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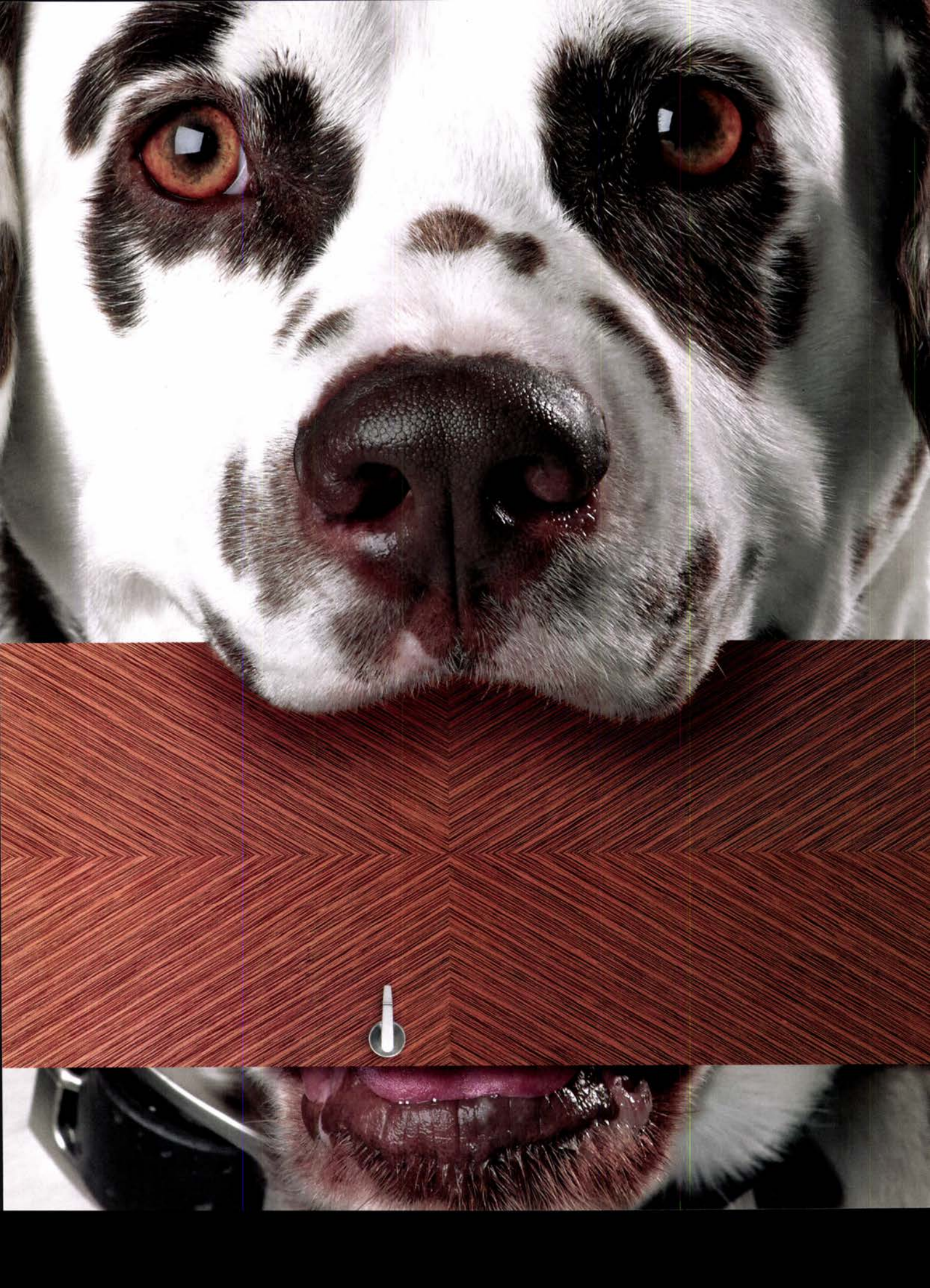

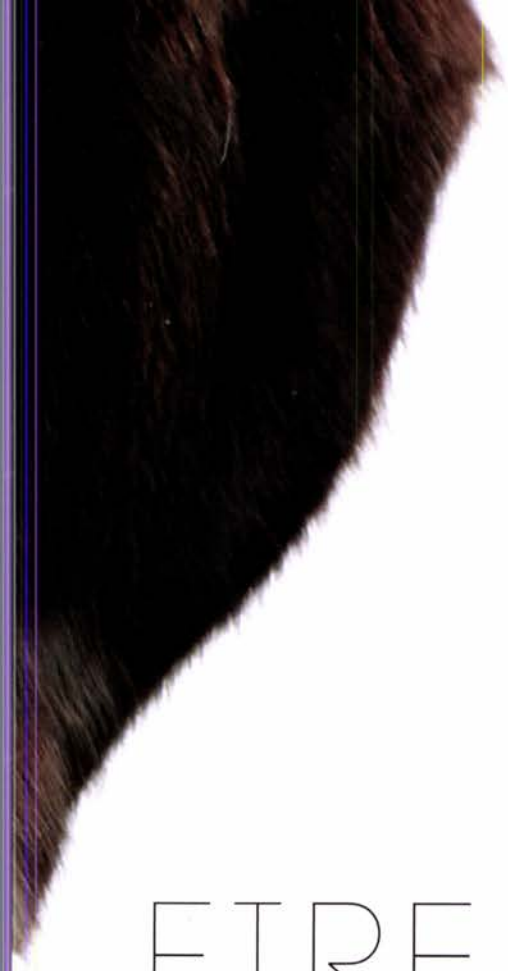

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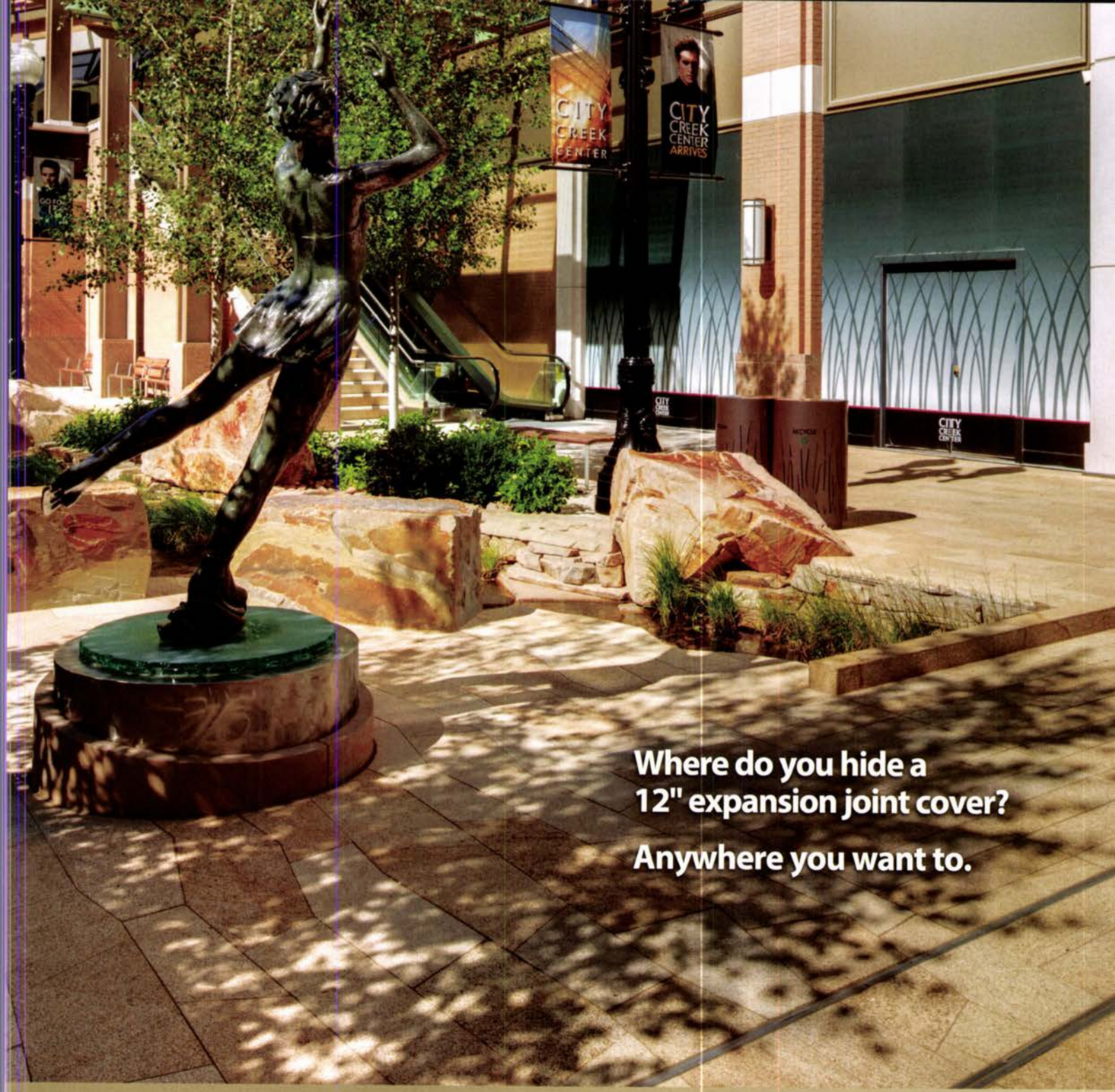

