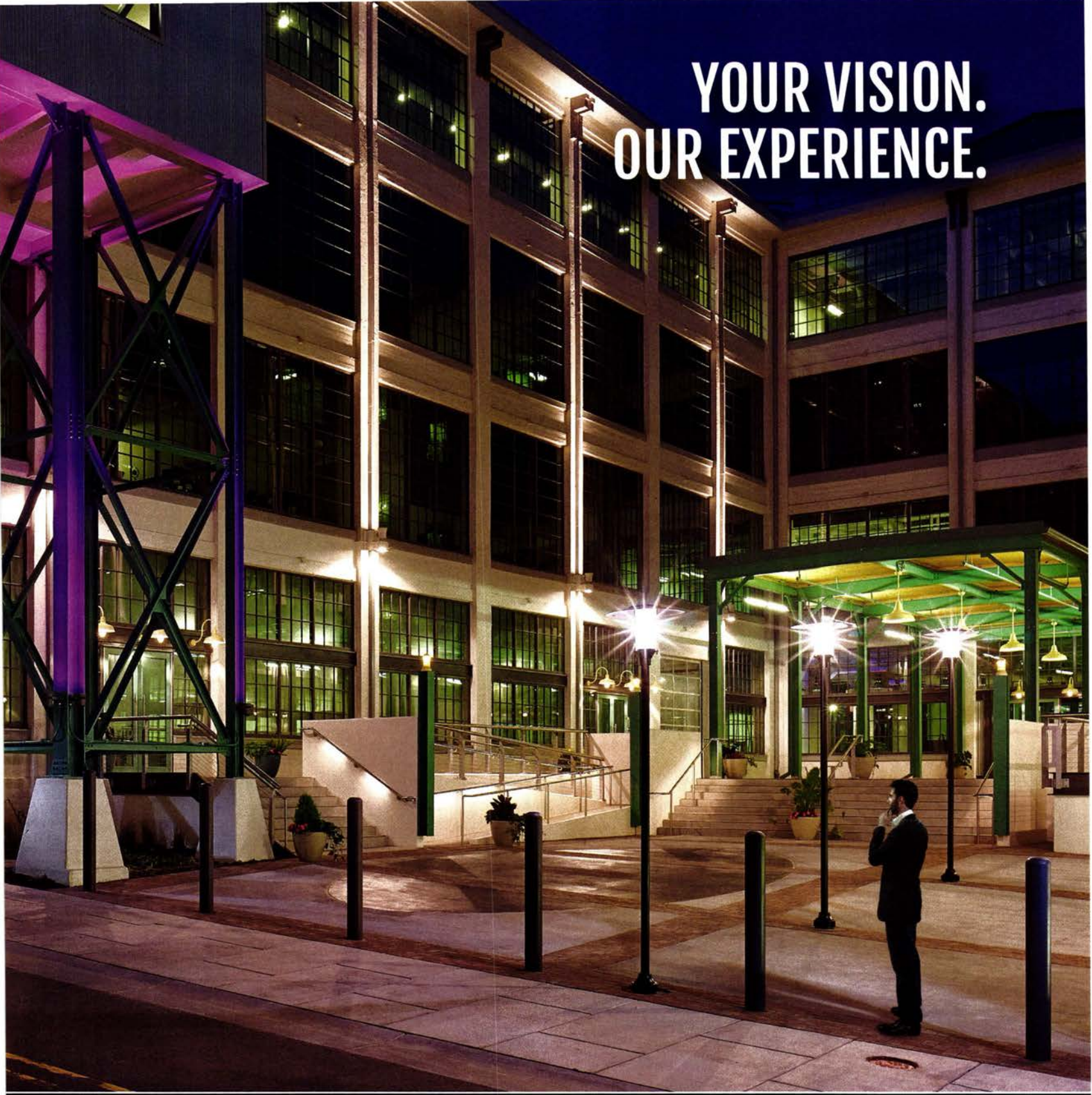

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CIRCLE 52

Urban Outfitters

Commercial interiors get more playful, practical, and polished thanks to edgy and slick furnishings, from foam seating to vibrant flooring.

By Sheila Kim

Against the Grain
Mannington Commercial has stepped into the carpet-plank arena with an 18" x 36" series called Against the Grain. As its name hints, the textures and colorations on the tiles evoke rough-hewn and reclaimed-wood grain patterns. Four space-dyed nylon styles are offered in a palette of 15 colorways and are designed to be mixed, matched, and turned.
mannington.com
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Fortina
Using hardwood slats to build architectural elements may not be an option due to weight or cost. But B+N Industries has developed a system that replicates them, using aluminum covered in a non-PVC surface. Reducing weight, waste, and cost, it can be used as walls, ceilings, screens, handrails, and more, in both interior and exterior environments. bnind.com CIRCLE 201

Mitesco
Architect Michele De Lucchi designed this simple acoustic panel for Snowsound that can be mounted on walls or floor stands, hung from ceilings, or left leaning. Measuring 17" x 63" x 1½" thick, they are composed of 100% recyclable polyester that absorbs mid- and low-range frequencies.
snowsoundusa.com
CIRCLE 202

BuzziPicNic
Ideal for offices where work, free time, and collaboration overlap, BuzziSpace's indoor picnic table provides a whimsical, multipurpose perching spot. Regular-, counter-, or dual-height versions are offered in various sizes in ash, oak, or plywood. Integrated cable entry points and matching benches are optional.
buzzispace.com CIRCLE 204

Zetacoustic
Carnegie has expanded its acoustic sheer textiles to offer styles that mimic natural fibers. One of two additions, Zetacoustic utilizes a nearly invisible sound-absorbing yarn to deliver NRC ratings comparable to those of velvet and felt. Usable as space dividers and drapery, it comes in 17 colors.
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products contract furnishings

Sliding Doors

Carvart's sliding doors feature a clean aesthetic using minimalist exposed or recessed hardware ranging from telescopic followers to tracks. Framed or frameless, the door glass can be specified in different opacities, textures, and hues, and combined with wood details. A soft-close mechanism completes the system. carvart.com **CIRCLE 205**

Shimoda Shapes

Injecting playfulness into workplaces, education facilities, and hospitality settings, this coated-foam furniture line was designed by architect Joey Shimoda for Trendway. It includes both standalone and modular pieces such as the terrier-shaped Phoebe and mountainous Super Lounge (below). trendway.com **CIRCLE 209**

Matuto

Bold and bright colors not typically seen in vinyl tiles mingle with neutral and earthy palettes in Mohawk Group's newest design for its Global Entry Collection of resilient flooring. The 12" x 24" tiles are topped with a high-performance wax-free, ceramic-enhanced urethane coating. mohawkgroup.com **CIRCLE 206**

Overlay/Underlay

This new Wolf-Gordon Type II wallcovering series is the work of artist and designer Kevin Walz. The five patterns, which read like layers of abstract silhouettes, utilize translucent inks to evoke the effect of paint seeping through canvas from the other side. wolfgordon.com **CIRCLE 208**

Whiteboard Films

An alternative to dry/erase paint and writable glass, 3M's flexible films offer a speedy option to transform nearly any type of surface into a whiteboard. Engineered to prevent ghosting, the films are easily removable if a space's functions change. 3m.com **CIRCLE 207**

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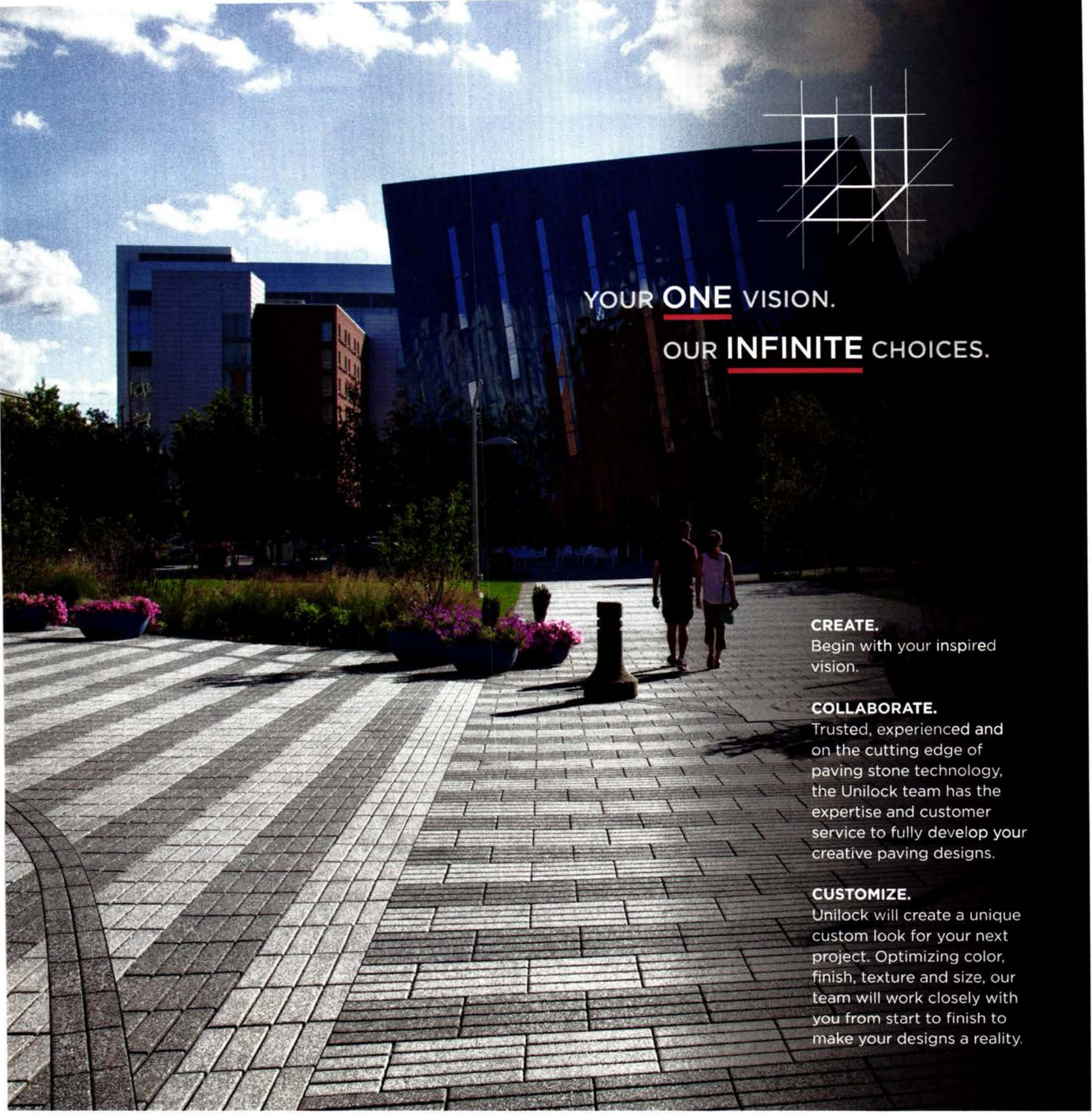

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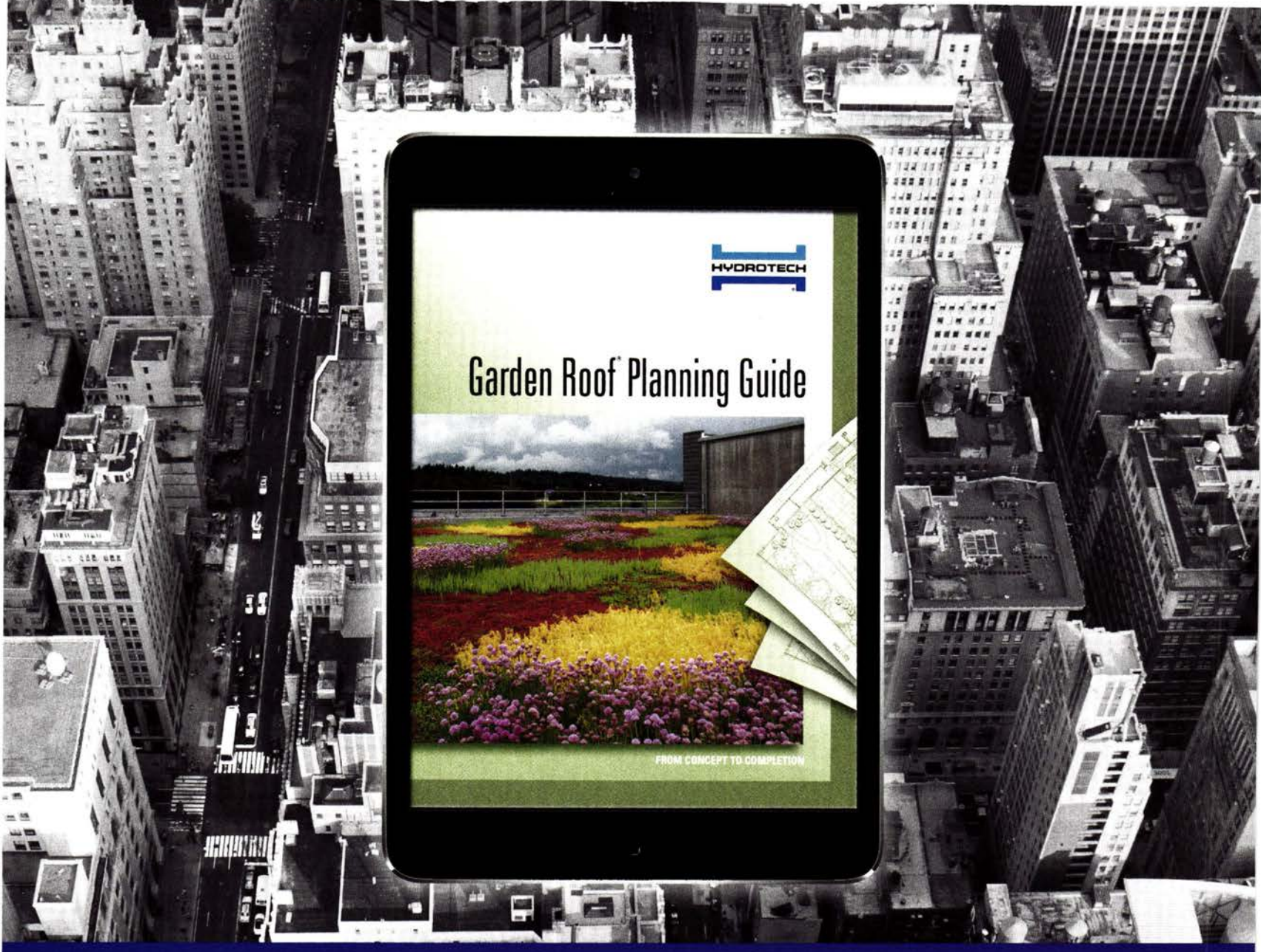

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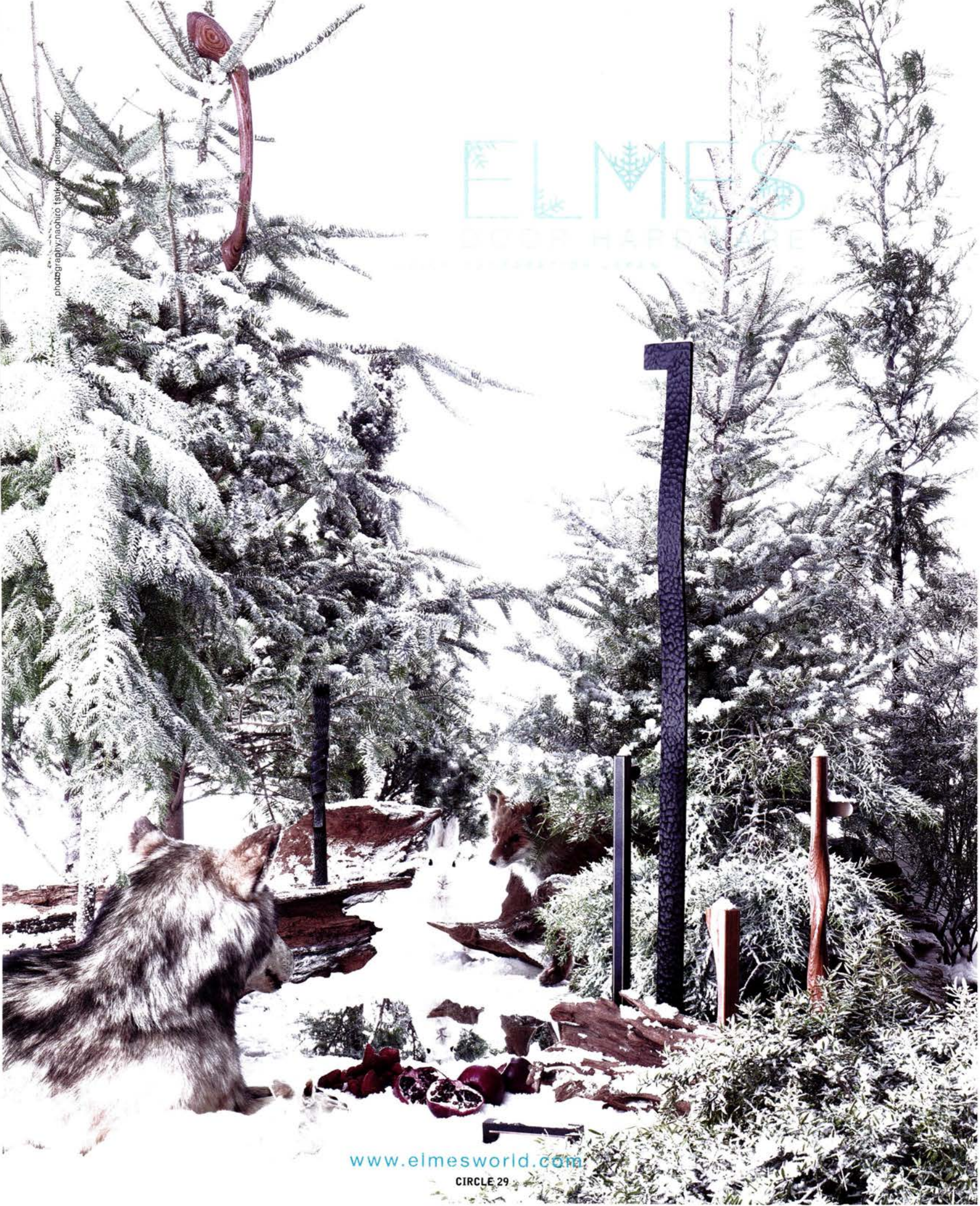
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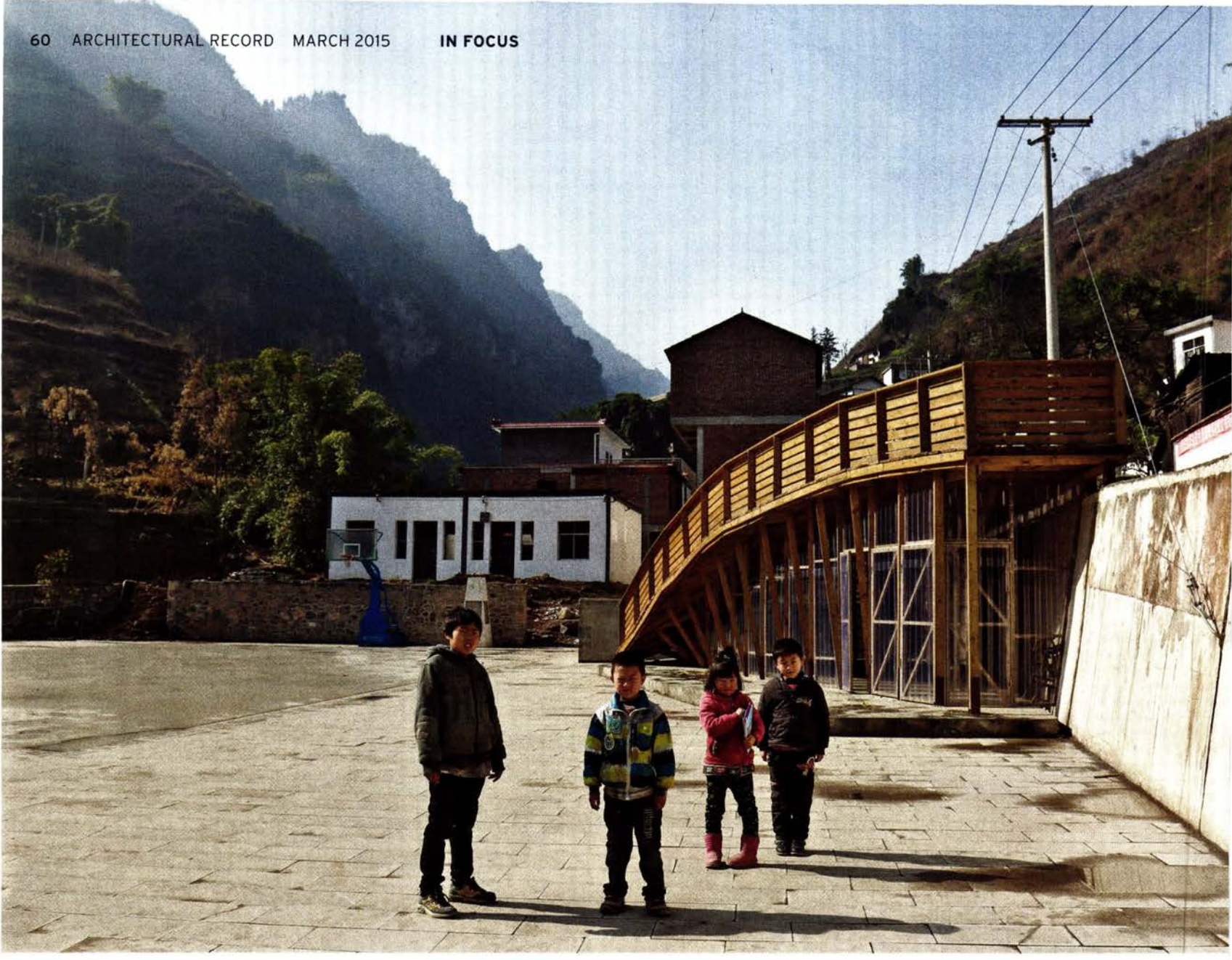


OPEN BOOK

Two libraries in remote locations on different continents demonstrate the impact of small projects on communities in need. Both buildings contribute to the civic realm and create spaces that encourage users to engage with the architecture—and have fun.

BY CLIFFORD A. PEARSON

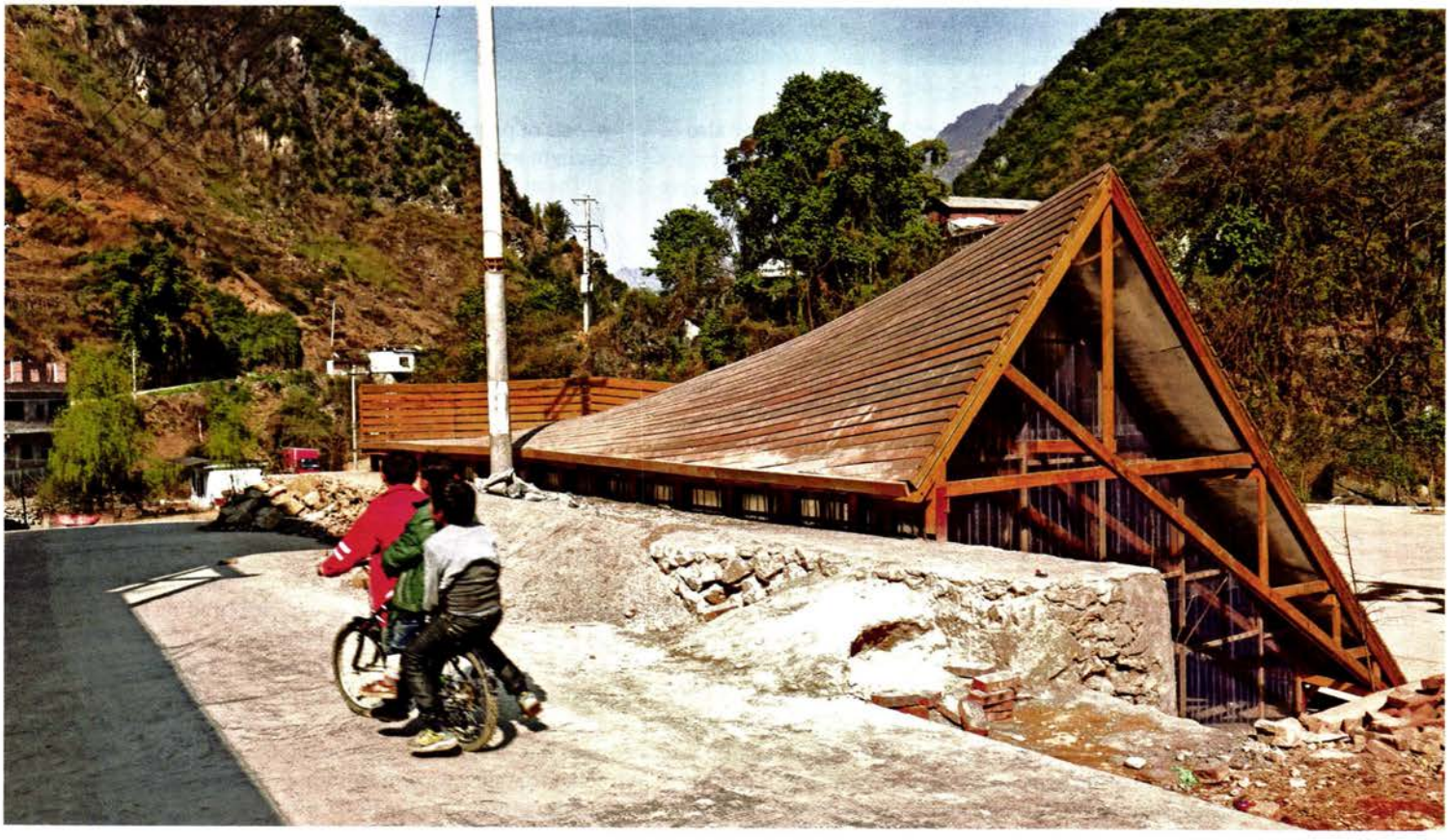
The Pinch
Yunnan Province, China
Olivier Ottevaere & John Lin

DEVASTATED BY a major earthquake in September 2012, the Chinese village of Shuanghe in the southwestern province of Yunnan suffered neglect and then misguided governmental attention. After living in tents for up to 12 months following the disaster, residents were moved into mostly poured-in-place concrete houses, charmless structures that eschewed the region's traditional mud-brick-and-timber-roof architecture. Realizing that the new village lacked much in the way of social spaces, the government built a large public plaza, but made it a barren concrete surface with nary a tree or a bench to soften its impact.

Olivier Ottevaere and John Lin, professors at the University of Hong Kong who had studied together at Cooper Union in New York, came to Shuanghe at the request of Habitat for Humanity China, which has been active in Yunnan since 2002. On their first visit, Ottevaere and Lin spoke with

WELCOME ADDITION
The architects used an existing public plaza and retaining wall as key elements in their design (above). While most new construction in the rebuilt village relies on concrete, the Pinch shows the continuing relevance of the area's traditional wood architecture (opposite, top). The peaked roof echoes the form of nearby mountains (opposite, bottom).

View additional images at architecturalrecord.com.



PHOTOGRAPHY: COURTESY OLIVIER OTTEVAERE & JOHN LIN

STORY TIME
A system of 17 trusses assembled on-site supports the double-curved roof; V-shaped extensions of the trusses support bookshelves that run the length of the space (opposite and above). Standard wood benches and stools, found in most rural Chinese schools, serve as the only furniture. Translucent polycarbonate panels bring daylight into the interior.

villagers and learned of the need for a library. They also realized that the soulless plaza offered an opportunity: a free site with a 13-foot-high retaining wall that could serve as part of the library structure and reduce the cost of construction. "We're always asking ourselves, 'What's the minimum we can do?'" says Lin, who worked on this project separately from his on-going collaborations with Joshua Bolchover and their firm Rural Urban Framework (RECORD, Design Vanguard, December 2013). "The minimum here was to use what existed—the retaining wall and the plaza—and just put a roof on it," explains Lin.

In the spirit of making the most out of a little, the roof serves multiple functions—enclosing the building's one large interior space, bridging the drop in elevation from a road above the site to the public plaza, and providing village kids with a wood-decked surface they can play on and slide down. Ottevaere and Lin designed the roof's supporting structure as a series of 17 exposed timber trusses, each one shaped differently so that together they define a sharply pitched, double-curved surface.

An aluminum waterproofing layer and timber decking rest on the trusses to form the roof. Inside the library, the trusses extend down toward—but don't touch—the floor to support floating bookshelves that run the length of the space. Perimeter walls and doors are made of translucent panels of polycarbonate, which bring in plenty of diffuse daylight and provide views to the plaza.

The architects approached the project, which they call The Pinch, as a way of connecting with the region's history of wood construction and demonstrating the material's future potential. They collaborated with a local timber manufacturer, which cut the wood members and shipped them to the site where they were assembled into trusses. They also engaged local carpenters, who are now working with them on other projects, including a viewing platform dubbed The Warp and a third one that will combine wood and poured concrete. "We want to show that timber structures could be safe" in high seismic zones in China, "and could engage the participation and pride of the local community," states Lin.

Ottevaere and Lin worked pro-bono and assembled all the funding for the project ($21,000), with support from the University of Hong Kong and a Knowledge Exchange Project grant from the university, along with funding from the local government and donations of labor from the timber factory. Most of the structure was built in the fall of 2013 and final work on the interior was done in the spring of 2014.

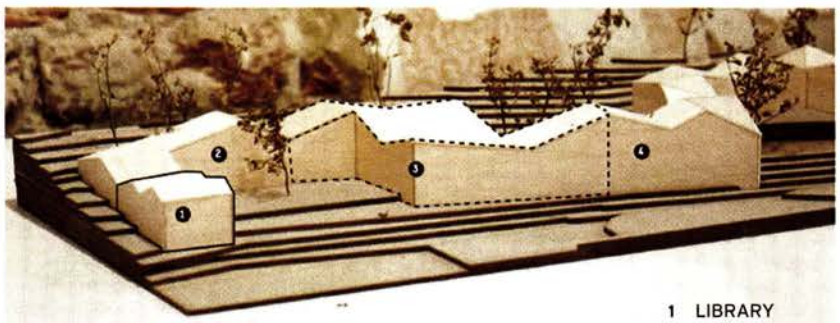
Driving the entire project, from design through construction, was "a spirit of experimentation," says Lin, and a belief that new ways of thinking can revive local crafts and building traditions in rural China. ■

Library of Muyinga
Muyinga, Burundi
BC architects & studies

THE FIRST phase of a school for deaf children, the 1,500-square-foot Library of Muyinga, in northeast Burundi, combines inexpensive local materials with a modern approach to design. "It's an architecture of low resources," says Laurens Bekemans, who with partners Wes Degreef, Nicolas Coeckelberghs, and Ken De Cooman started the Brussels-based BC architects & studies (BC-AS) in 2011 as they were all graduating from architecture school. The firm offers both design and research (the "studies" part of its name) in order to find solutions appropriate to particular climates and cultures. It is now working on projects in Morocco, Ethiopia, Niger, and Belgium, in addition to Burundi.

Shortly after it started, BC-AS caught the attention of a Belgian nongovernmental organization (NGO) now called EDUCANS, which focuses on educational projects in developing countries and was doing work with a Burundian NGO named ODEDIM. The nonprofit groups invited the firm to visit Muyinga and, as recent graduates, the young architects had the luxury of spending two months in Burundi, researching the local culture and traditions of building. This led them to use compressed-earth blocks (CEBs), a material that was popularized in the 1980s by foreign organizations in Africa but that had been mostly forgotten in recent years. To make the CEBs, the architects could use local labor and soil from the site, which reduced costs and provided employment and new skills for residents of the area. In a stroke of luck, the project team found a pair of old CEB machines in a cellar near the site and put them to use.

Instead of specifying corrugated iron, which must be brought in from afar, BC-AS used locally baked clay tiles for the roof. Since clay tiles are heavy, the architects placed CEB columns 4 feet, 4 inches apart, and used another native material—eucalyptus wood—for roof beams. Capitalizing on the local craft of sisal rope weaving, the architects applied it to a new purpose: creating a large hammock suspended in a double-height space that would provide a place for children



1 LIBRARY
2 CLASSROOMS, SANITARY BLOCK (PHASE 2)
3 CLASSROOMS, DINING, KITCHEN (PHASE 3)
4 WORKSHOP, CLASSROOMS (PHASE 4)

LOCAL HERO Using soil from the site for compressed-earth blocks, and local stones for mortarless walls helps anchor the 1,500-square-foot building to its physical and cultural context (opposite). Square spaces between the blocks aid natural ventilation in the library and the porch overlooking a courtyard (above). Wood shutters close the building when not in operation (right).

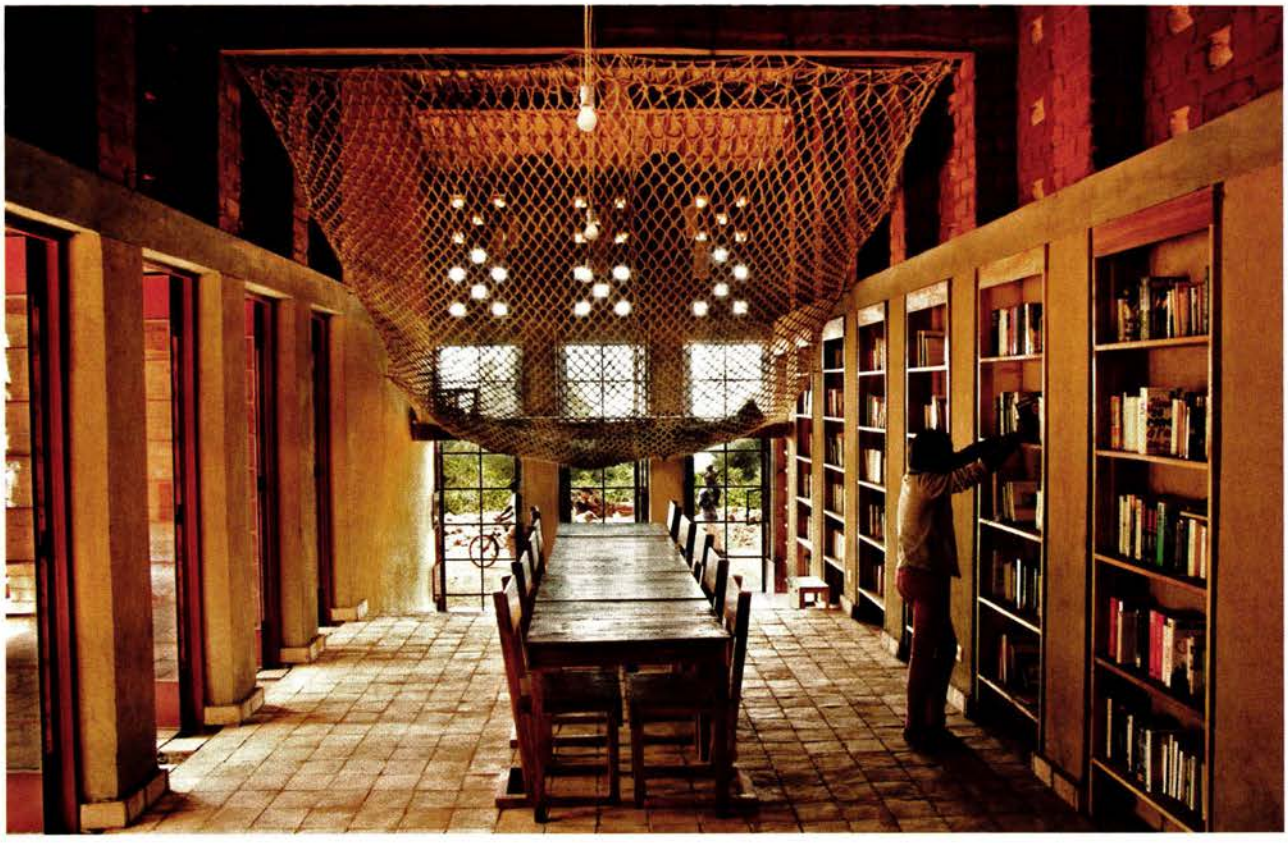
to literally hang out and read a book. "Behind all of our decisions," says Bekemans, "was our research into materials."

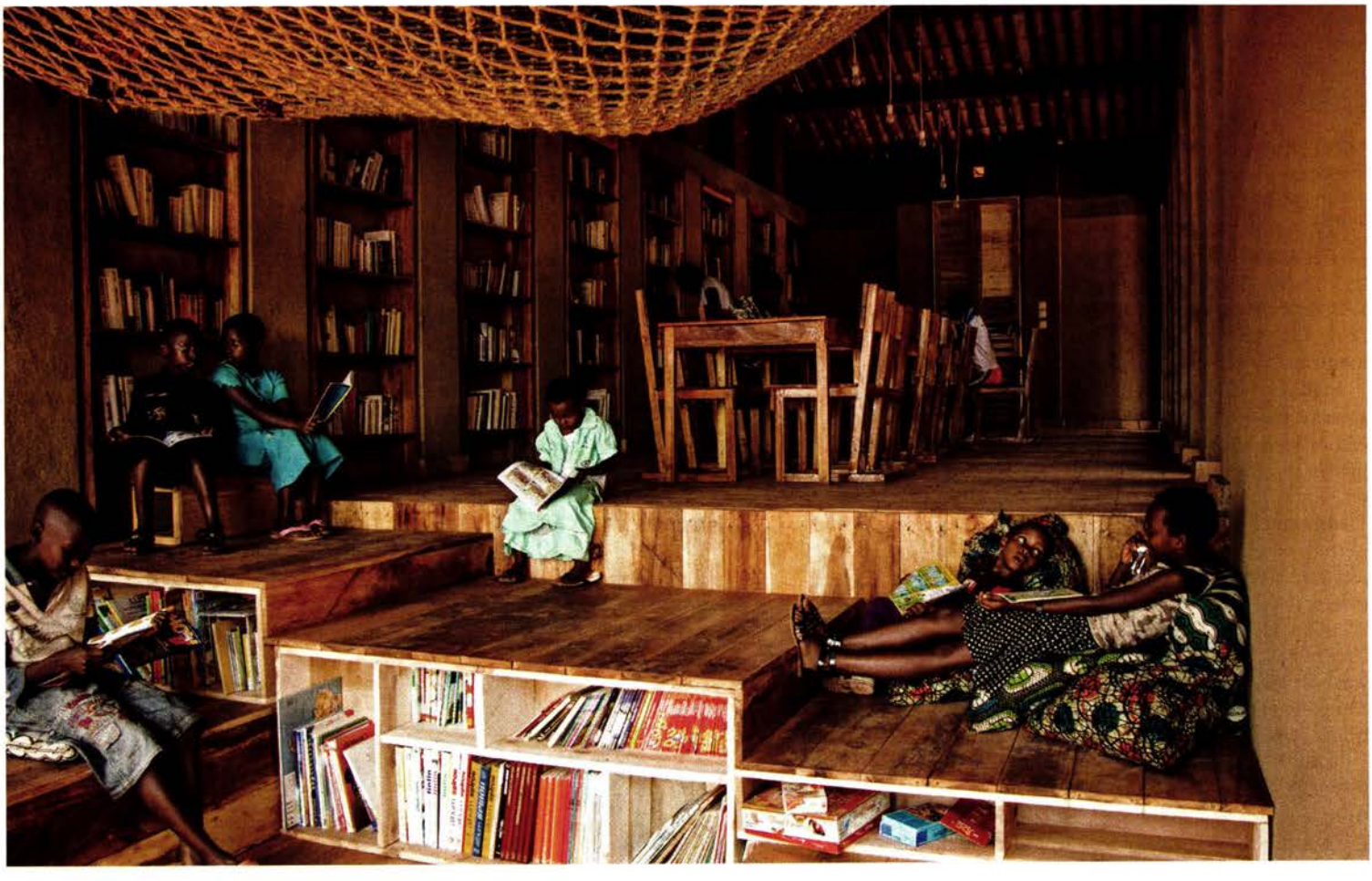
In plan, the building is a simple rectangle with just one interior space and a covered porch running its full length. Almost as wide as the indoor room, the porch provides protection from heavy rains and strong sun and serves as an important social space adjacent to a protected courtyard. Traditional houses in the area usually have a similar kind of covered space. For its public face, the library addresses an unpaved street with a set of five tall openings that welcome people inside or that can be shuttered when the building is closed. Phase 2 of the project—which includes a pair of classrooms, a sanitary block with toilets, and its own courtyard—stands perpendicular to the library and was completed this past summer. Two more phases, with additional classrooms, toilets, and a dining hall, are planned.

In addition to using local labor whose new skills will be useful for the people of Muyinga, BC-AS brought in students from Belgium to learn about Burundi, as well as help out. The transfer of knowledge here went in both directions. ■

IMAGES: © BCARCHITECTS & STUDIES (3); OLMO PEETERS (OPPOSITE, BOTTOM)

HANGING OUT
A large hammock (right) woven from sisal grown on the site, accessed by ladder, animates the library and provides a fun place where kids can curl up with a book. The single room steps down a few feet in the front to create book shelves and reading terraces (below).





James F. Battin U.S. Courthouse – Billings, MT
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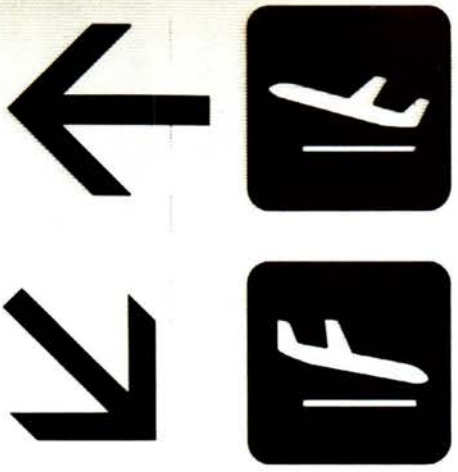
CIVIC DESIGN



Even in this post-recession era of continued government belt-tightening, civic buildings have an important role to play in fostering a sense of community. Using design, cities and towns have created inventive and engaging environments that attract diverse groups of people. The seven projects shown in the following pages demonstrate awareness of budget constraints but also assert architecture's role in creating significant public places. From an airport in northern Canada to a fire station in coastal Texas to a branch library in southern California, the structures featured here show a range of practical and symbolic solutions to shifting programmatic needs. In the past, such buildings established their civic credentials through monumental and formal design. Now a new generation of public architecture is asserting its importance by emphasizing transparency and accessibility.

PHOTOGRAPHY: © EMA PETER

FORT MCMURRAY INTERNATIONAL AIRPORT, ALBERTA

Pico Branch Library | Santa Monica, California
Koning Eizenberg

FOOD FOR THOUGHT

An inventive new library, in a park with a greenmarket, aims to be a beacon for a challenged community.

BY SARAH AMELAR

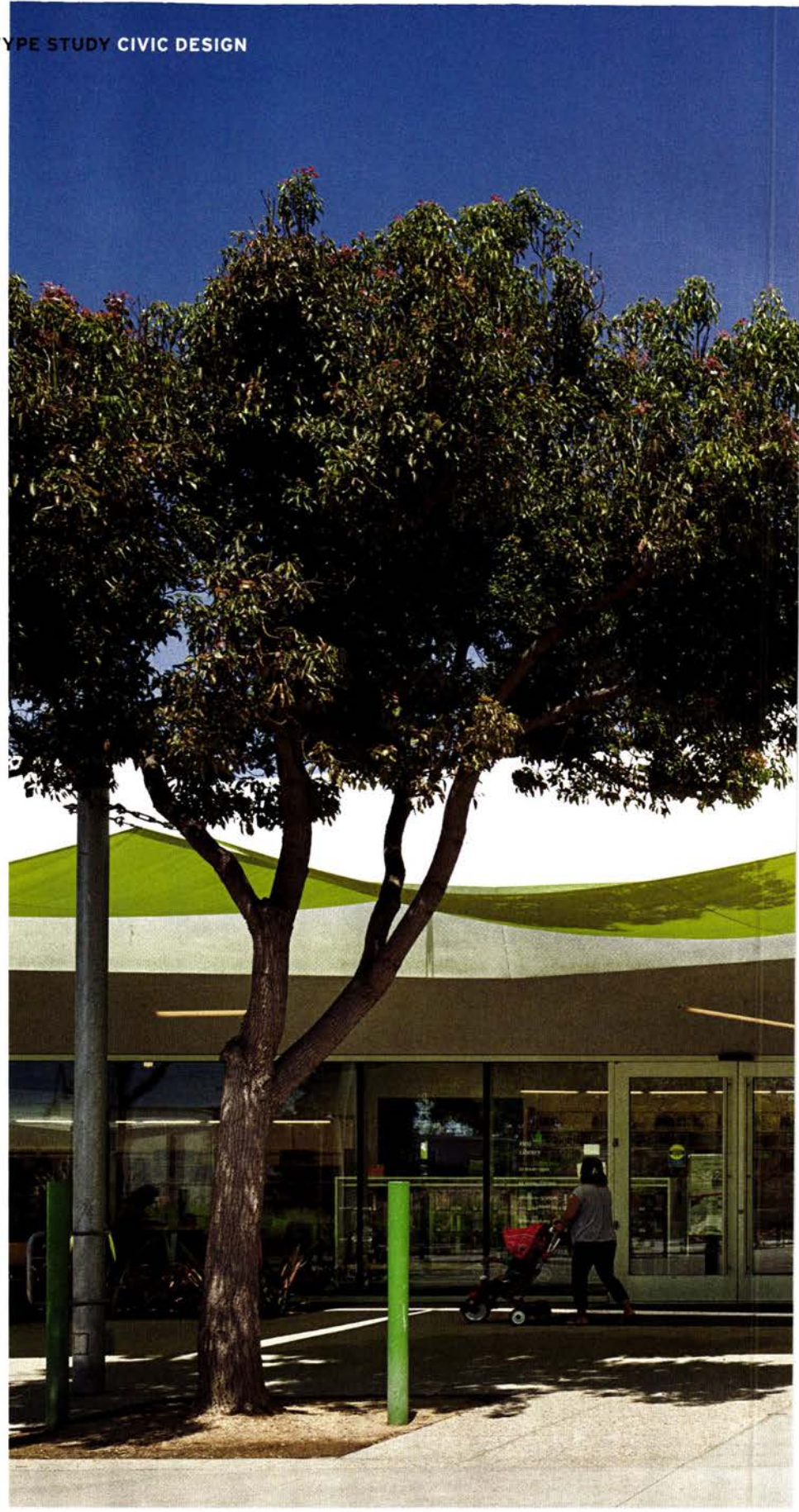
PHOTOGRAPHY BY ERIC STAUDENMAIER

The Pico Branch Library, a recent work by Koning Eizenberg (KE), is the first new public library branch in Santa Monica, California, in nearly 60 years. Its modest predecessor, originally a storefront operation, left the Pico area in 1956, creating what many locals considered a growing void. But by the time Santa Monica addressed that need, decades of transformative digital technologies, as well as neighborhood changes, made the project an unexpected opportunity: a chance to rethink what a 21st-century library could be—particularly as it relates to this community's distinctive character.

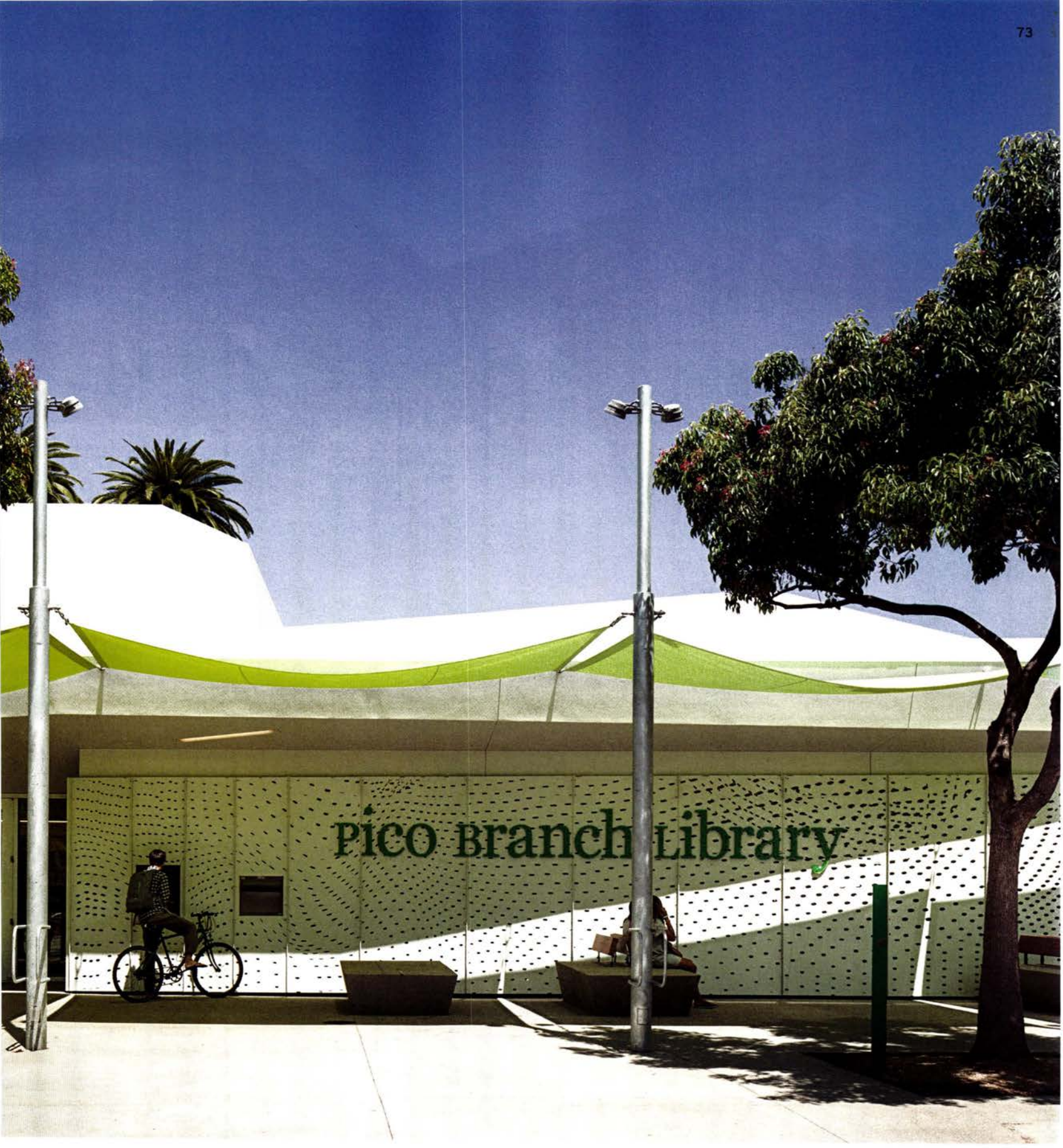
Set within the 9.5-acre Virginia Avenue Park, the site lies "at the heart of an underachieving area with the lowest high school performance in the city," says KE principal Julie Eizenberg. "Clearly, this library needed to reengage the community." The broad challenges were already familiar to her firm, which had created the park in 2006, with landscape architects Spurlock Poirier. Not merely a venue for recreation and a weekly farmers' market, their green space offered common ground for neighborhood pockets of contrasting urban densities, housing typologies, and ethnicities (among them Latino, African-American, and Japanese).

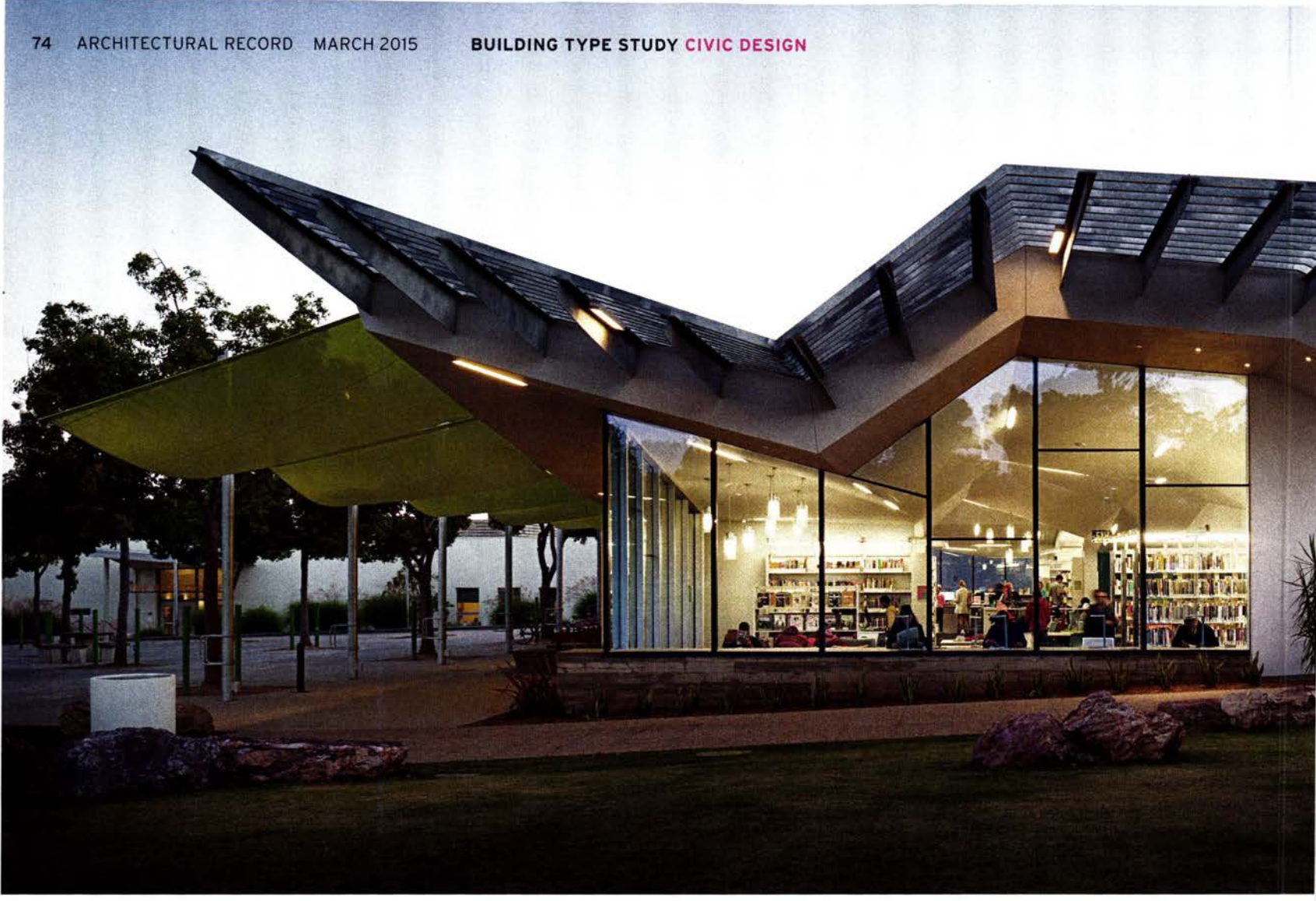
"Creating this library was a very community-driven process," says Eizenberg. Through a series of open public meetings, supplemented by a survey, the city sought neighborhood input on the programming, design, and precise location. Naturally, viewpoints diverged.

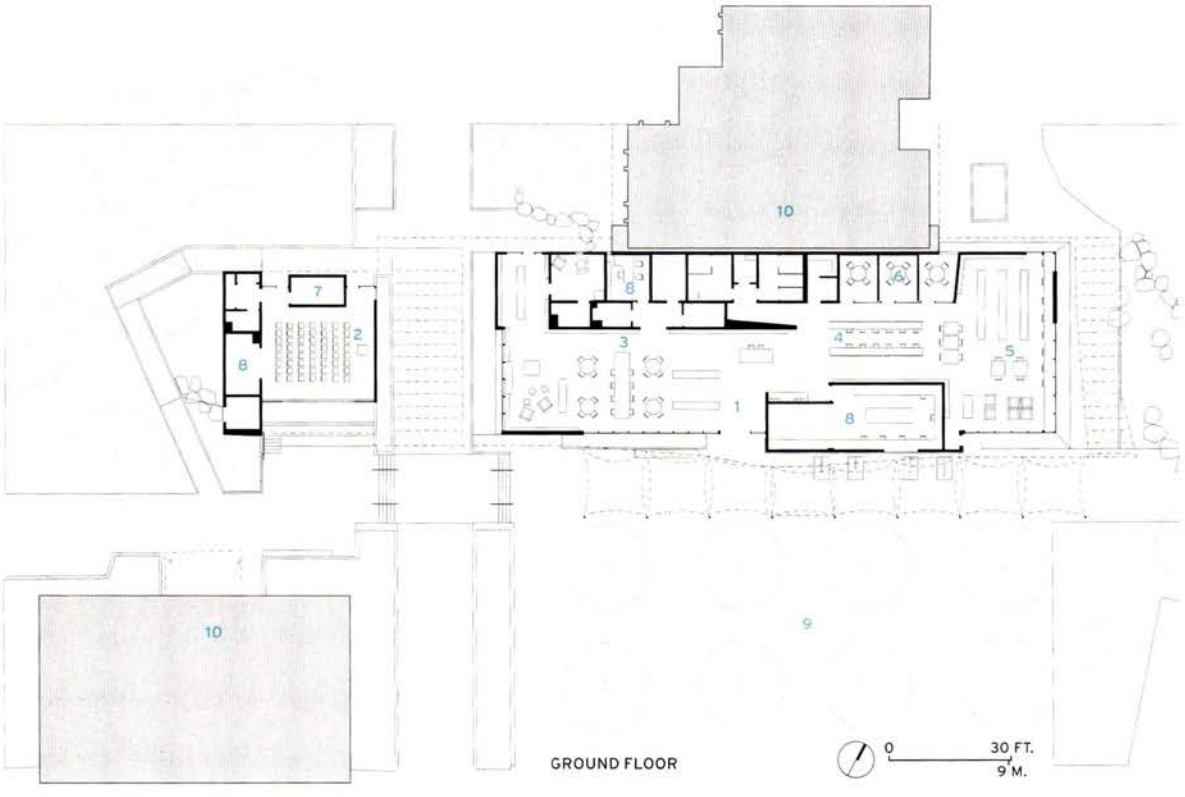
There were appeals to make the design "culturally specific to a particular group," recalls KE principal Nathan Bishop, "but we convinced them that a culturally universal approach



PUBLIC DOMAIN The facade's perforated-metal paneling derives its pattern from a topography map of the park. Inviting views out but not in, these screens veil the staff room and automated book-sorting system. Portals similar to ATMs allow for easy book return. Steel poles out front support canvas canopies, lighting, and bike racks.


Pico Branch Library

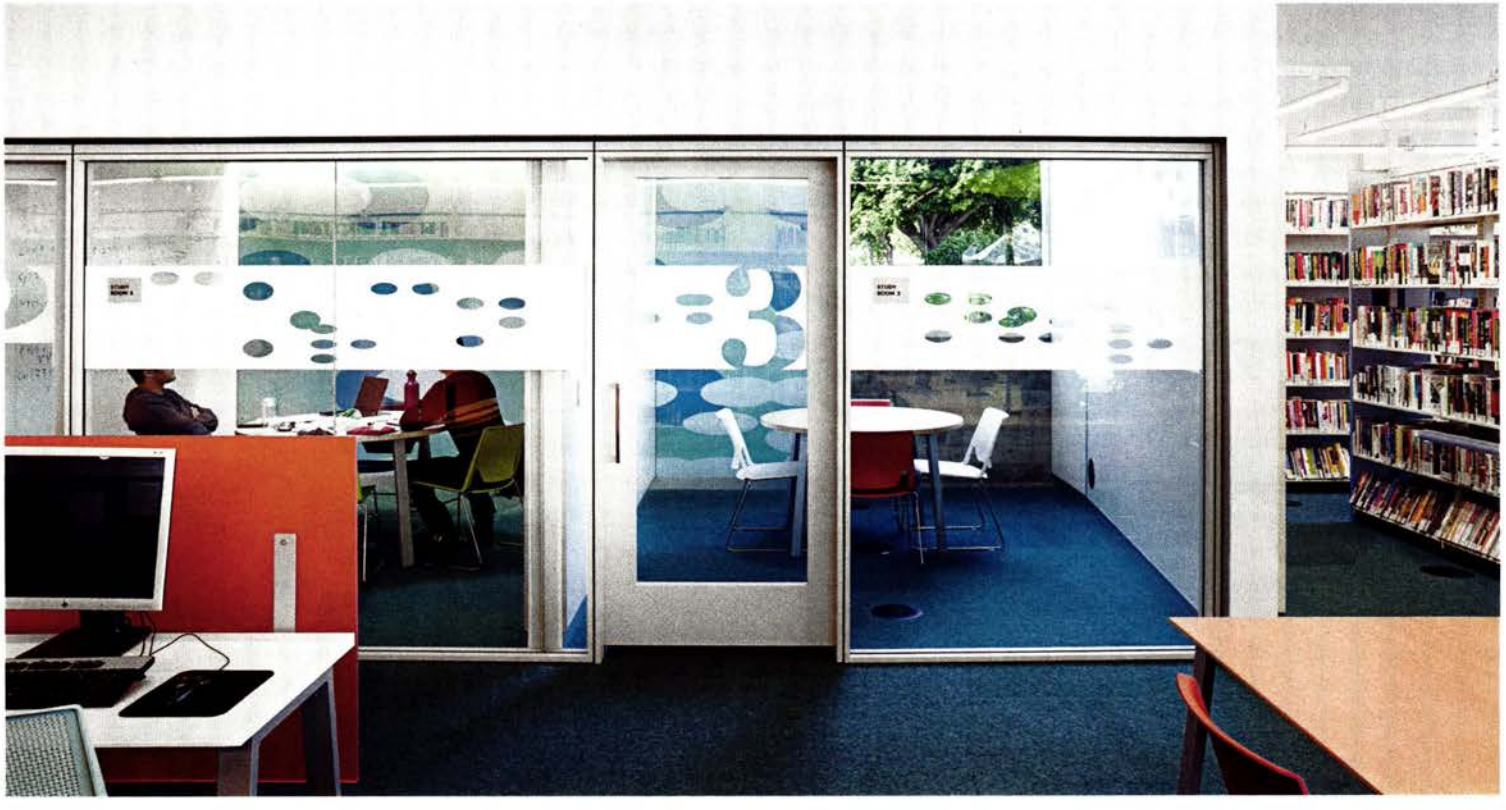




GROUND FLOOR

OPEN ACCESS Deep overhangs, trellises, and awnings shade the reading room, allowing for expanses of glass that open the interior to daylight and immersive park views (above). Clerestory light scoops punctuate the sculptural ceiling (opposite, top). A PV-studded trellis connects the library to its freestanding community room (opposite, bottom).

1 ENTRY
2 COMMUNITY ROOM
3 CHILDREN'S LIBRARY
4 COMPUTER COMMONS
5 LOUNGE
6 GROUP STUDY ROOM
7 KITCHEN
8 STAFF/SUPPORT
9 FARMERS MARKET PLAZA
10 PRE-EXISTING BUILDING



MAKING CONNECTIONS Through glassy facades, the Pico Branch engages both the wooded park and weekly farmers' market. Here, the architects' green awnings echo the vendors' tent-like stalls (opposite, top). The library's side chambers provide group-study or meeting venues for its patrons (opposite, bottom). The reading room's faceted ceiling of noise-deflecting plaster is embedded with LED lighting (right).

would be more inclusive, encouraging all different people to take on the library as their own."

Even the siting within the park was a point of debate. The city initially favored a prominent position on the boulevard bordering the park, but the architects made a persuasive case for a pavilion-like library near its center. "Not building along an edge," Bishop points out, "meant not privileging one neighborhood over another."

Visually light and transparent, the resulting 8,700-square-foot "park pavilion" has the openness of a community living room. From outside, its exuberantly curvy roof edge and fluttering apple-green canopy are a tip-off: this is no stifling, rule-ridden library. Inside, a single reading room extends from children's to adults' areas, under a sculptural, faceted ceiling. Its rolling peaks and occasional daylight scoops punctuate key spots such as the entry area. With all the airflow ducts tucked beneath a raised floor, and round vents underfoot, the ceiling is free for pure expressive form (integrating only sprinklers and flush LED lighting.)

Expanses of glass across the steel moment-frame building evoke the open-air feeling of a park gazebo—yet no blinds are necessary. Deep, stuccoed eaves, continuous with the ceiling planes, provide all-day shading. The facets overhead, lined in acoustic-absorbent plaster, deflect and dampen noise, achieving remarkable quiet even amid abundant activity. "Particularly with municipal projects," says Eizenberg, "you have to be inventive about getting each element to perform multiple roles."

In front of the $9.7 million facility, galvanized-steel poles support the canvas canopy while integrating outdoor lighting, plus custom bike racks. And the roofline undulations are not merely eye-catching: they harvest rainwater for the library's toilets.

The project, which includes a freestanding 1,200-square-foot community room, is on track for LEED Platinum certification. Though a fire road separates the two structures, a steel trellis connects them overhead, checkered with PV panels that generate the complex's electricity.

Beyond sustainability (and the ubiquity of computers and electronic offerings), the library's most 21st-century aspect is the absence of a circulation desk. An automated book-sorting system—a big budget item, at $187,000—innovatively frees up librarians to roam the reading room and interact with visitors. A modest information podium, supplanting the traditional hierarchy of a bulky circulation desk, trades old-school rigidity for a more laid-back atmosphere. With ATM-like portals, the sorting system relies on self-checkouts and returns, minimizing staff input.

Since opening last spring, the Pico Branch has logged over 100,000 borrowed items, with more than 84,000 visits and nearly 1,200 new library cards issued.

"I don't know how much credit we can take for this," says Eizenberg, "but we love hearing about families coming for the entire day for park-and-library outings—or the kid who just doesn't want to leave." ■

credits

ARCHITECT: Koning Eizenberg – Julie Eizenberg, Nathan Bishop, principals in charge; Nathan Bishop, design principal; Jennifer Rios, project manager; Paul Miller, project architect; Hank Koning, Jesse Baiata-Nicolai, Gina Grillo, project team

ENGINEERS: Thornton Tomasetti (structural); KPFF (civil); Glumac (m/e/p); GeoDesign (geotechnical)

CONSULTANTS: Spurlock Poirier (landscape); Lighting Design Alliance (lighting); Veneklasen Associates (acoustical, AV/low-voltage)

GENERAL CONTRACTOR: R.C. Construction Services

CLIENT: City of Santa Monica

SIZE: 8,700 square feet

CONSTRUCTION COST: $7.2 million

PROJECT COST: $9.7 million

COMPLETION DATE: April 2014

SOURCES

STEEL: Dragon Steel

CLADDING: Angelus Block (masonry); Hendrick Architectural Products (metal panels); Arcadia (storefront)

GLAZING: PPG (glass); VELUX (skylights); Solatube (tubular skylights)

LIGHTING: Axis, Lightolier, Louis Poulsen, Pinnacle, Vode, Lumenpulse, Lumascape, Bega, Lithonia

ACOUSTICAL PLASTER CEILING: Pyrok

Mons International Congress Xperience | Mons, Belgium | Studio Libeskind/H2a Architecte & Associés

NEW SPIN FOR AN OLD TOWN

A city in Belgium aspires to make it onto Europe's cultural map with an energetic building that ramps up the architectural volume.

BY HUGH PEARMAN

Once a medieval city on a hill in the French-speaking part of Belgium, Mons later became a center of heavy industry. Now it wants to reinvent itself as a visitor destination and business hub. The grandly named Mons International Congress Xperience (MICX) by Studio Libeskind and H2a Architecte & Associés is a visually striking statement of intent for the city's business community.

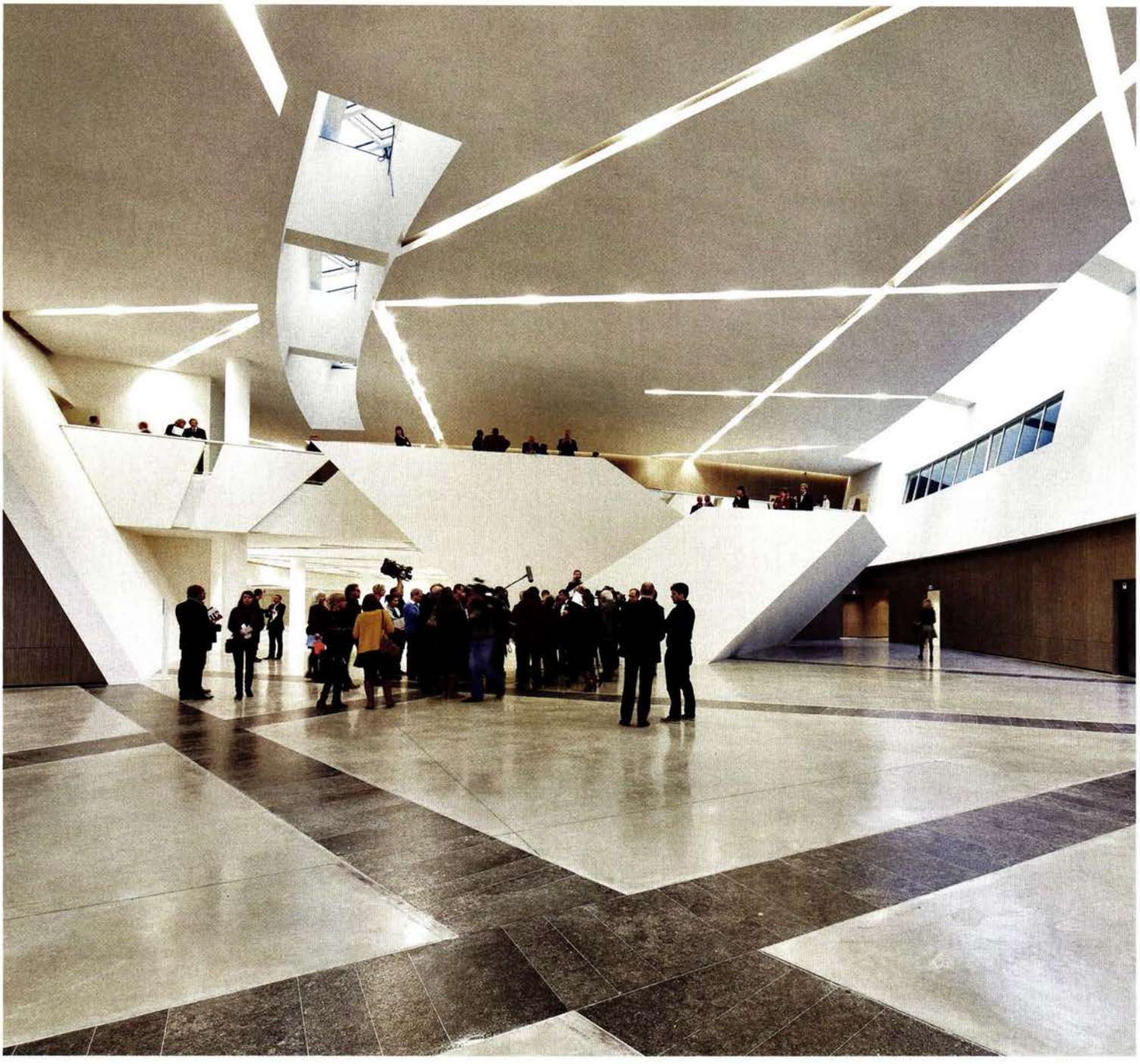
Throughout 2015, Mons will be a European Capital of Culture, along with Pilsen in the Czech Republic. The program's aim is to stage events, open or improve cultural buildings, and generally throw a spotlight on urban regeneration. Several building projects that Mons had planned, such as new and refurbished

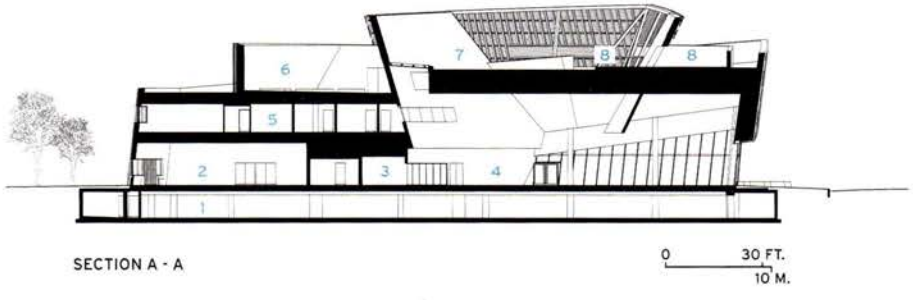
PHOTOGRAPHY: © HUFTON+CROW, EXCEPT AS NOTED

museums, are delayed, while the main gateway to the city, a rail station designed by Santiago Calatrava, has barely started on-site. But the MICX opened bang on time in early January, following a 2010 design competition and a construction start in June 2012.

For Daniel Libeskind, this is a relatively low-budget, generic building type familiar in most cities: the conference center. It's the usual mix of auditoria, meeting rooms, large foyers and events space. But nobody hires Libeskind to produce a dumb box—certainly not a city wanting to draw attention to itself. The mayor of Mons, former Belgian Prime Minister Elio di Rupo, wanted a landmark to start the regeneration of the postindustrial land between the railway and the River Haine, overlooked by the old city. Libeskind duly tossed out some vigorous shapes. The form of the concrete-framed building is expressed as two interlocking spirals—one clad in widely spaced timber strakes over a black waterproof membrane, the other in pale bronze aluminium slats of the same dimensions. The curving forms swoosh past and through each other, the aluminium one

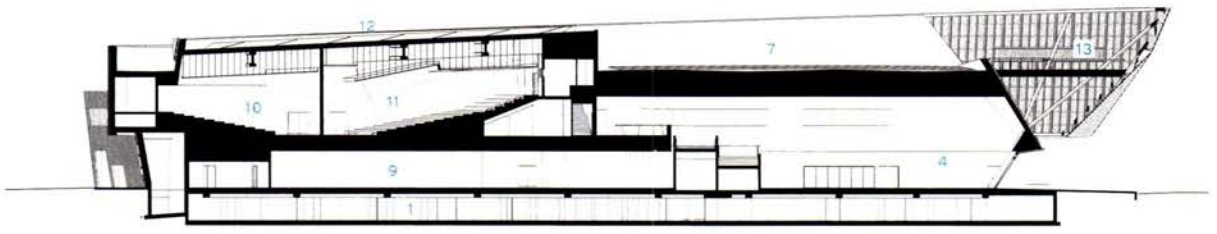
DOUBLE DOWN
A pair of intersecting spirals form the body of the 135,000-square-foot building with one clad in wood slats, the other in metal (above). The wood spiral tilts up at one corner to reveal the main entrance and plaza (opposite).





SECTION A - A

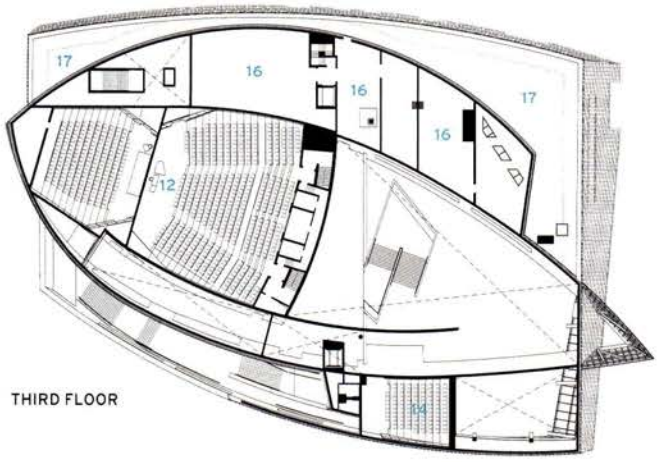
1 PARKING
2 EVENT SPACE
3 RETAIL
4 FORUM (EXHIBITION SPACE)
5 MEETING ROOM
6 MECHANICAL
7 GREEN ROOF
8 PUBLIC TERRACE
9 RESTAURANT/FLEX SPACE
10 AUDITORIUM (200 SEATS)
11 AUDITORIUM (500 SEATS)
12 SOLAR ROOF
13 BELVEDERE



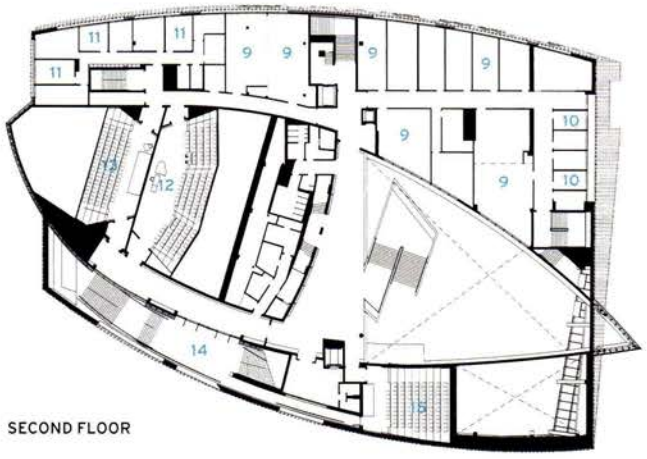
SECTION B - B

0 30 FT.
10 M.

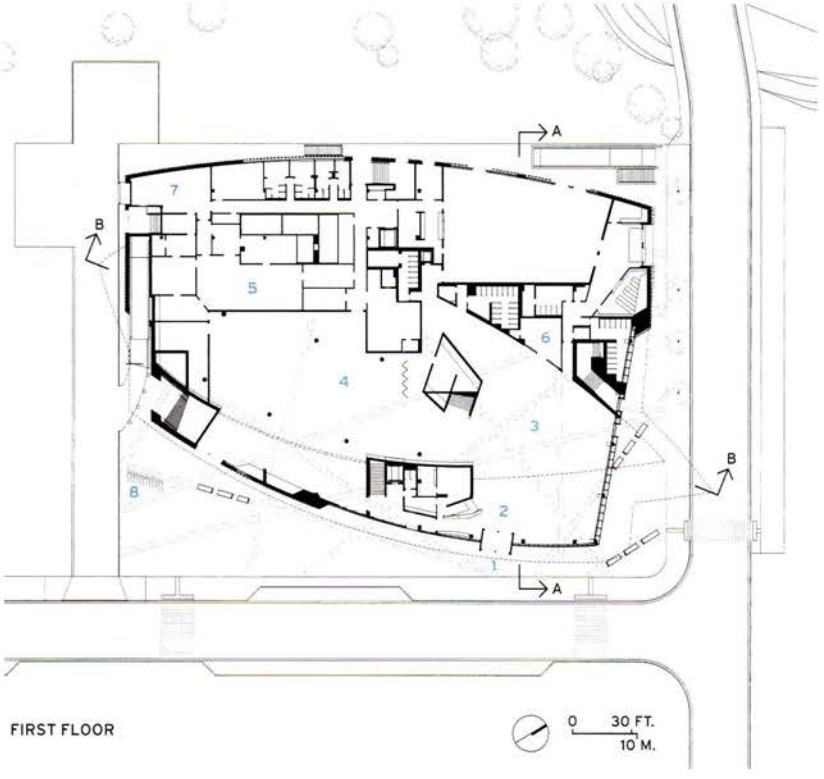
SEE AND BE SEEN
The architects designed the main lobby (opposite) as a large, flexible space that could be used in part for exhibitions and dining as well as congregating. A large sculptural stair in the lobby has a landing (above) where people can gather and take in the scene below.



THIRD FLOOR



SECOND FLOOR



FIRST FLOOR

credits

ARCHITECT: Studio Libeskind/ H2a Architecte & Associés – Daniel Libeskind, principal architect; Stefan Blach, principal in charge; Johan van Lierop, project architect; Pascal Daspremont, H2a partner in charge; Maciej Kowalczyk, H2a architect

ENGINEERS: Ney + Partners (structural); Putman (electrical); Energys Belgique (mechanical); Somec Marine & Architectural Envelopes (facades)

CONSULTANTS: Venac Bureau d'Études (acoustical); Neo&Ides (environmental)

GENERAL CONTRACTOR: CIT Blaton/Galère

CLIENT: City of Mons

SIZE: 135,000 square feet

CONSTRUCTION COST: $25 million

PROJECT COST: $30.6 million

COMPLETION DATE: January 2015

SOURCES

STEEL (IN PROW): WP Steel BE

CURTAIN WALL: Reynaers Aluminum

GLASS: TVITEC

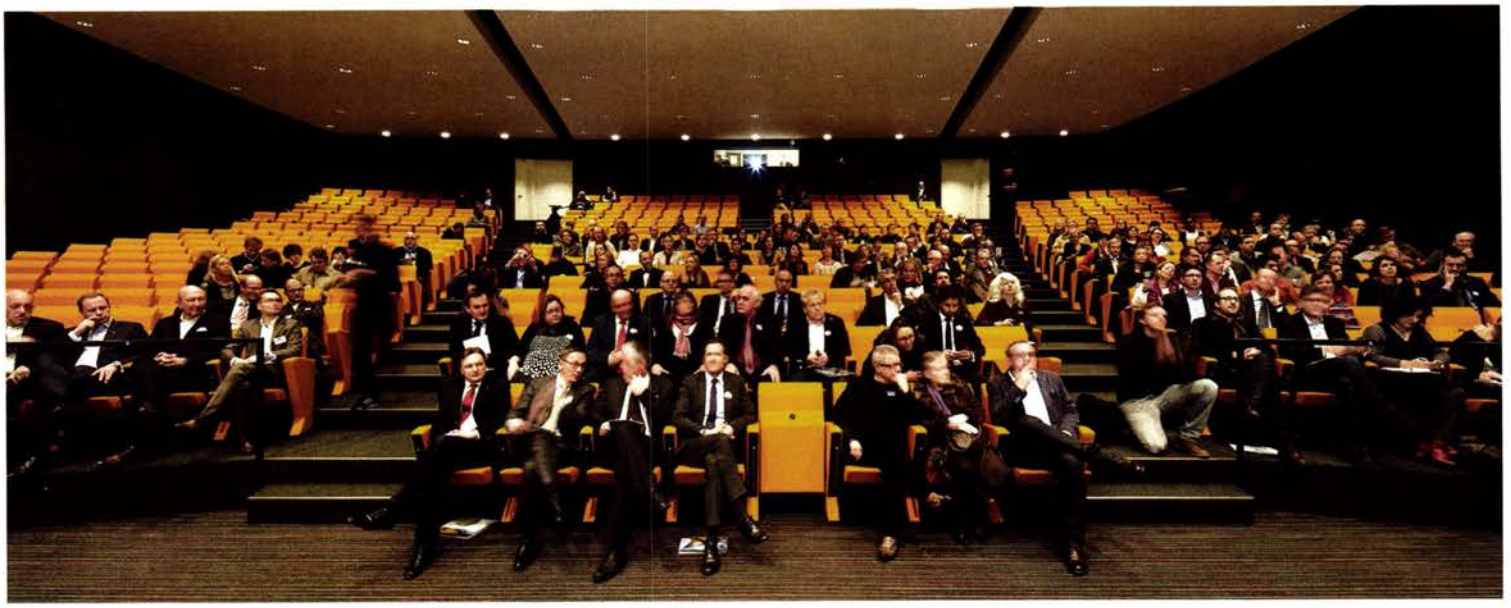
CARPET: Modulyss

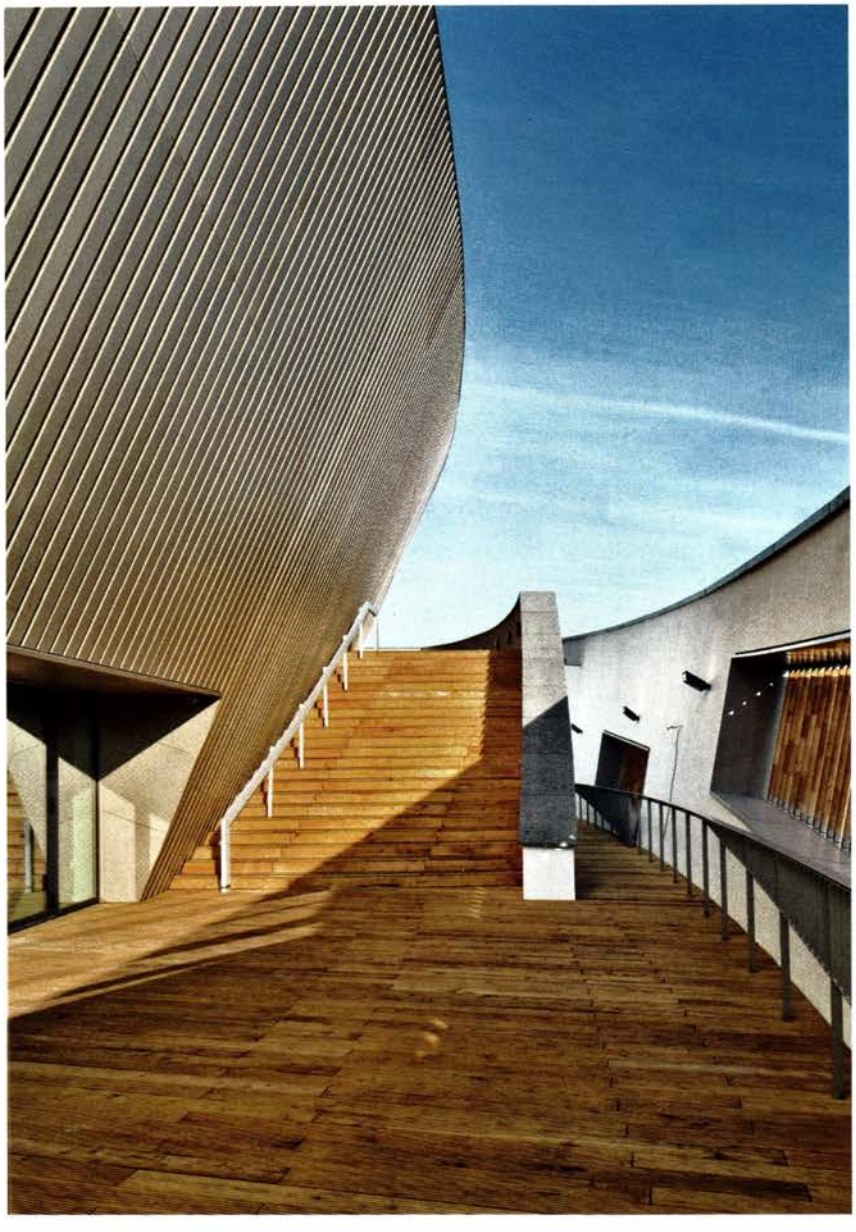
culminating in a familiar Libeskind motif, the caged viewing platform.

At the MICX opening, Libeskind was at pains to point out the tight constraints of the project. He wasn't making excuses; on the contrary, he seemed proud of the fact that his kind of architecture can work on a municipal budget. "It's a public building–we had to be wise with the resources we had," he said. "In a design-build project, you have to be very flexible." Construction costs came to $25 million for a three-level building totaling 135,000 square feet, with a parking garage beneath. A green roof, 1,725 square feet of photovoltaic cells, a geothermal heating system, lots of insulation, and, when the time comes, a direct pedestrian link to Calatrava's rail station have helped the conference center achieve Belgium's B Valideo status, the equivalent of LEED Gold.

For Libeskind, creating promenade spaces—both indoors and out—was an important way of adding value to the project and making it more attractive for the people attending events there. "It's good to have people dominating the building, rather than the building dominating the people," he remarked. Consequently, he brought plenty of daylight into the entrance lobby, made it huge, and complemented it with a showpiece stair, a piece of architecture in itself, with a spacious half-landing intended for hanging out. Breakout areas where people can socialize continue on the outside of the building—on timber-decked terraces with views across to

1 ENTRANCE
2 ENTRANCE HALL
3 FORUM (EXHIBITION SPACE)
4 RESTAURANT/FLEX SPACE
5 KITCHEN
6 RETAIL
7 LOADING DOCK
8 BICYCLE RACKS
9 MEETING ROOM
10 OFFICE
11 ADMINISTRATION
12 AUDITORIUM (500 SEATS)
13 AUDITORIUM (200 SEATS)
14 PUBLIC TERRACE
15 AUDITORIUM (100 SEATS)
16 PLANT ROOM
17 GREEN ROOF





MULTIPLEX The conference center includes three different auditoria, seating 100, 200, and 500 people. Libeskind sits in the front row (third from right) of the largest hall at the building's opening (above). Generous breakout spaces indoors and out create a better experience for people attending events in the complex. For example, a public terrace (right) on the second floor lets people enjoy some fresh air and leads up to a viewing platform on the prow of the building.