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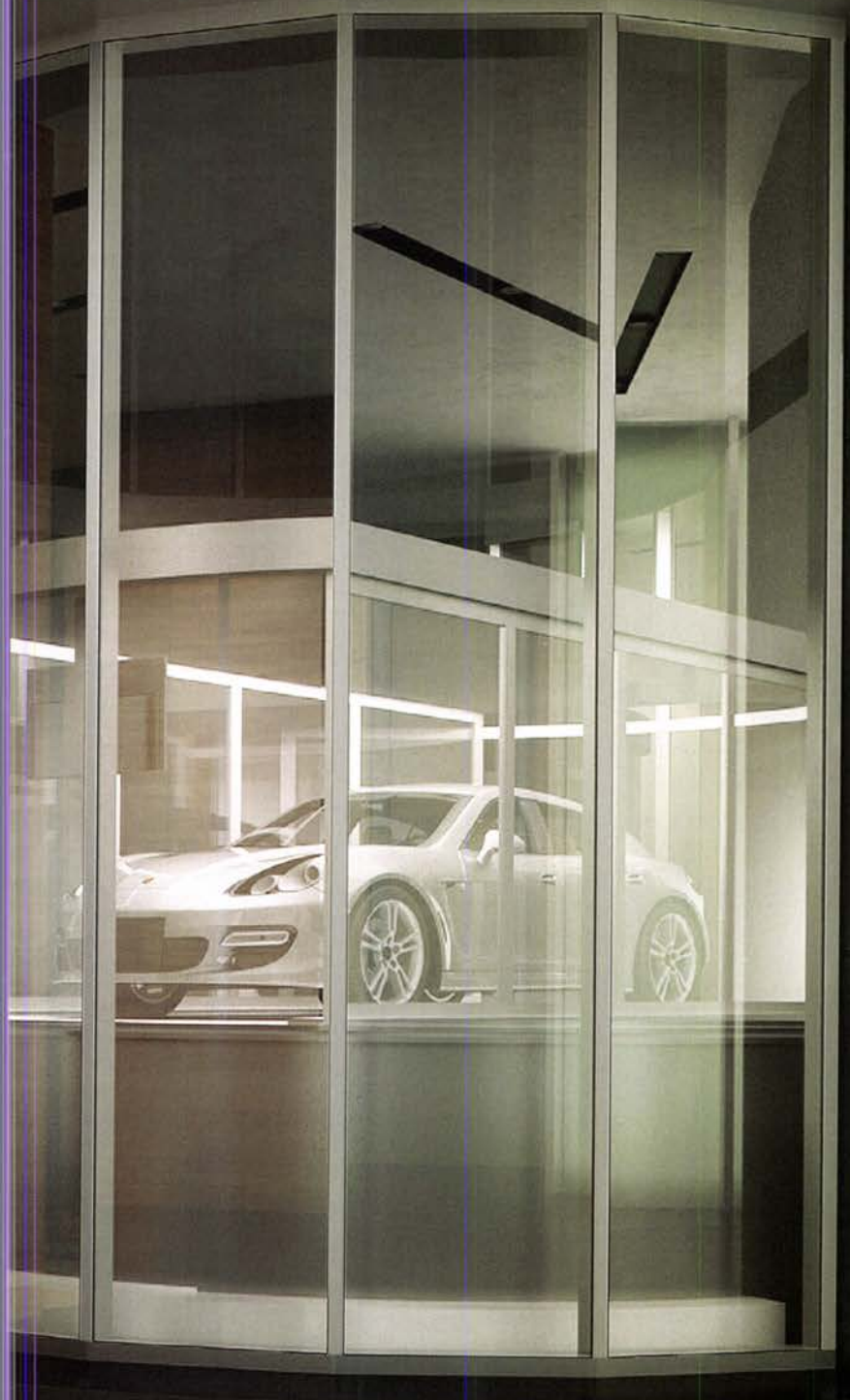

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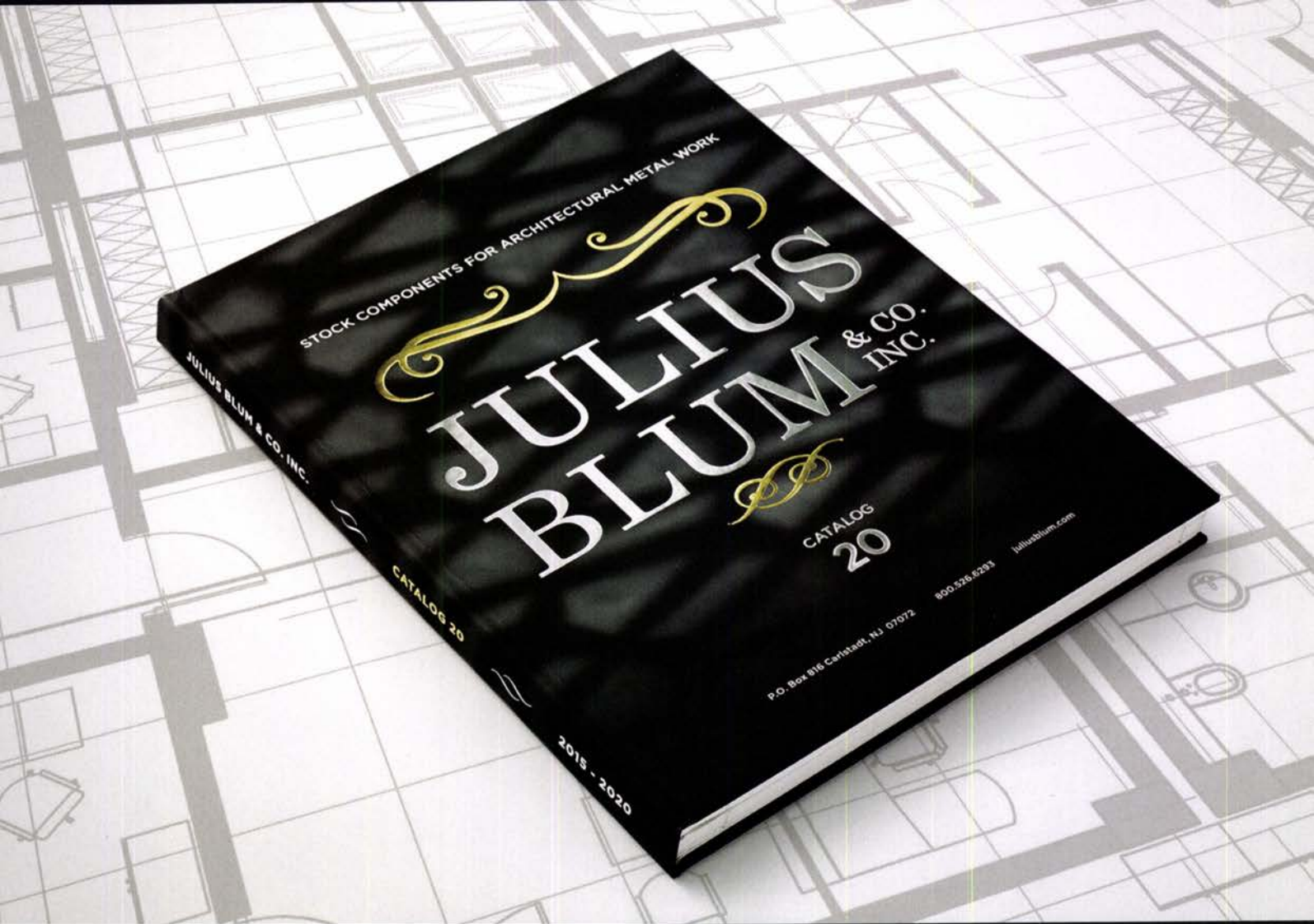
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THIS PAGE: VALLETTA CITY GATE, BYRENZO PIANO BUILDING WORKSHOP. PHOTO COURTESY RPBW.

COVER: ZAHA HADID AT MAXXI, THE NATIONAL MUSEUM OF XXI CENTURY ARTS, ROME. PHOTO BY IWAN BAAN.

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ZAHA HADID AND PATRIK SCHUMACHER AT THE MAXXI CENTRE OF CONTEMPORARY ART AND ARCHITECTURE IN ROME (NOVEMBER 2009).

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FROM THE VAULT
The results of our April Record Houses poll are in! Now, read the archival story about readers' favorite vintage Record Houses cover.

SACRED HEART CATHEDRAL OF THE CATHOLIC DIOCESE OF KERICHO IN KENYA, BY JOHN MCASLAN + PARTNERS.

HIGHLIGHTS

REMEMBERING ZAHA HADID
View our expanded gallery of the late architect's projects. [NEWS]

RECORD REVEALS
Plan your trip to the 2016 AIA convention with help from local architects who shared their favorite restaurants, bars, museums, and more in Philadelphia. [NEWS]

FEATURED HOUSES
Find photos, credits, and specifications for three new residential projects in this monthly online-only feature. [HOUSES]

AUDIO SLIDE SHOW
Watch our audio slide show with photos and sound from the dedication of the LGBT Congregation Beit Simchat Torah's new synagogue. [BUILDING TYPE STUDIES]

VIDEOS
Hear from architect John McAslan about his firm's two houses of worship—the Jumaa Mosque in Qatar and the Kericho Cathedral in Kenya—and see additional photos of both structures. [VIDEOS]

CONGREGATION BEIT SIMCHAT TORAH'S BOARD PRESIDENT NATHAN E. GOLDSTEIN, NEW YORK CITY MAYOR BILL DE BLASIO, AND RABBI SHARON KLEINBAUM CUT THE RIBBON ON THE NEW SYNAGOGUE.

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Architects and the Creative Impulse

Zaha Hadid was a gamechanger—in her radical vision of architecture and as a trailblazer for women.

WE AT RECORD were deep into preparing this month's issue when the startling, sad news broke of Zaha Hadid's death at age 65. The outpouring of mourning, on the Internet, in various publications, and on social media, was amazing—much of it from women in architecture for whom she was a trailblazer. Of course, no woman wants to be known as a "woman architect," least of all Zaha herself. Early in her career, she fiercely deflected the label: she was, in her way, a woman who was one of the guys, whether dining with the "boys' club" of architects that the late Philip Johnson used to bring together in New York or as the first female to join the elite Pritzker laureates. But she later admitted to experiencing sexism, calling out "misogynist behavior" in the U.K., where she had established her office. When the *Architects Journal* in London honored her for her "outstanding contribution to the status of women in architecture" in 2012, she was no longer a reluctant role model. "I see this incredible amount of need from other women for reassurance that it could be done," she said, "so I don't mind that at all."

The following year, Denise Scott Brown made a video speech for the *Architects Journal* that went viral, unleashing a torrent of support for reversing Scott Brown's exclusion from the Pritzker Prize, which had honored her partner Robert Venturi in 1991. That campaign failed, but it did spark another—to change the rules of the AIA Gold Medal to allow two collaborators to share the award. This month, Venturi, now 90, and Scott Brown, 84, will finally receive that medal, at a ceremony during the national AIA convention in Philadelphia.

But change is slow. Only this year did Zaha Hadid become the first woman to win, as a solo practitioner, the Royal Institute of British Architects's Gold Medal—an honor "totally overdue," said RIBA's president. In the award citation, Peter Cook, the founder of Archigram, described Zaha as "our heroine" who, "for three decades now, has ventured where few would dare."

Daring is just one word to describe her and her architecture. Rem Koolhaas, her early teacher and close friend, said Zaha was "somebody with a rare kind of courage." She was fearless, determined, unburdened by a need to please. She was also, as Koolhaas noted, an Arab who was not bound by Western conventions. The city of Baghdad where she grew up in the 1950s was then a cosmopolitan and diverse crossroads. That was reflected in her own childhood playmates; she attended a Catholic school, where, she said, she and the other Muslim and Jewish girls got to have extra recess, while the Catholic girls attended compulsory chapel. Later, she studied mathematics in Beirut before moving to London to study architecture.

Certainly the daring of Zaha's work transcends gender or biographical detail—though, as critic Paul Goldberger writes in his tribute to her in this issue, it was "often hard to separate her larger-than-life persona from her striking work" (page 98). But history will begin to disentangle the passionate character from the extraordinary buildings she created—from Azerbaijan and China to Rome, where RECORD contributing photographer Iwan Baan shot her inside her Maxxi Museum in 2009, as shown on this month's cover.