Mons's historic baroque belfry building and an outdoor ramp up to the green roof and the viewing platform on the prow.

Metal-mesh grating underfoot on the viewing platform (or belvedere) means you can see right down to the ground outside the building, not that there is anything to see. Apart from picking up the various key views and acting as a hinge-point between the old city and the planned new urban extension beyond, there is no particular rationale to the shape. This prow—unlike the similar latticework prow of Libeskind's Military History Museum in Dresden (RECORD, January 2012, page 56)—seems to point to nothing in particular. As the architect's practice principal Stefan Blach said, "People always expect from Daniel that everything must have a specific philosophical background. It does not have to be that way."

Studio Libeskind spent money at key points in the building—for instance, on the excellent auditorium seating, designed by the firm with an Art Deco touch, and made with an orange fabric, and on the local bluestone, familiar from the street paving in many a Belgian city, used here on the main stairs and in the geometric cross-hatching of the polished concrete floors in common areas. In contrast, meeting rooms are very plain.

MICX is by no means a first-rank Libeskind building. If this were fashion, you might call it a bridge line. But that's okay, because there is a hierarchy to all buildings, and a good architect should work at all price points. The detailing may not be exquisite and the external form distinctly willful, but this is honest, not cynical architecture. In global terms, it's no Guggenheim Bilbao. But bookings for events are flooding in, and, for Mons, that may be enough. ■

Hugh Pearman is the architecture critic of The Sunday Times, *London, and editor of the* RIBA Journal.

PHOTOGRAPHY: © CCM GEORGES DE KINDER (BOTTOM)

Halifax Central Library | Nova Scotia | Schmidt Hammer Lassen and Fowler Bauld & Mitchell

IT ALL STACKS UP

A vibrant new library emphasizes connections within its walls and out to the city, fast becoming a much-needed community nexus.

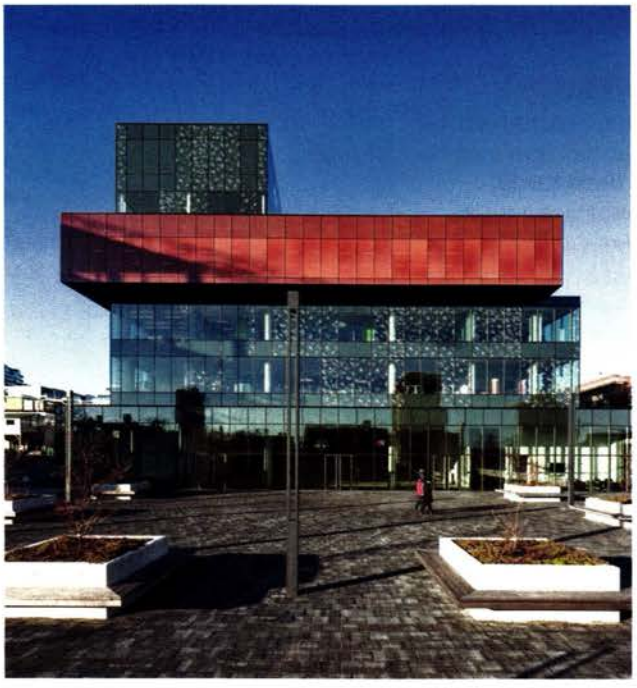
BY BETH BROOME

PHOTOGRAPHY BY ADAM MØRK

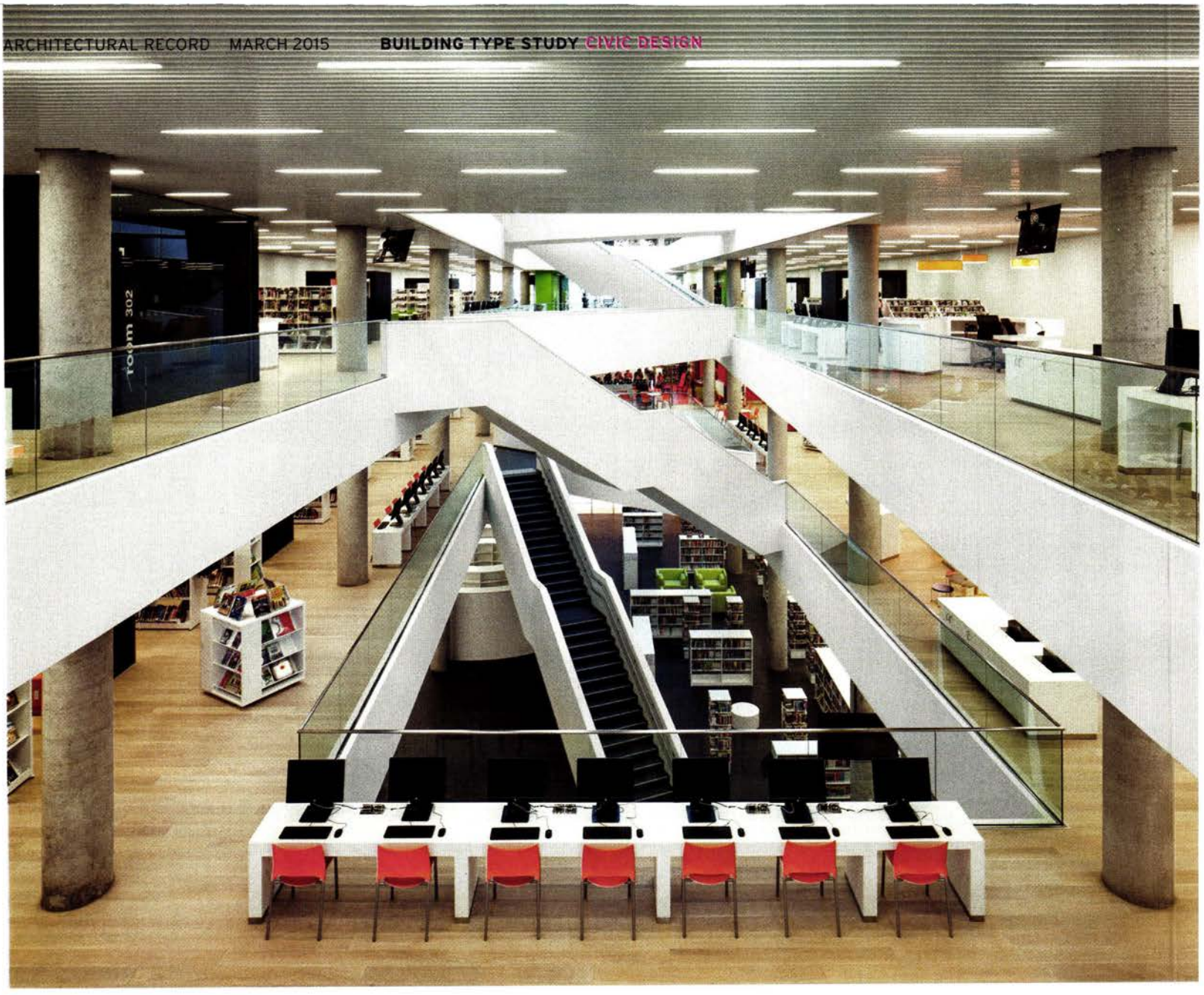
For a little city, Halifax, the capital of the province of Nova Scotia, has no shortage of bragging rights. The biggest urban area in Atlantic Canada with a large and strategically located harbor, it is a major economic center for the region—fueled by port commerce, shipbuilding, government services, and higher education, among other industries. Nevertheless, in recent years, there has been a dearth of civic investment in this city of 400,000. So the opening in December of the new Halifax Central Library, a syncopated stack of glass boxes designed by Danish firm Schmidt Hammer Lassen (SHL), with Fowler Bauld & Mitchell (FBM) as executive architects, has been a big deal for the people here.

The former facility, the 38,000-square-foot Spring Garden Road Memorial Library (now empty), catty-corner to the new library, dates to 1951 and was deemed inadequate in almost every way, from obsolete systems to limited accessibility. Various studies pointed to the need for new municipal facilities in the urban core. "A clear vision emerged," says Judith Hare, the CEO of Halifax Public Libraries from 1996 to 2013. "The public wanted a civic landmark that would contribute to the economic well-being of downtown—an accessible, adaptable

BALANCING ACT
Built on a former parking lot, the library comprises five canted boxes. The top volume cantilevers out to the north (opposite and above), emphasizing the main entry below it. Desire lines toward an adjacent street and footpath run on a diagonal and are expressed in the paving. Viewed from the south (right), a 40 percent ceramic dot frit renders the fourth level orange; a frit of random white letters forms abstracted leaf patterns on other levels.



Watch a video at architecturalrecord.com.



credits

ARCHITECT: Schmidt Hammer Lassen Architects – Morten Schmidt, founding partner; Chris Hardie, partner

EXECUTIVE ARCHITECT AND PRIME CONSULTANT: Fowler Bauld & Mitchell – George Cotaras, president and general manager; Wayne Duncan, vice president

ENGINEERS: SNC Lavalin, Arup, CBCL

CLIENT: Halifax Regional Municipality/Halifax Public Libraries

SIZE: 130,000 square feet

CONSTRUCTION COST: $35 million

PROJECT COST: $46 million

COMPLETION DATE: November 2014

SOURCES

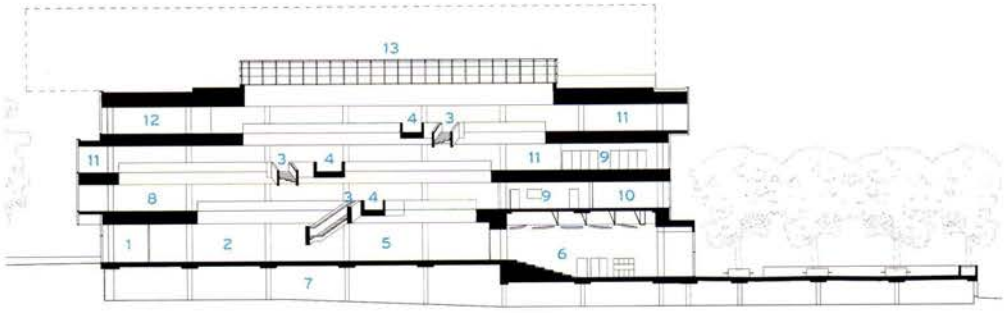
CURTAIN WALL: Schüco, Prelco

METAL WALL SYSTEM/ SOFFITS: Vicwest, Alcotex

GYPSUM BOARD: CertainTeed, Georgia-Pacific

CEILINGS: CertainTeed, Armstrong, Owens Corning

1 ENTRY
2 LOBBY
3 ATRIUM STAIR
4 ATRIUM BRIDGE
5 BOOK PICKUP
6 PERFORMANCE SPACE
7 PARKING
8 TEEN STUDY
9 PROGRAM ROOM
10 FAMILY/CHILDREN
11 COLLECTION/STUDY
12 LOCAL HISTORY
13 SKYLIGHT

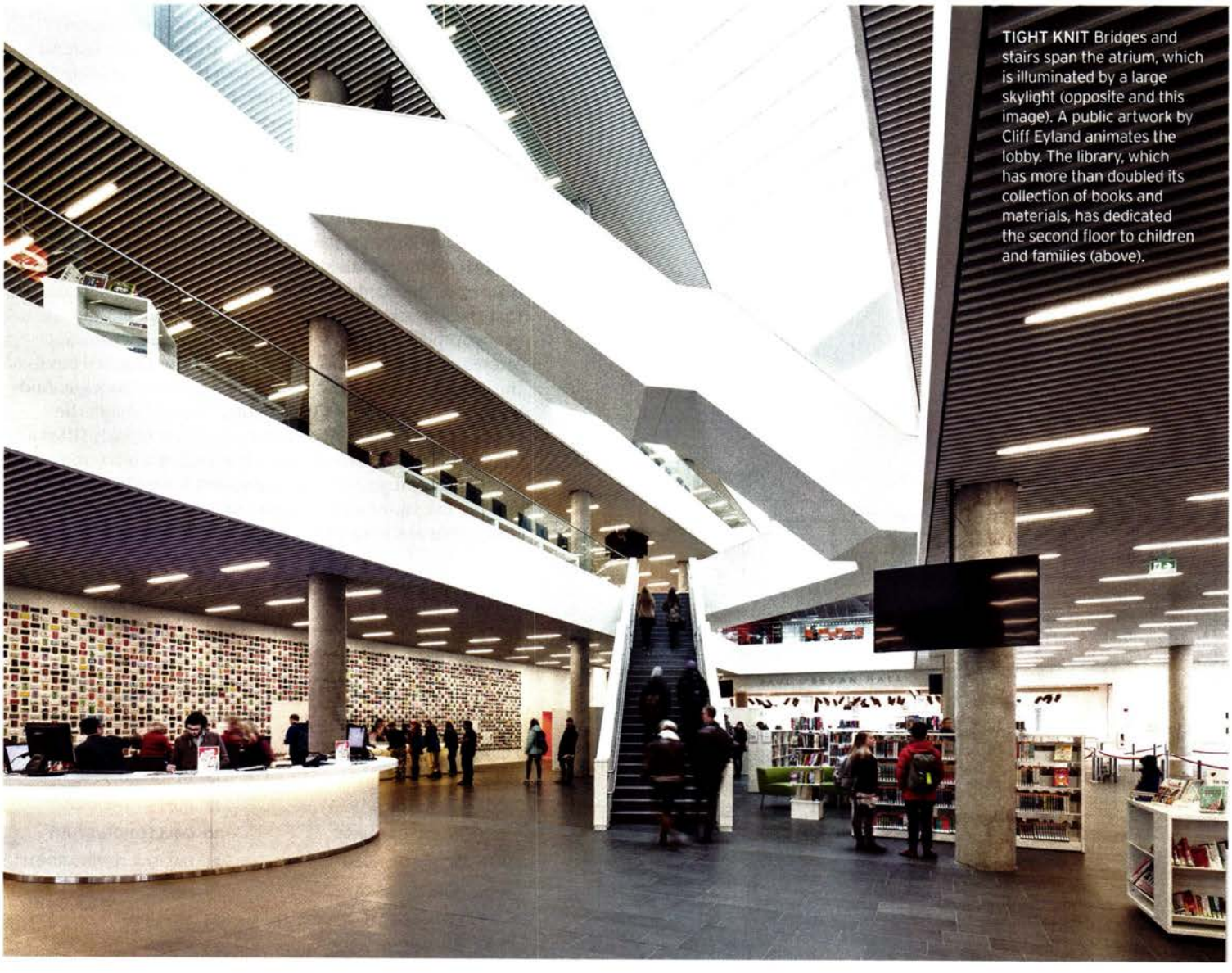


SECTION A - A

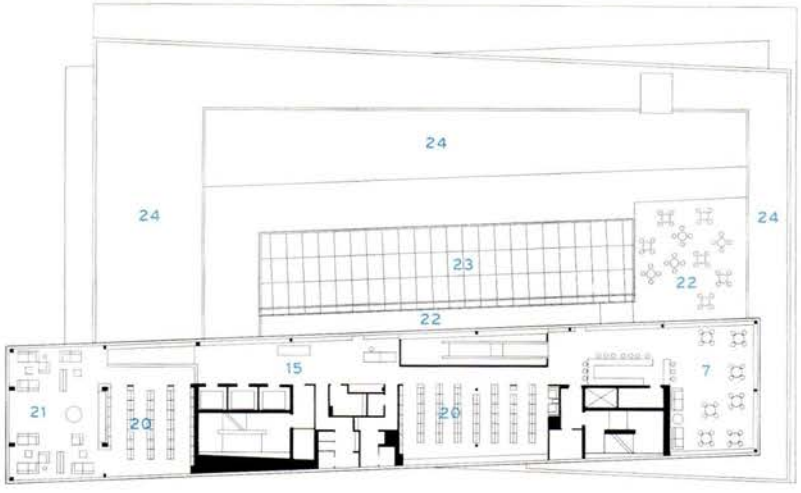
0 30 FT.
10 M.

resource center that would continue to meet future needs." SHL and FBM were selected from a short list in 2010. Meanwhile, an extensive series of public forums helped shape the design as it developed. The significance of this facility cannot be overstated. "No recent public development comes close to the scale and importance of the library," says Hare.

The 130,000-square-foot building reads as an assemblage of five volumes atop one another, each slightly cranked on a bias. Shaped by public input, the design also responds to its context. Rather than bringing the library right up to the edge of Spring Garden Road—a main shopping thoroughfare—the architects pushed it back, creating a public plaza and aligning the main facade with Dalhousie University's 1908 academic building next door. Then they pulled out the top floor as a cantilever, which nods to Halifax's maritime heritage by pointing to Citadel Hill and its historic fort to the north, with the volume's other end oriented toward the harbor, to the south. The twisting of the boxes is informed by the adjacent Queen Street and a pedestrian path. Both routes run on a diagonal, and their meeting point, if they

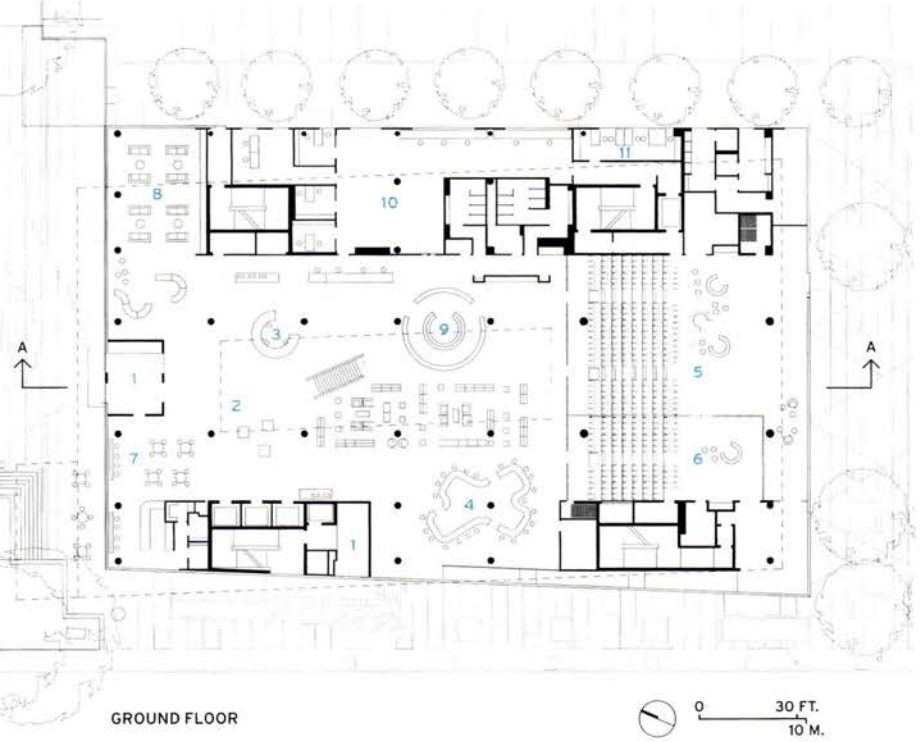


TIGHT KNIT Bridges and stairs span the atrium, which is illuminated by a large skylight (opposite and this image). A public artwork by Cliff Eyland animates the lobby. The library, which has more than doubled its collection of books and materials, has dedicated the second floor to children and families (above).



FIFTH FLOOR

SECOND FLOOR



GROUND FLOOR

0 30 FT.
10 M.

continued, would be at the site. "Many see the building as referring to a stack of books," says Morten Schmidt, founding partner of SHL. "It's a good reference, but the form has more to do with the urban grid and these crossed lines."

The building, which is targeting LEED Gold, employs green roofs, rainwater harvesting, and a heat-recovery system in combination with chilled beams and slabs. By making a thermally tight envelope with super-insulated glass spandrel panels, the architects were able to use vision glass for 47 percent of the curtain wall, connecting the inside to the active street life, points out FBM president George Cotaras. The glazing creates a coherent surface across the library, which is punctuated by an orange volume colored by a ceramic dot frit. Abundant daylight floods in from a skylight atop the fourth level and through the north and south elevations down into a dramatic atrium—spanned by zigzagging stairs—that visually connects the various programmed spaces. With this transparency, light, and clear circulation and sight lines, says Schmidt, "We brought the same approach we use for projects in Scandinavia. We call it democratic architecture: creating a sense of openness, inviting everyone into the building and letting them feel they own it."

With the trend of libraries' functioning as community centers as well as places of scholarship, the Halifax Central Library has a range of facilities—from cafés to recording studios, learning labs, and booth-like pods nestled among the book shelves. And it offers everything from cooking classes to 3-D printing and English as a Second Language workshops.

On a bright January morning, the library buzzed: toddlers and caregivers came for a drop-in, students camped out with laptops and coffee, and a group of seniors from nearby Faith Tabernacle Church rested in the lobby's reading lounge. English teacher Sarah MacVicar had brought her junior high class from Musquodoboit Harbour, 30 miles away. Remarking that the kids did not often get to the city, she said she brought them "hoping to open their minds to what can be offered at a library." Clean-lined and welcoming, the building combines a lot of program in one cohesive package. And with a strong sense of connectedness, both through the interiors and to the surrounding city, it has quickly filled a void as a vital community hub. "It's not just a place you go to read books and get literacy," points out Schmidt. "It's where you can use your hands, engage with art, music—all these things that are so important for a modern human being." ■

1 ENTRY
2 LOBBY
3 HELP DESK/INFORMATION
4 ELECTRONIC BROWSING
5 PERFORMANCE SPACE
6 PROGRAM ROOM
7 CAFÉ
8 READING LOUNGE
9 BOOKS ON HOLD
10 SORTING AREA
11 OFFICE/STAFF
12 PRESCHOOL AREA
13 FAMILY/CHILDREN
14 TEEN STUDY
15 SELF CHECKOUT
16 ACTIVE VIDEO GAMES
17 MUSIC LAB/STUDIO
18 WORKSHOP/STUDY
19 PUPPET THEATER
20 COLLECTION/STUDY
21 HALIFAX "LIVING ROOM"
22 HARBOUR VIEW TERRACE
23 SKYLIGHT
24 GREEN ROOF

TOP OF THE HUB
Dubbed "Halifax's Living Room," the 23-foot-high space within the building's top-floor cantilever serves as a daylight-drenched lounge where people come to read or take in their city from a novel vantage point (above). A 300-seat flexible performance space (left and far left) can accommodate all manner of gatherings.

Anaheim Regional Transportation Intermodal Center | Anaheim, California | HOK

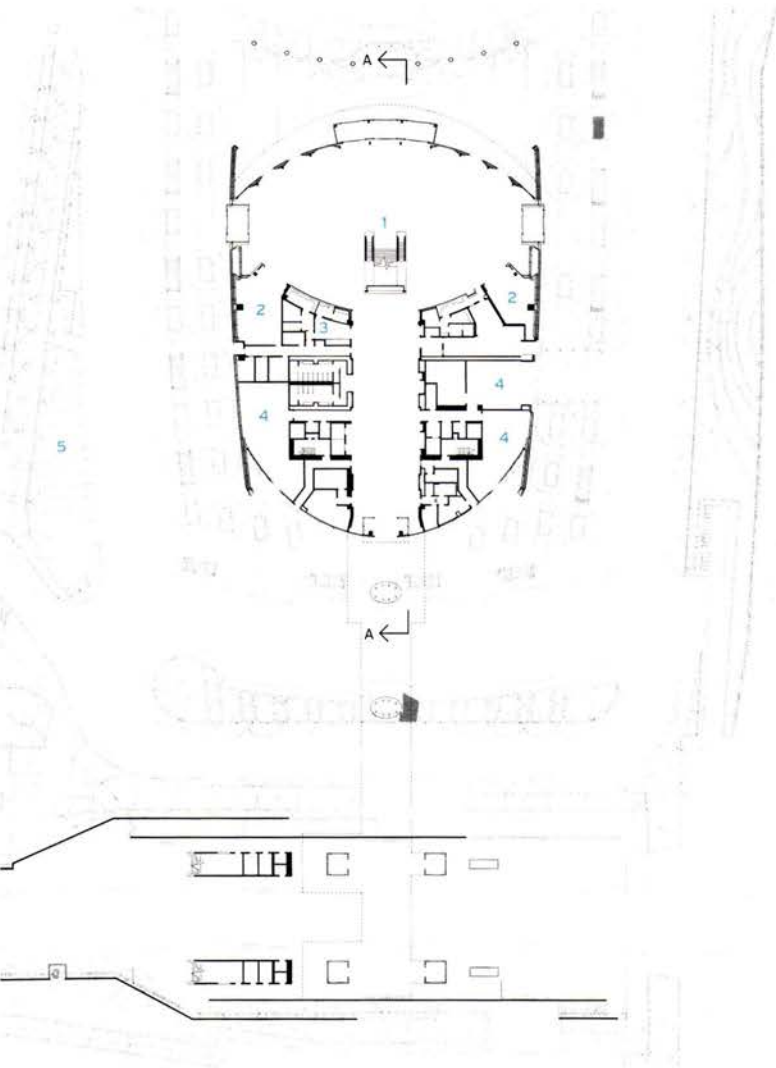
TRANSPORTATION BUBBLE

A competition-winning design leads to an iconic structure built to launch an automobile-centric Southern California city into a new age of public transportation.

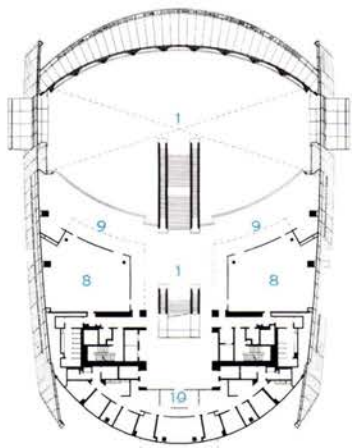
BY RUSSELL FORTMEYER

PHOTOGRAPHY BY JOHN LINDEN

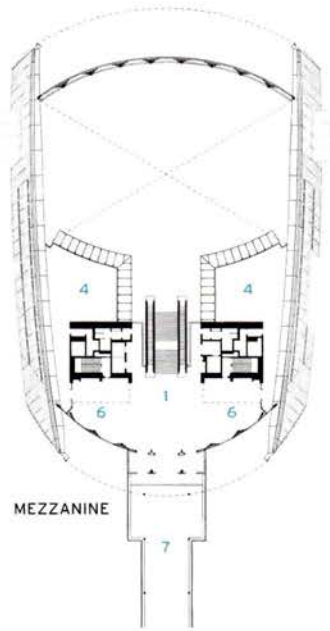
WAY STATION
Anaheim's new transit hub greets travelers with a soaring, light-filled building (above and opposite) designed for Amtrak service, regional and local trains and buses, and potential high-speed rail.



SITE PLAN / GROUND FLOOR



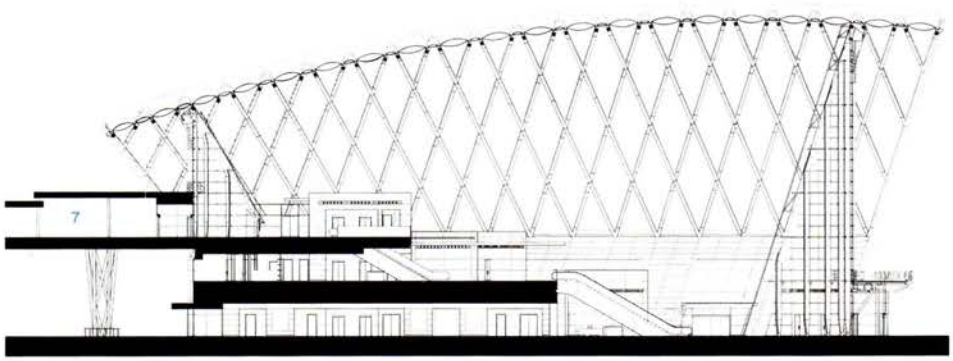
SECOND FLOOR



MEZZANINE

0 50 FT.
15 M.

1 LOBBY
2 RETAIL
3 TICKETING & INFORMATION
4 SUPPORT
5 SERVICE YARD
6 WAITING AREA
7 CONCOURSE TO TRAINS
8 RESTAURANT
9 DINING AREA
10 OFFICE



SECTION A - A

0 30 FT.
9 M.

credits

ARCHITECT: HOK – Ernest Cirangle, design principal; Albert Kaneshiro, project manager; Kazem Toossi, project architect

ENGINEERS: Thornton Tomasetti (structural); BuroHappold (enclosure, m/e/p); Parsons Brinckerhoff (rail and civil)

CONSULTANTS: SWA (landscape); Horton Lees Brogden (lighting design); Newson Brown (acoustics); STV (construction manager)

GENERAL CONTRACTOR: Clark Construction Group

OWNER: City of Anaheim

SIZE: 67,000 square feet

CONSTRUCTION COST: $132 million

PROJECT COST: $185 million

COMPLETION DATE: December 2014

SOURCES

ROOF: Vector Foiltec (ETFE); Kalzip (metal); Sarnafil (built-up)

CURTAIN WALL: Wausau, Viracon

CLADDING: Werner Systems; Centria (metal panels); Structure Cast (precast concrete)

When the City of Anaheim launched a design competition in 2009 for a new transit hub, city leaders wanted an iconic structure. In the Southern California home of Disneyland, itself a celebration of mobility and fantasy, the Anaheim Regional Transportation Intermodal Center, or ARTIC, is a soaring, optimistic expression of the potential for public transportation in this capital of car culture.

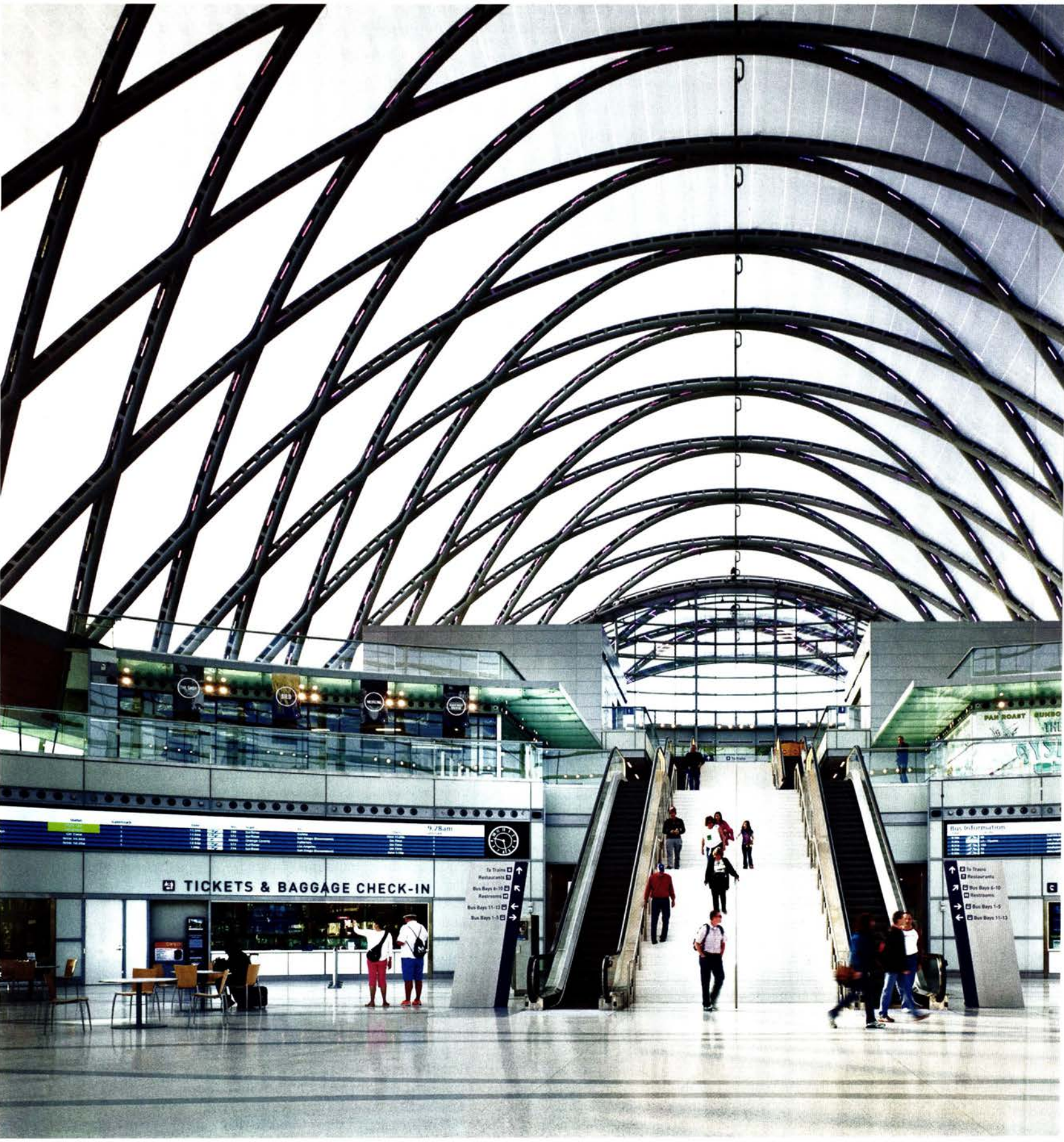
Designed by the Los Angeles office of HOK, the 67,000-square-foot ARTIC formally opened to the public in December. With an ethylene tetrafluoroethylene (ETFE) cladding around a steel shell, the exuberant form of the ARTIC fits in with such nearby megastructures as Angel Stadium, home of the Los Angeles Angels baseball team—with an oversized structural 'A' signpost planted amid a sea of parking—and the squat, multiuse Honda Center arena. But in terms of design, it is in a class by itself.

Though the ARTIC now serves passengers of the region's Amtrak and Metrolink trains, as well as local and regional bus lines, it will also accommodate the long-intended but still unpredictable plan to bring high-speed rail through California. "One of the key tenets of transportation architecture is that you have commuters using the building regularly, but also people who will pass through it only once," says Ernest Cirangle, FAIA, the Los Angeles–based design principal. "The building needs to be very clear, intuitive, and simple in terms of the flow of people."

That flow of people comes from all sides of the building. On the north, a parking lot transitions into a shared pedestrian and driveway space leading to the main entrance, a 120-foot-tall cable-hung glass curtain wall that allows views both into the main public hall of the center and, once inside, views north to the San Bernardino Mountains. Tapered, vertical box-section steel girts on the inside wall support the glass with custom armatures, resisting lateral loads like wind, while the tensioned-cable system supports the dead loads of the glass. A similar system supports the south facade's glazed curtain wall. Both curtain walls feature glass louvers for mixed-mode ventilation, part of the environmental strategy the design team is counting on to achieve a LEED Platinum target.

On the ground floor, ticket booths and a convenience store form the backdrop for casual tables and chairs scattered across the terrazzo floor. Doors on the east and west provide access to bus stops on either side. Escalators in the center lead to a second level that will eventually feature full-service restaurants. Another set of escalators takes visitors to the

RUSH HOUR
The textural vault-shaped structure maintains a dynamic transparency during evening hours as LEDs mounted on the interior diagrid framework illuminate the ETFE pillows in lively gradations of shifting hues (above).


TICKETS & BAGGAGE CHECK-IN
PAN ROAST

SKY VAULT
Centrally located stairs and escalators (opposite) carry passengers and visitors to a second-level restaurant area and third-floor mezzanine, where they will find waiting rooms and a covered bridge to the train platforms. Overhead, the building's structure is revealed, appearing like a space-age version of a Gothic cathedral's ribbed vaults.

third level, or mezzanine, which features small waiting rooms. From there, passengers can walk outside across a covered bridge to the train platforms. The soaring shell structure provides the space, daylight, and views to the outside that allow for clarity and continuous wayfinding.

Only on the underside of the shell does the glistening form of the building start to reveal its construction, as the steel tube arches organized in a diagrid pattern appear like a space-age version of the ribbed vaults in a Gothic cathedral. The steel girts at the curtain walls also stiffen the arches, acting somewhat like spokes on a bicycle wheel to prevent the arches from deforming.

Inspired by great transit halls of the past as well as the historic hangars for dirigibles found throughout Southern California, ARTIC takes its form from a catenary arch rotated to form a torus and then cut. Bruce Gibbons, the building's structural engineer and managing principal of Thornton Tomasetti's Los Angeles office, investigated several technical solutions for the building to find the most efficient, simplest shape. "It's like a doughnut with a catenary section. Then we took a small bite out of it and that resulted in the pure shell," Gibbons says. Buttresses concealed in metal cladding connect the shell to the ground. A combination of shop and field welds connect the individual steel members forming the arches.

The integration of the facade structure and the arch structure emerged from Gibbons's early involvement in the competition phase. At that time, the design team quickly settled on the use of ETFE as the main enclosure system for the shell due to the benefits of the material's light weight and daylighting characteristics. The ETFE pillows forming the envelope consist of three layers, with an approximate 75 percent frit on the outer layer and then two constantly pressurized internal cavities created on either side of the middle layer. Kurt Komraus, the facade consultant for the project and an associate at the Los Angeles office of Buro Happold, detailed the envelope from the model drawings and performance criteria Thornton Tomasetti had developed through the design development phase. "Distilling the software model geometry down to 9,000 data points gave the whole team a common language for locating our systems," says Komraus.

The ARTIC's ETFE pillows take complex forms to match the arch's curves. Each pillow is sized differently, with slightly smaller bottom layers to prevent puckering under tension. Rectangular steel "stools" welded to the top of the arch's tubular members provide the platform for a two-layer aluminum extrusion for clamping the edges of each pillow, while also forming a stormwater gutter system on the exterior.

Although it's not the first project to use an ETFE cladding system in Southern California, the sleek, comfortable quality of the great hall has become its own tourist attraction. The City even touts it on billboards around area freeways. It's not uncommon to see a family of bicyclists make a detour from the public path along the adjacent Santa Ana River to check out the building and find that, unlike the area's other attractions, it's free to enter. ■

Russell Fortmeyer leads sustainable design for the Los Angeles office of Arup. He is the coauthor, with Charles Linn, of Kinetic Architecture: Designs for Active Envelopes *(2014).*

Galveston Fire Station #4 | Galveston, Texas | HDR

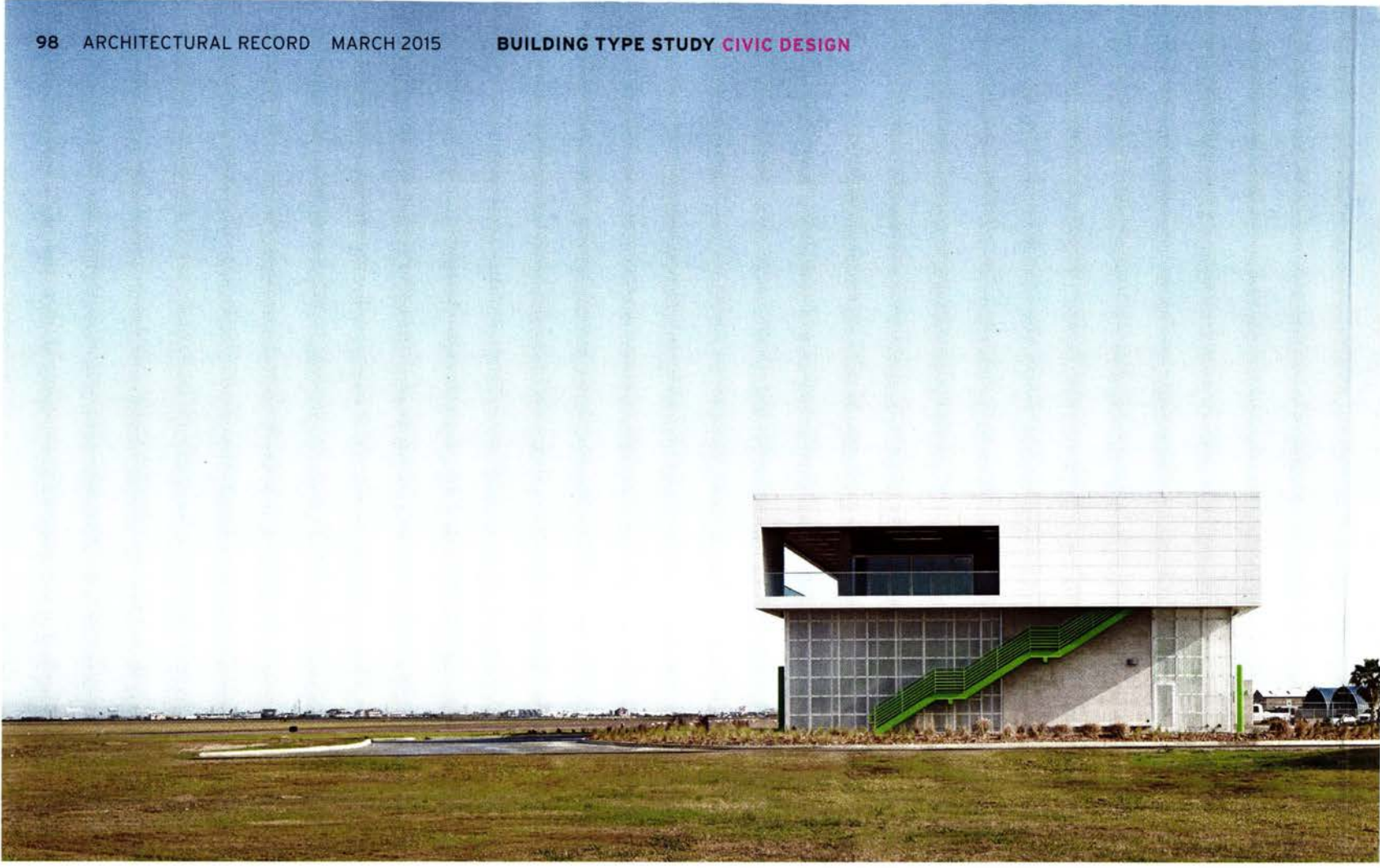
FIGHTING FIRE IN STYLE

A coastal community ravaged by Hurricane Ike rebuilds one of its fire stations with an eye toward the next storm.

BY LAURA MIRVISS

PHOTOGRAPHY BY ANDREW POGUE

NEW FLAME Built with Hurricane Ike recovery funds, a new fire station in storm-prone Galveston, Texas, can withstand 125 mph winds and over 20 feet of flooding.



LOOK OUT
An ipe-wood balcony on the second floor wraps around three sides of the building, with views of the airport, beach, and residential developments beyond (bottom). The fire station is sandwiched between an aviation tower (opposite) and a private helicopter repair company. HDR used neon green for graphics and other building features, including the emergency stair in back (above).

Don't let the miles of seaside kitsch fool you: Galveston, Texas, is no ordinary beach town. The community, precariously perched on a 27-mile-long island in the hurricane-prone waters of the Gulf of Mexico, is in an ongoing fight for its survival.

Seven years after Hurricane Ike, Galveston remains in recovery mode. The third-costliest storm in U.S. history, after Katrina and Sandy, Ike spilled over a 17-foot-tall sea wall and swamped most of the island.

The results were catastrophic—80 percent of the houses were damaged, along with much of the city's waste-water management system and many emergency facilities like hospitals and fire stations. Armed with disaster-relief funding, Galveston has been slowly shoring up its infrastructure and buildings in preparation for the next storm.

Surrounded by uncertainty, the architects of a replacement fire station next to the Scholes International Airport have left nothing to chance. Located just four blocks from the Gulf, the new Galveston Fire Station #4, designed by HDR, is a rock-solid, two-story, 14,000-square-foot bunker with the look of an unpretentious yet polished beach house.

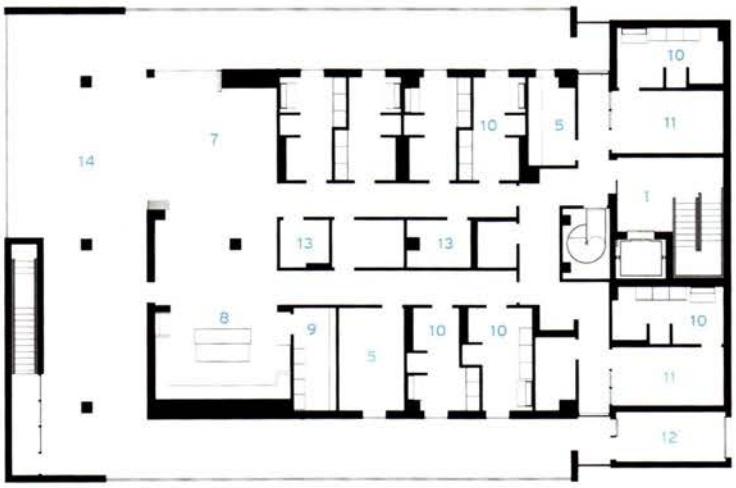
The station's vulnerable location in a high-risk flood zone but also adjoining an airport limited the architects' design choices. Living quarters and a critical operations center were elevated above flood levels but not too high to interfere with the adjacent airport's stringent height requirements.

The new building has a rectilinear concrete-frame structure, elevated about 2 feet above grade, and sits on 80 piles that descend 40 feet into the sandy soil. In keeping with Galveston's beach-town lifestyle, the design is simple, comfortable, and casual. On the first floor, the architects created a fairly spartan garage for the fire trucks and firefighting equipment, using minimal finishes and enclosing the open space with a translucent acrylic skin.

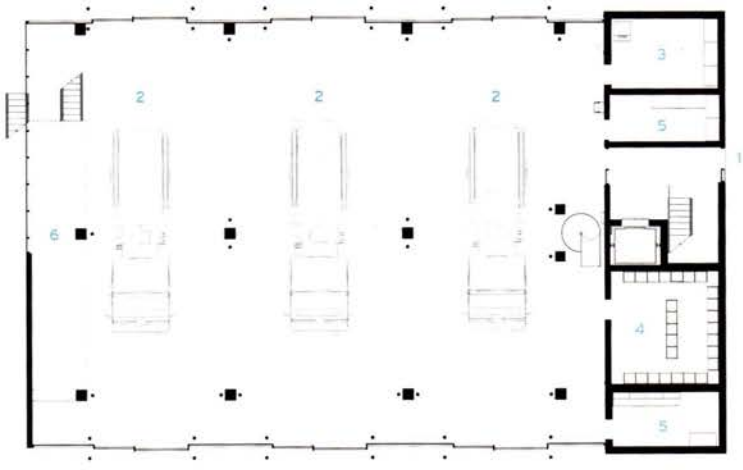
The second story, elevated 25 feet above sea level, is clad in white panels interrupted by long recessed terraces. At the core of the space are functionally designed sleeping quarters that share a living and dining area with an observation deck worthy of a luxury vacation house. "For the firemen, this is their home as well as their place of work—they're here for long periods of time," says Jim Henry, the southern regional design director at HDR.

The sleeping units, shared by three people who rotate in eight-hour shifts, each have a stowaway bed and shower. However, they are purposefully narrow and compact—and television-free—to encourage the firemen to socialize in the bright and airy living and dining area organized around the lime-green kitchen.

PHOTOGRAPHY: © DAN SCHWALM



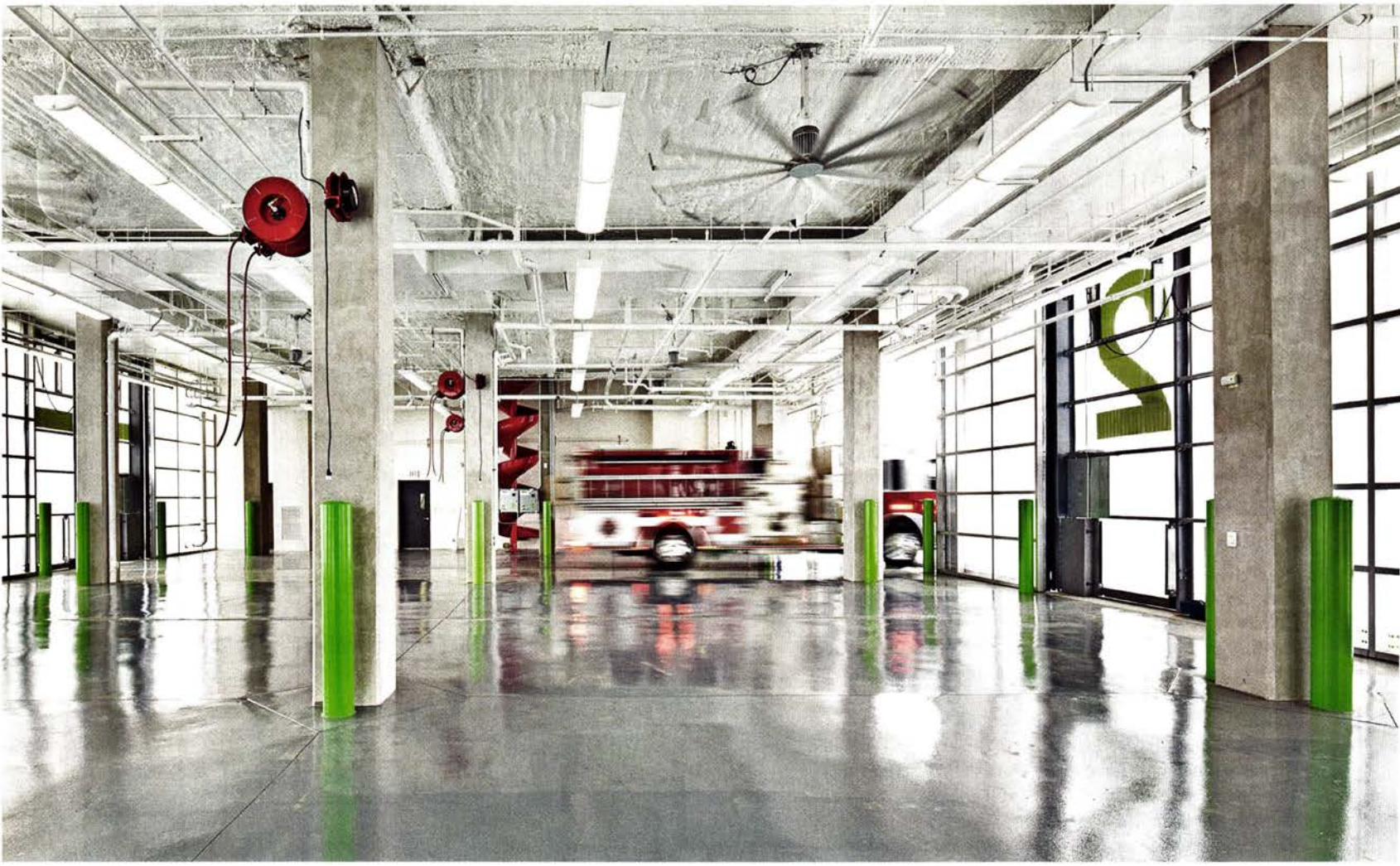
SECOND FLOOR

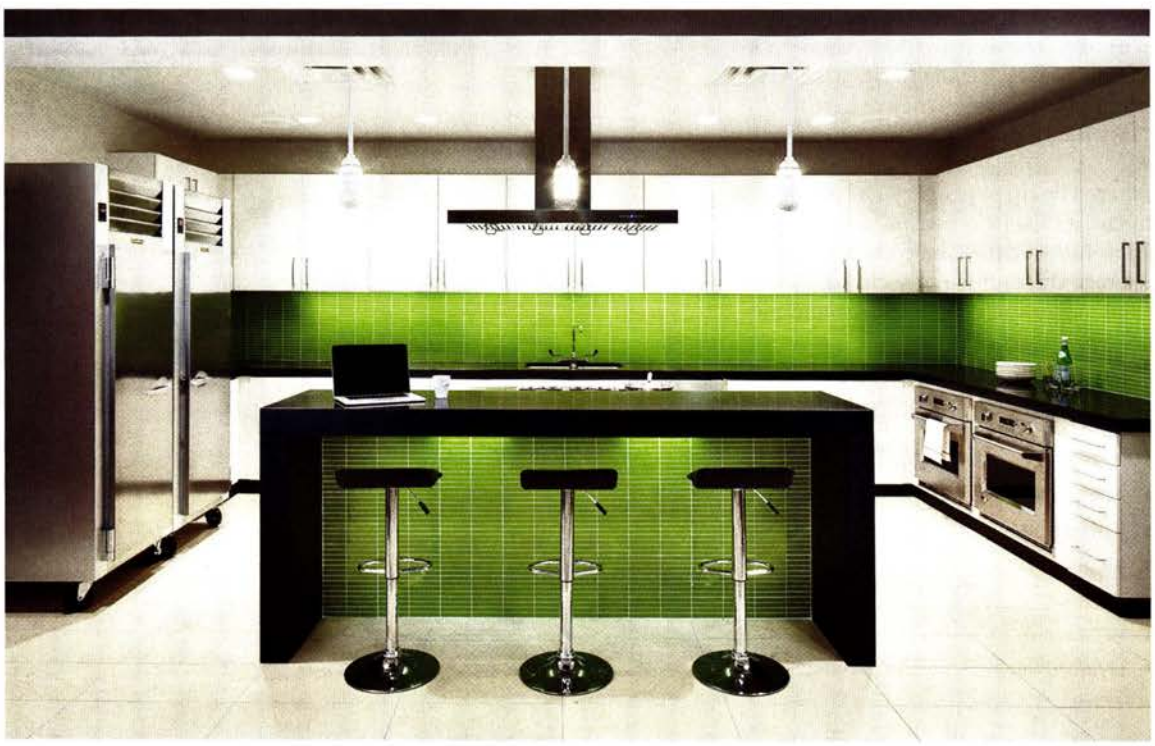


GROUND FLOOR

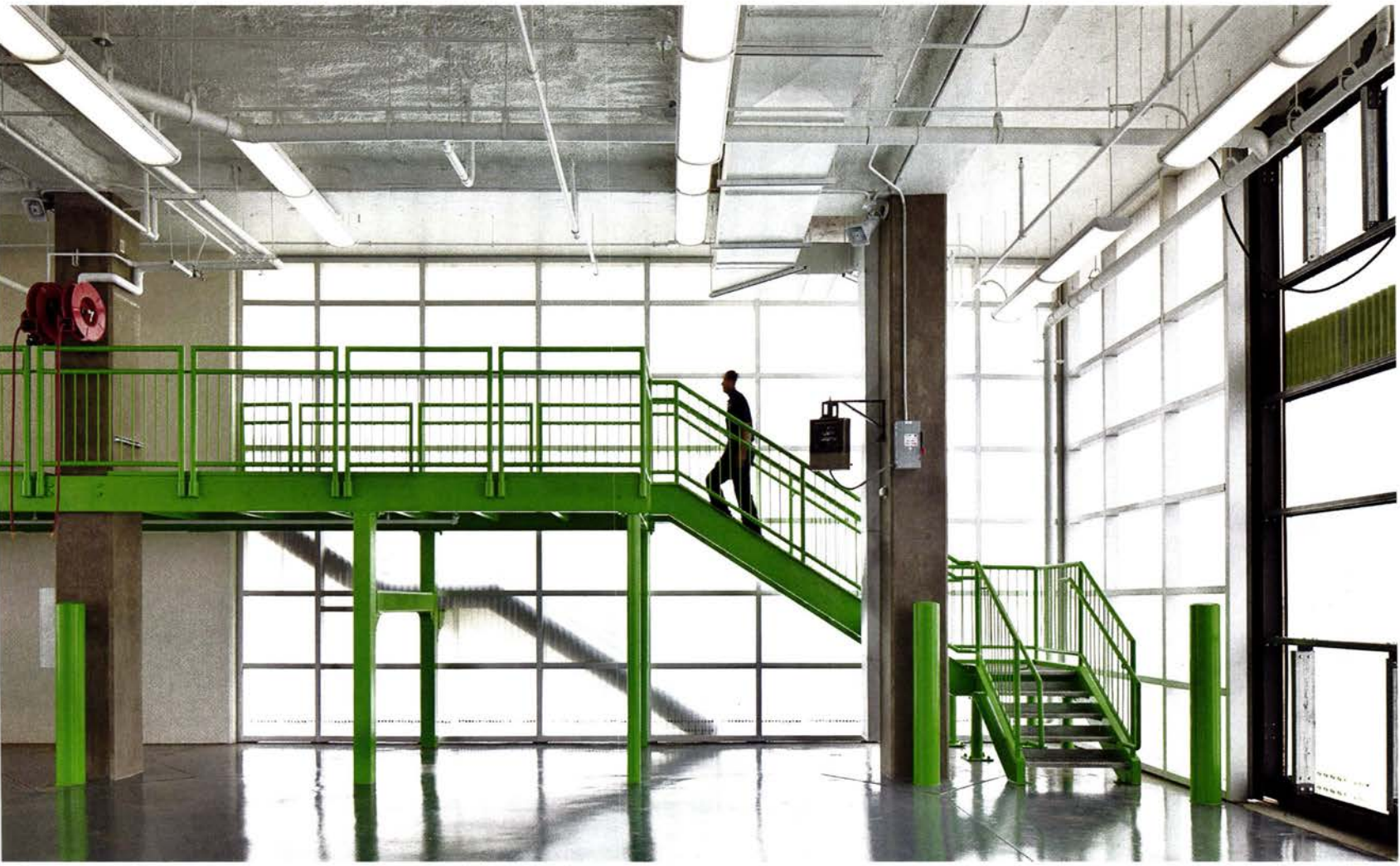
0 20 FT. 6 M.

1 ENTRY
2 APPARATUS BAY
3 WORKSHOP
4 GEAR ROOM
5 STORAGE
6 MEZZANINE
7 LIVING/DINING
8 KITCHEN
9 PANTRY
10 SLEEPING UNIT
11 OFFICE
12 GENERATOR
13 M/E/P
14 DECK





HIGH GEAR
The ground floor (above) can house up to three fire trucks ("fire apparatuses" is the official term), which will be moved inland in the event of a hurricane. A mezzanine above the ground floor offers additional storage (opposite). An industrial kitchen with stainless steel appliances has two refrigerators and ovens (left). "This is the heart of the home, says HDR architect Jim Henry.



On a quiet day, the firemen (currently there are no women) can sit on beach chairs and hang out on the partially enclosed balconies where floors, walls, and ceilings are ipe wood. "In addition to all the business, I wanted it to have all the relaxation of a beach house—a place where the firemen can come out, chill, and take in the scenery," Henry says, referring to the panoramic views of the Gulf, the airport, and residential developments.

The firehouse's bold graphics and striking color palette (not red but neon green) draw from the mellow and casual ambience of the shore community. Nearby, Galveston's South Texas resort-style waterfront is dotted with Tiki-style fish restaurants and bars and culminates with a 100-foot-tall Ferris wheel on Pleasure Pier, whose LED lights blink into the night.

While the look of the building is simple and nonchalant, it's just for show. Fire Station #4 can readily switch into crisis mode to withstand a major hurricane, with wind speeds of 125 mph and a 20-foot storm surge. Poured-in-place concrete shear walls, which bookend the building, help. During a hurricane, fire trucks will be moved farther inland, and the doors may be opened to allow flooding of the ground floor.

Remarkably, the city was able to get wind and storm insurance for the second level, where all of the key operational equipment is located. "Probably, in a million years' time, an archeologist will wonder what this building was used for, because it will still be here," says Steve Ratcliffe, an engineer at HDR. With a construction cost of $3.8 million, the fire station was a small project for HDR, a large, full-service firm. "People ask, 'Why would you do a fire station?'" says Henry, "But resilience is a hot topic, and the lessons learned here apply at every scale." ■

credits

ARCHITECT: HDR – Jim Henry, design director; Bryan Sumruld, Kevin Augustyn, associates; Michael Alread, project manager

ARCHITECT OF RECORD: English + Associates Architects

ENGINEERS: Haynes Whaley Associates (structural); HDR (civil, m/e)

GENERAL CONTRACTOR: Crain Group

OWNER: Texas Department of Rural Affairs

CLIENT: City of Galveston

SIZE: 14,000 square feet

CONSTRUCTION COST: $3.8 million

PROJECT COST: withheld

COMPLETION DATE: February 2013

SOURCES

METAL PANELS: Dri-Design

WOOD SIDING AND DECKING: Advantage Lumber

ROOFING: Johns Manville

ACOUSTICAL CEILING: Armstrong

SLIDING DOORS: NanaWall

PAINTS AND STAINS: Sherwin-Williams

East Boston Branch Library | Boston | William Rawn Associates

NARRATIVE ARC

An open-plan, single-room branch library lends books and serves as a place for a young and diverse community to come together.

BY LAURA RASKIN

PHOTOGRAPHY BY ROBERT BENSON

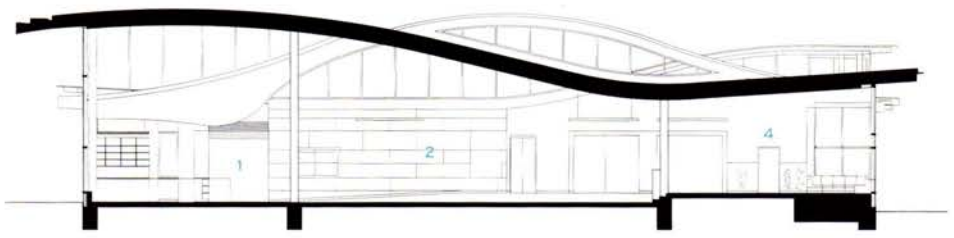
In 2011, the Boston Public Library (BPL) decided to close two branch libraries in East Boston—home to the nation's first municpally supported branch library, built in 1870—and open a new one midway between the two. Amy E. Ryan, BPL president, posed a challenge to Boston-based architecture firm William Rawn Associates (WRA). "We got together and talked about what kind of design we could come up with that really serves the expectations of a population that doesn't speak much English, doesn't have experience with a public library, and maybe is even suspicious of government institutions," says Ryan. "Libraries have never been as essential as they are today, for filling the achievement gap, bridging the digital divide, teaching English, helping people finding careers, enjoying literature."

East Boston, a neighborhood across the harbor from downtown Boston, has been a foundation for immigrants since the mid-19th century, beginning with Italians, the Irish, Canadians, and Russian Jews. Today, more than half of its 40,000 people were born outside of the United States; half of those are Spanish speakers, and one in four residents is under the age of 19.

William Rawn and WRA principal Clifford Gayley's answer to Ryan's challenge was multifaceted, but it crystallized around a main idea: that the library should function as a single room where the entire community could come together. "It's this century's version of a great reading room," says Gayley. "But instead of it being on a piano nobile, we placed it right near the front door, in a sense reaching out to the city." The East Boston Branch library, which opened in November 2013, is a simple volume: a one-story rectangle with a rippling roof and ample glazing. It has a few virtuoso moves, which are all that are needed.

The first is that the architects oriented the library's main entry facade to face south, looking out on an 18-acre public

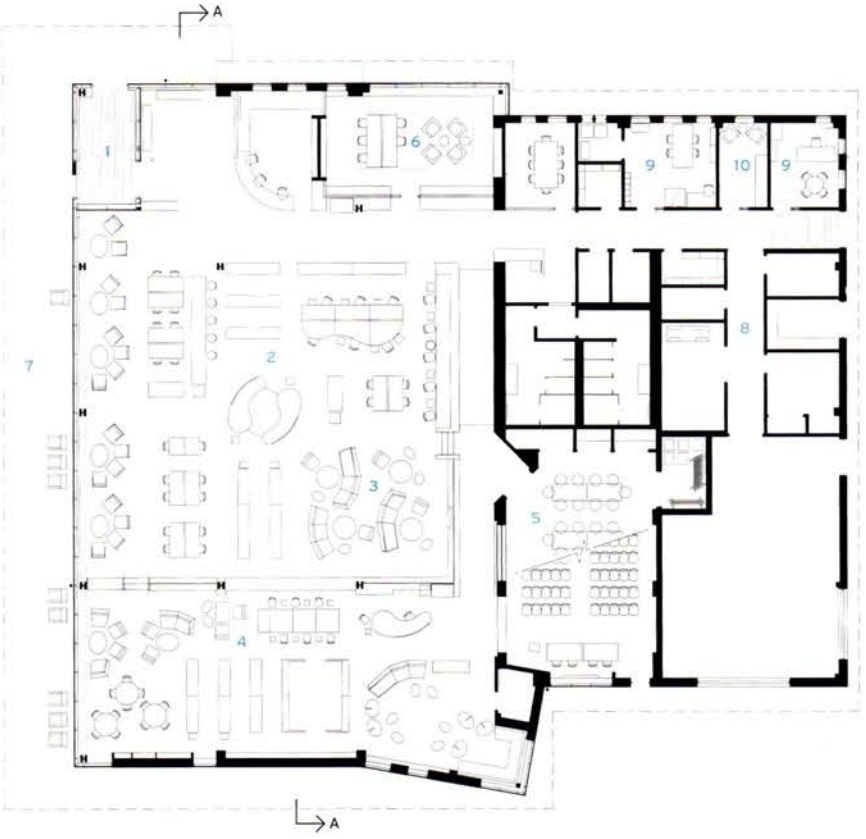
NEW HEIGHTS
The library's south-facing glass facade connects patrons to an adjacent park. Adirondack chairs on an exterior "reading porch" are shaded by the curved roof's cantilever.



SECTION A - A

0 20 FT. 6 M.

1 ENTRY
2 MAIN READING ROOM
3 YOUNG ADULTS LOUNGE
4 CHILDREN'S AREA
5 MULTIPURPOSE ROOM
6 QUIET READING ROOM
7 EXTERIOR READING PORCH
8 SERVICE AREA
9 OFFICE
10 STAFF LOUNGE



FLOOR PLAN

0 20 FT. 6 M.

credits

ARCHITECT: William Rawn Associates – Clifford V. Gayley, William L. Rawn, co-principals for design; Mark Oldham, project manager; Carla Ceruzzi, project architect

INTERIOR DESIGNER: Lab [3.2] Architecture

ENGINEERS: LeMessurier Consultants (structural); Cosentini Associates (m/e/p); McPhail Associates (geotechnical); Stantec (civil)

CONSULTANTS: Landworks Studio; Horton Lees Brogden Lighting Design; Acentech (acoustic)

GENERAL CONTRACTOR: Delulis Brothers Construction

CLIENT: City of Boston and Boston Public Library

SIZE: 15,000 square feet

CONSTRUCTION COST: $10 million

PROJECT COST: $17.25 million

COMPLETION DATE: November 2013

SOURCES

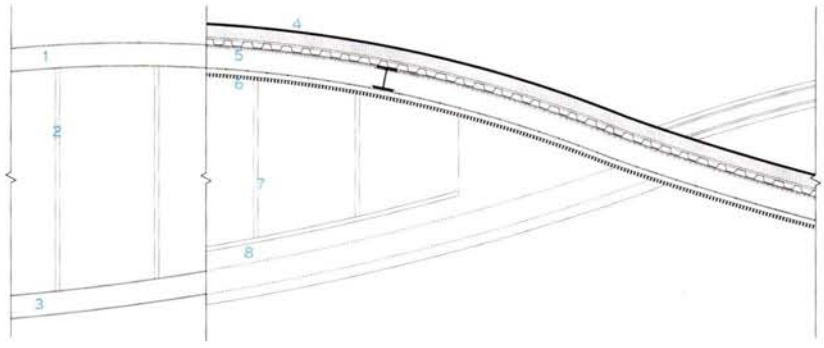
CURTAIN WALL: Kawneer

WOOD CEILING: Rulon International

LIGHTING: Winona Lighting, Bartco

GLASS: PPG

SHINE ON The undulating roof planes (opposite, top) give the library its graceful form and create eye-like apertures that allow daylight to penetrate to the center of the single-room space (above).



ROOF / CEILING ASSEMBLY

0 10 FT. 3 M.

1 UPPER TRUSS CHORD, SUPPORTING ROOF AT SECTION CUT
2 VERTICAL TRUSS MEMBER
3 LOWER TRUSS CHORD, SUPPORTING LOWER ROOF
4 ROOF ASSEMBLY
5 ACOUSTICAL PLENUM LINER
6 WOOD-SLAT CEILING
7 WINDOW MULLION ALIGNED WITH VERTICAL TRUSS MEMBER
8 WOOD-PANELED FASCIA

park, giving patrons a view that culminates at the horizon in downtown Boston's skyline. To the east is a highway and, beyond that, Logan International Airport (hence the need for a lot of noise-canceling triple-glazing). To the west is a residential street. "We could have faced the library toward Bremen Street, but we said that the way this library is going to be memorable is for people to sit next to the window and enjoy the park," says Rawn. "We started with that and then realized very early on that there was this view back to the city."

To make the most of that view, the architects designed what they call a reading porch, an exterior extension of the library floor furnished with brightly colored Adirondack chairs and shaded by the deep roof overhang. Even on a freezing-cold day in January, the appeal of plopping in a chair with a book and a coffee during warmer months is obvious. "The civic nature of the site seemed fundamentally important," muses Rawn. "It's a space that's all about opportunity. If you study hard in this library, you might be a lawyer in one of those buildings downtown—not that we all want to be lawyers."

The challenge of creating a single-room library, though, is how to get daylight into the center of the building. In a few other Boston libraries, this problem was solved by creating an interior courtyard (as at BPL's central library in Copley Square, designed by McKim, Mead & White and built in 1895). The cost of an interior courtyard for East Boston was prohibitive, so Rawn and Gayley focused on the roof.

The architects began to play with alternately curving roof shapes. In order to create a column-free space, structural engineer Pete Cheever conceived two 60-foot-long lenticular trusses with no diagonal members, only verticals connecting upper and lower cords. The undulating structural components of the roof produce eye-like apertures that send daylight into the center of the library. "The ceiling and roof sandwich is as tight as possible," says Gayley, which helps the roof look buoyant from the park and the highway. "The solution married our aspirations for the spatial experience while giving the roof enough verticality that it could stand up to a civic park."

Inside, the swelling ceiling—hovering at 15- to 25-foot heights—is clad in off-the-shelf hemlock slats. The warm wood sets the entire room aglow and hides sound-absorptive material behind it. This works well: when the library is busy with adults and children, the volume level stays at a pleasant murmur. Ryan and the architects dedicated a glassed-in reading room to patrons who still want a tomblike hush, pushing it to the western perimeter wall, behind the lobby desk. "Our common denominator is conversation," says Ryan. "Why wouldn't you want this activity?"

That activity—tweens doing homework and playing computer games, adults reading books in armchairs set near the south-facing window wall (screened from glare by slender, horizontal hemlock louvers)—is encouraged by the room's subtle divisions into spaces for all ages through the use of furniture, rugs, and WRA-designed shelves on casters. The flexibility of all of these elements suggests which activities might be done where, but without hierarchy or rules.

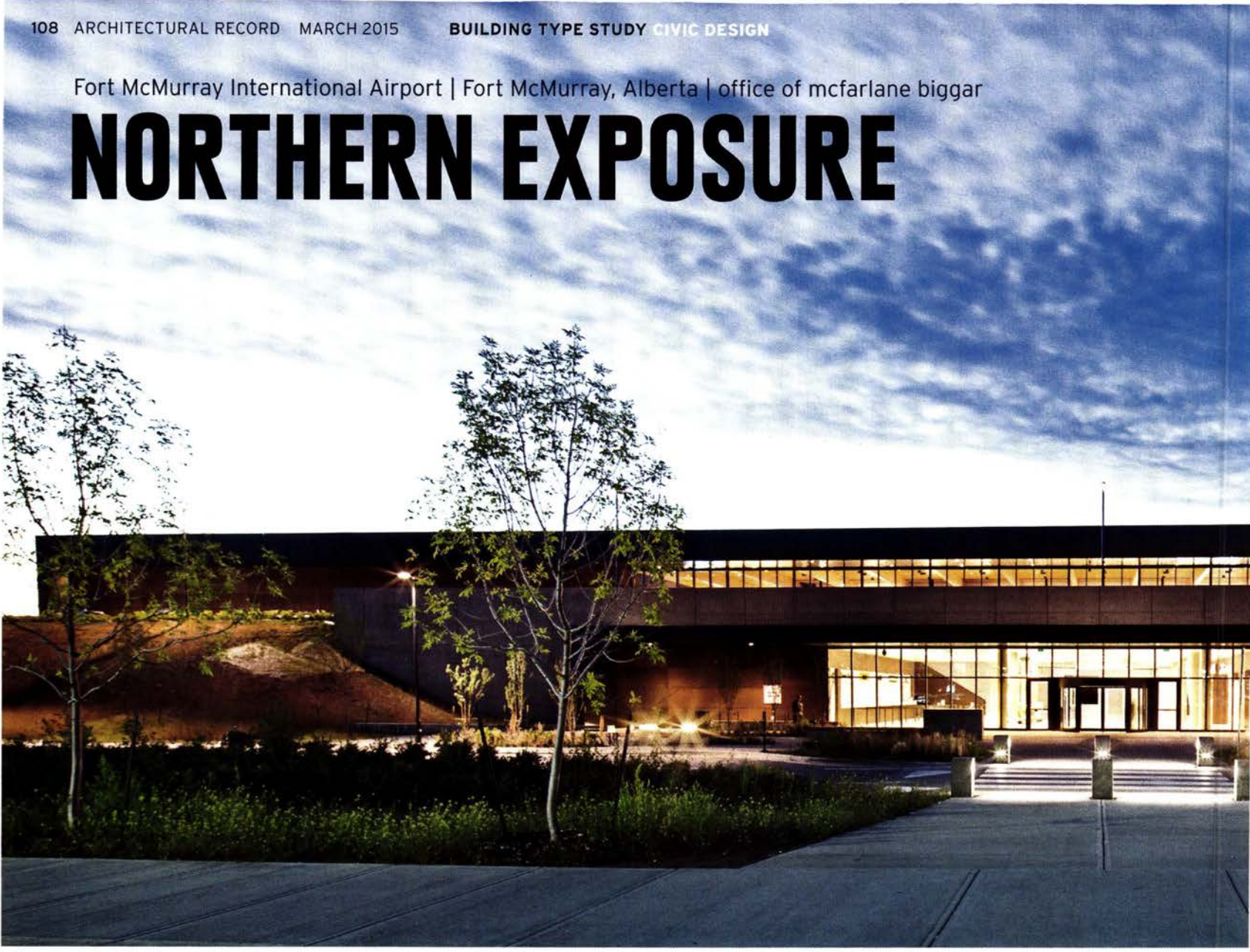
Ryan says that the East Boston Branch library is twice as busy as the two locations that it replaced combined, and it's the second busiest of BPL's 25 locations. "We were trying to create a place where people want to be," says Gayley. They succeeded. ■

View additional images at architecturalrecord.com.

COZY CORNER Shelves, furniture, rugs, and signs designate spaces for adults, teens, and young children, but don't force patrons to use one particular area or another (above). A multipurpose room for ESL and art classes (visible at rear, above) has a sliding barn door. Wood louvers (opposite) diminish glare while still giving people a sunny spot for curling up with a book.

Fort McMurray International Airport | Fort McMurray, Alberta | office of mcfarlane biggar

NORTHERN EXPOSURE



The creation of a new airport for an emerging Canadian town provides a welcome portal for world trade and recreation.

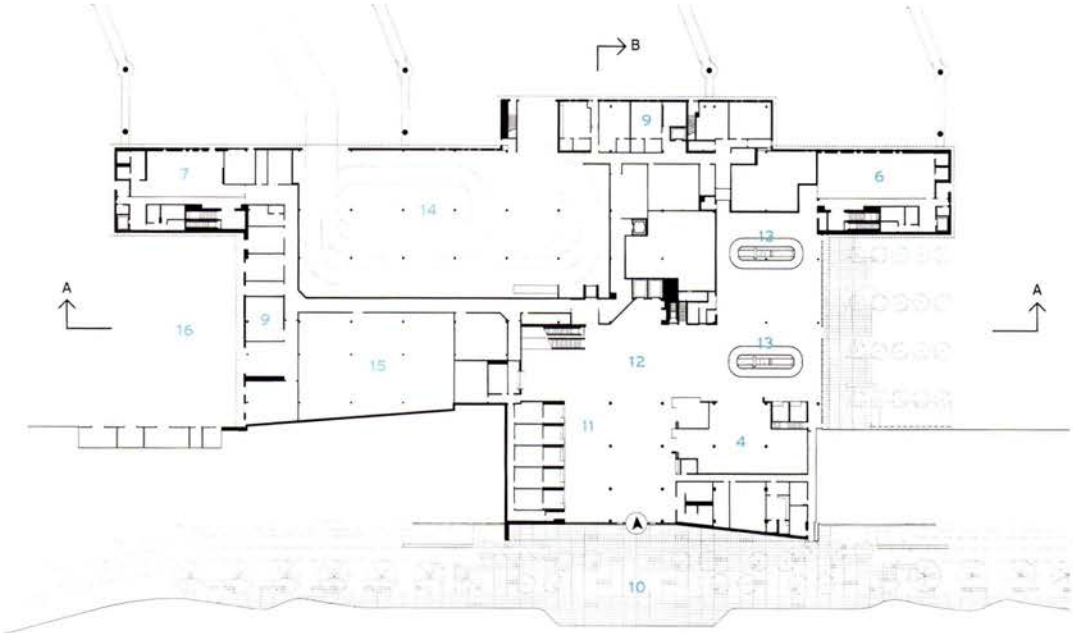
BY ADELE WEDER

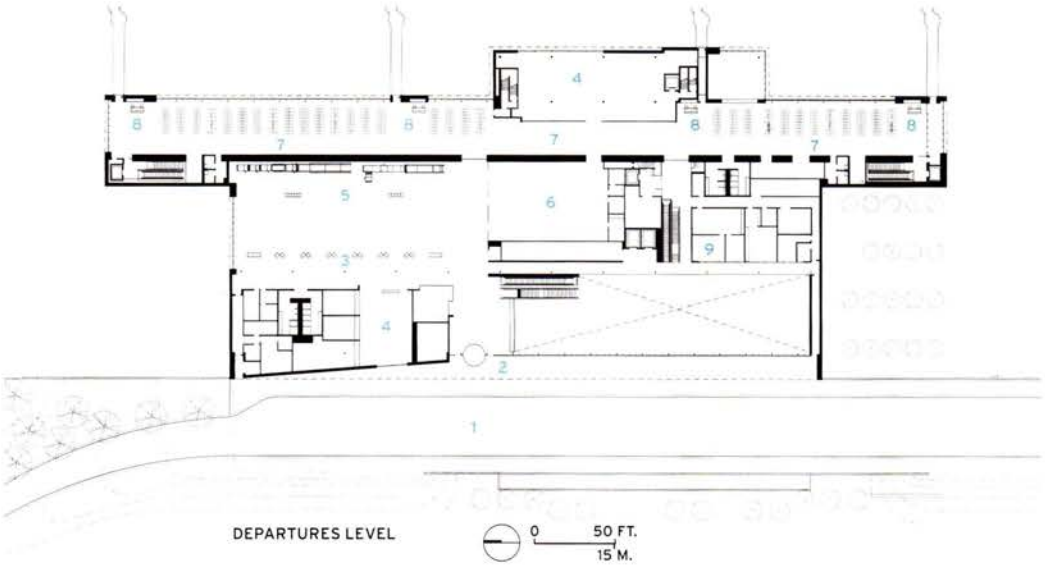
PHOTOGRAPHY BY EMA PETER

As you fly over the sepia tufts of northern Alberta's boreal forest on a winter's day, a new airport terminal in the town of Fort McMurray (Fort Mac) reads as an industrial sculpture on the flat prairie. Designed by the Vancouver, British Columbia–based office of mcfarlane biggar, the Fort McMurray International Airport is an unexpected gem in a region of beautiful natural surroundings but bleak architecture. The hybrid mass-timber, steel, and concrete structure is part of a larger multistage project and replaces an existing nearby terminal—a tiny bunker barely a fifth the size that has been refurbished for charter flights.

For most travelers, an airport is a fleeting architectural point of transition, a holding pen and launchpad between the realms of work or vacation and home. Fort McMurray International Airport is a different kind of portal. The local economy centers on a single industry: oil sands, also known as tar sands, the source of the synthetic crude that would be carried by the contentious Keystone XL Pipeline. The airport serves the transient workers who come here to build and operate the nearby mines where they extract bitumen, a viscous form of crude oil that must then be diluted in order to flow properly. It's grueling, labor-intensive work that relies heavily on far-flung contract workers like Jason Kailer, a 42-year-old husband and father whose home base is Port Alberni on Vancouver Island, B.C., about 1,000 miles to the southwest. He works two weeks on, one week off as a quality control-

BOREAL GATEWAY The terminal's minimalist language reads as a horizontal beacon in the isolated terrain and welcomes 250,000 passengers a year (left). The landscaping (below), based on plant species native to the area's harsh climate, includes white spruce, lodgepole pine, and quaking aspen trees, as well as juniper bushes.





1 ROADWAY
2 DEPARTURES CURB
3 CHECK-IN HALL
4 RETAIL, FOOD & BEVERAGE
5 BAGGAGE DROP
6 SECURITY CHECKPOINT
7 PASSENGER WAITING AREA
8 GATE
9 OFFICE
10 ARRIVALS CURB
11 CAR RENTALS
12 ARRIVALS HALL
13 BAGGAGE CLAIM
14 BAGGAGE MAKE-UP AREA
15 SERVICES
16 CARGO LOADING
17 ENTRANCE TUNNEL


SECTION A - A

SECTION B - B

credits

ARCHITECT: office of mcfarlane biggar architects + designers – Steve McFarlane, principal in charge; Rob Grant, project architect

ENGINEERS: Equilibrium Consulting (structural); Integral Group (m/e)

PROJECT MANAGEMENT: Stantec

CONSULTANTS: PWL Partnership (landscape); Faith Group (IT/Security); The Design Office (wayfinding/signage); Total Lighting Solutions (lighting); BKL Consultants (acoustics)

GENERAL CONTRACTOR: Ledcor Construction

CLIENT: Fort McMurray Airport Authority

SIZE: 160,000 square feet

PROJECT COST: $205 million

COMPLETION DATE: October 2014

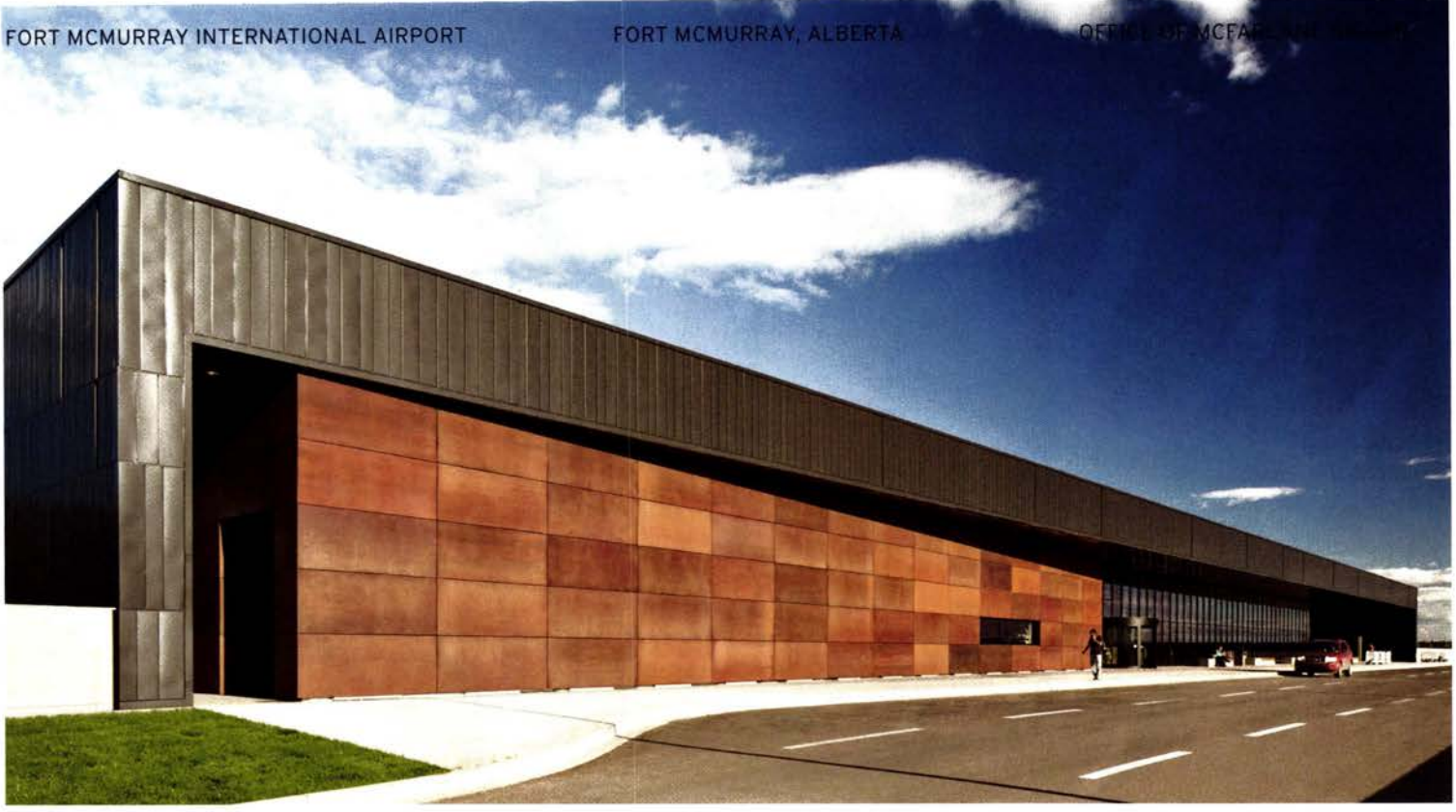
SOURCES

STRUCTURAL SYSTEM: Structurlam (Glulam and Cross Laminated Timber)

PRECAST CONCRETE: Armtec

CLADDING: Expocrete (concrete masonry units); Firestone Metal Products (metal); Dissimilar Metal Design (preweathered steel); Shüco (aluminum curtain wall); Cascadia Window and Doors (rainscreen)

GLAZING: Viracon, TGP, Garibaldi Industries



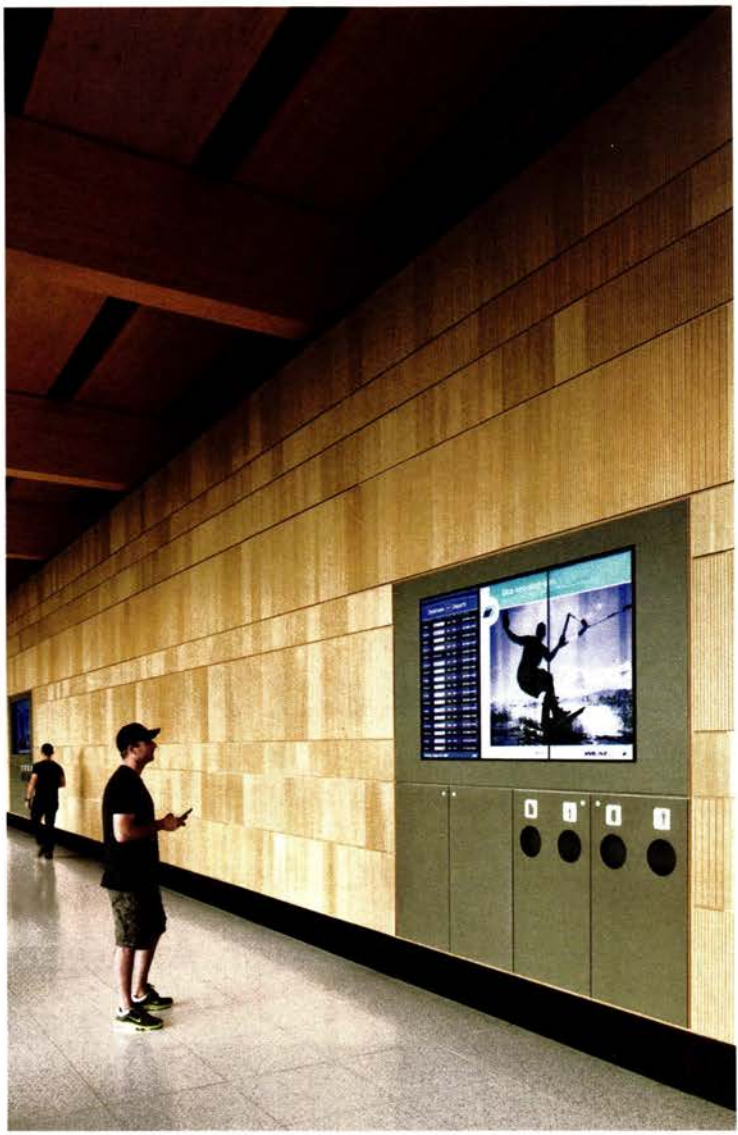
DRIVE BY
The facade is defined by large Cor-Ten steel panels and a metal-alloy cladding that imbue the front elevation with a variegated texture (above). Most panel and window systems were prefabricated in southern Alberta to minimize on-site construction time. The departures roadway (left) is also the roof above the terminal's main entrance. The structure's floor-to-ceiling windows are triple glazed to contend with the region's minus-40-degree winters.

ler and has passed through the airport four times a month, on average, for the past 12 years. "It's pretty much my home," he concludes. And the new terminal's light, beauty, amenities, and sheer solidity have literally changed the quality of his working life—it's "like night and day," says Kailer.