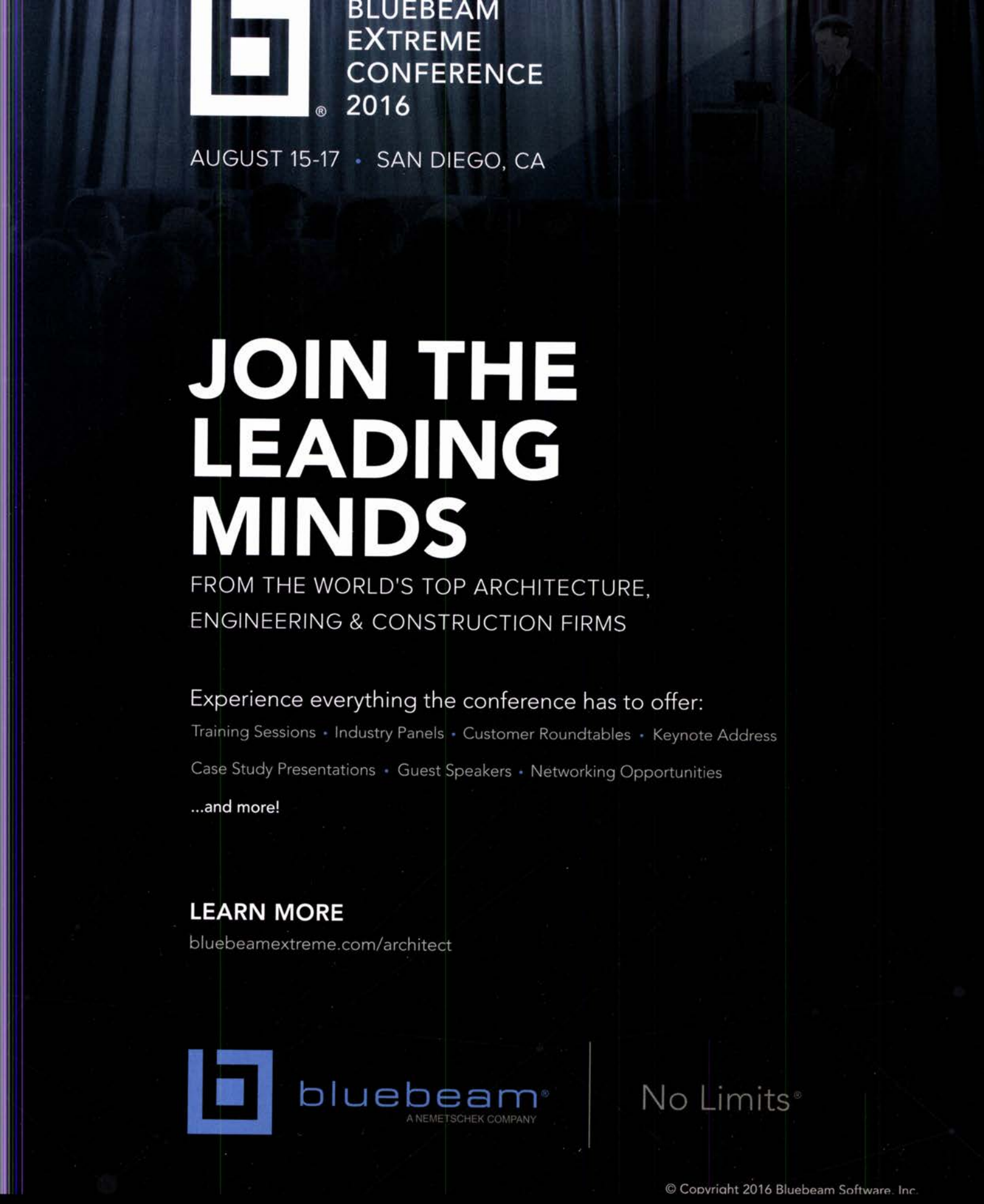
"I have always believed in progress and in creativity's role in progress," said Zaha. And so it seems a bit uncanny that the issue in which we honor her is devoted to creativity and architecture.

Creativity is a slippery subject. Philosophers and scientists have been trying to penetrate the mystery of the creative impulse for centuries—and they still don't have all the answers (page 110). In a fascinating new book, *The Creative Architect: Inside the Great Midcentury Personality Study*, scholar Pierluigi Serraino delves into a little-known research project at the University of California in Berkeley in the late 1950s that tried to delineate the qualities, and the turns of mind, that 40 prominent architects possessed and brought to their creative tasks. These included Eero Saarinen, Richard Neutra, and Philip Johnson, whose case studies are excerpted in the pages ahead (page 113).

Zaha's own creativity changed the culture of architecture today—not just because her structures manifested the pioneering potential of digital technology but because they sprang from an incredible mind, first expressed in the beautiful paintings she made, inspired by Russian Constructivism, that somewhat enigmatically conveyed, in colorful shards of planes and angles, a radical new conception of space and context. She defied categorization and helped lead, and unlock, all that architecture in the 21st century could become.

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief



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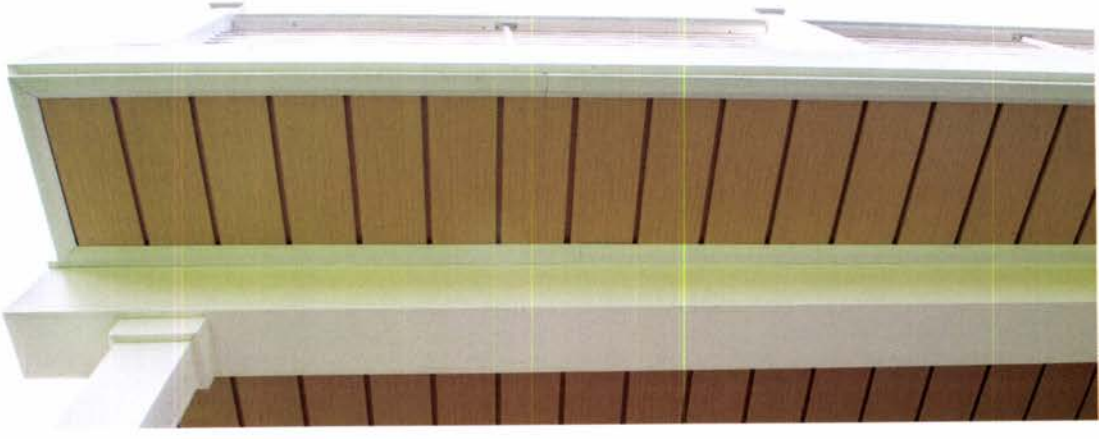

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Artisanry, Architecture, and North American Glass Tile

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Sustainable Stone From Cradle to Gate

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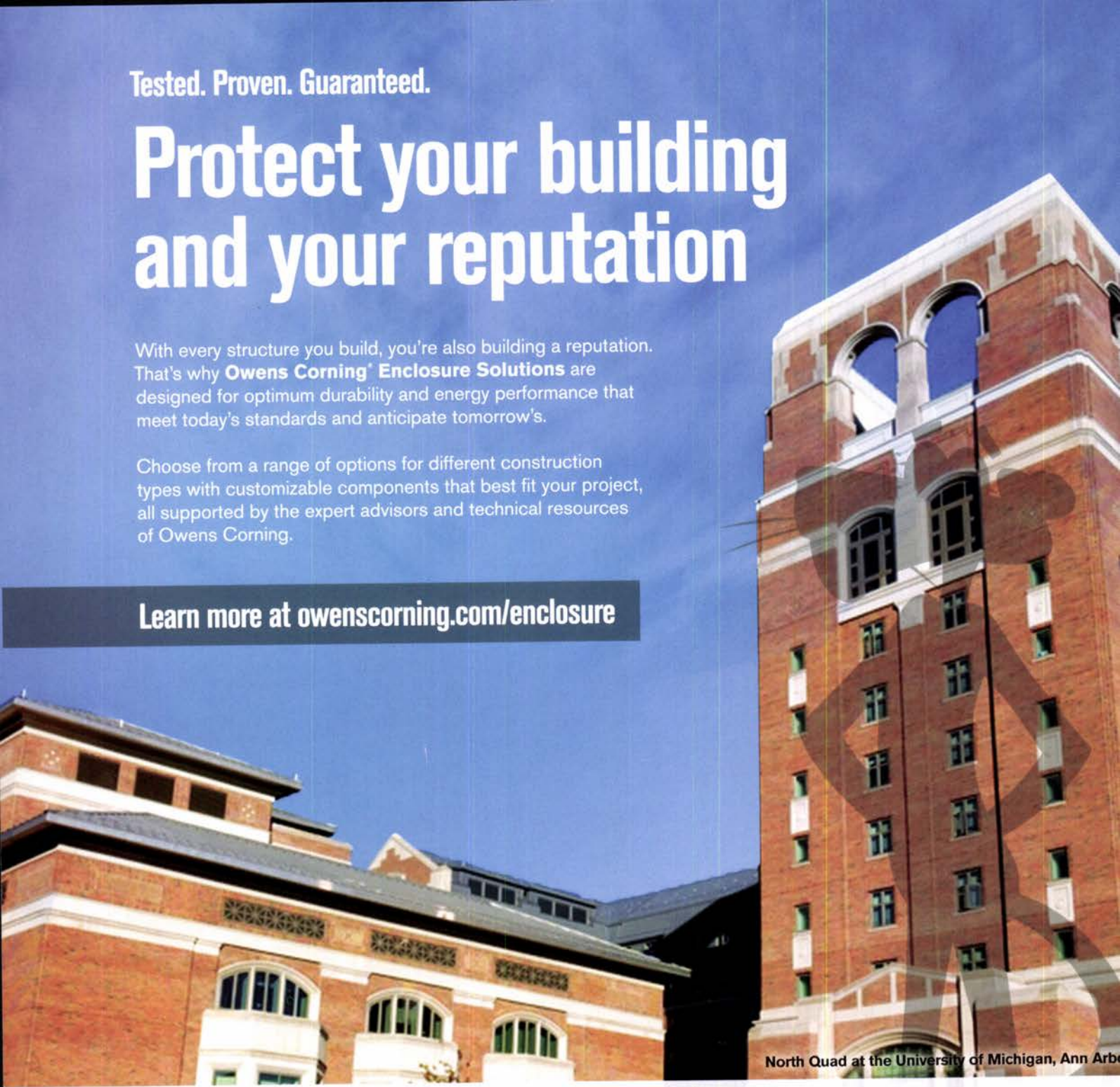