The 160,000-square-foot, three-story building takes its cue from the horizontality and colors of its rugged landscape. The canted bronzed Cor-Ten steel of its facade echoes the hues of the nearby forests and suggests the rigor, energy, and hardiness of the community it serves. The structure itself seems to emerge right out of the land: the upper roadway at departures level serves as the roof for the ground-floor arrivals level, making a seamless connection between the building and its surroundings.

The first thing you notice when you step from a plane is a bountiful sense of welcome, with daylight spilling in from floor-to-ceiling glazing. "Usually, in the arrivals area, you're herded into a dimly lit basement with no natural light at all," says firm principal in charge Steve McFarlane. "At Fort Mac, it's actually the grandest part of the airport." Daylight even seeps into the sequestered baggage-handling section on the east side of the ground floor via a series of slot windows—a workplace amenity almost unheard of in conventional airport design. The only sections that are strictly shielded from daylight are the security-screening offices that demand complete privacy.

MATERIAL CUES The engineered-wood ceiling is one of the longest continuous spans of CLT in North America (above). A wall clad in white laminated-MDF tile provides an acoustic buffer opposite the metal-slat "curtain" (opposite, left). Information screens and receptacles are discreetly embedded in terminal walls (opposite, right).



While a central interior stairway is sheathed in a steel alloy, the main passenger circulation and lounge areas are, by and large, defined by wood. Glulam beams hold up wide planks of cross-laminated timber (CLT)—a high-strength engineered spruce-pine-fir super-plywood made in British Columbia at one of only two facilities in North America. Beneath, an elegant oak veneer clads the wall along the gate waiting areas, its perforated surface serving as a conduit for sound-absorbing acoustic panels that are concealed discreetly behind it.

The muscularity of the forms and the material palette dovetails with the nature of the end-users: strapping, hard-working men and women—though, to be sure, mostly men. "We wanted the airport to reflect the community," says McFarlane. The firm has won acclaim for an art gallery, fashion boutique, and many high-end homes, but Fort Mac is another story altogether.

The long shoebox-like volume is broken up into discrete sections that read as intimate, demarcated by shifts in ceiling treatment and wall cladding. Most dramatically, a floating upper-level scrim of vertical slats, made of flat bars of white powder-coated steel, evokes the region's famed Northern Lights when illuminated. The designers have kept internal clutter to a minimum by embedding the waste receptacles and gate numbers in the walls and tucking the sprinkler system and other mechanicals—painted black—in gaps between the ceiling's CLT slabs. Additional sound absorption is integrated into the second-floor walls by way of acoustic insulation installed behind perforated laminated-MDF strips that read as tiles. Through this sort of careful streamlining and architectural clarity, the terminal provides what passengers arguably need more than anything: a sense of calm and quiet.

The plan was conceived so that it can expand in the future. In a town of hastily constructed buildings, whose previous airport was one step up from a Quonset hut, the new terminal is a harbinger for the future, figures Kailer, echoing the sentiments of many of his fellow workers. "It sends a message that it's built for the long term." ■

Adele Weder is a Vancouver, British Columbia–based architectural writer and curator.

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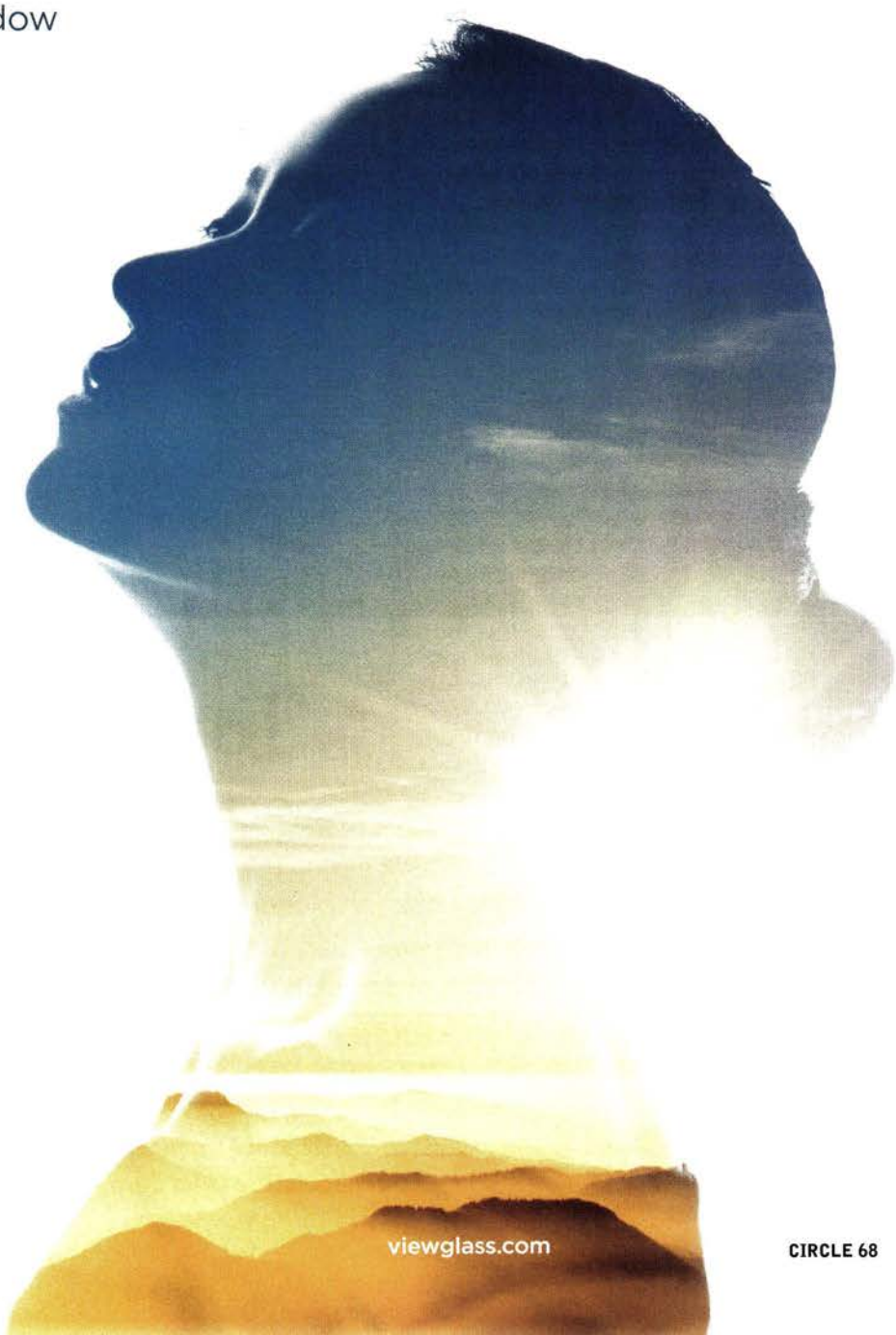

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CIRCLE 68

INNOVATIONS IN GLASS

Glass may be the most chameleonlike of building materials. Depending on how it is manipulated, combined with other materials, or how it is installed, it can appear transparent, translucent, or opaque. The same glass surface can take on varying characteristics in different atmospheric conditions. It can be made flat as a pancake or bent into perfect arcs. The following pages explore how architects are pushing the limits of technology to exploit this material's mutable nature, its aesthetic qualities, and its energy-conserving potential—demonstrating that glass is more than merely molten sand.

PHOTOGRAPHY: © THIES RAETZKE

ELBPHILARMONIE, HAMBURG, GERMANY, HERZOG & DE MEURON.

Continuing Education

To earn one AIA learning unit (LU), including one hour of health, safety, and welfare (HSW) credit, read the "Innovations In Glass" section on pages 118-138 and complete the test at architecturalrecord.com. Upon passing the test, you will receive a certificate of completion, and your credit will be automatically reported to the AIA. Additional information regarding credit-reporting and continuing-education requirements can be found online at ce.construction.com.

Learning Objectives

1 Discuss glass manufacturing processes as well as fabrication options and limitations that architects should take into account while designing glazed building skins.

2 Define terms relevant to glass and glazing selection, such as VLT, U-value, and solar heat gain coefficient.

3 Discuss how architects like SANAA and Foster + Partners have overcome the detailing challenges presented by curved glass.

4 Describe how technologies such as electrochromic glazing and double skins work to improve energy efficiency.

AIA/CES Course #1503A

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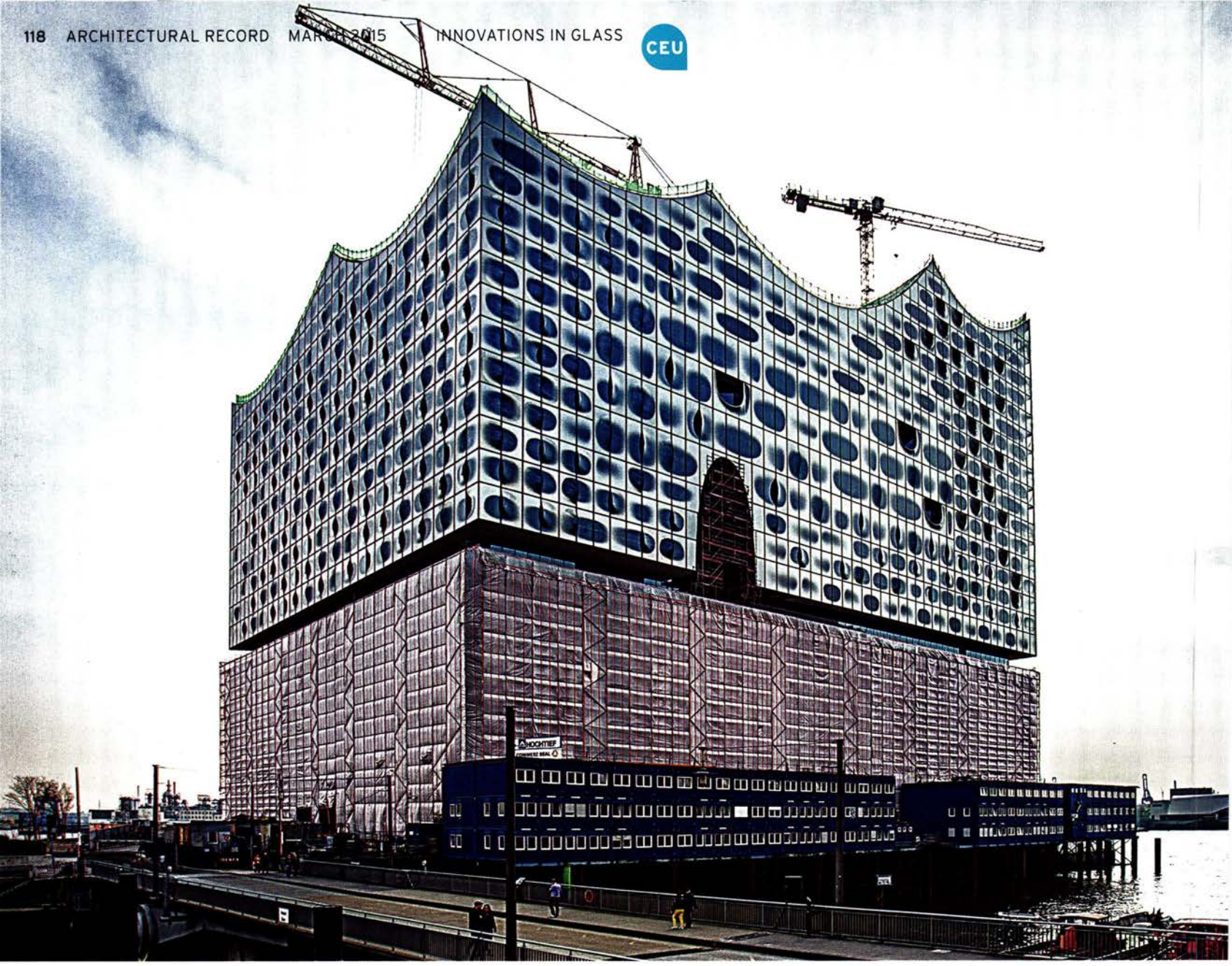


Straight Story On Curves

Fabrication advances allow architects to make glass buildings that are not only transparent or translucent but sculptural.

By James S. Russell, FAIA

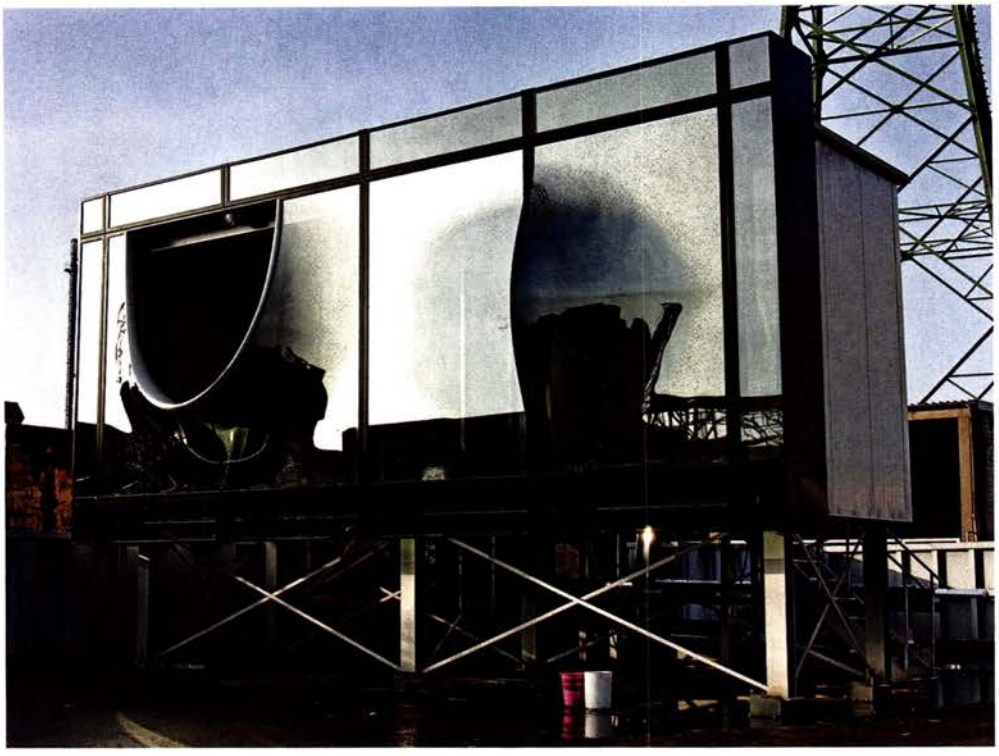
REFLECTIONS OF passing ships move constantly across the rippling, patterned surface of the Elbphilharmonie, a concert hall, hotel, and luxury apartment complex nearing completion on a riverfront site in Hamburg. Ascan Mergenthaler, Herzog & de Meuron's senior partner, describes the sensuous mixture of curved and flat panels atop a brooding 1966 brick cocoa warehouse as "hard and liquid, and at the same time reflective as well as translucent."

Technical innovation has made curved—also called bent—glass newly versatile. Aesthetic motives vary. While Basel-based Herzog & de Meuron wanted a surface that would react to changing light, Chicago's JAHN is using curved glass to soften the silhouette of 50 West, a 64-story residential tower with rounded corners rising in Lower Manhattan.

More varied and durable coatings for controlling heat gain and glare have improved the performance of curved glass. New vacuum-deposition techniques have made coatings tough enough to be applied prior to a variety of manufacturing steps, says Bruce Milley, the architectural design manager of Guardian, a major supplier to glass-bending fabricators. This improves visual consistency, permitting calibration of thermal properties, reflectivity, and solar heat-gain coefficient, he explains.

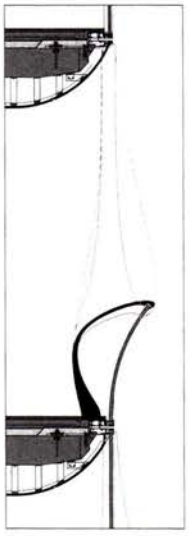
Curved insulated glazing units (IGUs)—typically made of two sheets of glass separated by a sealed air- or gas-filled gap—are now possible, even at large sizes, though they remain challenging to manufacture. Giles Robinson, a partner at Foster + Partners in London, points to improved tolerances, which means less waste, he says. Still, every piece must be bent individually, explains Daniele Petroni, a project manager at Permasteelisa North

PHOTOGRAPHY: © THIES RAETZKE

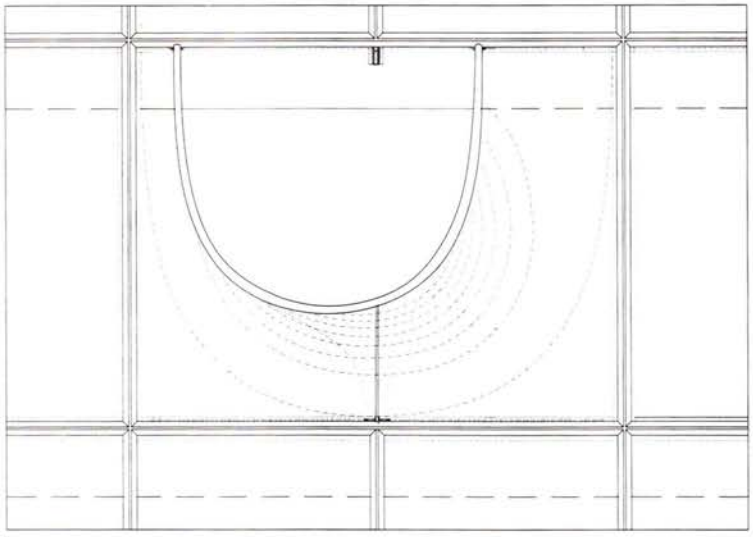


America, which engineers and installs complex facade systems. The process of heating the glass, draping it over a mold, then cooling it down, demands enormous attention to maintaining exact dimensions and avoiding surface distortion.

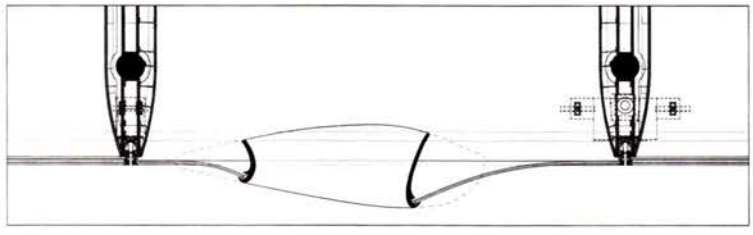
Diverse installation tactics help realize the elusive qualities of transparency, translucency, and reflection. The curved-glass IGU panels in JAHN's 50 West are conventionally detailed, with the glass attached on all sides to aluminum extrusions. Foster + Partners, by contrast, uses bravura engineering to minimize the visible profile of framing and structure at Fortaleza Hall, a visitor center that opened in 2010 at the SC Johnson headquarters in Racine, Wisconsin, known for its Frank Lloyd Wright buildings. Fortaleza, a 132-foot-wide oval in plan, has only slender external columns holding up the projecting roof, which shades the glass wall to minimize reflections and solar heat gain. The architects were able to use single-glazed units because only the base of the cylindrical exhibition space, below grade, requires tight temperature control. Narrow T-shaped horizontal rails support glass panels more than 17 feet long and 7 feet high while cables tensioned between the roof and foundation stiffen the entire wall system. The pavilion anticipates the quarter-mile-diameter doughnut-shaped headquarters that the firm has designed for Apple in Cupertino, California. It will be clad in giant bent-glass panels more than 30 feet long and 10 feet high.



SECTION



ELEVATION



PLAN

0 3 FT.
1 M.

BALCONY RAILING DETAIL

ELBPHILARMONIE The mixed-use complex designed by Herzog & de Meuron for a riverfront site (opposite) in Hamburg has two kinds of bent glass, shown in mock-up (top, left): IGUs that bulge in or out to allow for a swiveling ventilation panel (bottom, right), and laminated panels that seemingly droop to create a balcony railing (top, right).

IMAGES: COURTESY HERZOG & DE MEURON

50 WEST Curved IGUs mounted within aluminum extrusions soften the edges of a 64-story residential tower designed by JAHN rising in New York City.

FORTALEZA HALL The curved glass facade system at Foster + Partners' visitor center on the grounds of SC Johnson headquarters in Racine, Wisconsin, is stiffened by cables tensioned between the roof and the foundation.

On a former horse pasture in New Canaan, Connecticut, a 1,400-foot-long pergola snakes down a slope. Once the $60 million project is complete next fall, this "river," as it is referred to by its Tokyo-based architect, SANAA, will frame views into a 75-acre nature preserve and retreat. Spaces along the river, including a library, a dining room, and an indoor amphitheater—where the nonprofit Grace Farms Foundation will host events focusing on faith, the arts, and justice—will be almost invisible because they are being enclosed in curved walls of transparent glass.

The broad roof at Grace Farms shades the walls and minimizes reflections, while curved IGUs were chosen for their thermal performance. Painstaking fabrication has minimized the visual interruption caused by the vertical joint at the meeting of panels as large as 12 feet tall and 7 feet wide. The joint itself is about ½-inch wide, but spacers and sealants—covered by a fritted strip for neatness—help it read like a hairline. "SANAA didn't build the architecture around the limitations of insulated units," says Andy Klemmer, project director of the Paratus Group, the project manager. "We set new boundaries for IGUs, to accommodate the architecture."

Two types of curved glass are used at the Elbphilharmonie which, after numerous delays and ballooning costs, is now slated to open in January 2017. In some places, one edge of a IGU panel bulges out or is sucked in, and the resulting gap is filled with a swiveling ventilation panel. Elsewhere, laminated glass flares out from the wall like a wine flute, shaping a balcony rail as a drooping curve.

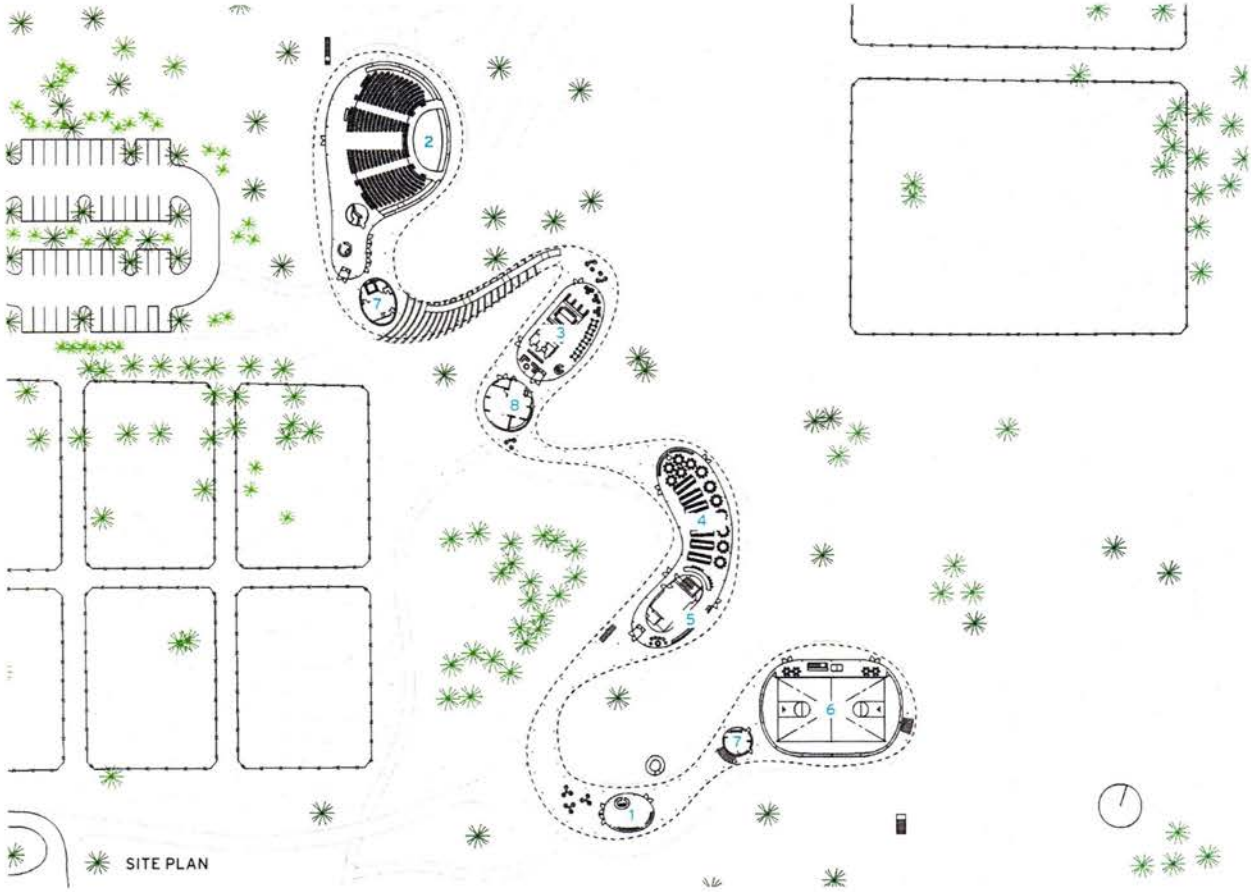
Glass this complex can require as many as six fabrication steps, with coating, bending, heat-strengthening, laminating, silk-screening, and assembly into insulated units, says Guardian's Milley. At the Elbphilharmonie, a cloudlike dot pattern was silk-screened around the edges of panels, inscribing transparent ovals that express the rhythm of spaces inside and help shield the interior from the sun while maintaining translucency.

With fabricating and installation choices so varied, "there's no rule of thumb," says Milley, to estimate the additional cost of bent glass. Conventionally sized units mounted in framing off-site reduce the premium. Yet the reason to use bent glass is often to achieve an extraordinary clarity or alluring tactility, which can entail labor-intensive fabrication and installation. Some clients will go the extra distance: "At Grace Farms, we have an incredibly patient client willing to take some risks," Paratus's Klemmer explained. "They wanted to make the building exceptional." ■

James S. Russell, FAIA, writes about architecture for several publications and blogs at JamesSRussell.net.

IMAGES: © DBOX (LEFT); SC JOHNSON (TOP)

1 FOYER
2 INDOOR AMPHITHEATER
3 LIBRARY
4 DINING
5 LIVING
6 GYMNASIUM
7 RESTROOM
8 OFFICE



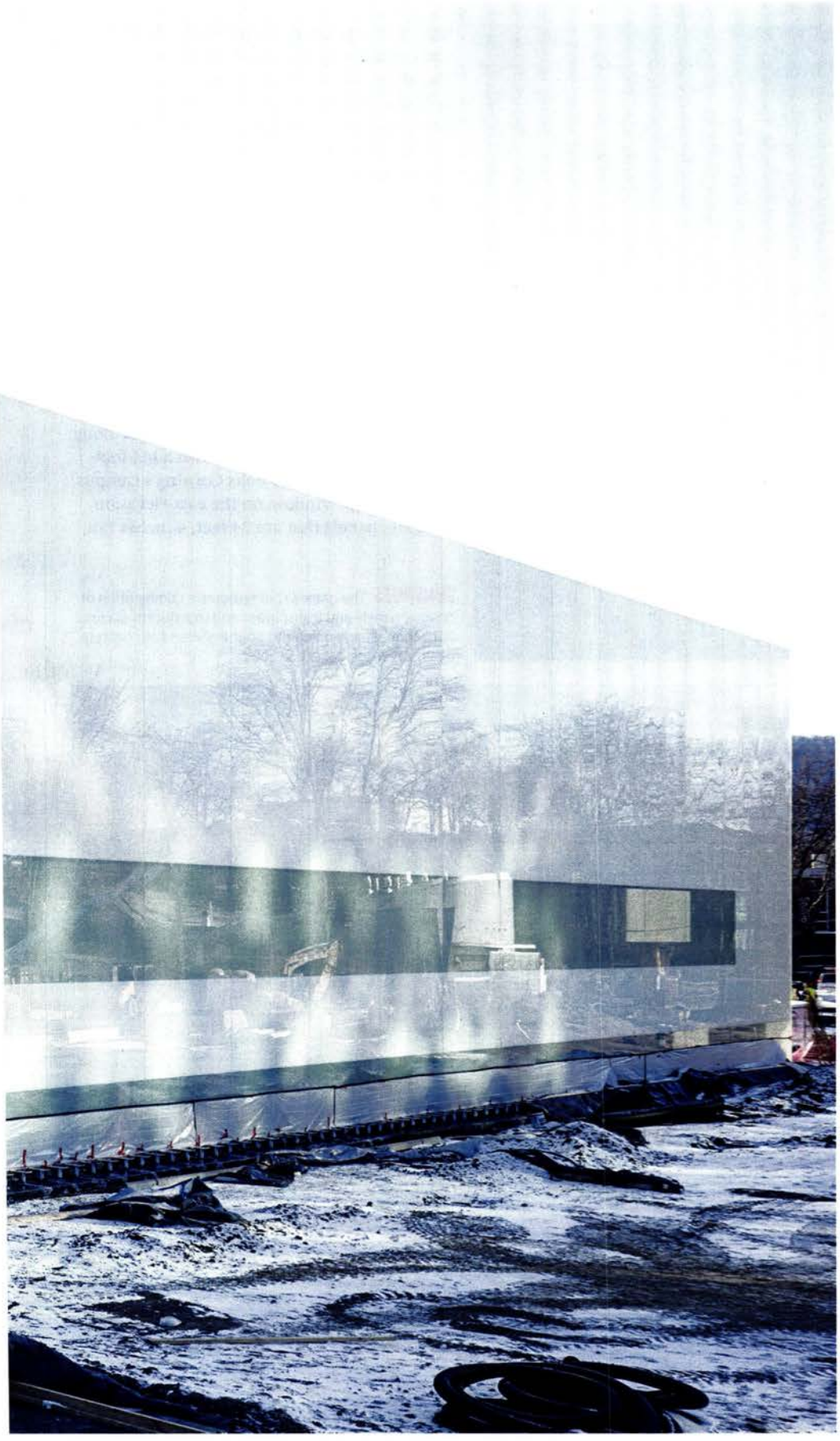
GRACE FARMS

For a 75-acre nature preserve and retreat in New Canaan, Connecticut, SANAA has designed a 1,400-foot-long pergola that snakes down a slope (below). Curved glass panels, some as large as 12 feet tall and 7 feet wide, now being installed (left), will enclose programmatic elements, including an indoor amphitheater, library, and dining room.

IMAGES: © DEAN KAUFMAN (MIDDLE); COURTESY GRACE FARMS AND SANAA (TOP AND BOTTOM)

Reflections on the Box

A new addition to the Corning Museum of Glass by Thomas Phifer and Partners continues a tradition of architectural invention at its upstate New York campus. By Josephine Minutillo



PHOTOGRAPHY: © IWAN BAAN, EXCEPT AS NOTED

MINIMAL EXPOSURE The addition's pristine exterior masks a series of inventive details that made it possible to sheathe the structure in a single layer of glass with few joints.

IT GOES WITHOUT saying that the material of choice for a glass museum is glass. At the Corning Museum of Glass in Corning, New York, this has been the case for every incarnation of its sprawling structure, beginning with the original 1951 International Style building by Harrison & Abramowitz, though the glass-block portions of its facade are now interior walls. A free-flowing addition by Gunnar Birkerts (1980) features a peculiarly tinted, steel-backed, rolled-glass facade over an angled mirrored surface, while Smith-Miller & Hawkinson's 2001 cable-stayed contribution is animated with glass stairs, freestanding glass walls, and glass walkways.

This month, a new addition opens. Though connected to the earlier constructions, it is as different from them as they were from each other. "We wanted our building to be a quiet voice in that ensemble," explains Thomas Phifer, architect of the new 100,000-square-foot Contemporary Art + Design Wing. Taking a reductivist approach, Phifer was inspired by the vitrines that typically house museum objects, which led to an extreme decision for a complex building type: his museum, like those display cases, would employ a single layer of glass to encase the 26,000-square-foot, one-story gallery and lower-level offices. (The new wing also links to a historic factory building renovated to contain a 500-seat facility for glassblowing demonstrations.)

The result is a pristine, frosty-white glass box with a visual simplicity that belies its underlying complexity. Thomas Phifer and Partners worked with structural engineers Guy Nordenson and Associates to create hefty but sinuous interior walls that take on much of the structural duty and house mechanical equipment, allowing the glass-clad exterior walls to be designed as a light steel frame. The 20-foot-tall cast-in-place curving concrete walls are topped by 3½-inch-wide and 4-foot-deep precast-concrete beams. Spaced 3 feet, 2½ inches apart, the slender beams direct daylight from the skylight-covered roof to the floor, where the large contemporary glass works—which, unlike many types of art, are unharmed by sunlight—will sit.

The real innovation, however, happens at the facade itself, where the glass transitions from rainscreen to window—a highly unusual design that maximizes the glass size and creates a skin with very few joints.

The facade's 10½-foot-wide glass panels, on average 19 feet, 8 inches tall, are stacked three

high, each one supporting the one above it and transferring dead loads to the foundation. The 140 panels were fabricated in Germany by Thiele Glas. German facade contractor MBM Konstruktionen coordinated their assembly at Thiele's factory, affixing aluminum supports to the back of the glass with structural silicone. These coat-hook-type elements fasten onto U-channels mounted on the building's exterior sheathing, facilitating installation.

Most of the perimeter walls that visitors will experience from within the gallery comprise an interior stud wall, the building frame, a rainscreen cavity, and the glass cladding, for a typical depth of 3 feet, 11 inches. But select zones consist of just 1-inch-thick low-iron glass, without vertical mullions, to provide views. These include the "porch," a display area along the building's northern edge with a 144-foot-long window that overlooks Corning's campus. Another large window, on the east elevation, has glass panels that are 24 feet, 4 inches tall.

SUNSPOTS The gabled roof features a combination of opaque panels and transparent and translucent glazing (left) that allows sunlight to pour between the concrete beams over the gallery (below).

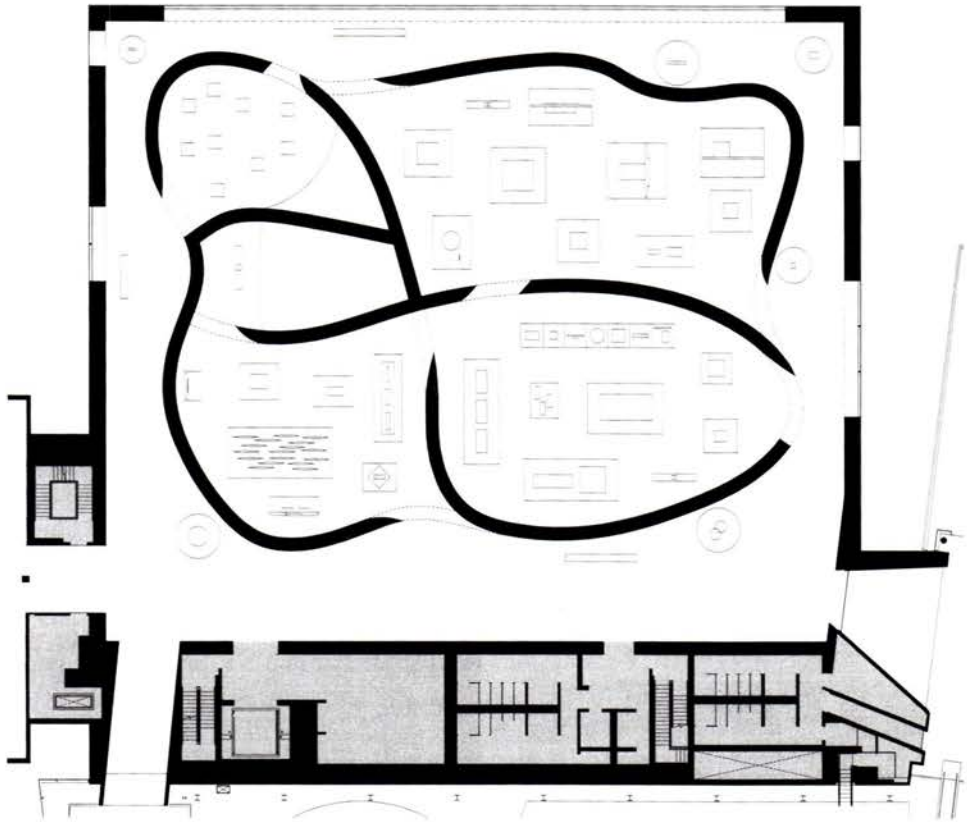
The PVB interlayer between the two ½-inch-thick sheets of fully tempered, laminated glass features an opaque white color where it passes in front of the cavity wall. Where it is used as vision glass, it is covered by a white dot-frit pattern.

That transition, where the weatherproof enclosure goes from a nearly 4-foot-thick insulated wall to a 1-inch-thick piece of glass, required an inventive detail. To keep water out at the windows, the silicone membrane wraps the mullion at the head, sill, and jambs, and is clamped and sealed to the window perimeter. "It sounds like a typical waterproofing detail, but it's used in a unique way because we have to drain all the water out between the joints of the glass," says Jessica Young, a senior associate at facade consultant Heintges & Associates.

Draining water, especially from melting snow, was also a concern on the roof. But this was achieved with a series of gables, each designed as a three-hinged arch, with gutters at each trough, concealed behind a fairly traditional parapet that extends past the skylights. The skylights feature insulated glass panels—some transparent, some acid-etched for translucency—made domestically by Viracon, and a number of opaque white metal panels, that combined allow up to 450 footcandles of light inside the gallery on a sunny day.

Phifer's minimal environment offers few distractions. "If you have a detail that shouts more than the works themselves, you've done a disservice to the works," he says. "Here, the poetry of the light, the systems, and the structure are all wound up together." ■

CURVES IN THE SQUARE Hefty but sinuous interior walls made of cast-in-place concrete support much of the structure, allowing the perimeter walls to be designed as a light steel frame.



GALLERY PLAN

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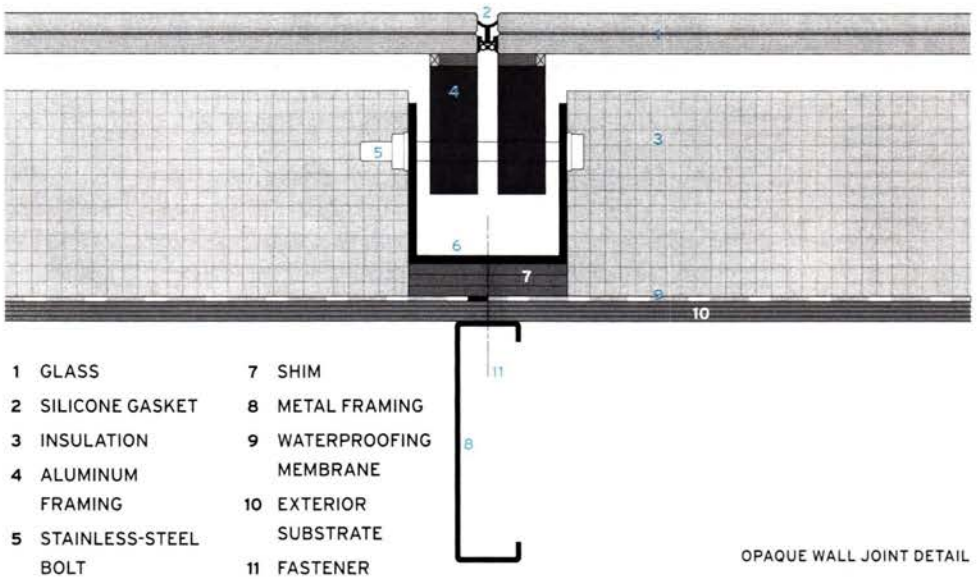


1 GLASS
2 SILICONE GASKET
3 INSULATION
4 ALUMINUM FRAMING
5 STAINLESS-STEEL BOLT
6 ALUMINUM U CHANNEL
7 SHIM
8 METAL FRAMING
9 WATERPROOFING MEMBRANE
10 EXTERIOR SUBSTRATE
11 FASTENER

OPAQUE WALL JOINT DETAIL

0 6 IN. 15 CM.

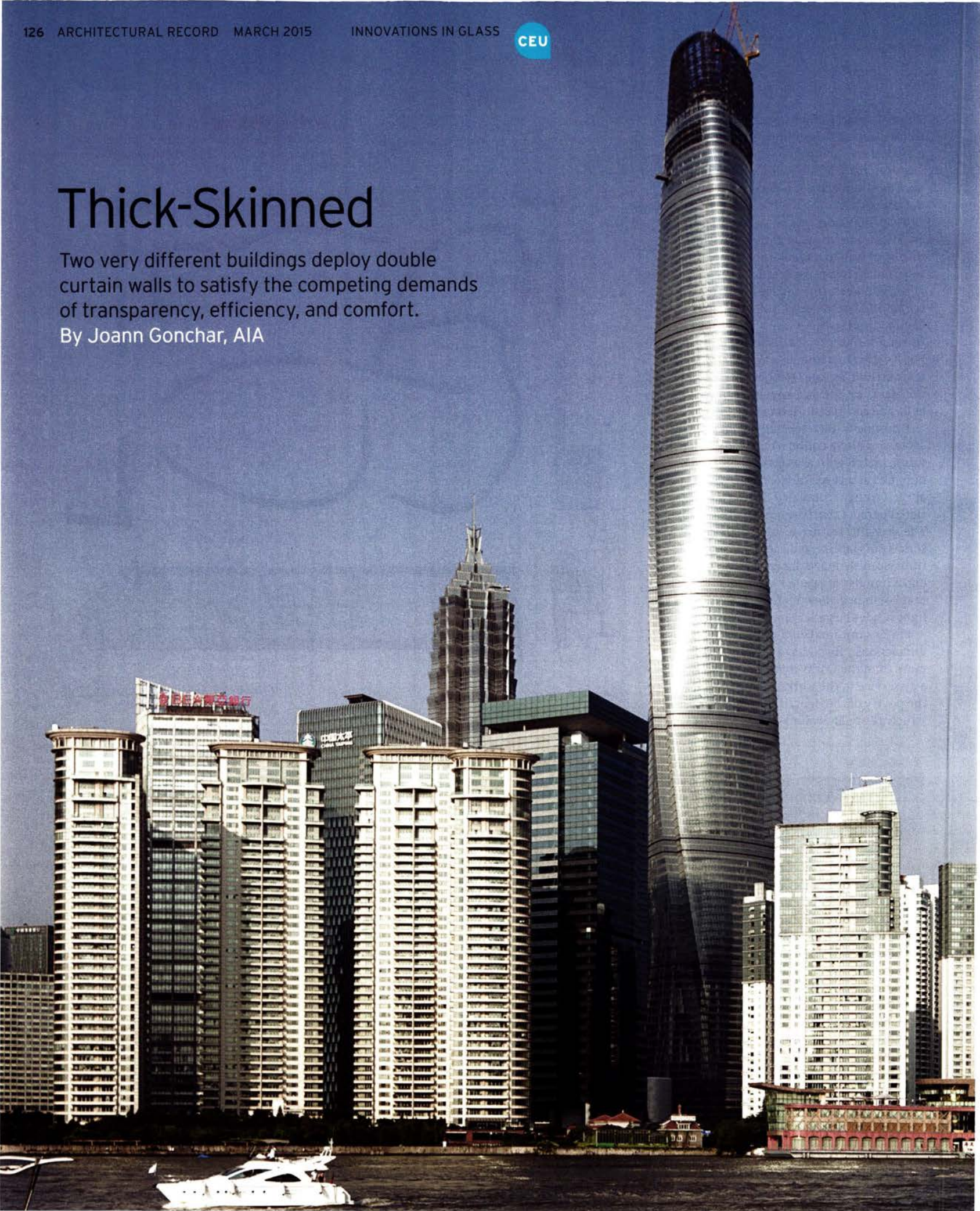
OFF THE HOOK The large glass panels were delivered to the site pre-assembled with coat-hook-like supports already affixed to their backs for easy installation.