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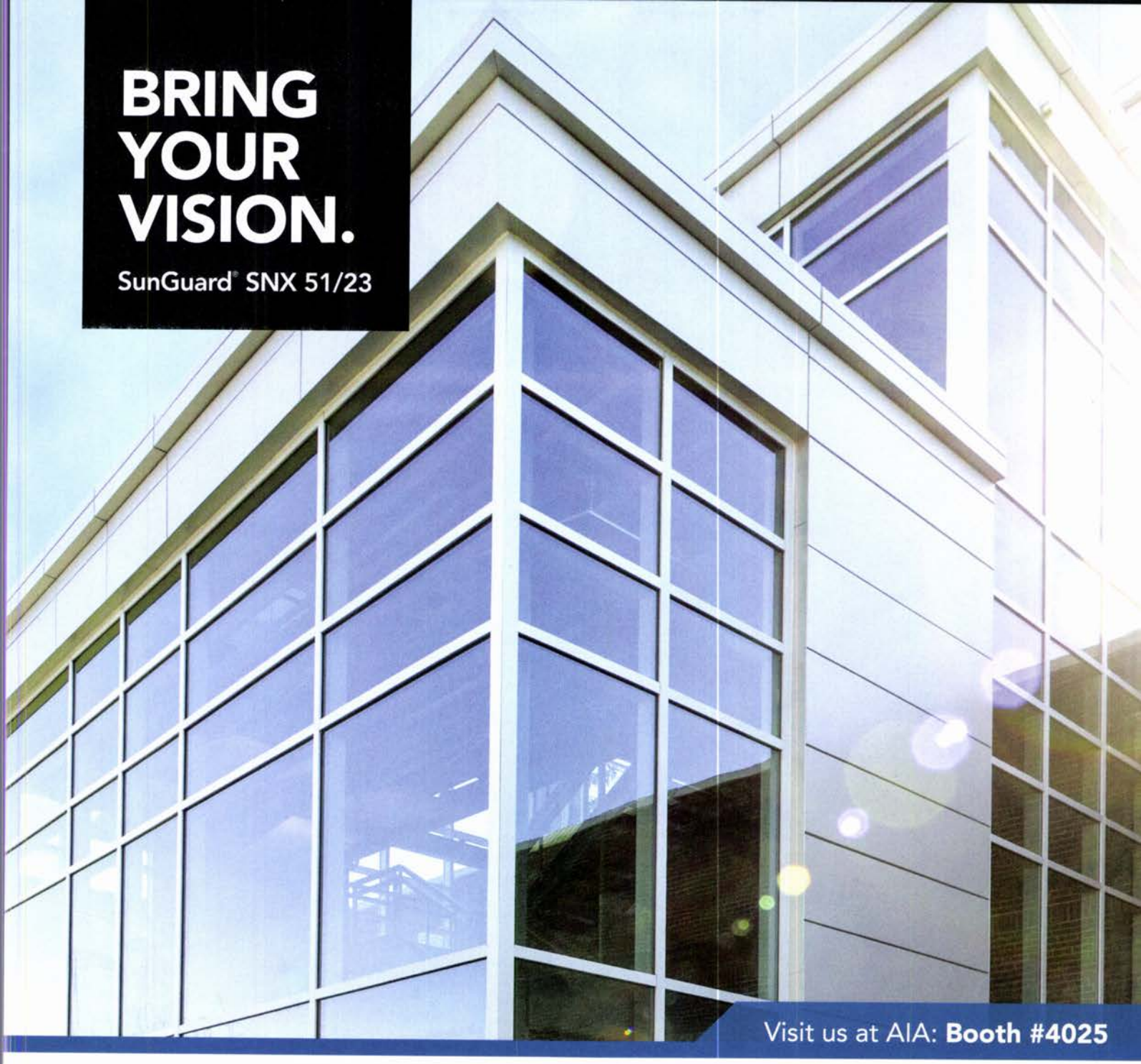

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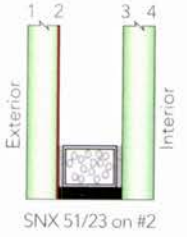

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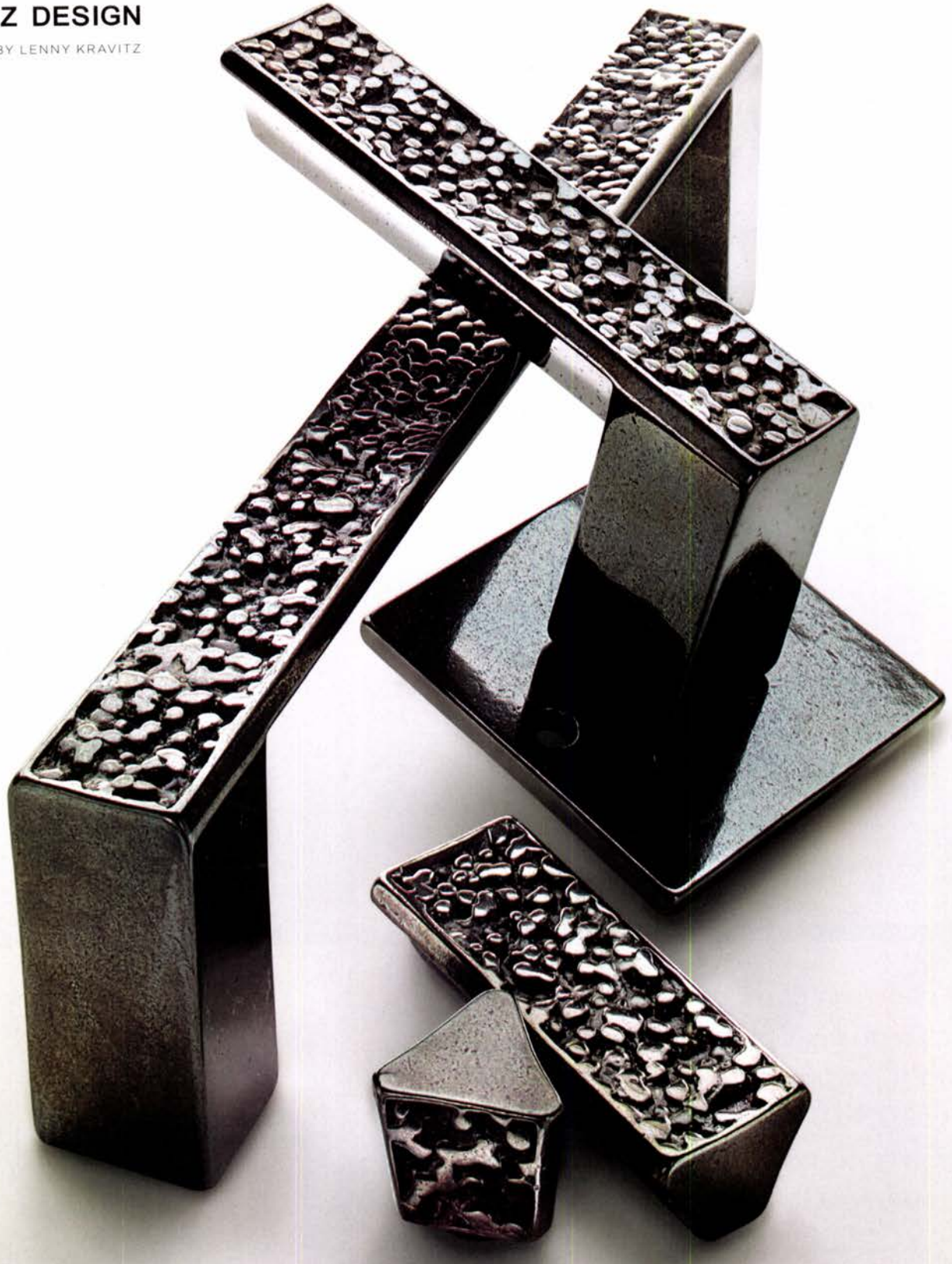

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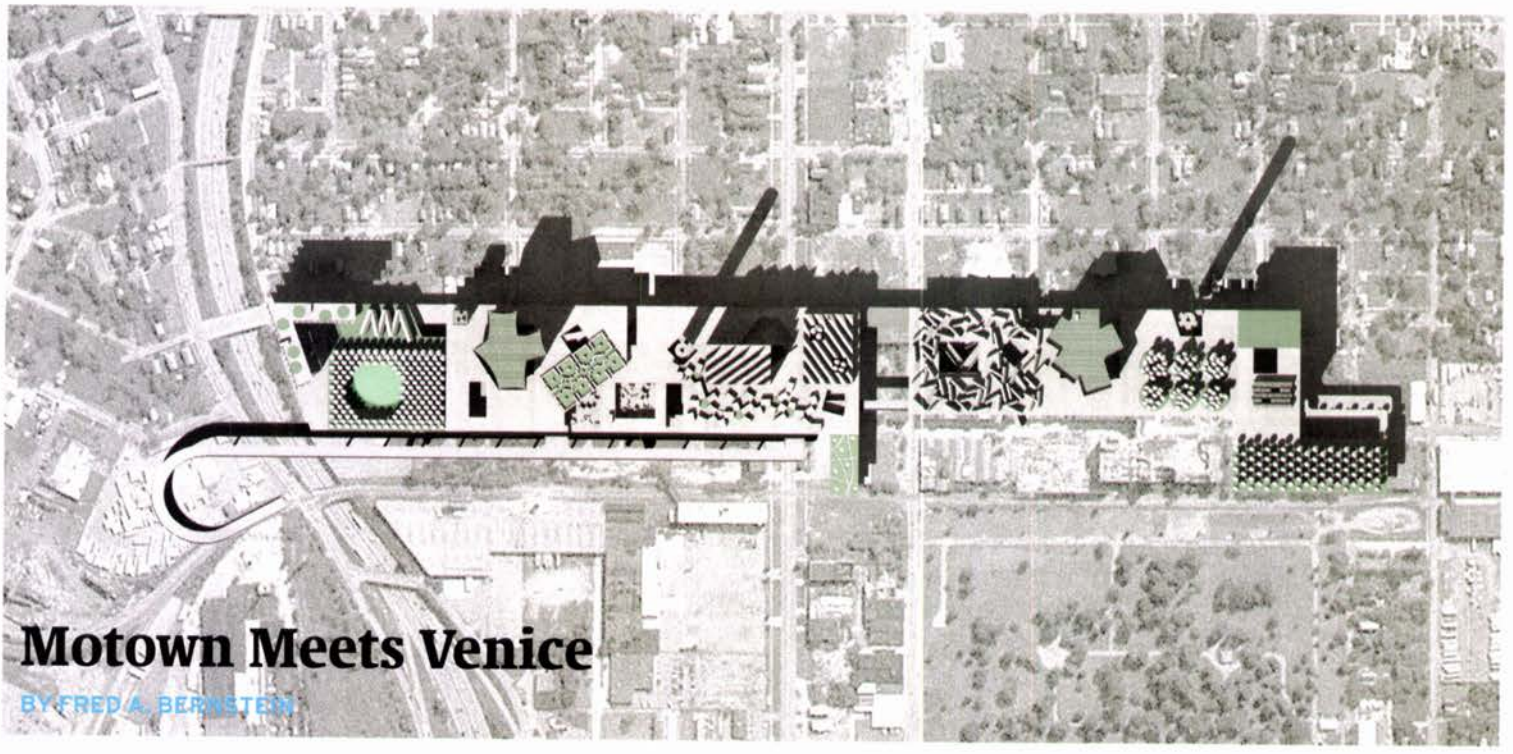
—Jean Nouvel, speaking at a panel discussion of past Pritzker Architecture Prize–winners in New York.