PHOTOGRAPHY: © KATIE BENNETT

Thick-Skinned

Two very different buildings deploy double curtain walls to satisfy the competing demands of transparency, efficiency, and comfort.

By Joann Gonchar, AIA



THE DOUBLE-SKIN curtain wall—an enclosure system that consists of two facades separated by a cavity—has long been a popular approach to all-glass buildings in Europe, in part due to higher energy prices and tougher energy codes there. But such walls have begun to proliferate in other parts of the world as a way to satisfy the sometimes competing goals of transparency, efficiency, and occupant comfort.

One of the highest-profile double-skin buildings under construction now is Gensler's tapering and twisting Shanghai Tower. At 121 stories and 2,073 feet, it will be the world's second-tallest skyscraper when completed later this year. The building, which includes office space, a hotel, and a conference center, is organized like a tiered wedding cake: nine cylinders with gradually smaller diameters—each between 12- and 15-floors tall—are stacked one on top of the other. Between each zone, triangular two-story mechanical floors serve as platforms for 21 public atria or "gardens in the sky," enclosed by the tower's outer and inner curtain walls.

The outer skin, which helps define the skyscraper's serpentine form, consists of laminated glass within aluminum extrusions supported by radial struts and encircling girts. The inner skin's aluminum curtain wall, supported by the office and hotel floors' circular slabs, is made up of insulated glass units (IGUs).

The atria in between the two layers will do more than offer office workers a place to eat lunch. The spaces will also perform as a climatic buffer, explains Alan Hung, a principal at Cosentini Associates, the tower's mechanical engineer. These spaces will be maintained at temperatures that are cooler than the outdoors in summer by taking advantage of so-called "spill air": used air from the tower's interior that will be recirculated through atrium. In the winter, when the recirculated air is warmer than outdoor temperatures, the strategy will reduce the amount of heating needed. And since only the lowest 8 feet of each roughly 190-foot-tall atrium is occupied, the space can be kept comfortable "with very little energy input," points out Benedict Tranel, a Gensler principal.

In New York, architects from Renzo Piano Building Workshop (RPBW) are using a double skin to enclose the Jerome L. Greene Science Center—a 9-story, 450,000-square-foot neuroscience lab under construction on Columbia University's new campus in northern Manhattan. Here the skin is the logical result of the 17-acre academic precinct's master plan designed by RPBW and Skidmore, Owings & Merrill which is intended to be permeable to the neighborhood around it. The plan has such features as publicly accessible green spaces

SHANGHAI TOWER Gensler's nearly complete skyscraper (left) has two curtain walls: an outer one that defines its tapering and twisting form and is supported by radial struts (right) and encircling girts, and an inner one supported by the circular floor plates. Between the two are 21 approximately 190-foot-tall atria.

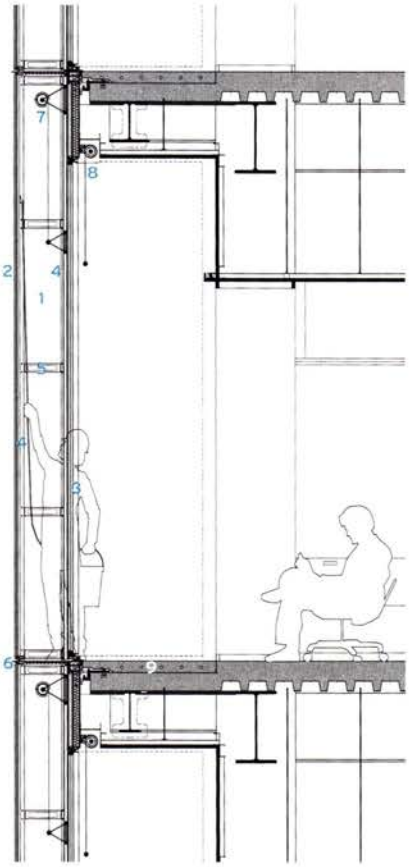
ATRIUM SECTION-PERSPECTIVE

1 CIRCULAR FLOOR SLAB
2 OUTER SKIN
3 INNER SKIN
4 TRIANGULAR MECHANICAL FLOOR
5 CIRCULAR GIRT
6 RADIAL STRUT

PHOTOGRAPHY: © SHEN ZONGHAI (OPPOSITE); COURTESY GENSLER (2)

JEROME L. GREENE SCIENCE CENTER
Renzo Piano Building Workshop is enclosing its new lab building (above) for New York's Columbia University in a highly transparent double skin (right). The 16-inch-deep unitized curtain wall arrived at the site assembled into panels 7 feet, 10½ inches wide and two stories tall. These included both skins as well as cavity shades.

1 CAVITY
2 LAMINATED GLAZING
3 IGU
4 ALUMINUM MULLIONS
5 BRACKET
6 CAVITY GRILL
7 CAVITY SHADE
8 INTERIOR SHADE
9 RADIANT FLOOR



CURTAIN WALL SECTION 0 3 FT. 1 M.

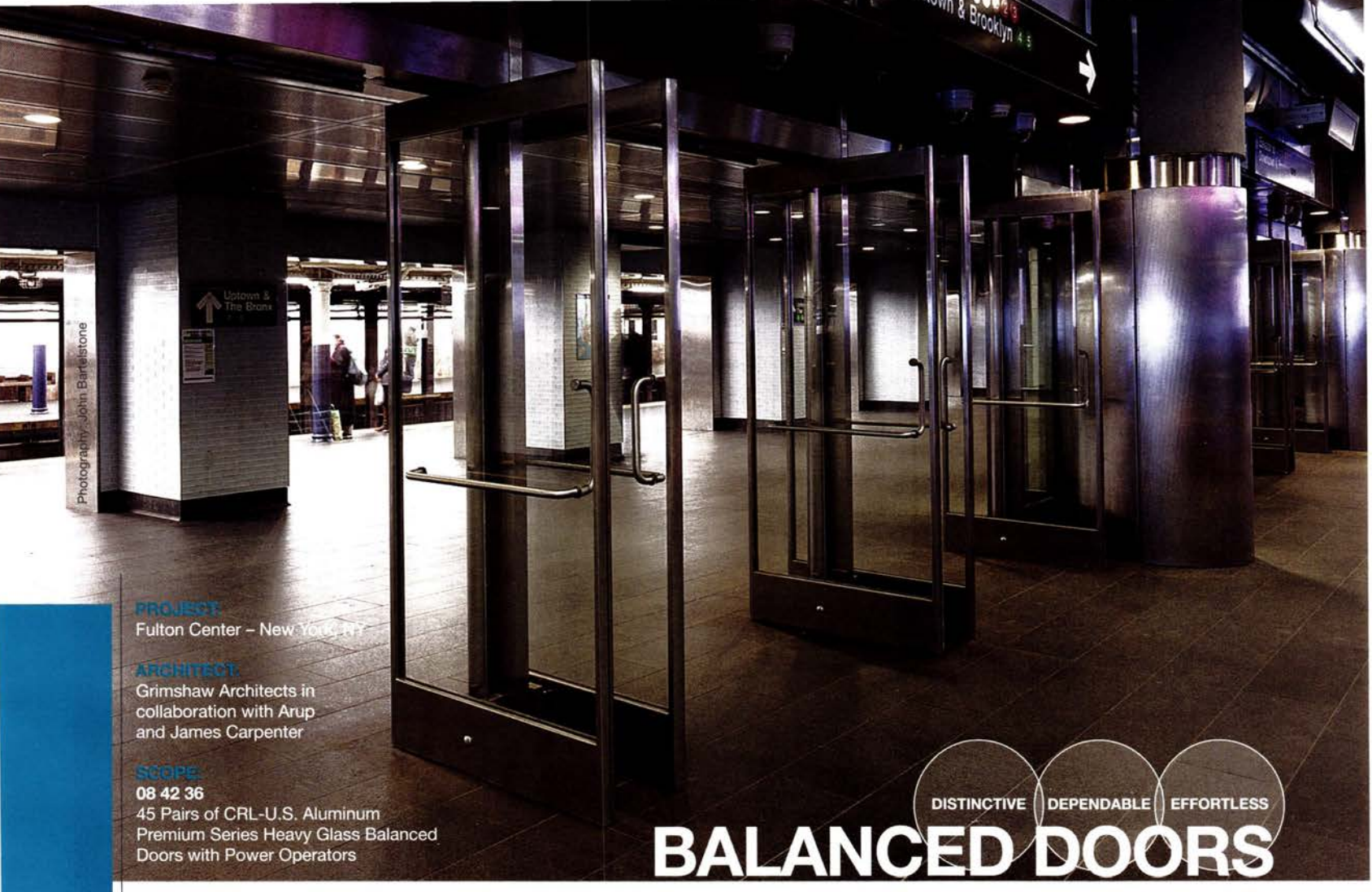
and ground-floor retail. "The transparent building envelope is an extension of this philosophy," says Philip Pitruzzello, Columbia's vice president in charge of the new campus's development.

Though RPBW's building is shorter and has a different program from Gensler's tower, the composition of its curtain-wall elements is similar, though not identical. The envelope's outer skin consists of laminated glass, while the inner one is an IGU, albeit one with an interior-facing lite that is laminated. This additional layer helps keep out sounds such as the rumbling of a train that passes by the building on elevated tracks, explains Mic Patterson, vice president at Enclos, the curtain wall's fabricator and installer.

The primary difference between the configuration of the curtain walls on the two buildings is the distance between the inner and outer skin. In New York they are separated by only a 16-inch cavity rather than by occupiable space, a cavity just wide enough to house automated shades that prevent solar gain (the building will also have interior automated shades to mitigate glare). Like Shanghai's atria, although much narrower, the cavity still makes use of spill air to create a thermal buffer. The strategy is especially appropriate for labs because of their high ventilation requirements, points out Scott Frank, a partner at Jaros, Baum & Bolles, the project's mechanical engineer. This air, which would typically be vented from the building, is essentially a "free resource," he says.

Because of the buffer that the envelope system provides—along with a host of other features, including heat recovery, state-of-the-art lighting controls, and chilled beams—Columbia's new lab building is expected to be about 30 percent more efficient than required by code. For the Shanghai Tower, such savings are predicted to be about 21 percent. But efficiency isn't the only reason to use a double curtain wall—at least not for Gensler's Tranel. "It provides the opportunity to create something spatial," he says. "It's an architectural solution rather than a technical one." ■

PHOTOGRAPHY: © ENCLOS



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ARCHITECT:
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SCOPE:
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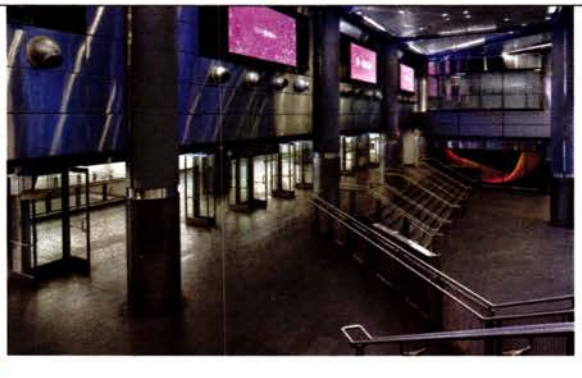

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CIRCLE 61

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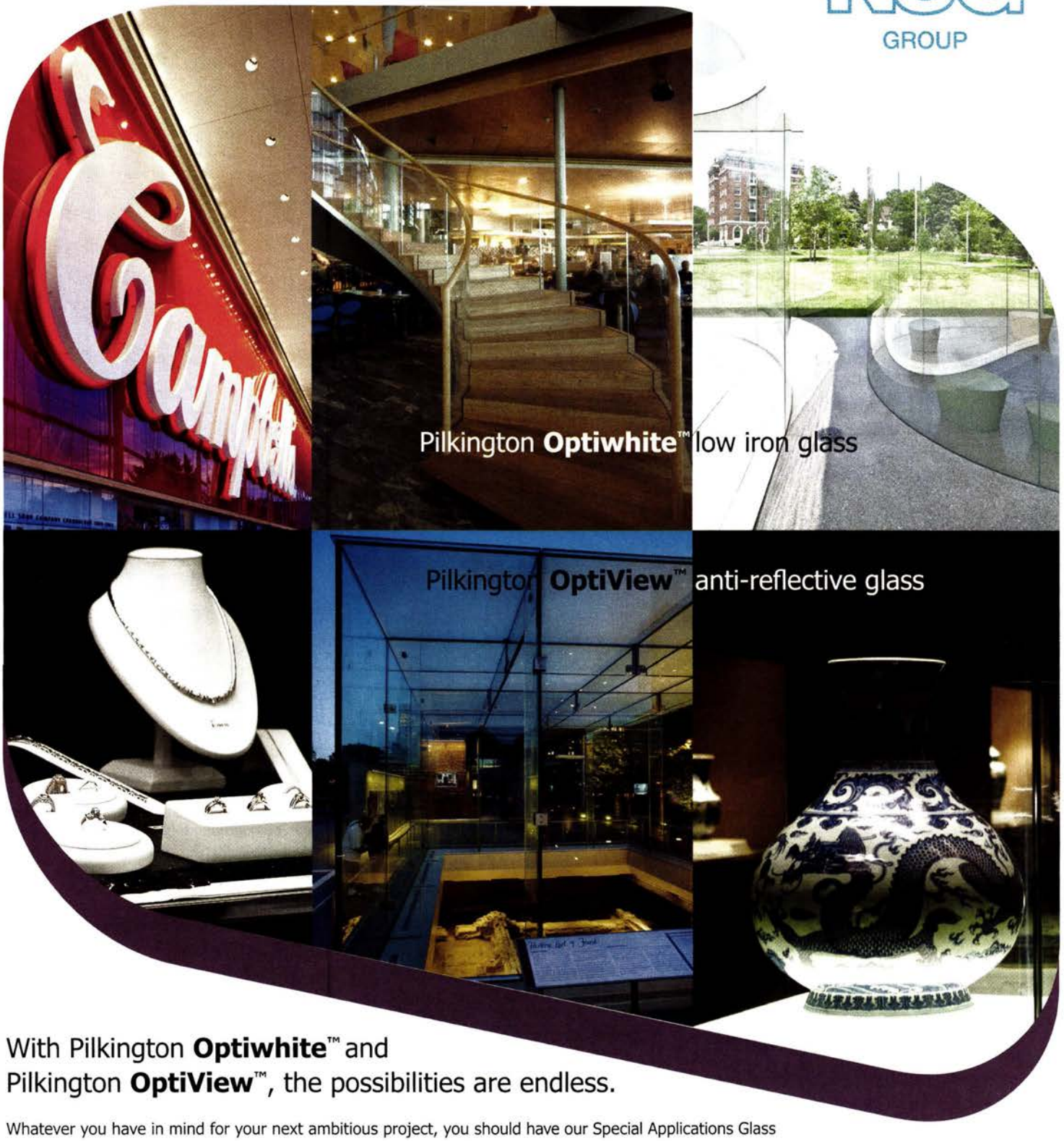

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Bigger, Flatter, Clearer

Two towers rising in Shenzhen, China, demonstrate SOM's approach to creating transparent and pristine facades.

By Joann Gonchar, AIA

WHEN IT COMES to commercial towers, many architects and their clients prefer buildings with highly transparent and ultrasmooth skins. Made up of large pieces of glass separated by as few mullions as possible, these exteriors reflect the long spans and open interiors within. "The quality of space and flexibility is undoubtedly what the market is looking for," says Nick Holt, technical director at Skidmore, Owings & Merrill (SOM) in New York.

Among SOM's many current projects is an office and hotel complex in Shenzhen, China, now under construction for the Shen Ye Land Company and slated to be complete by mid-2017. To deliver the desired openness within a pristine envelope, the architects designed two towers—one 984 feet tall and the other 1,276 feet tall—each with a reinforced-concrete core and minimal perimeter structure, enclosed in large expanses of glass.

The buildings' typical vision-glass panel will be about 77 square feet—slightly larger than what is considered the maximum for standard-sized insulated glazing units (IGUs), says Holt. Instead of using tall and narrow IGUs to span from one floor to another, the design team specified a wider but shorter insulated unit, 9 feet, 10½ inches wide by 7 feet, 10½ inches high. Made up of a laminated outer lite and a fully tempered inner lite, the vision glass

ENVELOPING ENCLOSURE
The two all-glass towers, part of a mixed-use complex, are to be completed by 2017.

IMAGES: © SOM

FROM INSIDE OUT By making the Shun Ye towers' typical vision-glazing panel wider than it is tall, the architects will provide occupants with a field of view with fewer obstructions (above). A visual mockup of a portion of the facade (below) includes products from various manufacturers.

will be positioned between a skinny lower lite and a highly insulated spandrel panel. "Instead of thinking vertically, we turned the module on its side," Holt says, to provide a wider field of vision for occupants.

Size isn't all that matters when it comes to selecting the right cladding. As the architects evaluate the Shen Ye towers' potential suppliers, they are considering the performance and appearance of their coatings, frits, and low-iron glazing—glass that is ultra-clear with a reduced greenish tint. The project team will also be keeping an eye out for surface imperfections like those known as "roller waves"—an optical distortion that can result from heat tempering or heat strengthening.

Factors that could compromise the precision of the skin aren't limited to the manufacturing process. Problems during assembly, transportation, and installation can mar the facade.Even a building's day-to-day operations can blemish a meticulously detailed enclosure. Holt points to "pillowing"—a slight but visible bowing of the skin caused by a pressure differential between a tower's interior and exterior imparted by mechanical systems or the stack effect.

SOM's method for combating this phenomenon involves IGUs with extra-thick—⅝ inch—outer lites, which will also help counter the wind deflection caused by the region's occasional typhoons. But the all-glass skin will still be much lighter than other cladding schemes, such as masonry with ribbon windows, he says, and "it makes beautiful buildings." ■

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Agents at the Torrington Port of Entry in Wyoming were forced to adopt a unique dress code. Their job requires them to record detailed information from each truck that enters the station. But blinding sunlight made it necessary to wear hats and sunglasses inside all day, all year long. And it was often too hot in the space, even in winter. Discomfort was impeding workflow and affecting efficiency.

Then SageGlass was installed. Now the windows tint electronically to block heat and glare. The trucks are monitored comfortably, any time of the day. And the agents are cooler than ever, even without their sunglasses.

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CIRCLE 35

SAINT-GOBAIN

This Steel Fabricator Has a New Assistant

Used to be you had to move paper. Lots of it. A change here, a change there. Run out to the plant, make sure everyone's on the same page. Reprint the drawings. Distribute them. Heck, the paper cost could put you at a loss. And the time involved!

Jake Thomas suddenly found himself the owner of Thomas Steel. So when this third generation was called into action to lead his team, he quickly found out he needed some changes. The process was inefficient.

Brought in new assistants. Jake equipped his entire 55,000 sq. ft. plant with 44 iPads. And he taught everyone in the plant how to use them. "They thought I was crazy," he says. "Until the results started to happen almost instantly."

Like saving money – around six figures. Like saving time – thousands of hours. And Jake says it's just the beginning. "What iPads do more than anything else is expedite networking," he says. "It puts us all on the same page. And that's a competitive advantage in any business."

In the digital age, to be competitive, you have to move fast – faster than the competition. It's no longer ready-aim-fire. It's aim-fire-aim-and fire again. And again. With his new assistants, Jake Thomas is always ready. And putting himself in a very competitive position. All the time.

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CIRCLE 69

Dynamic Glass

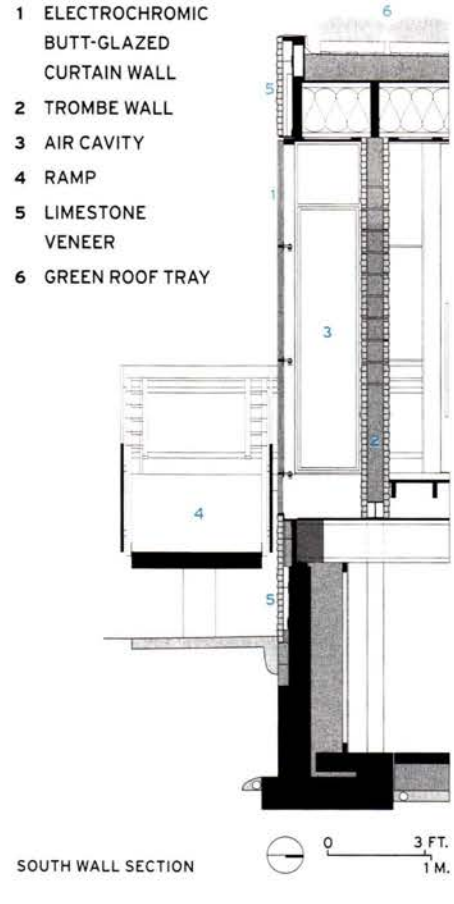
Three design teams explore the potential of electrochromic-glazing technology to enhance building-envelope performance and aesthetics. By Linda C. Lentz

SITUATED ALONG a main approach to the University of Kansas, the Center for Design Research (CDR) touts a sustainable strategy within a taut modernist skin made of limestone tailings and glass.

Designed and built in 2010 and 2011 by architect Dan Rockhill with Studio 804 (a graduate program he directs at the university's school of architecture), the super-insulated, wood-frame building is LEED Platinum and Passive House–Certified. Unique to a passive building is the lack of shading devices on its butt-glazed south-facing curtain wall. To escape the strictures of a typical "green" building envelope, the architects employed a relatively new glazing made by SageGlass on that elevation—one that uses electrochromic (EC) technology to modify the glass, so it tints dark to block the brutal Midwest sun in summer and remains clear during the winter to capture solar heat on a limestone trombe wall 2 feet behind it.

Electrochromic glazing is gaining traction with an increasing number of architects and sustainability professionals for its ability to manage solar heat gain, visible light transmission (VLT), and glare. One of two architectural dynamic glazing technologies, this "active" system has been commercially available for just a little more than a decade. It comprises a double- or triple-pane insulated glazing unit

CENTER FOR DESIGN RESEARCH This LEED Platinum and Passive House–Certified project at the University of Kansas features a trombe wall behind an electrochromic butt-glazed curtain wall developed with SageGlass.



SOUTH WALL SECTION

PHOTOGRAPHY: COURTESY STUDIO 804

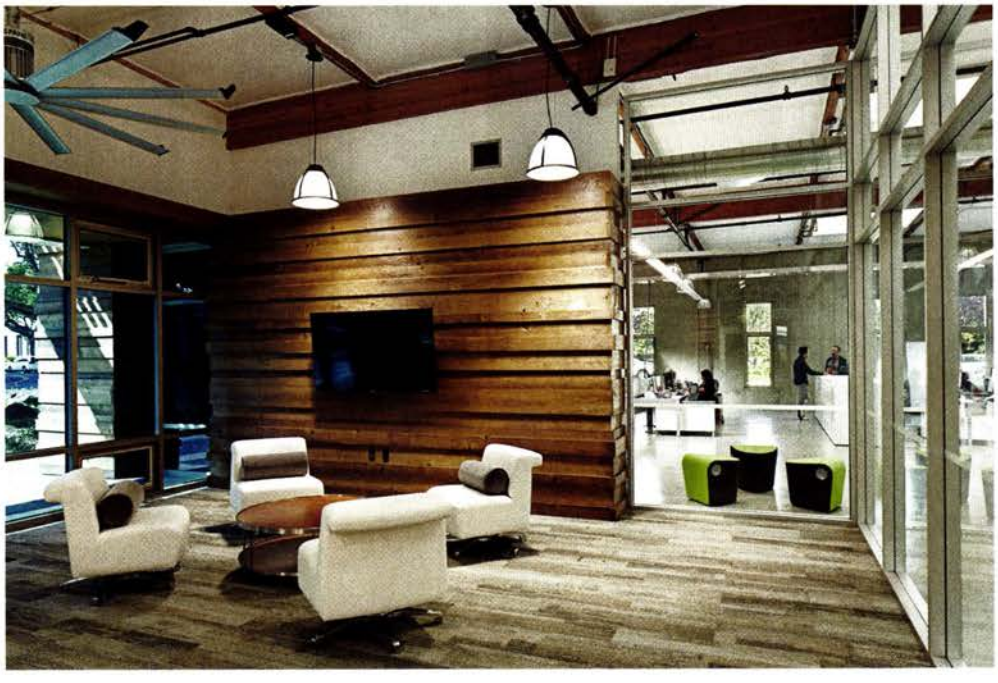
View additional images at architecturalrecord.com.

(IGU) with an electronically chargeable metal-oxide coating applied to the interior side of its outermost pane. When activated by a low-voltage current, the coating shifts from a clear to a dark state, varying among four VLT levels. Programmed by the manufacturer to tint in response to location and orientation, EC systems include sensors that monitor existing sky conditions and manual overrides for specific needs. (The second dynamic option, thermochromic glazing, uses a film that tints when warmed by the sun. While effective for managing heat gain, it cannot be controlled and does not block glare well in cold weather.)

The ability to simplify the architecture and still satisfy Passive House criteria by tailoring the controls of the CDR's facade is what most appealed to Rockhill and his crew. Meanwhile, in northern California, Sharp Development, working with green engineering consultants Integral Group and RMW Architecture, used the material to transform a 1970s tilt-up structure—located at 435 Indio Way in Sunnyvale—into a net zero energy-cost spec office. To do this, the design team wrapped the 30,000-square-foot, one-story building with a highly insulated envelope that operates in tandem with rooftop photovoltaics, precisely configured motorized skylights that diffuse daylight for maximum spread, and a pattern of EC fenestration from View Dynamic Glass—including operable, motorized windows—on the south, east, and west elevations. This glazing was critical to the scheme, says Integral Group principal John Andary. "Controlling the glazed areas so no direct sunlight penetrates the building allowed for a small and simple HVAC system—much smaller than we would normally put into a building like this."

THE CONNOR GROUP HEADQUARTERS Moody Nolan installed View Dynamic Glass above the atrium of this headquarters building in Dayton, completed in 2014. The glass keeps the space comfortable in all seasons.

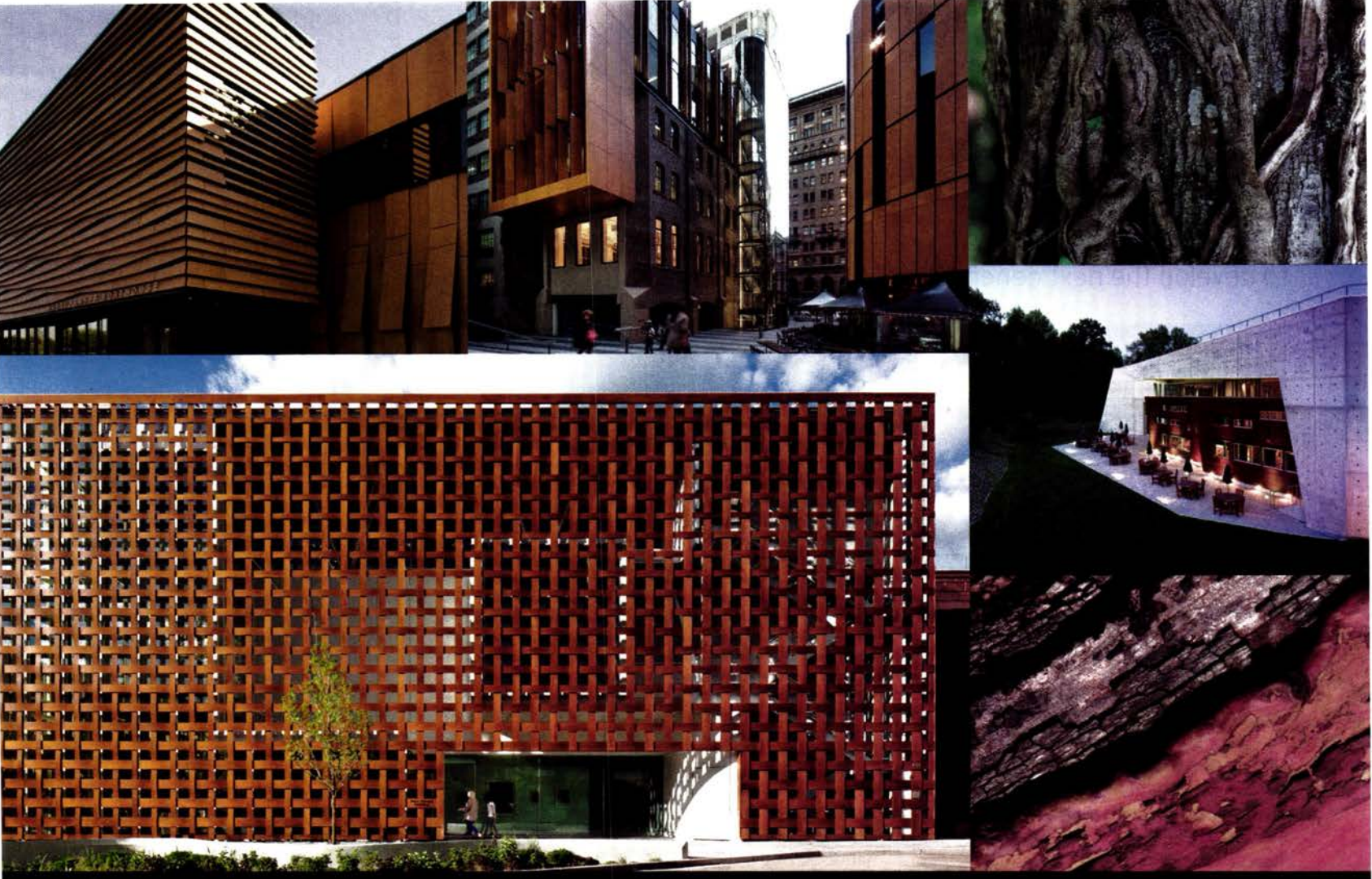
435 INDIO WAY
Completed in 2014, this 30,000-square-foot spec office building in Silicon Valley was designed to be a net zero energy-cost facility. It is glazed on the east, south, and west sides with View Dynamic Glass. An overhang above the entrance on the south side assures its glass remains in a clear state longer.



On the recently completed headquarters of the Connor Group, a real-estate investment firm in Dayton, Columbus, Ohio–based Moody Nolan used more than 4,800 square feet of View's EC glass over the atrium and in the west-facing conference room and east-facing curtain wall to reduce heat and glare. The firm is also about to complete a technology center for a Louisiana-based telecommunications company, which features 37,000 square feet of EC glazing.

Manufacturers of the glazing continue to improve its quality and performance—with progressively smarter controls, gradations, and variations of VLT and hue, larger panels (up to 5 feet by 10 feet, to date), and more shapes than rectangles. Ultimately, says Moody Nolan partner Daniel Pickett, quite aside from aesthetics and comfort, "the secret to this technology is going to be demonstrating the savings on energy costs. Once that can be documented, we will see other projects." ■

PHOTOGRAPHY: © BRUCE DAMONTE (LEFT); © BRAD FEINKNOPF (TOP)



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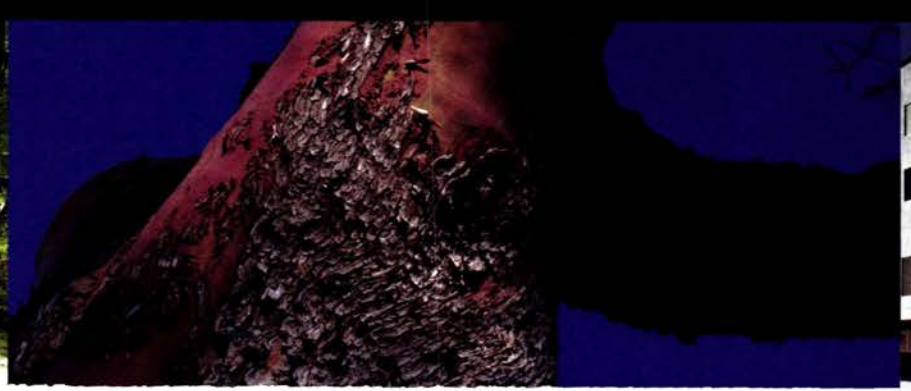
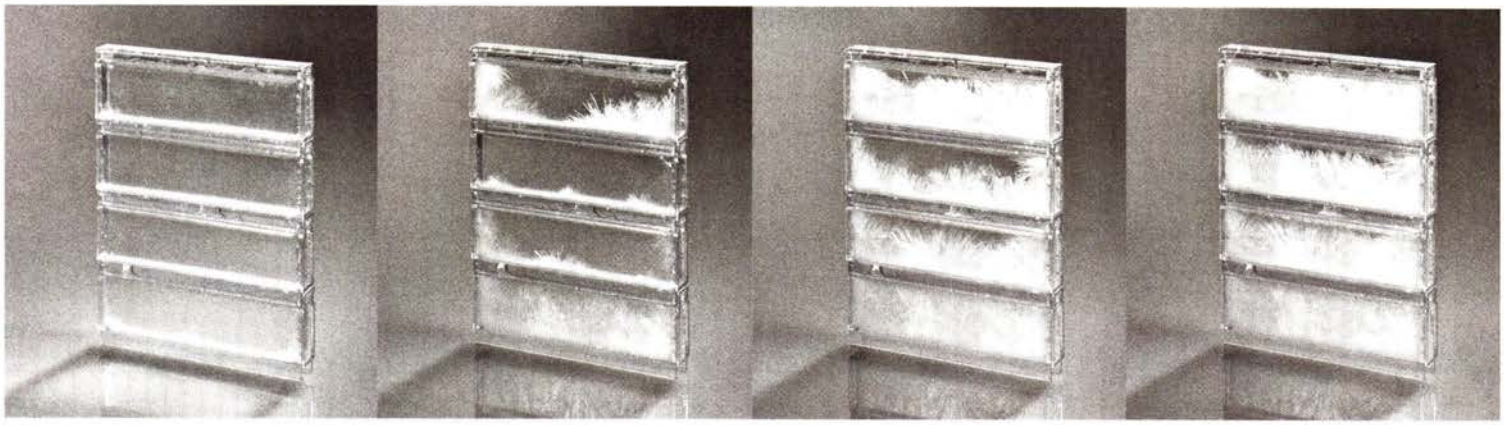


The Future Is Crystal Clear

Architects, scientists, and manufacturers look toward emerging technologies and materials to develop the next generation of glass and glazing products. By David Sokol



THE 1970S energy crisis spawned a golden age of research that yielded low-emissivity coatings, among other advances in glazing technology. Today's eco-building movement has spawned new inquiries into the material, resulting in a next generation of performance glass with even greater efficiency.

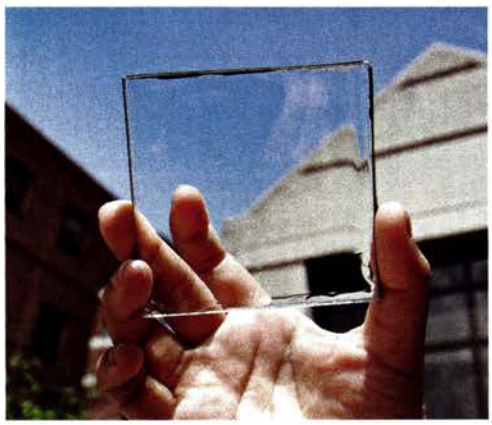
The concept of sandwiching an insulating layer of air between two glass lites dates as far back as the early 18th century, when Daniel Defoe described the double-glazed windows of Siberian homes in his sequel to *Robinson Crusoe*. Insulated glass units (IGUs) proliferated in the latter half of the 20th century, and, over this time, manufacturers began to fill the space between double- and triple-pane windows with more thermally efficient gases.

Gas-filled windows tend to be thick and heavy, however, making them difficult for historic and retrofit projects. Vacuum-insulated glazing (VIG) eliminates the gas altogether. Best suited for cold-weather climates, current VIG units rival the performance of triple-pane windows at a fraction of the thickness, but at a much higher price. The Pewaukee, Wisconsin–based company V-Glass is developing a new VIG assembly whose cost should be comparable to triple glazing. It comprises two glass panes separated by a patent-pending spacer system that, CEO Peter Petit says, "prevents panes from bowing and reduces the risk of the scratching of low-emissivity coatings." Unlike some existing VIG products, V-Glass comprises a flexible metal-foil edge to further mitigate potential bowing, which can cause the glass surfaces to touch and transfer heat. Petit expects his system to be available within the next several years, at which point he will license it to manufacturers of residential windows for installing in their own frames.

Swiss architect Dietrich Schwarz has also set his sights on the cavity within a window assembly, in this case filling the thermodynamic glazing he created, GlassX, with calcium chloride hexahydrate. This phase-change material, with a room-temperature melting point, absorbs convective heat and solar gain, and releases it upon recrystallization. The nontoxic salt does not block visible light transmission, appearing translucent in its solid state and clear in its liquid state. GlassX assemblies can achieve a U-factor of 0.07.

Buildings featuring GlassX have been operating in Germany and Switzerland since 2005, and the company's chief technology officer, Martin Schröcker, expects specifiers in North America (through Greenlite Glass Systems) to follow soon. Later this year, the company will offer phase-change areas of any height, which, Schröcker says, "gives architects more aesthetic flexibility." Previously, GlassX assemblies could not exceed 10 feet. The maximum width remains 6½ feet.

CUTTING EDGE GlassX thermodynamic glazing (top) transitions from a clear to translucent state. Ubiquitous Energy's ClearView Power is a clear photovoltaic coating that can be applied to glass (below).

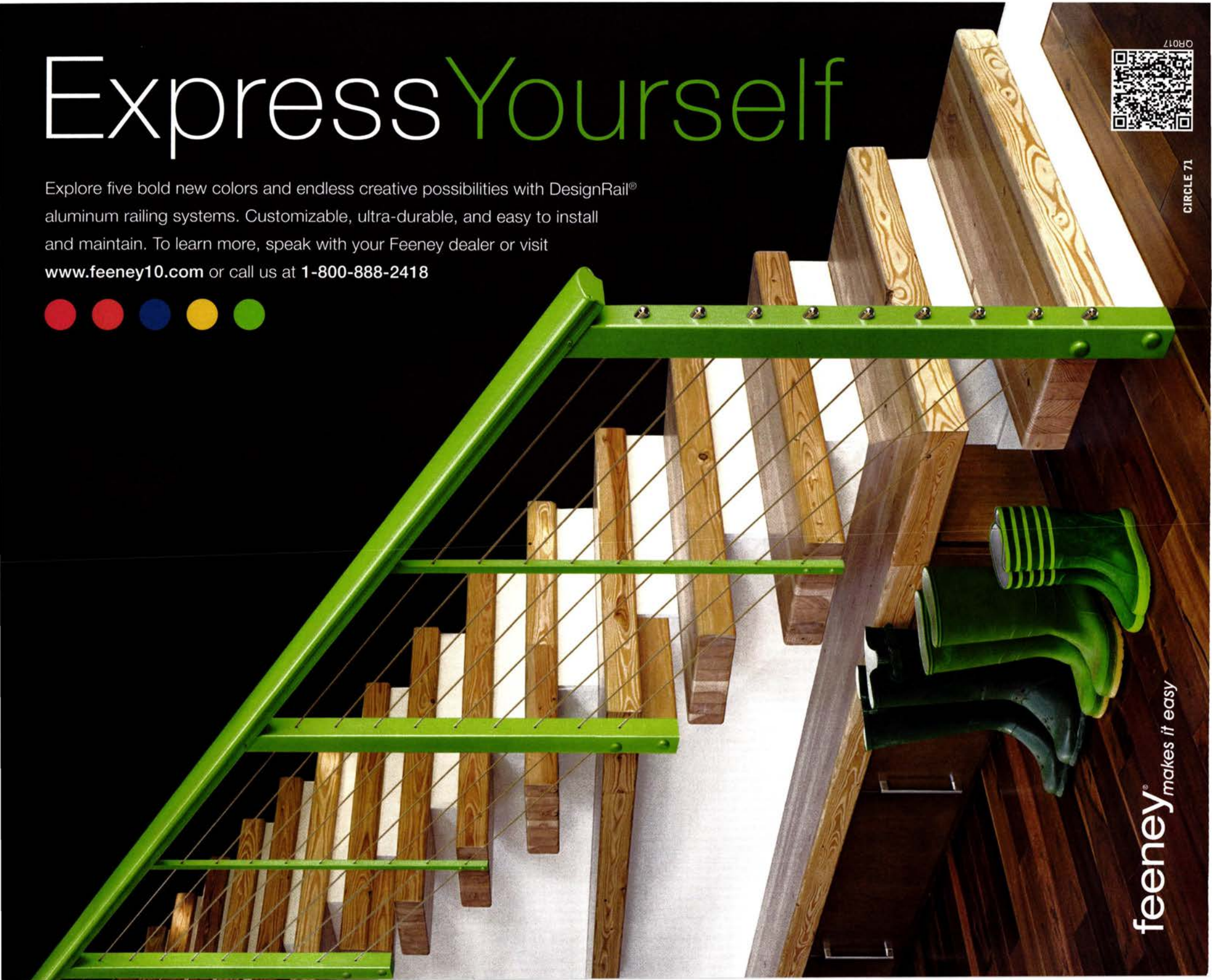


Most studies of high-performance glass manipulate solar thermal gain to reduce energy consumption. In 2010, a group of scientists at MIT—Miles Barr, Vladimir Bulović, and Richard Lunt—began transforming surfaces like glass lites or plastic film into photovoltaic systems. They've started a company, Ubiquitous Energy, in Menlo Park, California, to market the technology they produced, ClearView Power.

ClearView Power's see-through photovoltaics are organic molecules, vapor-deposited on a clear substrate, that absorb all the energy from the sun except for wavelengths that appear to the naked eye. The transparent coatings include semiconductor materials and electrodes channeling electricity to an external circuit. While this invention does not yet produce as much energy as standard photovoltaics, ClearView Power's invisibility allows integration into greater areas of the building envelope.