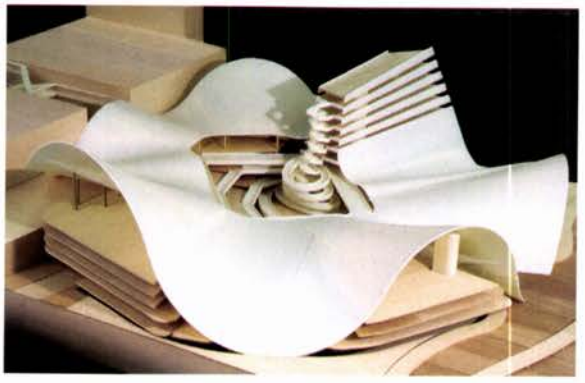


Motown Meets Venice

BY FRED A. BERNSTEIN

WHEN HE was named director of the 15th Venice Architecture Biennale, Chilean architect Alejandro Aravena asked curators to focus on projects that "improve the quality of the built environment and life and consequently people's quality of life."

At the time, Cynthia Davidson and Monica Ponce de Leon, curators of the U.S. pavilion at the Biennale, were already working on a program that answered Aravena's call. When the pavilion opens on May 28, it will contain speculative designs by 12 architecture firms for four sites in Detroit. Two are empty lots, one adjacent to the burgeoning community known as Mexicantown and one near the thriving Eastern Market. Two are existing buildings—an abandoned, derelict Packard factory by Albert Kahn and a semi-occupied post office near the riverfront. Davidson and Ponce de Leon chose the four sites in consultation with local leaders and selected the 12 architects out of 253 entries in an open competition. Some of the offices are well established—Greg Lynn FORM of Los Angeles and Mack Scogin Merrill Elam Architect of Atlanta—while others are relative unknowns. Two are in Michigan: A(n)Office in Detroit and T+E+A+M in Ann Arbor.



Together, Davidson says, the firms offer "a diversity in age and ethnicity that is very representative of the U.S. today."

The architects were asked to come up with programs as well as designs. They met with a diverse group of locals, including businesspeople, a bishop and church congregants; and architects and planners, including Maurice Cox, the new director of city planning, who is on the pavilion board of advisors. The pro-

For his contribution to the U.S. pavilion exhibition, Stan Allen envisions Albert Kahn's Packard Automotive Plant in 2045 (top). Meanwhile, Preston Scott Cohen has designed an undulating canopy for the George W. Young Post Office (above, left). Marshall Brown Projects contributed a speculative tower for Detroit's Dequindre Cut greenway (above, right).

IMAGES: © STAN ALLEN ARCHITECT (TOP); PRESTON SCOTT COHEN, INC. (MIDDLE); MARSHALL BROWN PROJECTS (BOTTOM, RIGHT)

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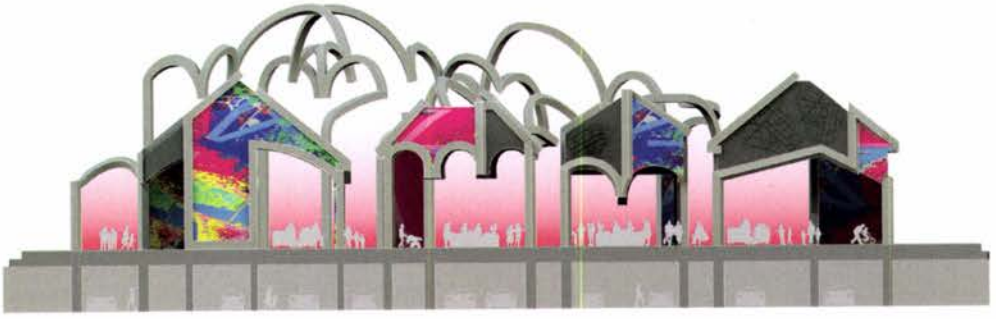


The Architectural Imagination cocurator Monica Ponce de Leon designed a group of foam columns that will stand in front of the neoclassical U.S. pavilion (above). LA-based firm Pita & Bloom proposes a vaulted marketplace with parking beneath (right) for its project, the New Zocalo.

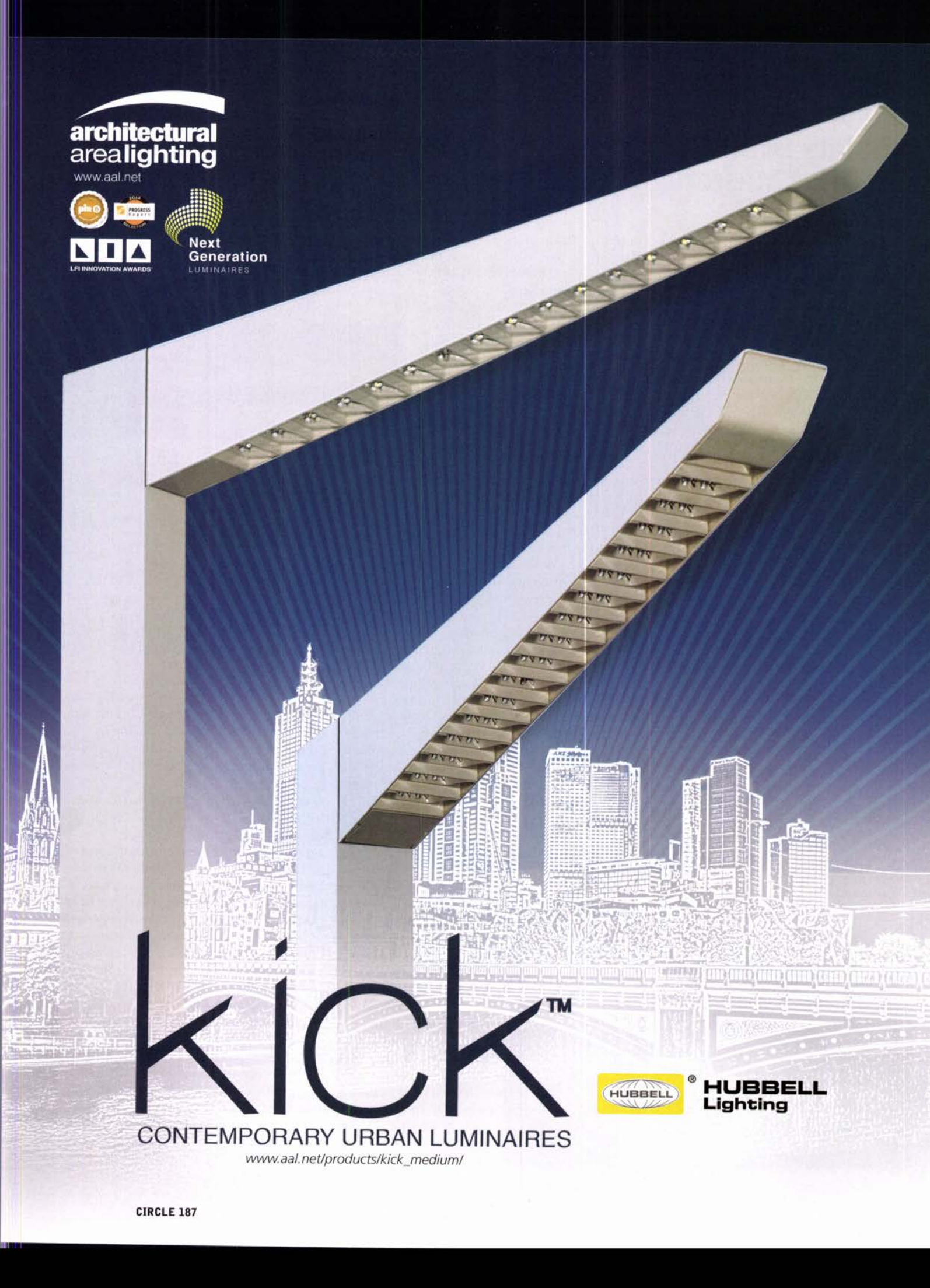
grams the architects came up with include a mix of parks, marketplaces, schools, housing, sports facilities, a library, greenhouses, and even an aviary.

For the exhibition, titled *The Architectural Imagination*, each firm has created a 4-by-7-foot model that will stand in one of the four rooms of the neoclassical U.S. pavilion in the Giardini in Venice, some 250 items in all. "It's going to have a Soane-esque quality," says Davidson, referring to the plethora of drawings, paintings, and models in Sir John Soane's Museum in London. But Soane depicted an idealized past. This exhibition will focus on a somewhat humbling present. "But we're not exhibiting Detroit," says Davidson, head of an architecture think tank that produces books, conferences, and the journal *Log*. "We're exhibiting new possibilities for Detroit." The takeaway is meant to be ideas that can be applied in cities around the world.

There will also be a physical takeaway: the curators invited photographers to submit images of present-day Detroit. Out of nearly 500 entries, they chose 20 that will be printed as postcards, available free at the pavilion. If there is a theme to the photos, it is of people adapting to decline. One shows a wedding party in front of the city's decrepit former train station; another shows a teenage boy casually riding his bicycle past what appears to be a burning building.

The exhibition design by Ponce de Leon, former dean of architecture at the University of Michigan and now dean at Princeton, calls for a group of columns that will stand in front of the pavilion, forming what she terms "a hypostyle without a roof." Made of foam and covered in white automotive paint, the columns will beckon visitors with the words *The Architectural Imagination* written in Detroit's eight most-spoken languages, including Arabic and Hebrew.

From Venice, the exhibition will move to the Museum of Contemporary Art Detroit (MOCAD) next year. ■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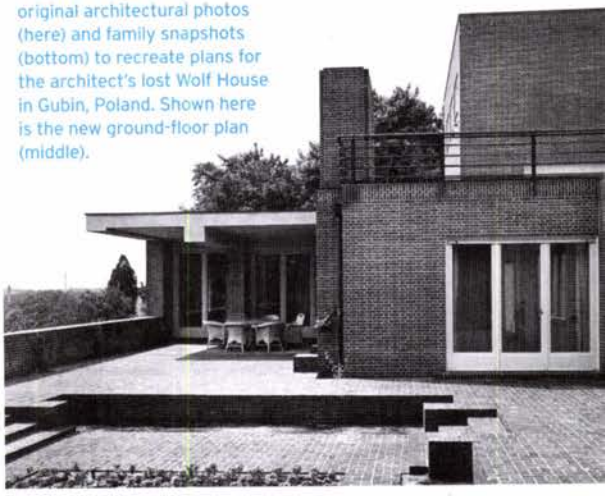
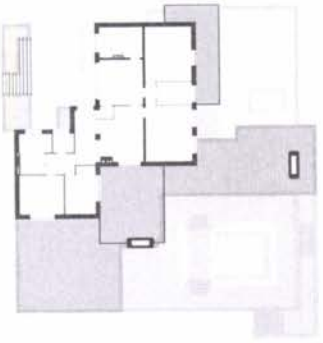
Scholars Debate the Fate of a Lost Mies Masterwork

BY ANNA FIXSEN



Historians have relied on original architectural photos (here) and family snapshots (bottom) to recreate plans for the architect's lost Wolf House in Gubin, Poland. Shown here is the new ground-floor plan (middle).



"IT IS much better to be good than to be original," Ludwig Mies van der Rohe famously advised his protégé Philip Johnson.

That's the rationale of a faction of Mies enthusiasts who want to reconstruct a forgotten but seminal work of the architect's, now buried beneath a park in Poland. Called the Wolf House, it is Mies's first built modernist house.

Supporters of the project hope to rebuild the structure as a museum to experience Mies's genius. "The reconstruction is an important visual and physical aid to understand the architecture," asserts Florian Mausbach, a retired German planner spearheading the efforts. Advocates of the proposal hope to break ground by 2019 to mark the Bauhaus's centennial.

But the campaign has sparked ideological debate among historians who believe the house cannot be reconstructed economically and authentically. "All you would get is a very abstract rendering of what the Wolf House may or may not have been," says Leo Schmidt, a professor at Brandenburg University of Technology. "It seems completely artificial."

In 1925, Erich Wolf, a well-to-do German cloth manufacturer and art collector, approached Mies to design a house for his family on the site of a former vineyard. The result was a sprawling modernist brick villa—a dramatic interplay of volumes and terraced gardens.

"The Wolf House is the very first work in which Mies developed the idea not of the open plan, but a plan of sliding spaces," says Barry Bergdoll, who organized the 2001 MoMA exhibition *Mies in Berlin* during his tenure there as the Philip Johnson Chief Curator.

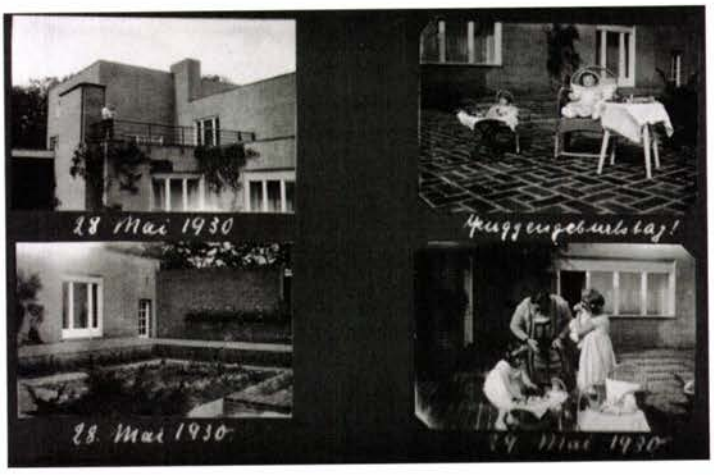
After WWII, the German-Polish border was redrawn along the Neisse River, and the town was split. Germans were expelled from the Polish side, and the Wolf House was destroyed, its bricks carted away to rebuild Warsaw.

The house was lifted out of obscurity by the *Mies in Berlin* exhibition and an excavation by Schmidt and his students the same year. They unearthed the basement and shards of the Wolfs' china collection.

In 2013, Mausbach launched a campaign to reconstruct the masterwork. The blueprints for the house are lost, but he enlisted a group of researchers at the University of Potsdam to remake the plans, relying on drawings in the MoMA collection and family photographs.

"The notion is to make it possible to experience the spaces," says Dietrich Neumann, a professor of architecture at Brown University who is partnering with Mausbach. In Neumann's estimation, the Wolf House could be constructed even more accurately than Mies's 1929 German national pavilion in Barcelona, rebuilt in 1986 to critical acclaim. "We know the ceiling heights and the layout of the floor," he says. "There might be corners where you have to make a guess, but I don't think it detracts from the advantage of experiencing the space."

But Bergdoll calls the whole initiative "crackpot" and points out that the Barcelona pavilion was meant to accommodate vast numbers of people moving through it. Furthermore, "Many of the interesting perceptions about the pavilion that came from reconstruction had to do with polished materials—you were to experience it phenomenologically. I don't see how that's going to happen in a white plaster box."



Proponents of the reconstruction believe that a new Wolf House could promote cultural understanding and generate tourism for the hardscrabble towns on either side of the river. Officials on both the German and Polish sides have greeted the endeavor with open arms.

Schmidt finds such an approach problematic. "The Wolf House's significance is not primarily because it was designed by a famous architect but because it's an archaeological site of the 20th century and the horrors in that part [of Europe]," he says. "Its emotional content is an important factor in the significance of the place." Instead, he and his students proposed a dozen alternatives to a complete reconstruction.

At the moment, the crucial barrier to reconstruction is funding. In Mausbach's estimation, the project will cost approximately 2 million euros. He has recruited the support of an advisory board including patrons Phyllis Lambert and Lord Peter Palumbo, and architect Helmut Jahn, and is seeking the financial support of private backers and European government grants. With Neumann, he intends to drum up awareness with a traveling exhibition which they hope could be shown at the Illinois Institute of Technology. With the aid of the Potsdam team and archaeologists, he hopes to embark on a separate excavation in 2017.

"The Harvard philosopher Nelson Goodman said there is art that can be faked—like a sculpture or a painting—and art that can be played again and again, like a piece of music, a play, or a book that's been reprinted," says Neumann. "I would claim to a certain degree with architecture, it's like having a score from which you work." ■

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David Chipperfield Architects Plans to Renovate Saarinen's U.S. Embassy

BY REBECCA SEIDEL

When Eero Saarinen's embassy building was completed in the late 1950s (left), it stood out from its neo-Georgian neighbors. David Chipperfield Architects' proposed renovation (above) preserves its facade while creating public space at its entry.

WHEN THE United States' London embassy moves across town from Mayfair to Nine Elms in 2017, it will leave behind a monumental home: the Eero Saarinen–designed Chancery Building, the architect's only project in the United Kingdom. David Chipperfield Architects' proposed renovation of the building would transform it into a hotel with retail and event spaces, retaining Saarinen's patterned Portland stone facade.

Under Chipperfield's plan—commissioned by Qatar-based developer Qatari Diar—the building's nine stories (three of which are belowground) would be converted into 137 guest rooms, five restaurants, six flagship retail units, a spa, and a 1,000-person ballroom. The renovation would also strip the property of existing security bollards and barricades, to turn the ground-level area into a welcoming, permeable public space.

Saarinen's building is in Grosvenor Square, which has been the United States' diplomatic home in London since the late 18th century. RECORD called the design of the new embassy "the most important single project" in the State Department's foreign buildings program (RECORD, April 1956), but when it opened in 1960, it sparked controversy because its monolithic form stood out from neighboring neo-Georgian buildings.

Said David Chipperfield of the renovation, "Our design proposals protect and respect the significant architectural and structural characteristics of Eero Saarinen's design, with a focus on restoring and enhancing this unique building to secure its long-term future at the heart of Mayfair."

The firm's proposal will be submitted to the Westminster City Council for approval this month. ■

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[NEWSMAKER]

Jason F. McLennan

BY JOANN GONCHAR, AIA

JASON MCLENNAN says green building is not about putting on a sweater when you're cold. It is about creating better buildings. For two decades, his mission has been helping the design and construction industry do just that.

Best known as the author of the Living Building Challenge (LBC), a certification system that is widely regarded as the world's most stringent green building standard, McLennan, now 42, started his architecture career at the pioneering sustainable-architecture firm BNIM in Kansas City, Missouri. In 2004, he became its youngest partner. But in 2006, hoping to push green architecture further, he left to become CEO of the Cascadia Green Building Council, the Pacific Northwest chapter of the U.S. Green Building Council. From there, he officially launched the LBC. Three years later, he founded the International Living Future Institute (ILFI).

Under his leadership, ILFI introduced a roster of deep-green standards, including Declare, a products ingredients label; a certification for net-zero buildings; and the Living Community Challenge, a planning-scale version of the LBC. He's the winner of this year's Award of Excellence from RECORD's sister publication, *Engineering News-Record*, for his role in raising the sustainability bar.

In January, he stepped down from his post at ILFI to focus on his architectural practice, McLennan Design, on Bainbridge Island, Washington. RECORD spoke with him about his plans for continuing to push the industry forward.

You just introduced the Green Warrior Society, a new charitable arm of your firm that will provide architectural services to nonprofits. How will it differ from other pro bono design endeavors?

We're pulling together not just architects but all the disciplines. So it's an integrated process, with engineers, landscape architects, and construction companies. The effort is meant to match firms with NGOs that are doing good work and have a deep commitment to sustainability. It's about constructing a Living Building, a net zero energy building, or a LEED Platinum building at a minimum. The idea is that everybody deserves the greenest building possible.

Are you recruiting firms or individuals?

I want commitments from firms. Although there are many that do pro bono work, I've heard consistently that they have a hard time managing that work and identifying projects. So it is helpful to have a structure like this. The society will also serve as a peer learning group. We're going to be in frequent contact with partners like Miller Hull and Lake|Flato to talk about what we could be doing differently. We'll be getting better at this together.

Your partner at McLennan Design, Thomas Knittel, is continuing the orphanage project in Haiti that he started at HOK, the William Jefferson Clinton Children's Center. Will it be completed as a Green Warrior project?

That's how we're looking at it. We had to redesign it for a new site, and we consider that part of our piloting process.

Tell me about McLennan Design's eco resort on Blackadore Caye, off the coast of Belize. Do you have any misgivings about bringing tourists there?

If people don't do something, the island is going to be gone and the entire ecosystem with it. So actually there has to be an intervention. Definitely there's a carbon footprint for flying, but people have to vacation somewhere, and I'd rather they do it in deep-green buildings.

Why would Blackadore disappear?

People have completely stripped the island of its mangroves. There are changes in sea level, and the island's other trees can't stand the salinity. They're dying, and the whole system is in rapid decline. This is the story of islands all over the world, where humans have changed the way that their systems work.

I've heard that you plan to start a design school. Is that so?

Yes. We just purchased a small historic building on Bainbridge Island that we will transform into a Living Building. We're going to be taking students from different design schools for a semester to a year. They would get credit from their home institutions and a deep dive into regenerative design thinking.

Was it always your plan to someday return to practicing architecture?

Yes. My goal was not to run a nonprofit. My goal was to create change. The team at ILFI is now really strong. I can continue to help transform the industry by designing Living Buildings and staying on the cutting edge myself. ■

noted

MoMA to Eliminate Architecture and Design Galleries

The Museum of Modern Art in New York—the fi U.S. museum to establish an architecture and de department—has confirmed it will be closing th galleries as part of a multiyear expansion projec Diller Scofido + Renfro. The future of the galleri unclear as, the museum says, curators "are experimenting with different ways of bringing t diverse holdings of the museum's collection into fresh and meaningful dialogues."

Calatrava Designs Dubai's Tallest Tower

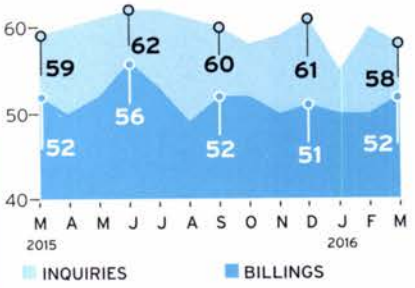
Santiago Calatrava has won a competition to construct a half-mile tower in Dubai. If comp ed as planned, the skyscraper—a slender spir anchored by cables—will be slightly taller tha the Burj Khalifa, currently the world's tallest building. In addition to multiple glazed obse tion decks, the tower will include mixed-use floors, restaurants, and a hotel, according to Emaar properties, the developer.