Whether through generating power or saving energy, the developers of glazing products continue to explore how glass can address the increasingly complex needs of the built environment, enabling architects to maximize creative expression, building performance, and occupant comfort. ■

PHOTOGRAPHY: COURTESY GLASSX (TOP); UBIQUITOUS ENERGY (BOTTOM)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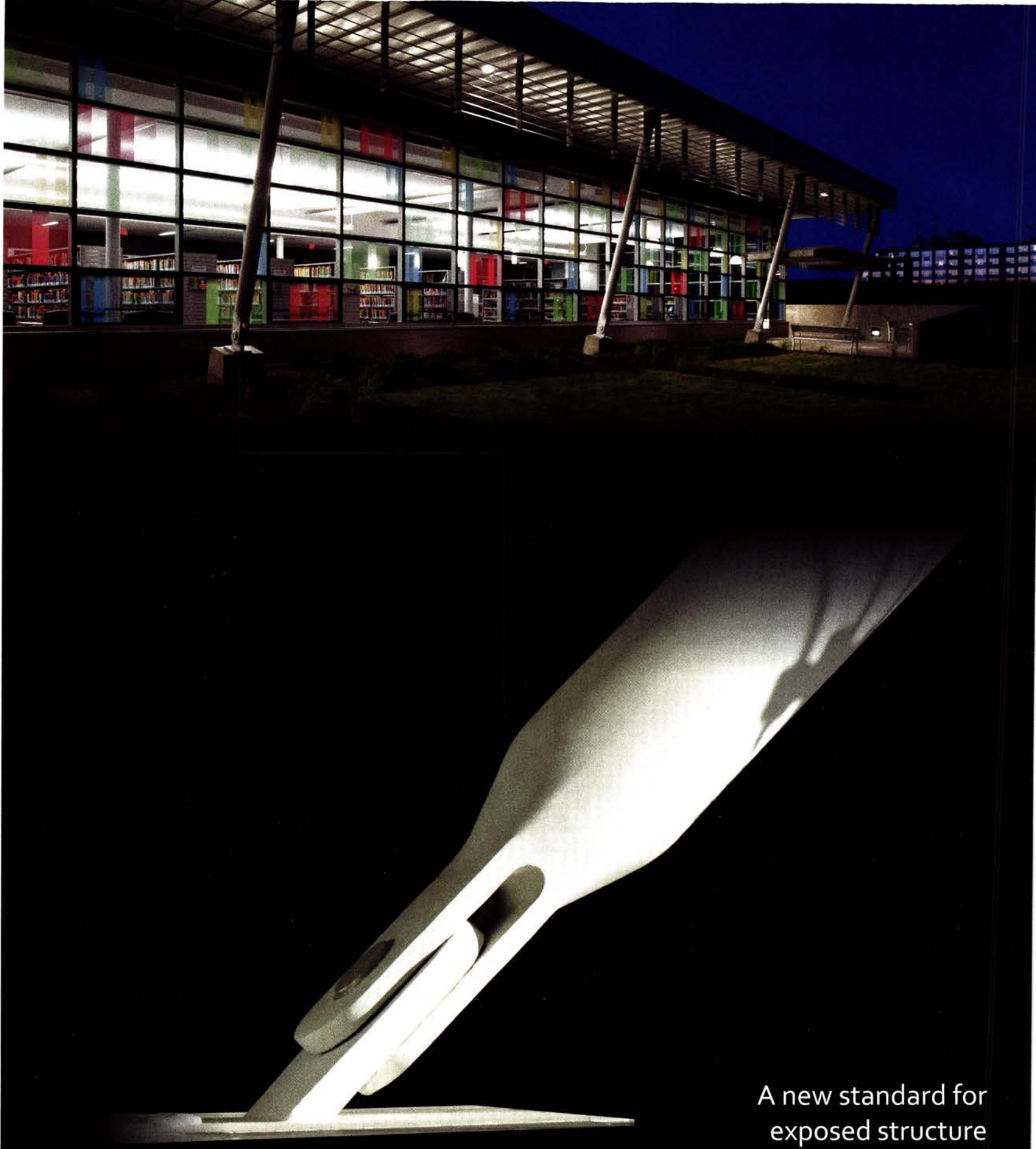

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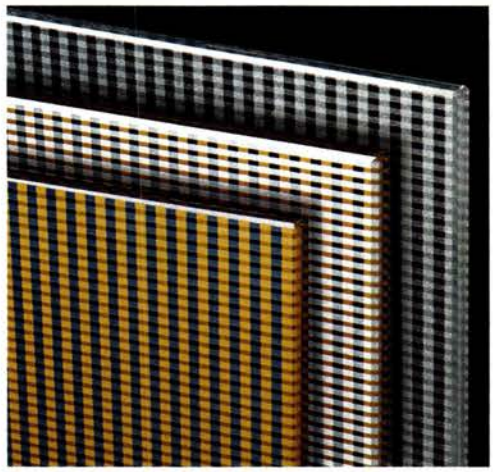
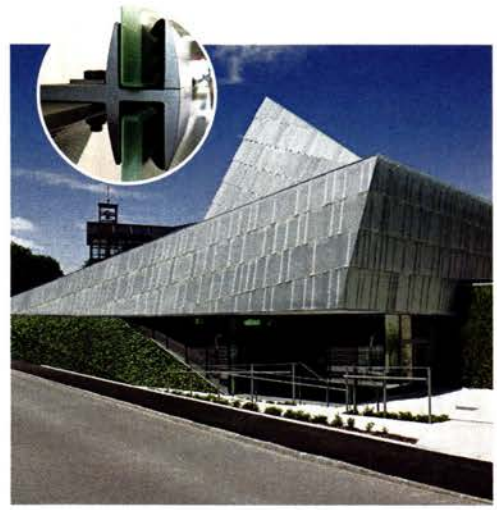




Fireframes ClearFloor System

Technical Glass Products (TGP) fireglass.com

To expand Northwestern University's Engineering Life Sciences building, Flad Architects constructed a five-story infill bridging two existing wings. The Fireframes glass floor system used in the addition's fifth level diffuses light to the ground floor atrium and surrounding areas housing equipment sensitive to direct sunlight, while also meeting stringent fire and life-safety codes. CIRCLE 210

Galaxy + Level Design Collection

Galaxy Glass & Stone galaxycustom.com

Collaborating with wall-decor manufacturer 4walls, Galaxy Glass & Stone has expanded its offerings with new graphics that range from flocked patterns to nature motifs. The imagery can be scaled to different sizes and is encapsulated in glass for use as walls in office, hospitality, retail, health-care, institutional, and even residential settings. The designs come in opaque, transparent, translucent, or satin finishes. CIRCLE 215

Metal Network

Pulp Studio pulpstudio.com

A total of 10 graphic patterns—ranging from grids to dots—are rendered in metallic-ink interlayers for this laminated-glass collection by Pulp Studio. All are available in custom panel sizes up to a maximum of 60" wide x 180" high, in four thicknesses from 5/16" to 13/16", and with clear, low-iron, mirrored, colored, or textured glass. Safety treatments can be applied to panels 7/16"-thick and up. CIRCLE 211

Bird Safe Low-E Acid-Etched Glass

Walker Glass Co. walkerglass.com

PPG Industries and Walker have partnered to introduce a product that offers all the benefits of PPG's low-E Solarban glass while also preserving avian wildlife. Studies show that visual markers on the outer surface of the glass can significantly reduce the chances of bird collisions, so Walker's AviProtek acid-etching is applied to the outside face in stock linear, striated, or custom patterns. Full surface etching is also available. CIRCLE 214

Decorative Glass Rainscreens

Bendheim bendheimrainscreens.com

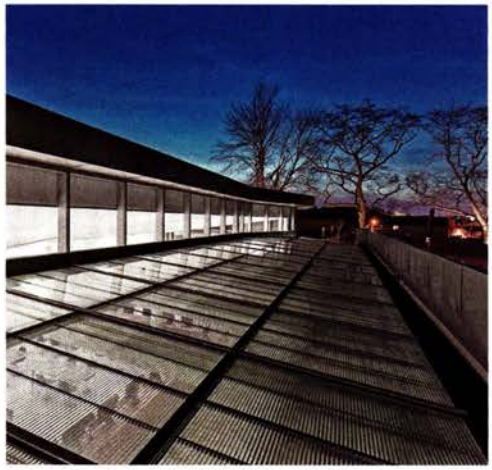
This compression fitting rainscreen system—which does not require cutouts or holes in the glass—allows for quick and easy transformation of a new or existing facade. For the Rif Community Center in Salzburg, Austria, Klasz Kleeberger Architects used the system to create a sloped, ventilated rainscreen comprised of vertically and horizontally overlapping etched-glass panels. CIRCLE 212

Unity Series

Joel Berman Glass Studios jbermanglass.com

This decorative glass was introduced in 2008, but the project for which it was conceived has only recently been completed. HOK turned to the glass studio when designing a world-class airport in Doha, Qatar, commissioning glazing to line various passenger corridors (shown). Berman senior designer Saleem Khattak drew on Islamic art and motifs to devise the collection's geometric patterns, which are screen-printed with white ceramic-frit ink. CIRCLE 213

products glass & glazing



SunGuard Spandrel HT

Guardian sunguardglass.com

Guardian uses a proprietary system that permanently bonds coatings to spandrel glass, resulting in higher opacity levels ideal for concealing unsightly mechanical components between a building's floors. Since this product is part of the SunGuard line, it also offers excellent solar control. Available in white, gray, and black, the glass is stocked in two sizes: 96" x 130" and 100" x 144". CIRCLE 216

Okasolar S

Okalux North America okaluxna.com

The Mariners Harbor Library (shown) on Staten Island, New York, gets ample natural reading light without the discomfort of solar heat gain, courtesy of Okasolar S. The system diffuses daylight using fixed mirrored louvers sandwiched between glass sheets. A*PT Architecture specified the product for both the east and west facades of the library, as well as for an expansive stretch of skylights. CIRCLE 217

Skyline Design Exterior Glass

Skyline Design skydesign.com

A fixture in the glass business for more than 30 years, Skyline has completed just a few exterior glazing projects on a custom basis. Now the company is making it a standard service to provide its proprietary etching process for building skins. An example includes a 15' x 22' window with artwork by Larry Kirkland, on a Lehigh University building by Bohlin Cywinski Jackson Architects. CIRCLE 218

SuperWall

Wausau viracon.com

At a University of Minnesota wellness center in Minneapolis, Studio Five Architects and Cannon Design introduced light and views by running a ribbon of Wausau's structurally glazed SuperWall system along three of the four facades, wrapping a rounded corner in the process. The curtainwall is fitted with a mix of clear and silk-screened VE1-3M low-E insulated glass by Viracon to ensure occupant comfort and semi-privacy. CIRCLE 221

Dapple Color Pressed

3form 3-form.com

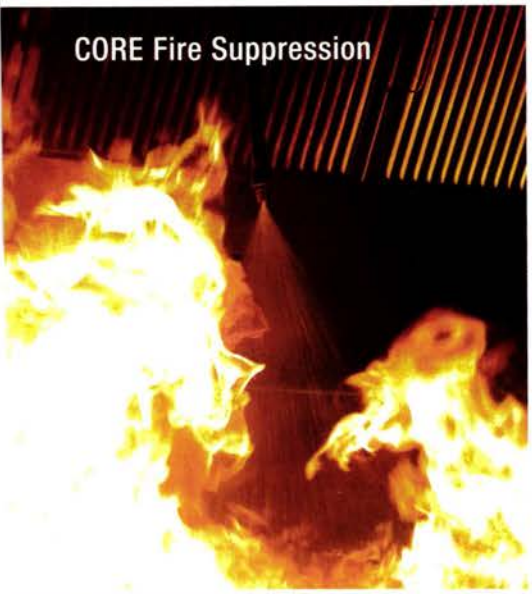
Offered through 3form's Pattern+ Color program, this linear-dot pattern for decorative architectural glass can be specified at four scales in more than 10,000 colors. The resulting laminated glass is well suited to corporate, health-care, and hospitality settings as dividers, interior walls, and doors. Panel sizes are 48" x 96" or 48" x 120" in six thicknesses ranging from 5/16" to 1 1/16". A total of 28 designs are available in Pattern+ Color. CIRCLE 220

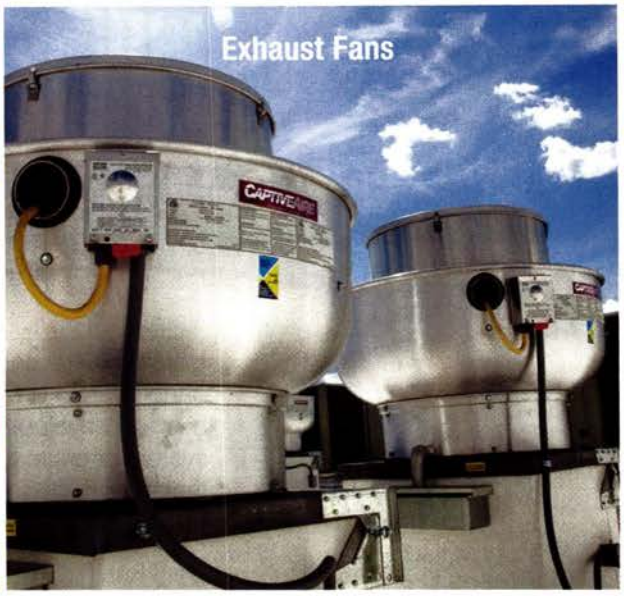
Digital Ceramic Printed Glass

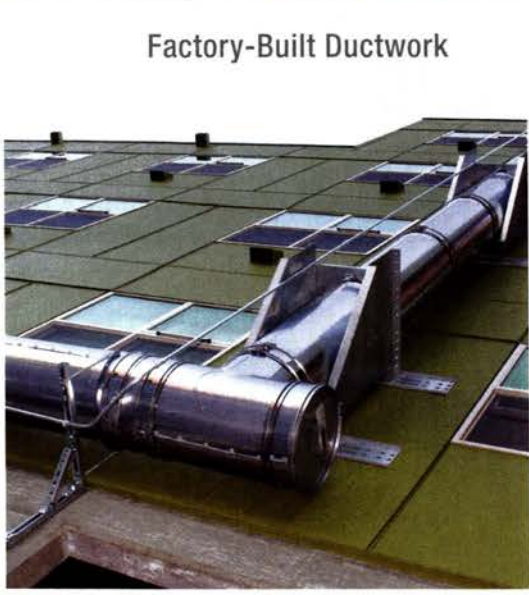
Dip-Tech dip-tech.com

The Glass Farm (shown) in the Dutch town of Schijndel houses public amenities, restaurants, and shops within an entirely glazed container that pays homage to the region's historical farms. Architecture firm MVRDV and photographer Frank van der Salm pieced together local farm imagery for AGC Glass Europe to print the final composition onto 500 glass panels using Dip-Tech's digital ceramic printing technology. CIRCLE 219

PHOTOGRAPHY: © RYAN SIEMERS, ASMP, ASSOC. AIA, LEED AP (BOTTOM, LEFT); PERSBUREAU VAN EIJNDHOVEN (BOTTOM, RIGHT)







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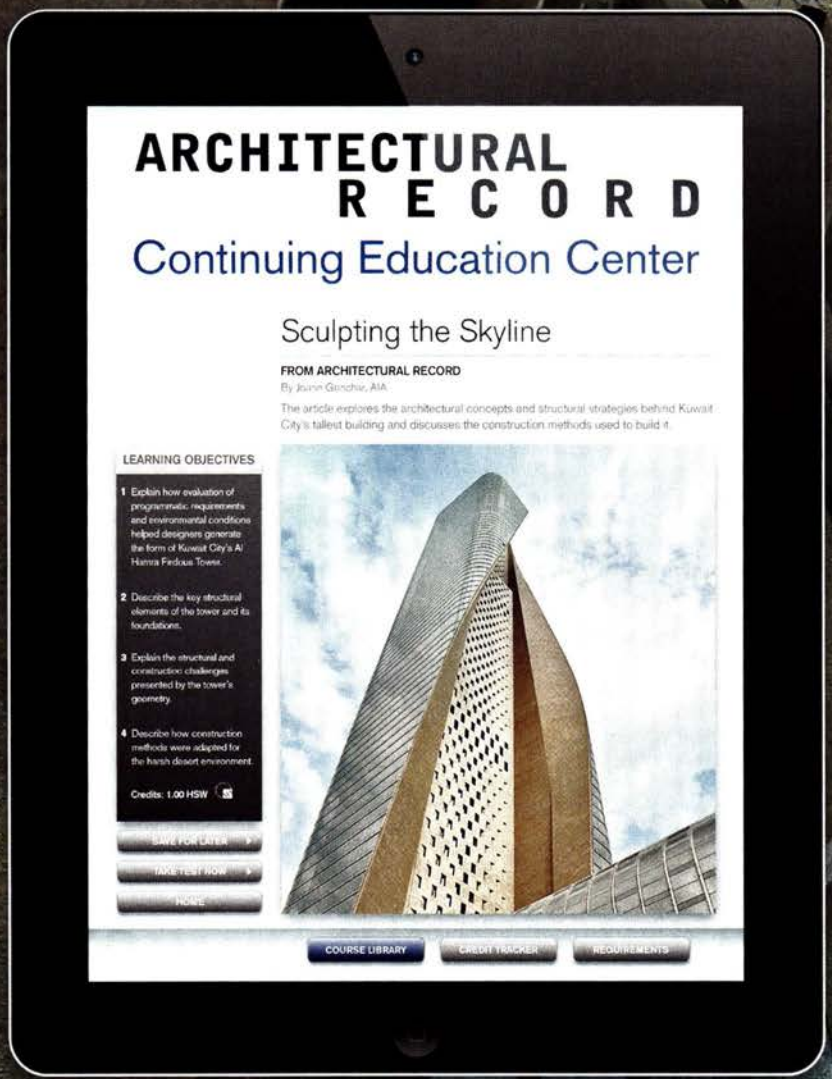

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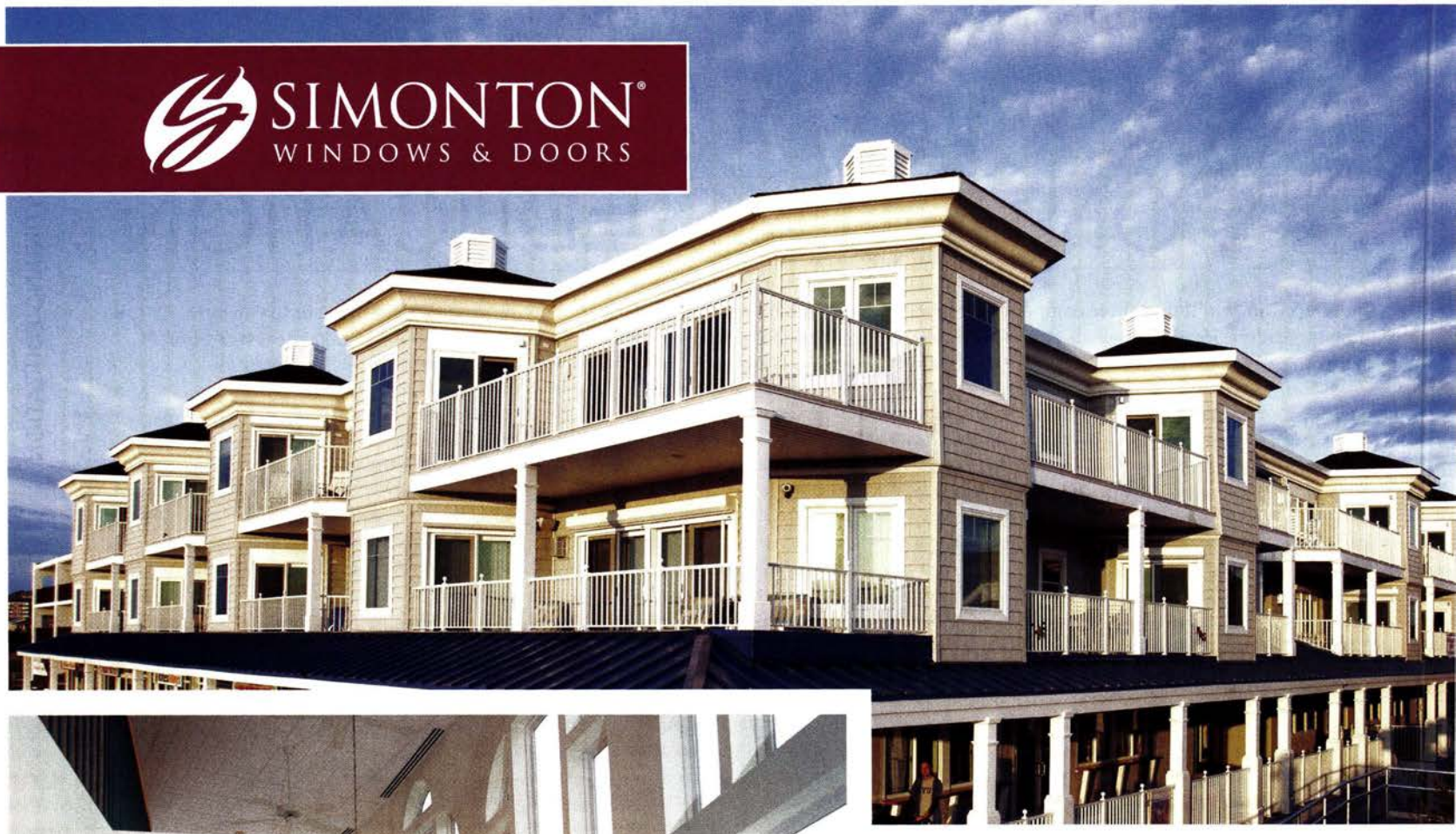

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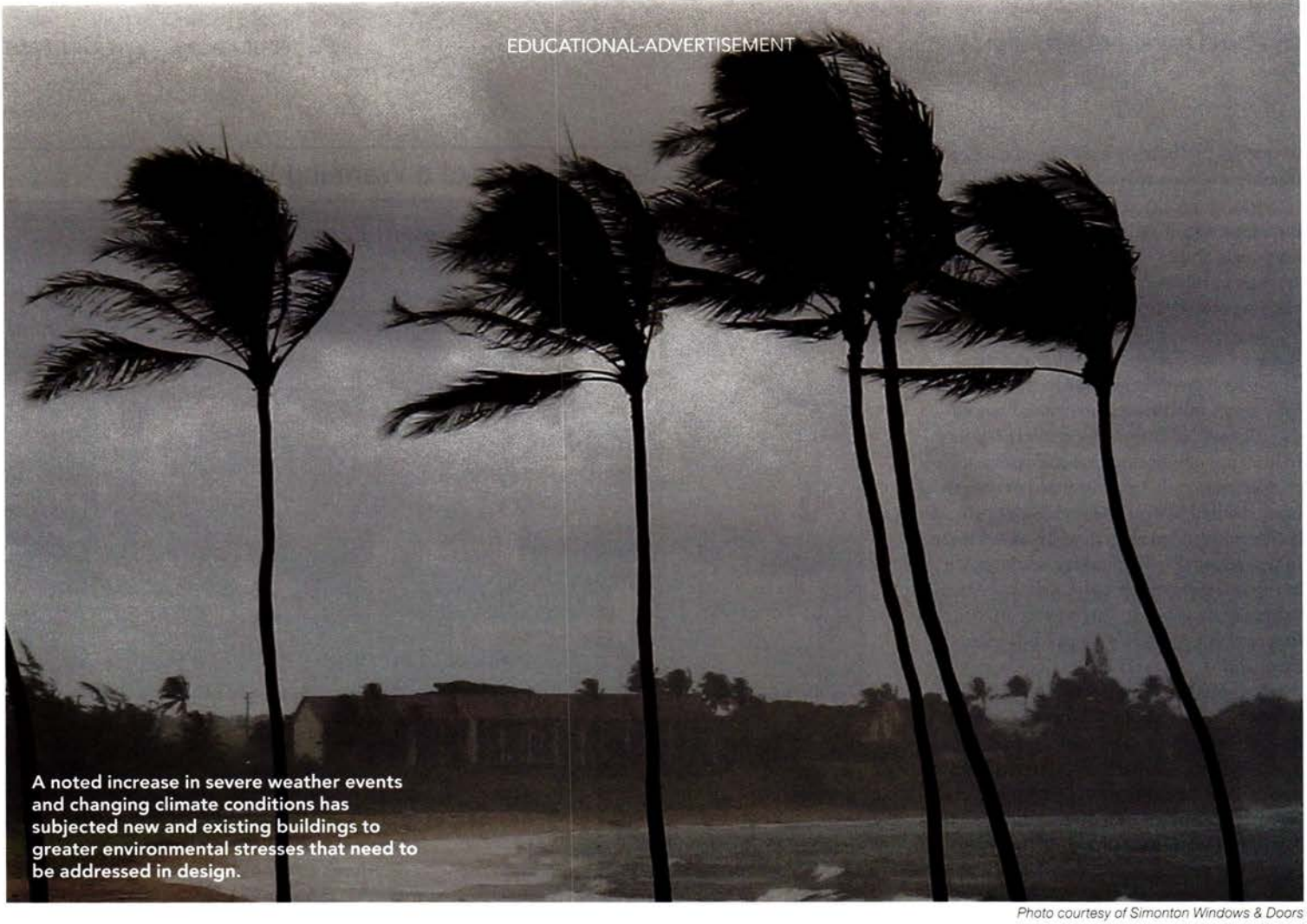

A noted increase in severe weather events and changing climate conditions has subjected new and existing buildings to greater environmental stresses that need to be addressed in design.

Photo courtesy of Simonton Windows & Doors

Designing for Extreme Environments

Incorporating resiliency into buildings that are subjected to harsh or damaging conditions

Sponsored by PHIFER Incorporated, Polyisocyanurate Insulation Manufacturers Association (PIMA), Simonton Windows & Doors, and Smart Vent Products, Inc.

By Peter J. Arsenault, FAIA, NCARB, LEED AP

All buildings are subjected to the rigors of the natural environment wherever they are located. Some locations, though, have inherently more extreme conditions than others such as coastal and desert locations that can be subjected to more wind, salt, or sun exposure than inland temperate regions. Further, some building sites are prone to known natural events such as earthquakes along the West Coast or hurricanes along the Southern Atlantic/Gulf of Mexico region. In recent years, all areas across the United States and elsewhere have seen an increase in severe environmental conditions and events that have been linked to measured climate changes. As architects and design professionals, we have always been called upon to create buildings that can respond to these environmental conditions such that they can reasonably resist the range of normal forces and conditions imposed. More significantly, there is a growing need for buildings to be designed so they can be resilient enough to survive a severe weather or environmental event so the building is still usable and can return to normal operations.

THE NEED FOR DESIGN RESILIENCY

Realizing the need to address how buildings and communities respond to extreme weather, the term "resiliency" has become commonly adopted. It is a good term since it fundamentally refers to the ability of a building or community

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Learning Objectives

After reading this article, you should be able to:

1. Identify and recognize the characteristics of resiliency in building design and the role that government, organizations, and design professionals play.
2. Investigate the design issues related to creating buildings that can bounce back from extreme environmental conditions.
3. Assess design strategies related to wind and rain resistance, sun control, thermal resistance, and flood control in buildings.
4. Specify and design buildings that achieve higher degrees of resiliency through available products and systems.

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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to recover or "bounce back" from a natural weather event such as a hurricane, flood, tornado, or similar severe conditions. In a broader sense, it can also be applied to the long-term ability of a building or community systems to function properly and well under ongoing conditions.

Role of the Federal Government

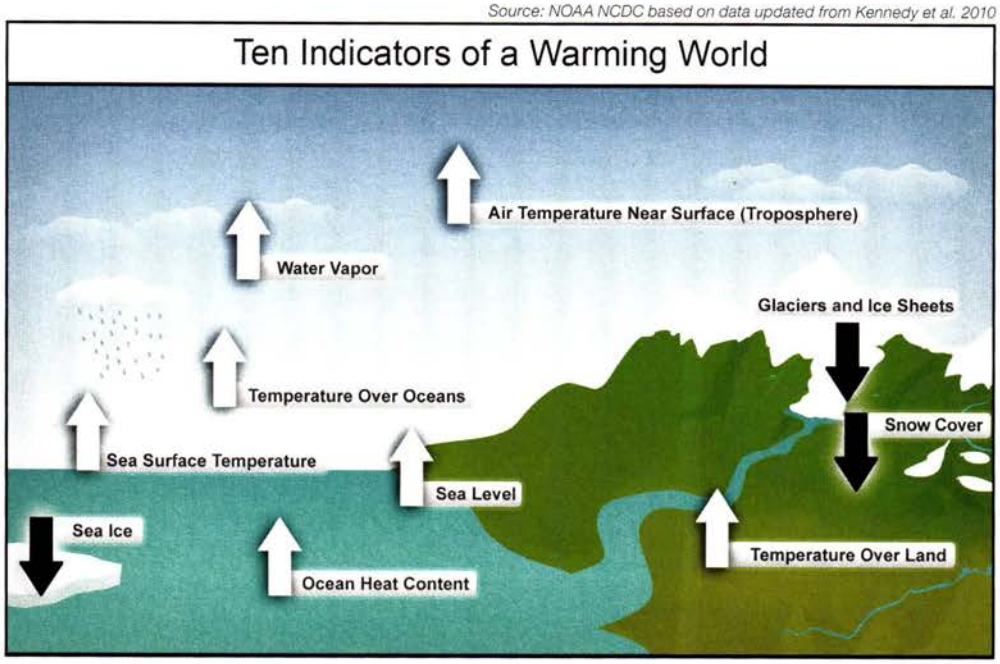
The federal government has recognized that the science of climate study has advanced significantly, leading to increased certainty that we are now seeing impacts associated with climate change (human induced or otherwise) in the United States. The accumulating evidence includes extended records of observed trends in temperature, precipitation, sea level, ice mass, and many other variables recorded by a variety of measuring systems and analyzed by independent research groups from around the world.

In response to this scientific work, the White House initiated a National Climate Assessment to summarize the impacts of climate change on the United States, both now and in the future. A team of more than 300 experts guided by a 60-member Federal Advisory Committee produced the report, which was extensively reviewed by the public and experts, including federal agencies and a panel of the National Academy of Sciences. (See National Climate Assessment, U.S. Global Change Research Program Report, nca2014.globalchange.gov.)

Their conclusion is that "climate change is already affecting the American people in far-reaching ways. Certain types of extreme weather events with links to climate change have become more frequent and/or intense, including prolonged periods of heat, heavy downpours, and, in some regions, floods and droughts. In addition, warming is causing sea level to rise as glaciers and Arctic sea ice melt, and oceans are becoming more acidic as they absorb carbon dioxide. These and other aspects of climate change are disrupting people's lives and damaging some sectors of our economy."

Based on this work, in November 2013, the President of the United States issued Executive Order 1365 "Preparing the United States for the Impacts of Climate Change." This Executive Order establishes a Council on Climate Preparedness and Resilience with a mission to modernize federal programs to support climate resilient investment. While some of the directive deals with information, agency coordination, and public infrastructure issues, there is a recognition that resilient buildings are a key component for allowing people to remain and continue to function in their communities.

Source: NOAA NCDC based on data updated from Kennedy et al. 2010



Role of Professional Organizations

In response to the growing awareness of the need for resiliency and the leadership of the federal government, the not-for-profit National Institute of Building Sciences convened a broad-based meeting in September 2013 for the purpose of dialogue among government and numerous professional organizations. The forum included representatives from architectural, engineering, planning, green building, environmental, building code, and infrastructure organizations as well as federal agencies such as the Department of Homeland Security (DHS). One of the conclusions of this dialogue is that, while there is a role for government to play, there is a bigger role for the design and construction community to play.

In particular, the group focused considerable attention on the challenges of pre-incident planning versus emergency response. By acknowledging that many of the impacts of weather and climate can be reasonably well predicted in any given community, it follows that planning for those impacts is both possible and desirable. Related to that is the notion that prevention of damage and harm can be facilitated by building codes and standards that recognize the issues relevant to a community and effectively legislate a higher level of performance. There was little doubt that the design community can support any level of performance required, but that a corresponding level of regulatory requirement or other insistence is required to actually move towards a specific basis of design. Hence, it is incumbent on a variety of professional organizations to continue the dialogue to collectively achieve design standards appropriate to different concerns in different locations as well as those that may be universal.

Role of Design Professionals

Working with building owners and clients, design professionals of all disciplines need to be attuned to site-specific issues that create environmentally induced demands on buildings and grounds. Part of the basic design program and criteria for a successful project increasingly needs to include measures to address the weather and climate conditions of the building, both current and anticipated. Some of this approach is like buying an insurance policy—you hope you never have to use it, but when something occurs, it is essential in order to continue forward. Hence, resilient buildings are designed in the same manner, anticipating the worst-case scenario as a design condition and fully expecting to meet or exceed it.

The Rockefeller Foundation is one of many organizations that have led advanced thinking in the area of resilient building design. Based in New York City, which has seen a fair share of extreme events in recent times, it has engaged design professionals directly in conversations about resiliency. Justin Davidson, architectural critic at *New York* magazine, commented on the general concept, noting: "A resilient building is a building that rolls with the punches. A resilient building in a flood zone isn't necessarily designed not to get wet—it can get wet, because it's designed not to fall apart." This is a significant distinction. The issue isn't elimination of a condition, it is the ability to design a building to survive that condition and continue to be operational in short order. Davidson provides an example from the low-lying Red Hook portion of Brooklyn, which was pretty heavily battered by floodwaters during Superstorm Sandy in 2012. "The two biggest businesses in Red Hook are Ikea and Fairway

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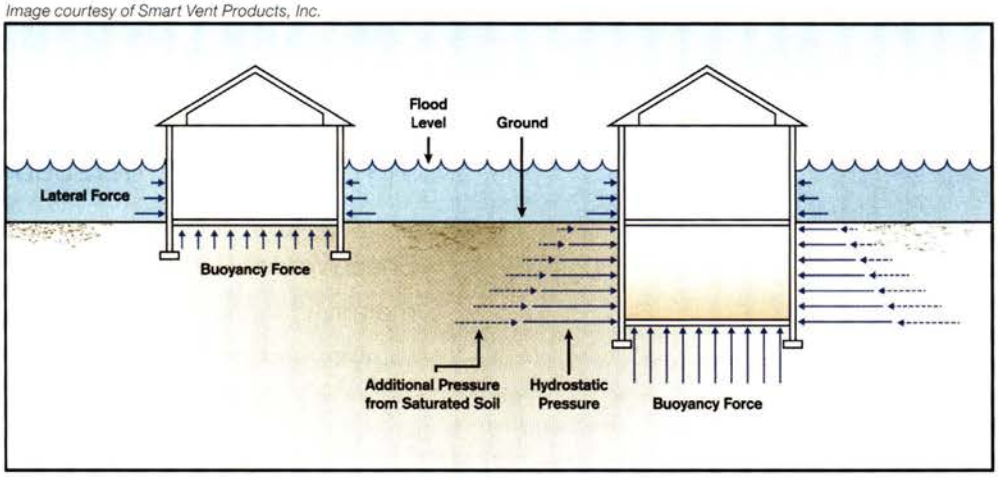

Design professionals who understand the forces at work in an extreme environmental situation, such as flooding, can appropriately create buildings that can tolerate stresses and recover quickly.

[supermarket]. The way Ikea is designed—where they lift everything to the second floor—meant that it could withstand damage, restock, and go back to business immediately. But Fairway is in a Civil War-era warehouse, with no protection, and the entire store was underwater. They had to close, repair, and restock their entire inventory. A smaller business would have been wiped out completely." The basic design and layout of the two buildings made the difference between being able to bounce back quickly compared to a more dramatic, and expensive, effort to recover.

DESIGN CONSIDERATIONS

The specific forces of weather and climate can take different forms with differing impacts on buildings. Some are indirect impacts like a storm that interrupts electrical service to a building. Others impact a building directly, and those are the considerations we will primarily focus on in four areas: wind and rain resistance, sun control, thermal resistance, and flood water control.

Wind and Rain Protection

In severe weather events, wind and rain are usually the most common things to directly impact a building. However, the reality is that buildings are designed to provide wind and water protection all the time. Weather-related events simply increase the amount or intensity of rain and wind that need to be addressed. Techniques to make the opaque portions of a building envelope resistant to wind and rain are fairly well known and straightforward as long as they are detailed properly. However, it is the openings, such as windows and doors, that deserve special attention to prevent intense rain and wind from penetrating a building.

Because of potential vulnerabilities, windows and doors in buildings have been subject to special scrutiny, particularly in areas where severe weather is readily anticipated. The Florida Building Code, for example, has identified design wind loading for all areas of the state and requires windows and doors to demonstrate the ability to withstand the stated wind conditions for the location where they are installed, ranging from 115 to 180 miles per hour. This is obviously more than most building codes require and is indicative of planning and regulation that addresses the hurricane-prone nature of the state of Florida.

Taking it even one step further, the Florida Building Code also identifies the southernmost counties of the state as part of a High Velocity Hurricane Zone (HVHZ). Any building work in this zone must meet additional requirements for wind and water resistance, particularly all types of windows, glazing, and curtain wall assemblies. Products must be tested and shown to comply with these requirements in order to be installed in this zone. Megan Mazur, Director, Channel and Product Management, Simonton Windows & Doors, notes, "Most window manufacturers recognize that there are extreme conditions that need to be met in order for their products to be accepted for code-compliant use. Hence, as a practical matter, it is common to produce windows that meet the most stringent requirements and offer them throughout the state or region." Using windows that meet the superior performance requirements assures not only code compliance but a greater degree of resiliency in buildings, particularly if code minimum requirements are exceeded.

Sun Control

Windows and other glazing systems are not only intended to keep things out, but to let things in, like natural daylight and perhaps fresh air. Sunlight in particular is commonly a welcome thing and brings with it many positive attributes. However, too much of a good thing becomes problematic. In buildings that rely on air conditioning for human comfort, direct sunlight is treated as something to reject or control due to problems from solar heat gain, not to mention glare and excessive brightness. In situations where electricity is in fact interrupted and mechanical air conditioning is no longer available, then the issue of heat and light control from the sun becomes all the more significant. Bill Strickland, National Market Manager of Sun Control Products, PHIFER Incorporated, notes, "As architects and designers incorporate more glass into their building designs, the need to manage harsh solar heat and glare becomes essential."

Overall, then, a good building design needs to find the balance between the beneficial properties of sunlight while mitigating or controlling the negative ones. A system that can be adjusted according to the needs of a building across the hours of the day or the times of the year provides the greatest control

Photo courtesy of Simonton Windows & Doors

Windows and doors are commonly the first line of defense against wind and rain in openings in exterior walls.

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and management of sunlight. This need for management is true on an ongoing basis and also true in the aftermath of severe events.

Thermal Resistance

Opaque surfaces of building envelopes are the key barriers to weather and climatic conditions in all forms. Not the least of these conditions is the flow of heat energy into or out of a building. Properly insulated walls, roofs, and floors are critical to maintaining thermal comfort when a building is occupied. Just as important, in the case of a catastrophic energy failure where mechanical heating or cooling is no longer available, insulation can be vital to maintaining a favorable indoor environment before conditions become unbearably cold or hot.

Jared Blum, President of the Polyisocyanurate Insulation Manufacturers Association (PIMA), has spent considerable time and effort looking at the role insulation plays on a resilient building. He notes, "Resiliency in the building envelope, especially in thermal performance, has both short- and long-term human impact. Whether it is human comfort that needs to be protected during climactic or other events that threaten the integrity of the building, or long-term climate change issues that are addressed through energy efficiency, resiliency in the thermal envelope is important."

Flood Water Control

Flooding doesn't only occur during severe weather such as hurricanes; rather it occurs almost daily across the country due to local heavy rainfall, dam failures, land development runoff, drainage problems, inland remnants of storms, and many other conditions. Nationwide,

Photo courtesy of Rielamericano, Buenos Aires Argentina, and PHIFER Incorporated

Balancing the right amount of beneficial sunlight with solar control to prevent glare and overheating is a significant design concern for all buildings.

flooding is the leading cause of deaths related to severe weather. As such, flood control has become a significant issue with people and programs focused intently on how to be more resilient in the face of flooding.

Most people are familiar with the National Flood Insurance Program (NFIP), which allows flood insurance to be obtained for buildings, whether they are located in established flood zones or not. Any property owner with a building located in a community that participates in the NFIP is eligible to purchase flood insurance. However, due to recent and pending flood insurance reforms, not all flood insurance is subsidized meaning many people may not find it affordable. Those located in a moderate-to-low risk area would most likely opt to purchase a Preferred Risk Policy to reduce the premium payments. Otherwise they would pay based on the full Actuarial Risk Rating determined for their location. Either way, the intent is to help protect building owners from catastrophic costs associated with flooding, and the NFIP has become the recognized authority on flood-related matters.

Separate from the government, a private organization known as the Association of State Floodplain Managers (ASFPM – www.floods.org) is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, as well as flood preparedness, warning, and recovery. ASFPM has become a respected voice in floodplain management practice and policy in the United States because it represents the flood hazard specialists of local, state, and federal government, the research community, the insurance industry, and the fields of engineering, hydrologic forecasting, emergency response, water resources, and others. It has also established a national program for professional certification of floodplain managers, which recognizes continuing education and professional development that enhance the knowledge and performance of local, state, federal, and private-sector floodplain managers.

Brian Shaw, a Certified Floodplain Manager and Director of Sales and Marketing at Smart Vent Products, Inc., notes that the work of floodplain management can save dramatic amounts of money from damages. He cites an NFIP estimate "that just 1 inch of floodwater that enters the first finished floor will cause about $21,000 worth of losses." He notes that one proven method to mitigate those losses is the use of self-regulating flood vents which can be used in a "wet floodproofing" condition to prevent structural damage to a building. (For more information about the use of flood vents, see the online version of this course.)

With an understanding of some of the specific issues affecting buildings, we turn our attention to strategies to address them in the interest of greater resilience in buildings.

Continues at ce.architecturalrecord.com

Photo courtesy of Jason Flakes

The opaque areas of a building envelope are the best places to assure full and continuous thermal resistance.

Peter J. Arsenault, FAIA, NCARB, LEED AP, *is an architect and green building consultant who has authored over 100 continuing education and technical publications as part of a nationwide practice. www.linkedin.com/in/pjaarch*

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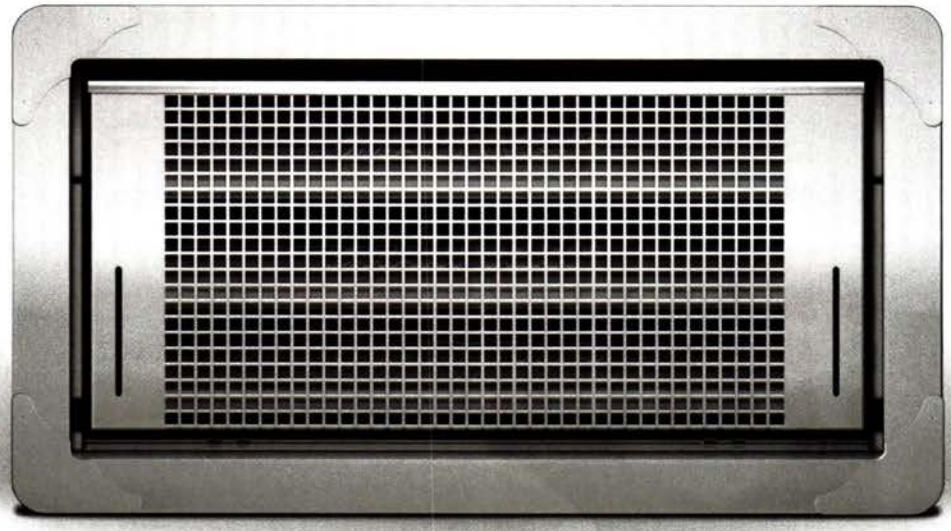

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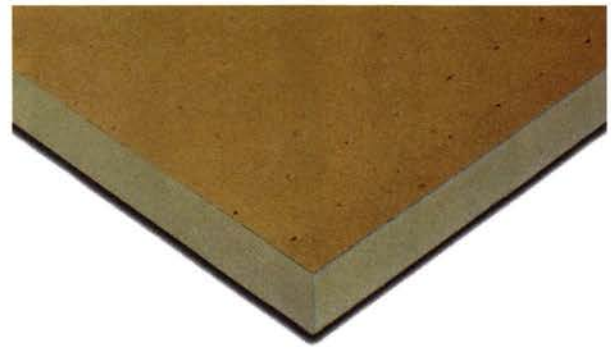

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For restaurants and hotel areas that need to close off a party space or a section of a foodservice area, sliding doors can match the establishment's aesthetics and help keep renovation costs low. Panels of custom wood and glass match this interior design.

Open Sesame: Specifying Top-Hung Sliding Hardware Systems

Straight, folding, and stacking door systems offer innovative uses of space and longstanding, durable operations

Sponsored by Hawa Americas Inc. | *By C.C. Sullivan*

Sliding hardware systems open doors, both literally and figuratively, to creating more flexible, accessible, space-saving interior architecture. Solutions using top-hung sliding hardware are seemingly unlimited, with options including straight-sliding, curving, folding, and stacking configurations for glass, wood, metal, and other panel materials. Applications include sliding doors, movable walls, hardware for furniture as well as sliding shutters.

All of these applications present a range of benefits for the end-user and for architectural design in general. But to tap into these advantages and make the building more user-friendly and adaptable, savvy architects are educating themselves about the various top-hung sliding hardware types, how they work, and how to create the best possible designs and specifications.

Hardware consultants, manufacturers, and fabricators are helping to illuminate this challenge while also demonstrating that good working knowledge of top-hung sliding hardware basics will give the design professional a decided advantage. "Using sliding hardware systems adds new dimensions to a building's design and interior functionality," says Keith Duckett, national sales director for Hawa Americas Inc. "While the architectural concept starts with considerations about how the moveable elements will function, the key to success is basic, baseline knowledge of how

to identify and specify the suitable top-hung system for any given application."

With that in mind, this educational article offers a brief overview of benefits of top-hung sliding systems, which can help guide their use in architectural projects. Then we consider the basic components of a top-hung sliding hardware system—including the standard terminology and how they work—and look at their use in basic system types and varied, common applications. Last, we present a straightforward, basic method for identifying the suitable top-hung hardware system for a given architectural need or building application.

"The best way to select a system is by considering the architectural objective or function: Are you trying to divide a room, hide a space or storage, frame or block a view, replace a pivoting door or something else?" Duckett asks. "But before you can match that with the most effective or suitable top-hung system, architects need a working understanding of this family of specialty hardware."

Sliding hardware units for full-height sliding doors with dark wood panels appear visually flush to the ceilings thanks to fully concealed tracks.

A HISTORY OF SLIDING ARCHITECTURAL HARDWARE

Older buildings around the world often have doors that slide on heavy metal tracks, usually flat or angled. These early, top-hung sliding door assemblies, originally developed for use in horse stables, agricultural facilities, and other high-function, low-design exterior openings, were rudimentary and occasionally dangerous. The door hangers—wheel assemblies also called trolleys or trucks usually held by heavy bolts and attached to the wood or metal doors—would at times unseat from the tracks, with calamitous consequences. To prevent such incidents, in the late 1920s architects began specifying *enclosed tracks*, also called box tracks, which guided the trolleys better and kept occupants safe.