GSD Creates Real Estate Prize

The Harvard Graduate School of Design (GSD) h announced a new annual prize recognizing exceptional real-estate proposals. Called the Plimpton-Poorvu Design Prize, the $20,000 awa will be given to a student or team that propose project that is feasible in both design and execu

Knight Foundation Names Winne of Cities Challenge

The Knight Foundation has announced the winn of its 2016 Cities Challenge, awarding a total of $ lion for projects aimed at improving cities. The winning 37 proposals are for cities including Al St. Paul, and Charlotte and range from pop-up cultural spaces to bike tours.



Uptick in March ABI

The Architectural Billings Index for March w 1.6 points from the month prior, rounding ou first quarter of 2016 with a score of 51.9, acco to the American Institute of Architects (AIA). score above 50 indicates an increase in billing The index for new project inquiries scored 58 "The Midwest is lagging behind the other reg but otherwise business conditions are genera healthy," said AIA economist Kermit Baker.

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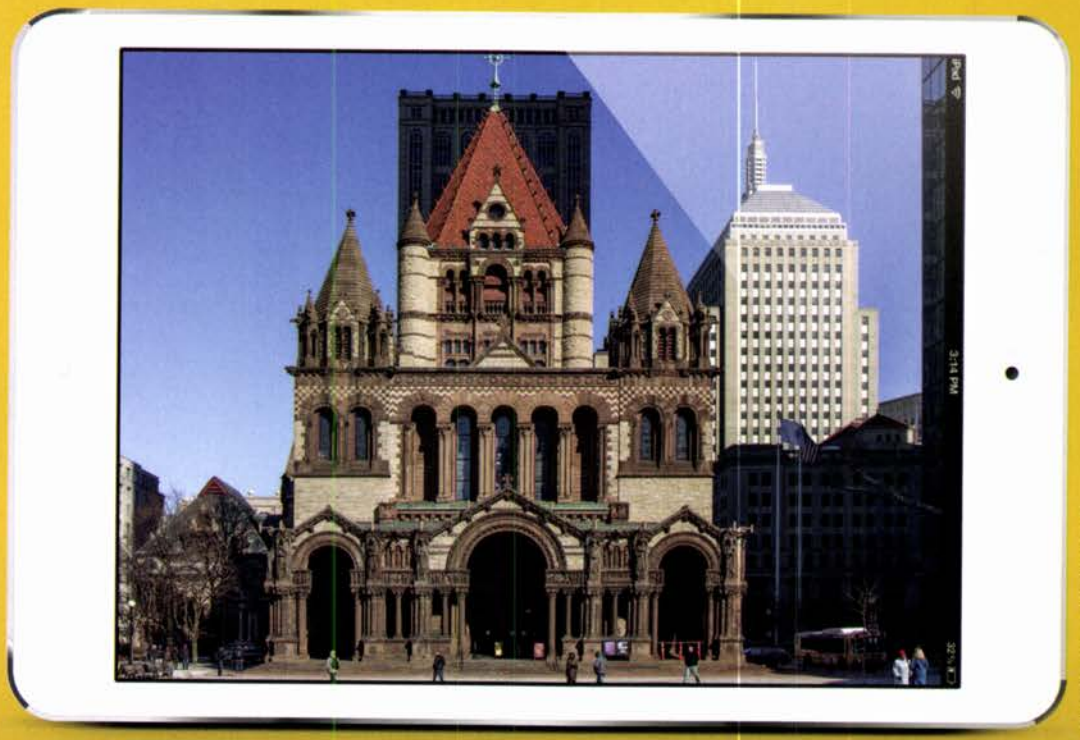

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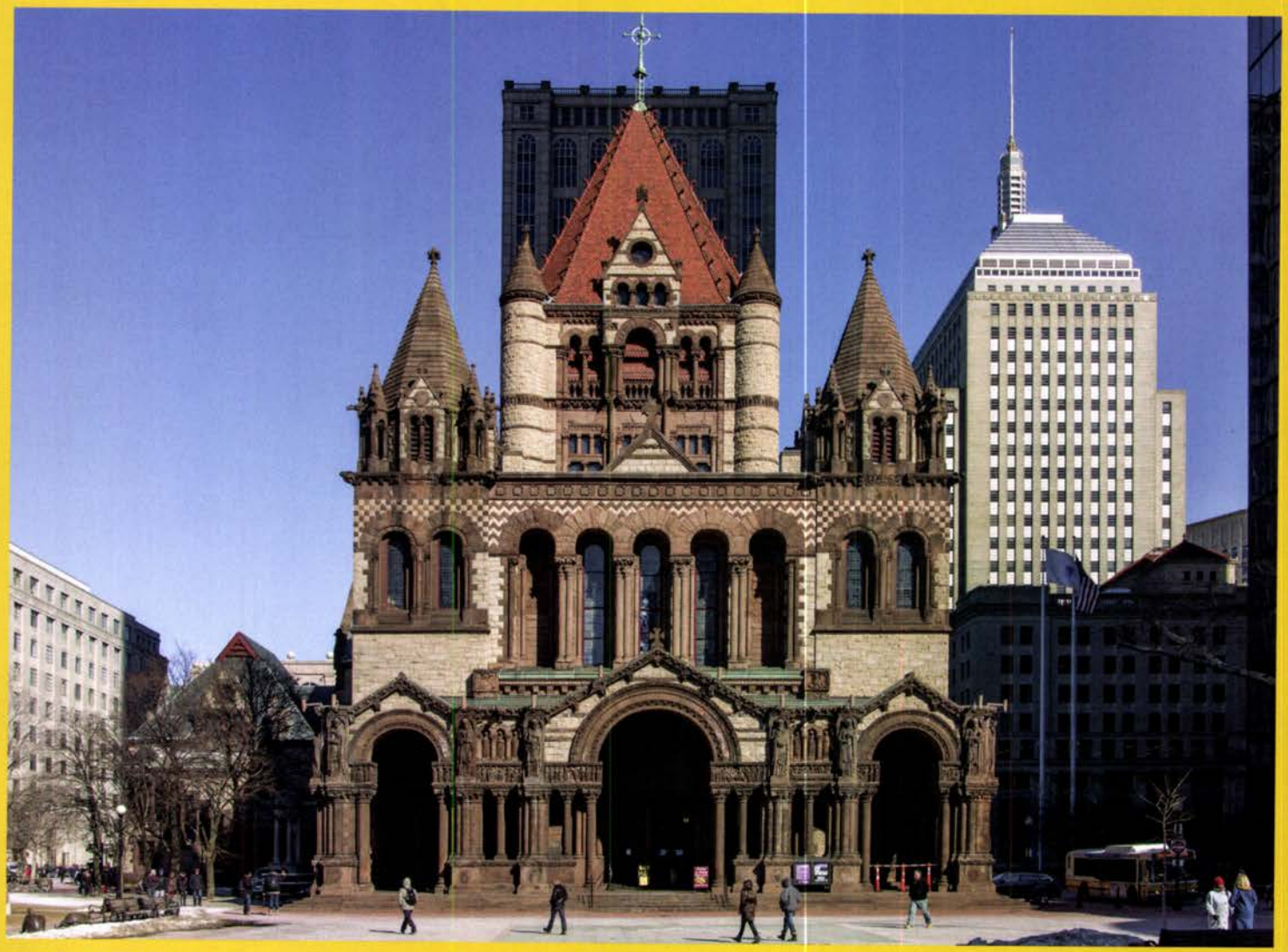

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The answer to the April issue's Guess the Architect is **LUDWIG MIES VAN DER ROHE**, who designed the Tugendhat Villa in Brno, Czech Republic, in 1930. The partially steel-frame and plastered-masonry house is perched on a slope where the entrance is on the top floor, facing the street. The living and dining areas, on the lower level, look out to a garden through an 80-foot-long band of alternately retractable glass windows. The house, extensively renovated in 2012, is part of the Brno City Museum.

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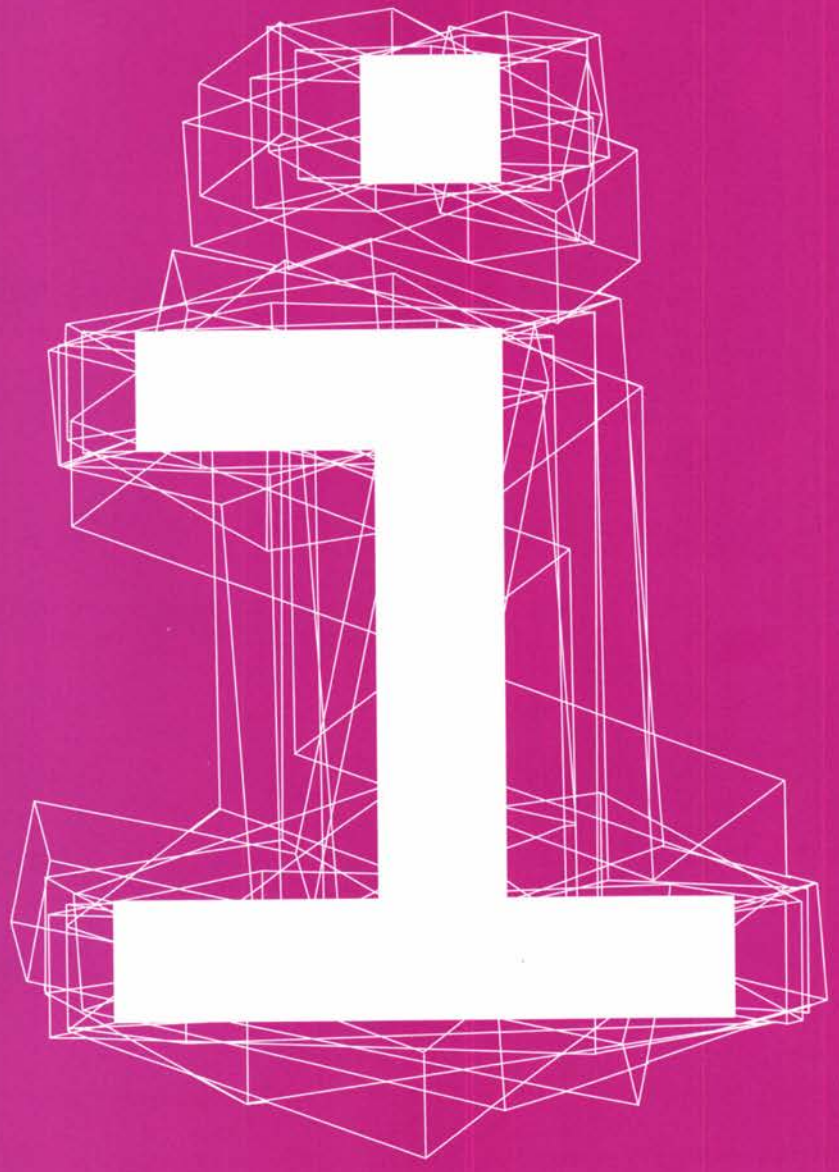

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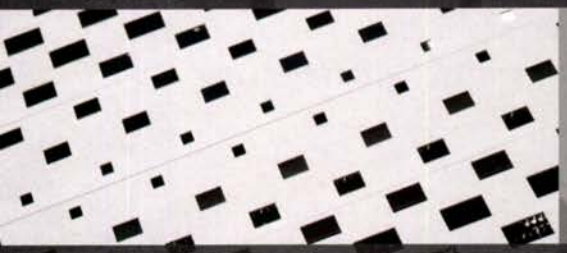

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perspective **house of the month**

A WEEKEND RETREAT IN UPSTATE NEW YORK EMBRACES ITS RURAL CONTEXT AND GREEN AND SMART SOLUTIONS. BY ANNA FIXSEN

WHEN NEW York firm Hariri & Hariri unveiled a design for a futuristic residence they called the Digital House in 1998, it caused a stir: in place of walls, the architects integrated floor-to-ceiling LCD panels that, when turned on, were interactive screens and, when off, became completely transparent.