With a new and safe approach that many manufacturers promoted over the next decades, the popularity of "modern sliding hardware" began to grow. Applications emerged for building interiors—not just in stables and mills but also in schools, office buildings, shops, cultural facilities, and more. Incremental design improvements yielded cleaner, more reliable operations because the tracks did not become a resting place for dirt and dust. The rigid, rectangular steel sections also boosted the weight capacities, leading to more slender, lighter track assemblies.

Interior partitions date back earlier, but they flourished in the modern architecture era of the 1950s and 1960s. Fabricators experimented with lighter steel, aluminum, and other materials for the hardware, and the indoor panels could be made with glass, allowing more light and transparency into building interiors. Industrialization led to a new era of convenience, accessibility, and adaptability in the interiors, thanks to a new generation of sliding hardware systems.

THE SYSTEMS APPROACH

For today's architectural applications, sliding hardware can best be considered as a hardware system rather than as assemblies of mix-and-match components. Still, the architect and project team should be familiar with all the essential components, many of which have survived since the era of the primitive sliding barn door. The key terminology includes the track, the trolley, the suspension that connects the trolley to the door or wall panel, and door guides and door stops. (This terminology is described in detail in the section "Reviewing the Basics" starting on page 161 and continuing online.)

Systems approach thinking also helps illuminate the various benefits of today's top-hung sliding hardware systems. The advantages combine both architectural form and function as well as health, efficiency, and sustainability—suggesting a number of pragmatic solutions to creating better interior space. In particular, architects describe the following benefits of sliding hardware systems:

Architectural Interest

By creating more malleable, integrated spatial arrangements, sliding doors enhance architectural function and meaning. Transitions between rooms, between indoors and out, and between protected areas and those dappled with sunlight, can be created with sliding doors due to a threshold condition that can be closed, fully open, or partially open. Moving walls assist daylight control and privacy, too.

CONTINUING EDUCATION

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Learning Objectives

After reading this article, you should be able to:

1. Discuss the benefits of top-hung sliding hardware systems for safe, healthy interiors.
2. Identify the basic components of a sliding hardware system, and understand the terminology for proper installation and operation.
3. Describe the basic system types and application types for top-hung sliding doors and panels, including their benefits for more adaptable, inclusive occupancies.
4. Apply the lessons learned to identify the suitable top-hung system for a given architectural need or application to serve the special needs and overall welfare of the building users.

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For the placement of retracted panels in a large opening, sliding and stacking systems utilize curvilinear track interchanges engineered to smoothly move panels parallel or perpendicular to the opening.

Motion

Architecture that moves is not only functional but it's also dramatic and meaningful. This is especially true with top-hung hardware that moves two bi-parting doors simultaneously; move one door, and the door opposite moves in synch. (These *symmetric doors*, which some architects call "mirror doors," are discussed in more detail in the section "Telescoping and Symmetrical Arrangements" in the online version of this course.)

Space Savings

Efficiency of floor plan and interior uses can accrue from a single sliding door or wall panel. The relatively narrow tracks save space. The net effect is to make spaces look larger, especially when transparent panels are used.

Eliminates Door Swing

Also, the sliding door, like a traditional pocket door, needs no space for a swinging leaf or pivoting panel, meaning more floor area is available for programmatic needs. This related benefit is valuable for safety in some circumstances. For interior planning purposes, pivoting doors tend to intrude into occupant room, while sliding panels typically do not.

Cost Savings

Sliding doors and walls save space both in visual and practical terms. This means interior spaces and rooms generally can achieve as much or more while being more efficient in square footage.

Accessibility

Sliding door hardware can be employed to accommodate people with disabilities, such as the mobility impaired. Sliding doors are easy to move and operate with little force, so the door panels move out of the path of travel for people using walkers or wheelchairs. In this way, the sliding door presents no obstruction for most users, and it is an appropriate opening specification that meets the requirements of the Americans with Disabilities Act (ADA).

Flexibility in Division of Space

"Beyond space savings, top-hung sliding doors allow new ways to divide up suites, classrooms, conference centers, and any other buildings that serve multiple functions and constituencies," says Duckett. A simple linear door can neatly separate a kitchen from a laundry unit, giving it two uses. Many restaurants use top-hung sliding doors to set aside space for private parties,

Top-hung sliding doors similar to these can be found in numerous hotels including the Marriott Marquis Hotel in Dubai.

TOP-HUNG DOORS IN DUBAI

More than 2,000 sliding hardware units are operational in the brand-new JW Marriott Marquis Hotel in Dubai, United Arab Emirates. The 77-story structure, comprising two identical twin towers shaped like date palms, contains a new hotel and 18 shops along with varied amenities for guest wellness and conference needs.

The design by Dubai-based Arch Group Consultants with input from another local firm, LWD Interiors, featured a sleek concept that included guestroom designs with full-height sliding restroom doors, which appear visually flush to the ceilings thanks to fully concealed tracks.

With 1,600 rooms and suites, the project required 2,020 top-hung sliding hardware units for the 1,165-foot-tall complex, all carrying large doors made from a rich, deeply grained wood finish to match the paneling used throughout.

Why did the design team select concealed top-hung hardware for these monumental doors? First, the sliding hardware saved space by eliminating a door swing or pivot. Second, the linear (straight path) doors practically disappear into the matching wall paneling when retracted (open). Third, like all the hotel detailing, these easy-to-move, impressively high-quality doors bespeak modern convenience while affording a classic, natural finish.

And there was a fourth reason: the reliable nature of top-hung door systems, says Peter Snellgrove of LWD Interiors. "The hardware is an excellent product," he says. "It has proven itself time and time again."

Hardware for pivot/slide-in systems does not require a bottom guide channel to optimize flexibility and utilization, allowing for "hidden offices" and kitchenette storage and leaving an uncluttered look in the space.

whether intimate or grand. Workplaces and learning environments can "break out" into smaller groups with all the requisite privacy, says Stuart Brodsky, AIA, LEED AP, an associate principal at Cannon Design who has used operable interior glass panels. "This flexibility allows access to shared resources and adapts spaces for small and large groups."

Safety

In addition to easing movement between interior areas, sliding doors can reduce the collisions or disruptions of egress associated with traditional pivot doors. (Ever wonder why vision panels are specified in so many swinging doors?) Sliding doors ease the transition, and open the area for occupant movement.

Renovation Uses

Several benefits specific to top-hung sliding door hardware systems improve the success of renovation projects. First, compare them to *bottom-rolling* sliding systems that carry the weight of the door panels on the floor: In these cases, uneven or bumpy floors with material transitions must be corrected and completely leveled for the bottom-rolling hardware to work properly. Floor condition in a renovated building becomes critical. But this is less so for top-hung systems, which can tolerate some variations in floor level, conditions, and materials, such as a transition from high-pile carpet to tile or stone.

Clean Floor Plane

A related benefit is the visually clean and uncluttered floor expanse allowed with top-hung systems. The bottom-rolling types require a threshold or track on the floor—which not incidentally is also a physical obstacle and impediment, not just a visual obstruction. Top-hung sliding systems may eliminate the thresholds and floor tracks.

Clean Door, Jambs, and Ceiling

Above eye level, top-hung sliding hardware is easier to conceal than bottom-rollers and other opening systems. No door-jamb header is needed, and the track can be recessed into the ceiling.

Allowing spaces to be rearranged effortlessly and cleaning up the details of the interior—while also allowing for safer and more functional use—are perhaps the most essential reasons to use top-hung sliding hardware. With more interest in multifunctional interiors as well as indoor-outdoor architecture, sliding doors take many residential and commercial applications to new heights of efficiency and visual interest. It's no exaggeration to say that sliding door hardware can be considered integral to a building's environmental and design strategy.

Understanding the numerous ins and outs of sliding hardware systems—from materials to mounting, and from trolley to track—will help architects not only take advantage of these numerous benefits but also create better experiences for building owners and occupants.

REVIEWING THE BASICS

To identify the components of the sliding door hardware systems, one can start with the historical fundamentals and expand from there, adding the new elements introduced in more recent engineering and manufacturing advances. For architects, the following are most important in the design and specification of a project leveraging top-hung sliding hardware:

Track

Sliding door tracks come in different shapes (sections) that offer varied benefits and lend themselves to certain applications. Box type track, mentioned earlier, holds the door securely and is less prone to contamination than others. By eliminating the potential for trolleys to "jump the track" and because they are easier to keep clean than other types, box sections are generally a solid, economical specification for any need.

Continues at ce.architecturalrecord.com

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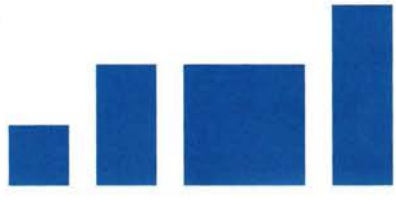

CIRCLE 81

Creating Healthy Learning Environments

Identifying and removing toxic hazards from educational buildings

Sponsored by Forbo Flooring Systems | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

Selecting building products for education facilities that do not contain harmful chemical compounds or require extensive cleaning, helps create healthier indoor learning environments.

Photo courtesy of Forbo Flooring Systems

Across the United States it has been documented that there are currently over 100,000 public and private K-12 schools plus over 5,000 colleges and universities that collectively define the education sector of our society and the built environment. These buildings and facilities are central forces in the lives of some 60 million K-12 students, 20 million college students, and 13-15 million faculty members and support staff. Altogether, that represents almost one-third of the U.S. population who spend a significant portion of their waking hours in an educational setting.

We take for granted that these facilities are safe, healthy, and productive environments in which children and adults can learn, grow, and develop. However, solid scientific evidence is increasingly linking the epidemic rise in serious health issues among our nation's youth to exposure to conditions and toxins emitted by what have been considered "standard" school building construction materials, cleaning products, and maintenance practices. The alarming reality is that educational settings may in fact be a hotbed of hazards that are compromising the health of their occupants and children's ability to learn.

THE CURRENT STATE OF SCHOOLS

According to the National Center for Education Statistics, the typical American school was built in the 1950s to 1960s and is an average of 50 to 60 years old. They have determined that most have outdated building products and outmoded maintenance procedures. The United States Environmental Protection Agency (EPA) has recognized the potential for problems within an aging inventory of school buildings and conducted a study titled "Indoor Air Quality Tools for Schools: Actions to Improve Indoor Air Quality." They found that up to half of our nation's schools have problems associated with indoor air quality, most notably from the growth of mold and mildew created by damp indoor environments. In related work, other EPA studies confirm indoor levels of pollutants in buildings, including schools, may be over 1,000 times higher than outdoor levels.

Where do those pollutants come from? Experts worldwide confirm that a variety of toxins known as volatile organic compounds, or VOCs, can be emitted from certain building construction materials, cleaning and maintenance products, or school supplies. VOCs include substances such as formaldehyde and glycol ethers as well as plasticized polyvinyl

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Learning Objectives

After reading this article, you should be able to:

1. Identify and recognize the current state of educational facilities and the issues related to healthy indoor environments.
2. Investigate the human impacts of toxins found in common building products used in school and educational buildings.
3. Assess the available tools available to help design professionals and others gain transparency into the make-up and toxicity of building products.
4. Specify products for educational facilities that are healthier, more sustainable, and cost effective over the life cycle of the building.

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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chloride (PVC). PVC is a thermoplastic made of 57 percent chlorine (derived from industrial grade salt) and 43 percent carbon (derived predominantly from oil/gas via ethylene) which is made softer and more flexible by the addition of chemicals known as phthalates. PVC and phthalates are often used in common products such as vinyl flooring, carpets, building materials, floor strippers/finishes, and in school supplies such as binders, backpacks, lunchboxes, and laptops. VOCs and phthalates contain known human toxins that are absorbed through the respiratory system or through skin contact, leading to potential health hazards for those exposed.

In addition, since (and despite) the enactment of the Toxic Substance Control Act of 1976, 84,000 chemicals remain untested for toxicity and are potentially harmful. The overwhelming majority of these chemicals don't require testing and less than five have been regulated or banned under this law. Some are legal in the U.S. based on the quantity present in a given product and their ability to flow from that product to people, i.e. the exposure level. The presence of these hazards is further exacerbated by school buildings that are tightly sealed and/or poorly ventilated—a condition prevalent in both old as well as newly constructed facilities.

When it comes to maintenance in schools, there is also a concern. In 2008 the 21st Century School Fund conducted a study, along with the separate American School & University's 36th Annual Maintenance & Operations Cost Study for Schools that revealed that U.S. public schools spent only about $5 per square foot per year to maintain and operate a school. At that level, the average school reportedly spent less than half of the money on maintenance, repair, and capital renewals than would be necessary to bring it into a state of good repair and optimal environmental conditions for students. With only this amount to spend on building maintenance, it would seem wise for schools to invest in products that require minimal maintenance and post-installation expenses. However, growing financial pressures and a historic disconnect between capital and operating budgets, especially in the K-12 arena, have often driven less-than optimal investment decisions. Building materials are often selected to satisfy only first-cost, short-term budget issues without understanding the long-term cleaning and maintenance costs associated with cleaning supplies and operations labor.

HUMAN IMPACTS OF SCHOOL ENVIRONMENTS

With the presence of potentially harmful substances in school buildings, is there any impact on students, staff, or teachers? To answer

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General Contractor at Caywood: Messer Construction
Flooring Contractor at Caywood: Spectrum Interiors
Construction Manager at Turkey Foot: Turner Construction
Flooring Contractor at Turkey Foot: CDI Carpet Decorators, Inc.

A Kentucky school district wins top nationwide honors without losing sight of the bottom line.

The district's challenges:

- Addressing the excessive time and expense of floor care, wanting to free busy maintenance staff for more productive tasks
- Using products that reflect a concern for the community's long-term environmental health
- Maximizing environmental performance without exceeding tight construction budgets

The solutions used:

- Linoleum tile and sheet flooring which require no time-consuming stripping and finishing processes
- 100 percent bio-based products that are naturally antimicrobial and free of allergens and plasticizers. They are completely biodegradable, without the toxicity or disposal issues of PVC-based products.
- From the moment of occupancy, the linoleum tile cost less to own. The advantages continue forward through significantly lower maintenance costs.

Photos courtesy of Forbo Flooring Systems

For complete case study, see the online version of this course.

Photo courtesy of Forbo Flooring Systems

Unless carefully selected and understood, building products used in educational settings may contain ingredients and chemical compounds that are known to be harmful to both the environment and to human health.

that question, highly respected medical and scientific organizations worldwide have begun tracking the impact of exposure to some of the toxic chemicals we have described. These organizations include medical organizations such as the U.S. National Institutes of Health, Harvard School for Public Health/Harvard Medical School, and the Asthma Regional Council of New England (ARC). It has also included organizations specifically focused on buildings and the environment such as the Healthy Building Network, the U.S. Green Buildings Council (USGBC), and the Center for Health, Environment & Justice (CHEJ). Even state legislatures in California, New York, and elsewhere have initiated investigations into human impacts from material exposures. These efforts have revealed a number of findings concerning health concerns among children that have been documented to be on the rise.

First of all, some studies have found that children are especially vulnerable to chemical toxins emitted from materials and substances in buildings. In particular, children consume more food, liquid, and air for their size and body weight than adults, making them more susceptible to the absorption of chemicals that can potentially harm their still developing immune systems, brain functions, metabolisms, endocrine systems, etc. Based on their highly tactile and oral nature (e.g., sitting on, playing with, touching, or even tasting objects or surfaces containing toxic substances), children are at greater risk of breathing in or ingesting toxic chemicals emitted by suspect building materials, maintenance products, and school supplies. Compounding this vulnerability is the fact that children are spending more time in school buildings than ever before. At 35 to 40 hours per week for 9 to 10 months per year, along with an increasing amount of time spent in school settings for after-school activities, daycare, meals, and community events, children are spending the equivalent of two to three years of their formative lives in school buildings with the potential for toxic exposure.

Connections to Chemical Compounds

Different studies have shown a link between certain chemical compounds and specific diseases or disorders. Some of these are summarized as follows: (References to studies can be found in the online version of this course.)

Autism. A 2009 study found a statistically significant link between polyvinyl chloride (PVC) and phthalates found in building materials and school/office supplies and the incidence of autism spectrum disorders, concluding that children continuously exposed to these toxins may be twice as likely to have autism. Cases of autism spectrum disorders have been documented to increase by 78 percent since 2002 and currently affect 1 in 88 children, a number still on the rise.

Asthma. A Healthy Building Network study identified a dozen chemicals commonly used in building products, foam insulation, paints, adhesives, floors, and carpets that can lead to the development of asthma in children, especially the presence of phthalates, which can impair the development of the lungs and immune system. The prevalence of asthma among children nearly doubled between 1980 and 1995 and currently affects 7 million children, or 1 in every 13. Considered the #1 chronic childhood illness, asthma is a leading cause of school absenteeism, with some 14.7 million school days missed each year due to this condition.

Learning disabilities. A recent South Korean study found that children with higher concentrations of two common phthalates in their urine had lower IQ scores than their peers. The number of children classified with learning disabilities increased by 191 percent between 1977 and 1994. Currently, as many as 1 in every 6 children is believed to have a learning or developmental disability of some kind.

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Attention deficit. Exposure to phthalates has been linked to the rise in attention deficit hyperactivity disorder (ADHD), which has increased six-fold between 1985 and 2000 and may affect as many as 1 in 6 children today.

Childhood cancers. Leukemia, brain cancer, and other childhood cancers have increased by more than 20 percent since 1975 and early puberty and other signs of endocrine-related disruption is now experienced by 1 in 10 girls, a condition which poses a risk factor for breast cancer later in life.

Obesity. Exposure to phthalates has also been linked to obesity, which currently affects 16 to 33 percent of U.S. children and teenagers.

Laurie Stillman of the Asthma Regional Council of New England has summed it up this way: "VOCs may contribute to any of a full range of health effects, including triggering an asthma attack in someone who already has asthma, gradually leading to the development of asthma in someone who doesn't have it, or contributing to health effects ranging from minor irritation to cancer." To add insult to injury, a recent study found childhood health issues caused by environmental hazards such as air pollution and exposure to toxic chemicals cost the U.S. $76.6 billion in 2008 and have been on the rise.

Connections to Mold and Mildew

As noted, the EPA has identified that up to half of our nation's schools have problems associated with the growth of mold and mildew created by damp indoor environments. The Healthy Building Network, an organization dedicated to transforming the market for building materials to advance the best environmental, health, and social outcomes, confirms that the presence of mold and mildew caused by standing water or damp conditions in school environments increases the risk of chronic allergies and asthma among children. They note that this moisture can further accelerate the emission of hazardous chemicals into the air from building materials—all increasing the risk of serious health consequences for the children, teachers, staff, and community members who use these facilities.

Connections to Infectious Bacteria

In recent years, there has been an awareness of the need to control the spread of infectious bacteria in many institutional settings, including schools. Staphylococcus aureus, often referred to as "staph," are bacteria commonly found on the skin or in the nose of healthy people. Approximately 25 to 30 percent of the population are colonized with staph bacteria (i.e., carry the bacteria without becoming ill). Sometimes staph causes minor skin infections (e.g., pustules, small boils) that can be treated conservatively, without antibiotics. However, on occasion, staph bacteria can cause much more serious skin infections, as well as bloodstream infections, pneumonia, etc.

Methicillin-resistant Staphylococcus aureus (MRSA) is a type of staph that is resistant to some antibiotics, including the antibiotic methicillin. Infections caused by MRSA have historically been associated with ill persons in healthcare institutions. However, MRSA has now emerged as a common cause of skin and soft tissue infections that may occur in previously healthy adults and children who have not had prior contact with healthcare settings.

Continues at ce.architecturalrecord.com

Peter J. Arsenault, FAIA, NCARB, LEED AP, *is an architect and green building consultant who has authored over 100 continuing education and technical publications as part of a nationwide practice. www.linkedin.com/in/pjaarch*

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Record Kitchen & Bath

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The fee is US$50 per entry. Download the official entry form with submission and payment instructions at architecturalrecord.com/call4entries. E-mail questions and submissions to ARCallForEntries@construction.com. (Please indicate **Record Kitchen & Bath** as the subject of the e-mail.) **Submissions are due May 29, 2015.**

2015 CALL FOR ENTRIES
Record Interiors

The editors of ARCHITECTURAL RECORD are currently inviting submissions for the 2015 Record Interiors issue. All architects registered in the United States or abroad, as well as interior designers working in collaboration with architects, are welcome to submit interiors-only projects that have been completed in the last year. The projects may be new construction, renovation, or adaptive reuse; commercial or residential; domestic or international. Special consideration will be given to works that incorporate innovation in design, program, building technology, sustainability, and/or materials. The winning projects will be featured in the September 2015 issue.

The fee is US$75 per entry. Download the official entry form with submission and payment instructions at architecturalrecord.com/call4entries. E-mail questions and submissions to ARCallForEntries@construction.com. (Please indicate **Record Interiors** as the subject of the e-mail.) **Submissions are due May 29, 2015.**

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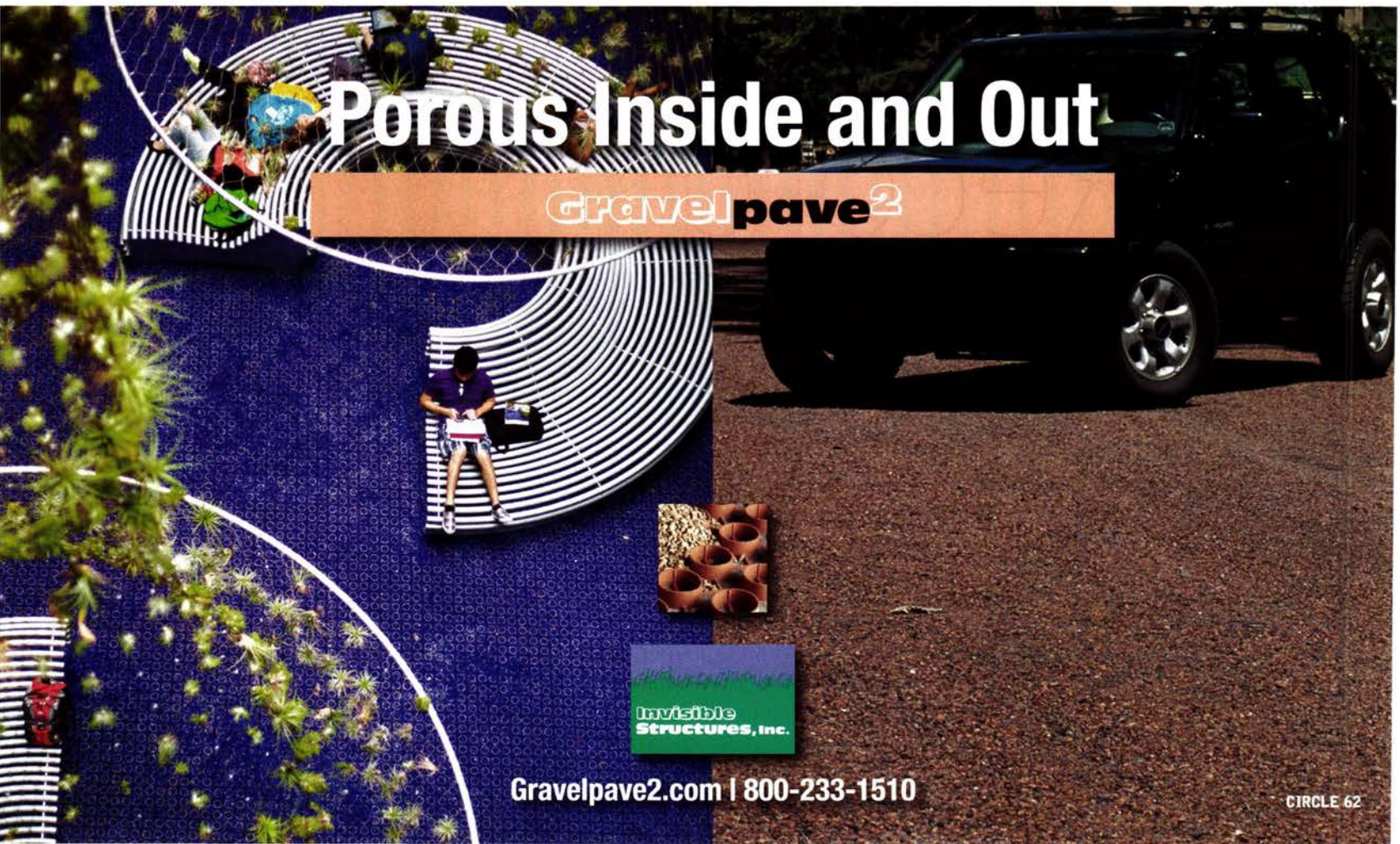

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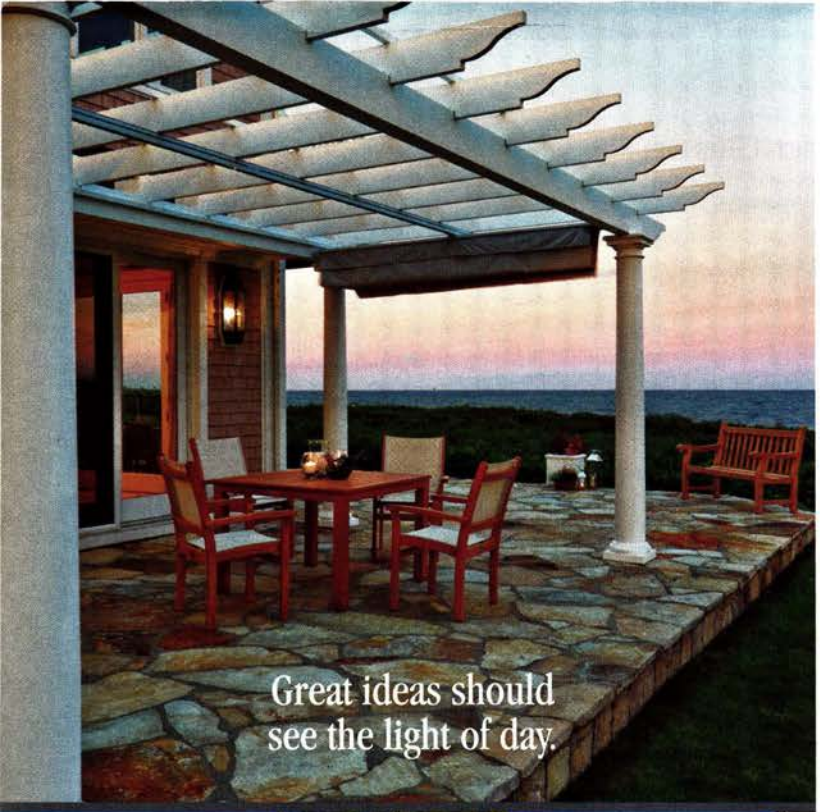



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Los Angeles
Through March 8, 2015
Dynamischer Raumplan is a spatial installation based on the city as a dynamic and complex adaptive system. It displays the creation and use of energy as a critical parameter for urban planning of the 21st century and as a catalyst for a new city morphology. The installation can be read in several scales: a city block, a city district, or an urban region. At SCI-Arc. For more information, visit sciarc.edu.

The Way We Live Now, Modernist Ideologies at Work
Cambridge, Massachusetts
Through April 5, 2015
The Way We Live Now is a group exhibition exploring the influences and legacies of modernist visionaries on contemporary art and life through site-specific installations at Le Corbusier's majestic 1963 Carpenter Center. It also features existing work that stands in dialogue with the legacy of figures such as Mies van der Rohe, Eileen Gray, Bruno Taut, Anne Tyng, Adolf Loos, Lilly Reich, and others. The exhibition looks at the aspirations of these modernist architects and how their experiments with architecture and design radically transformed the way we experience the built environment today. At the Carpenter Center for the Visual Arts. For more information, visit ccva.fas.harvard.edu.

New Territories: Laboratories for Design, Craft and Art in Latin America
New York City
Through April 5, 2015
This exhibition examines the confluence of art, design, and craft in several cities throughout Latin America, where some of the most pertinent new directions are emerging. *New Territories* explores the collaborations between small manufacturing operations and craftspersons, artists, and designers, and demonstrates how the resulting work addresses not only the issues of commodification and production, but also of urbanization, displacement, and sustainability. The exhibition explores a number of key themes, including the dialogue between contemporary trends and artistic legacies in Latin American art; the use of repurposed materials; the blending of digital and traditional skills; and the reclamation of personal and public space. For more information, visit madmuseum.org.

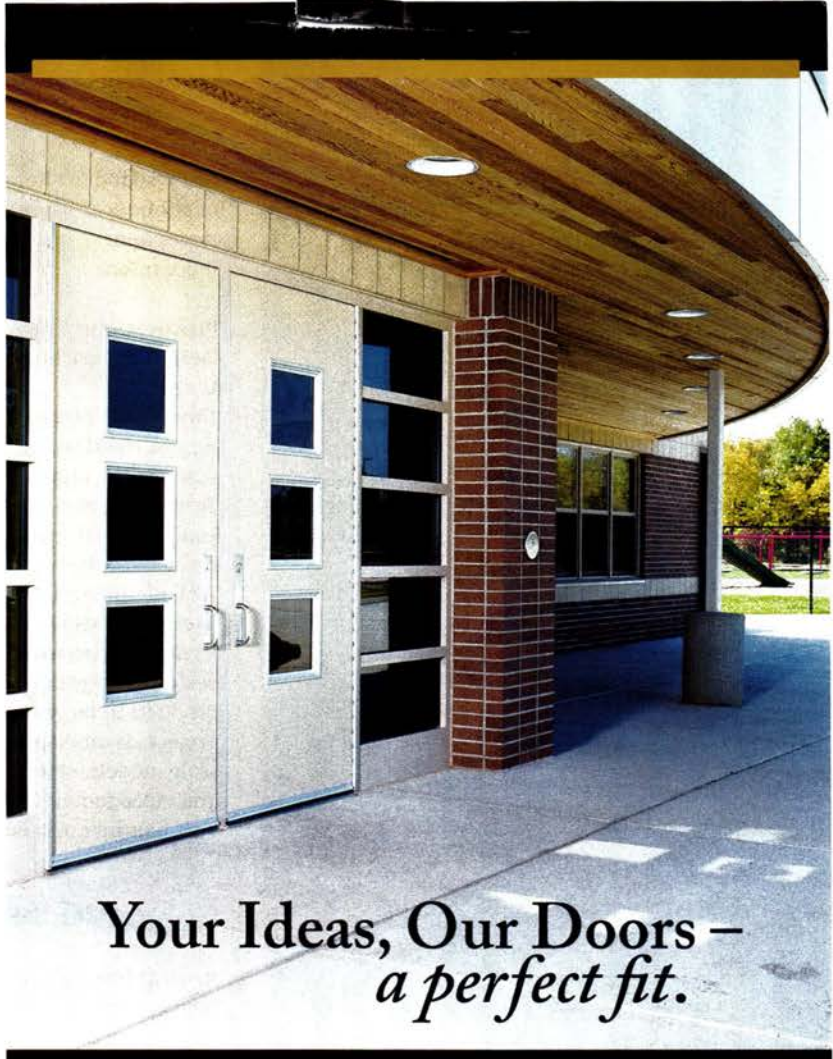
Ways to Modernism: Josef Hoffmann, Adolf Loos, and Their Impact
Vienna
Through April 19, 2015
With *Ways to Modernism: Josef Hoffmann, Adolf Loos, and Their Impact*, at the Museum for the Applied Arts, legendary works of Josef Hoffmann and Adolf Loos offer a portrayal of the development of Viennese modernism into a global brand. The two designers worked out contrary alternatives for modernity in art, architecture, and design; their work is shown in tandem, allowing viewers to make comparisons between their approaches. *Ways to Modernism* focuses not only on the thinking and key works of these two visionaries, but also the historical background of their ideas, and the continued resonance of their work in architecture and design. In addition to the late œuvres of Hoffmann and Loos, the exhibition features works by Oskar Strnad, Josef Frank, Margarete Schütte-Lihotzky, Atelier Singer-Dicker, and Anna Heringer. For more information, visit mak.at.

One Way: Peter Marino
Miami Beach, Florida
Through May 3, 2015
American architect Peter Marino has been celebrated over the past four decades for his forward-thinking work, which exists at the intersection of art, fashion, and architectural design. Curated by Jérôme Sans, this exhibition, at the Bass Museum of Art, explores the interplay between Marino's iconic architectural designs and his personal collection of contemporary art, which includes pieces by Loris Gréaud, Keith Haring, Richard Serra, Rudolf Stingel, and Andy Warhol. A handful of artists, Gregor Hildebrandt and Erwin Wurm among them, will also present new work commissioned for the exhibition. For more information, visit bassmuseum.org.

Sink or Swim: Designing for a Sea Change
Los Angeles
Through May 3, 2015
Through the work of a select group of architectural, fine art, and news photographers, *Sink or Swim* casts an eye on both the problem of climate change in densely populated coastal regions and contemporary design as a means to navigate the changing landscapes. It explores the story of resilience, from adaptation for human survival to ambitious infrastructure planning, in some of the world's richest and poorest coastal communities. Curated by architecture writer and radio host Frances Anderton with the Annenberg Space for Photography, *Sink or Swim* features newly commissioned and archival works by photographers Iwan Baan, Stephen Wilkes, Paula Bronstein, Jonas Bendiksen, and Monica Nouwens. Images show highly complex coastal flood mitigation in the Netherlands, controversial sea walls in Japan, and innovative homes and community buildings by leading architects including Thom Mayne, Toyo Ito, and Shigeru Ban. For more information, visit annenbergspaceforphotography.org.

The Architectural Image, 1920–1950: Prints, Drawings, and Paintings from a Private Collection
Washington, D.C.
Through 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 presents an exhibition of 70 prints, original drawings, and paintings from this period in architectural history, 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 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
Through May 10, 2015
As the world's population approaches 8 billion, city authorities, urban planners and designers, economists, 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 showcases the work of six interdisciplinary teams who present new architectural possibilities for global metropolises Hong Kong, Istanbul, Lagos, Mumbai, New York, and Rio de Janeiro. The resulting proposals show how emergent forms of tactical urbanism



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dates&events

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.

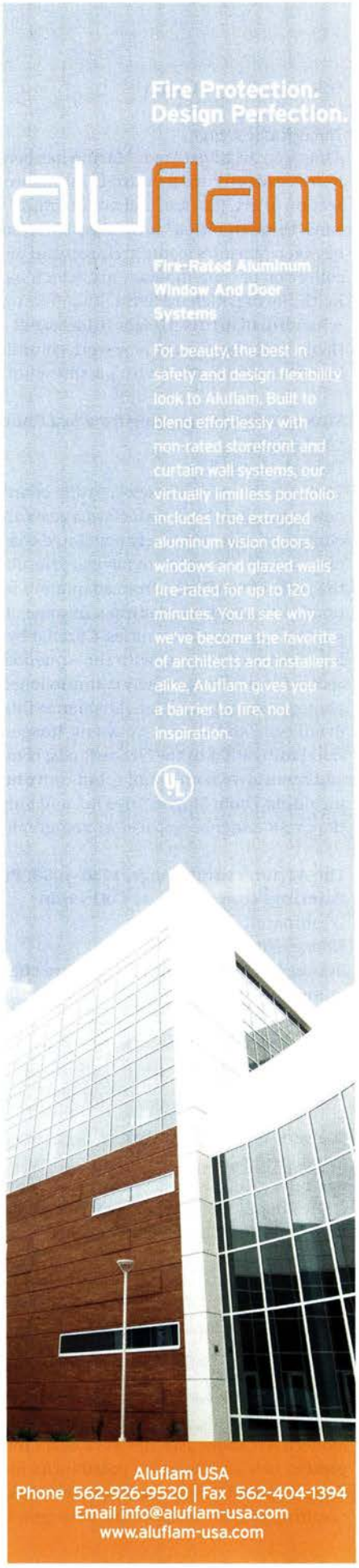
Provocations: The Architecture and Design of Heatherwick Studio
Los Angeles
Through May 24, 2015
Held at the Hammer Museum, *Provocations* features the imaginative work of British designer Thomas Heatherwick and his London-based studio, established in 1994 and recognized for combining novel engineering with new materials and innovative technology to create unusual, often sculptural, building forms. Heatherwick is known for unique design concepts and for range, from small products to large structures. A selection of projects is on display, including prototypes, scale models, objects, photographs, and film and video footage. For more information, visit hammer.ucla.edu.

Competitions

Radical Innovation Competition
Submission deadline: March 31, 2015
This international design competition, open to students and professionals, challenges the hotel industry to elevate the guest experience using new thinking in design and operations. Three finalists will be flown to New York to present their ideas at an event on September 30. One grand-prize winner will receive a $10,000 cash prize. All entries require a clear and compelling brief along with realistic renderings, showing how the concept would be brought to life. For more information, visit radicalinnovationaward.com.

Robert A.M. Stern Architects Travel Fellowship
Submission deadline: April 10, 2015
The RAMSA Travel Fellowship is a $10,000 prize awarded yearly by Robert A. M. Stern Architects for the purpose of travel and research. The prize is intended to nurture emerging talent and will be awarded to an individual who has proven insight and interest in the profession and its future, as well as the ability to carry forth in-depth research. The program is open to students in their penultimate year, pursuing a Master of Architecture degree from one of 18 U.S. and Canadian schools. For more information, visit ramsa.com.

E-mail information two months in advance to recordevents@construction.com.



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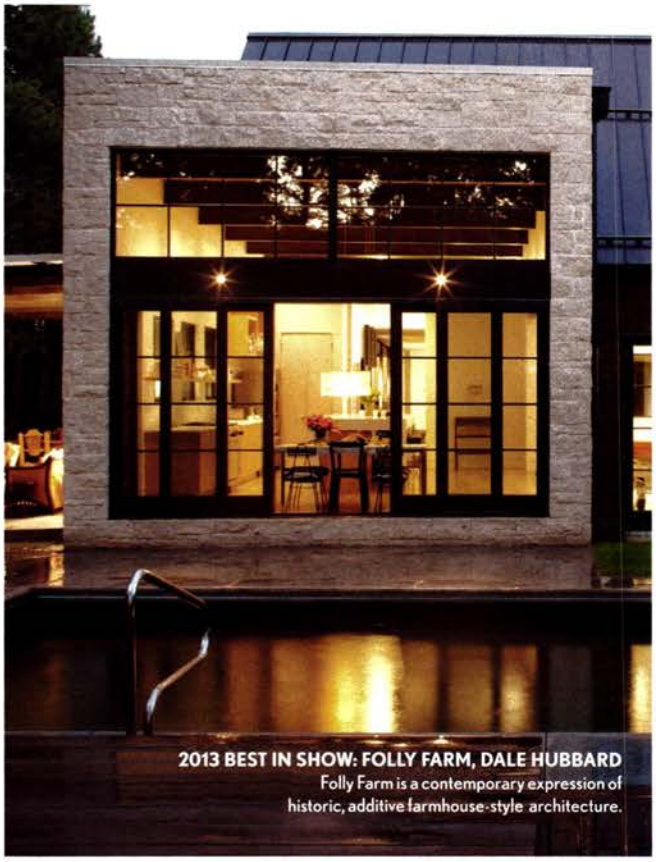

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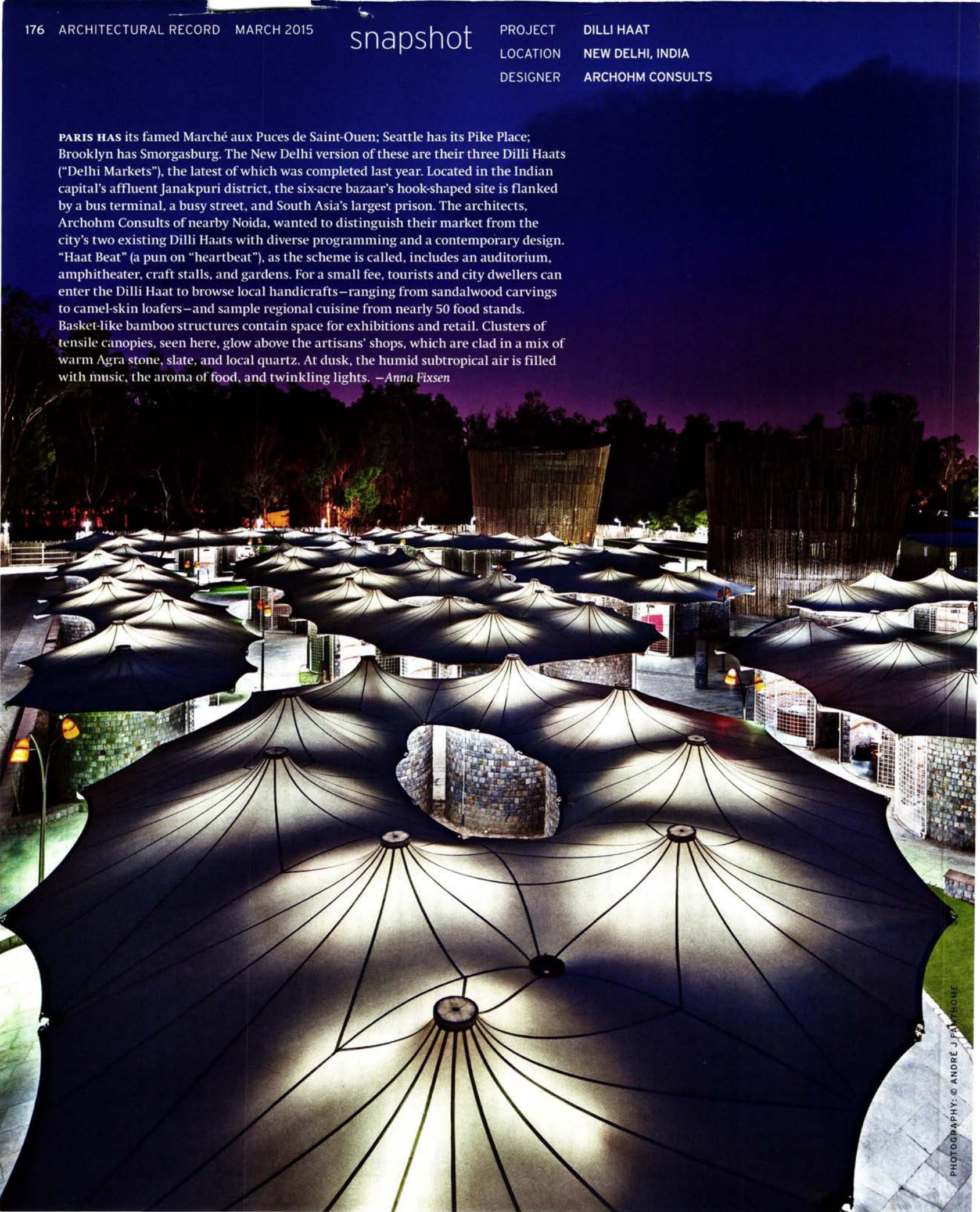
snapshot

PROJECT DILLI HAAT
LOCATION NEW DELHI, INDIA
DESIGNER ARCHOHM CONSULTS

PARIS HAS its famed Marché aux Puces de Saint-Ouen; Seattle has its Pike Place; Brooklyn has Smorgasburg. The New Delhi version of these are their three Dilli Haats ("Delhi Markets"), the latest of which was completed last year. Located in the Indian capital's affluent Janakpuri district, the six-acre bazaar's hook-shaped site is flanked by a bus terminal, a busy street, and South Asia's largest prison. The architects, Archohm Consults of nearby Noida, wanted to distinguish their market from the city's two existing Dilli Haats with diverse programming and a contemporary design. "Haat Beat" (a pun on "heartbeat"), as the scheme is called, includes an auditorium, amphitheater, craft stalls, and gardens. For a small fee, tourists and city dwellers can enter the Dilli Haat to browse local handicrafts—ranging from sandalwood carvings to camel-skin loafers—and sample regional cuisine from nearly 50 food stands. Basket-like bamboo structures contain space for exhibitions and retail. Clusters of tensile canopies, seen here, glow above the artisans' shops, which are clad in a mix of warm Agra stone, slate, and local quartz. At dusk, the humid subtropical air is filled with music, the aroma of food, and twinkling lights. *—Anna Fixsen*



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