The house was never realized but, nearly two decades later, its conceptual underpinnings have been reintroduced in a quiet weekend residence in upstate New York. The low-slung structure marries innovation with a vernacular sensibility.

"We wanted it to be part of the architecture of the area, not a machine in the field," explains Gisue Hariri, who runs the firm with her sister Mojgan.

Their client, a New York City–based IT specialist, wanted a house that was environmentally friendly, on the forefront of technology, and that would provide a comfortable retreat.

After establishing a site defined by a trio of rock formations on the wooded 140-acre property, the architects, inspired by the weathered agrarian buildings dotting the landscape, conceived the house as a collection of wood-framed interlocking volumes, or "pods."

A glazed sitting area in the living room "pod" (bottom) opens onto an outdoor terrace sheltered by deep eaves, with an additional fireplace and an infinity pool (top). The master bedroom suite has its own private courtyard and spa (above, right). When viewed from afar, these discrete geometric forms hug the landscape as a unified object, surrounded by an expanse of grasses and flowers (above).

The main volume, a combined kitchen and living space, features smooth stone floors, a double-sided fireplace, and accents of blackened steel.

But it is the concealed elements that make this a smart home: geothermal wells and solar panels provide energy, while a home-automation system allows the client to control the residence remotely through his mobile phone.

GROUND-FLOOR PLAN

0 30 FT.
10 M.

1 ENTRANCE
2 LIVING ROOM
3 KITCHEN
4 MASTER BEDROOM
5 MEDIA ROOM
6 MECHANICAL
7 GARAGE
8 GUEST SUITE
9 OUTDOOR LIVING ROOM
10 TERRACE

The architects paid particular attention to the subtle spaces between volumes, both emphasizing views through the building and out to the landscape. It's in these areas where the wood structure is most evident, the ipé-clad walls intentionally splayed to evoke the buckling walls of aging barns.

"A lot of people eliminate these spaces," says Gisue. "I think they make the architecture special." Luckily, the architects had little difficulty convincing their tech-savvy client of this approach: he was so enthusiastic about the design process, he rendered the house using 3-D software and gave the architects a virtual tour himself. ■

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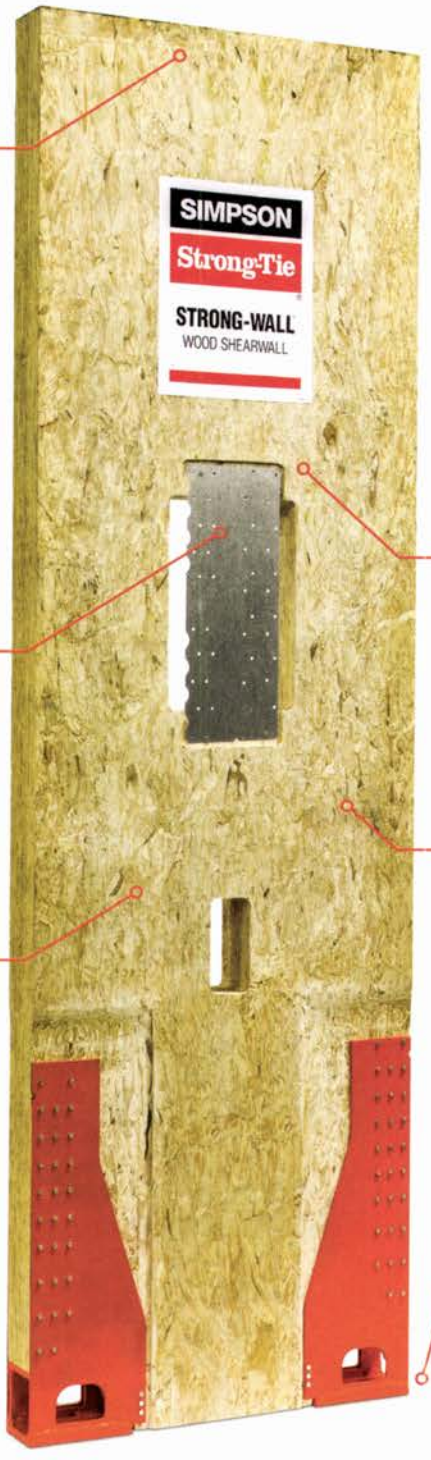

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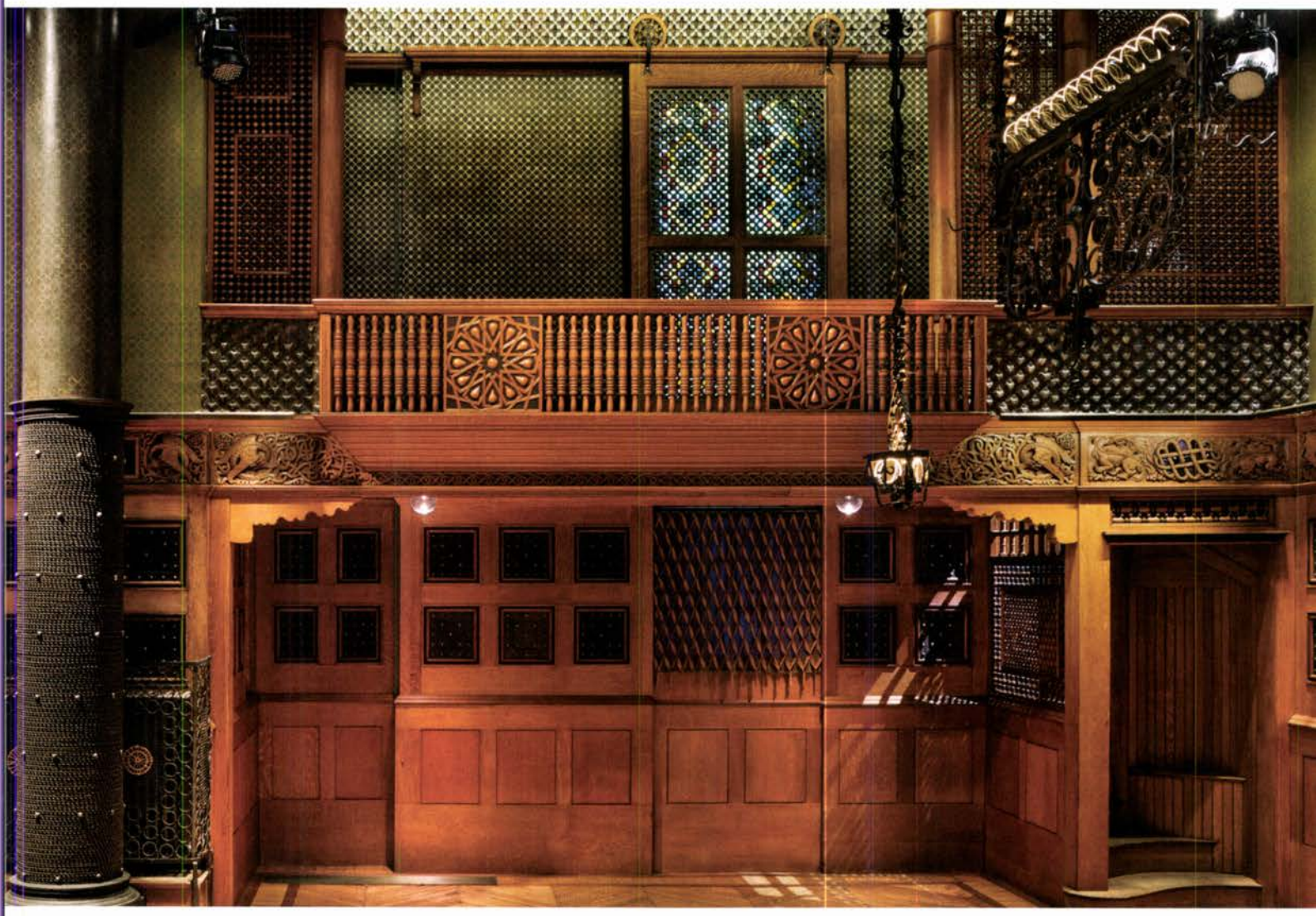

PHOTOGRAPHY: © JAMES EWING

Every Last Detail

Herzog & de Meuron shine a new light on a sumptuous gem.

BY JOSEPHINE MINUTILLO

ECLECTIC AND eccentric, with influences that range from Islamic to Celtic to Japanese, the Veteran's Room at the Park Avenue Armory was reopened to the public in March as an intimate space for lectures and recitals. A thorough overhaul of the timeworn, and previously poorly altered, room was overseen by Herzog & de Meuron, architects of the ongoing restoration of this enormous historic building that once housed New York's elite Seventh Regiment (RECORD, February 2012, page 50).

Intricately carved wood screens, hammered copper accents, brilliant blue mosaics: these are a few of the many ornaments that harmonically blend with unusual found objects—iron chains wound around Doric columns, for instance—in this early work by Louis Comfort Tiffany. It is one of the few extant interiors of the American Aesthetic Movement.

Tiffany began the project in 1879 with Associated Artists, a newly formed and short-lived collective that included a young Stanford White. "It's a fantasy room," says Armory president Rebecca Robertson. "But it was like a stage set, the whole thing practically held together with three nails."

Though Herzog & de Meuron is known for its inventive designs, restoration work is an important aspect of the firm's portfolio, from its first project at the Tate Modern in London to the recent Musée Unterlinden (see page 134). "We've always been interested in palimpsests—in different layers, depth, texture, and how materials age," says senior partner Ascan Mergenthaler. "On the level of sophistication of decoration, the rooms at the Armory are top-notch."

In addition to upgrading mechanical systems and acoustics, Herzog & de Meuron created new wallpaper using modern and original techniques to mirror the intent, color balance, and process employed by Tiffany with painter Samuel Colman and textile designer Candace Wheeler. According to Mergenthaler, "First we had to clearly understand how they did it, then decide which of the steps they took were logical for us, and how to give it a contemporary take."

To achieve the effect of the original gas lighting, thick glass—a favorite material of Tiffany's applied in many ways throughout this interior—works in combination with LEDs. "You can't reproduce a flame, but you can try to bring back its material quality," says Mergenthaler. "This room had a lot of radical ideas. It was completely crazy, yet, as a whole, it all made sense." And now, with the landmark restored to its former glory, it makes even more sense. ■

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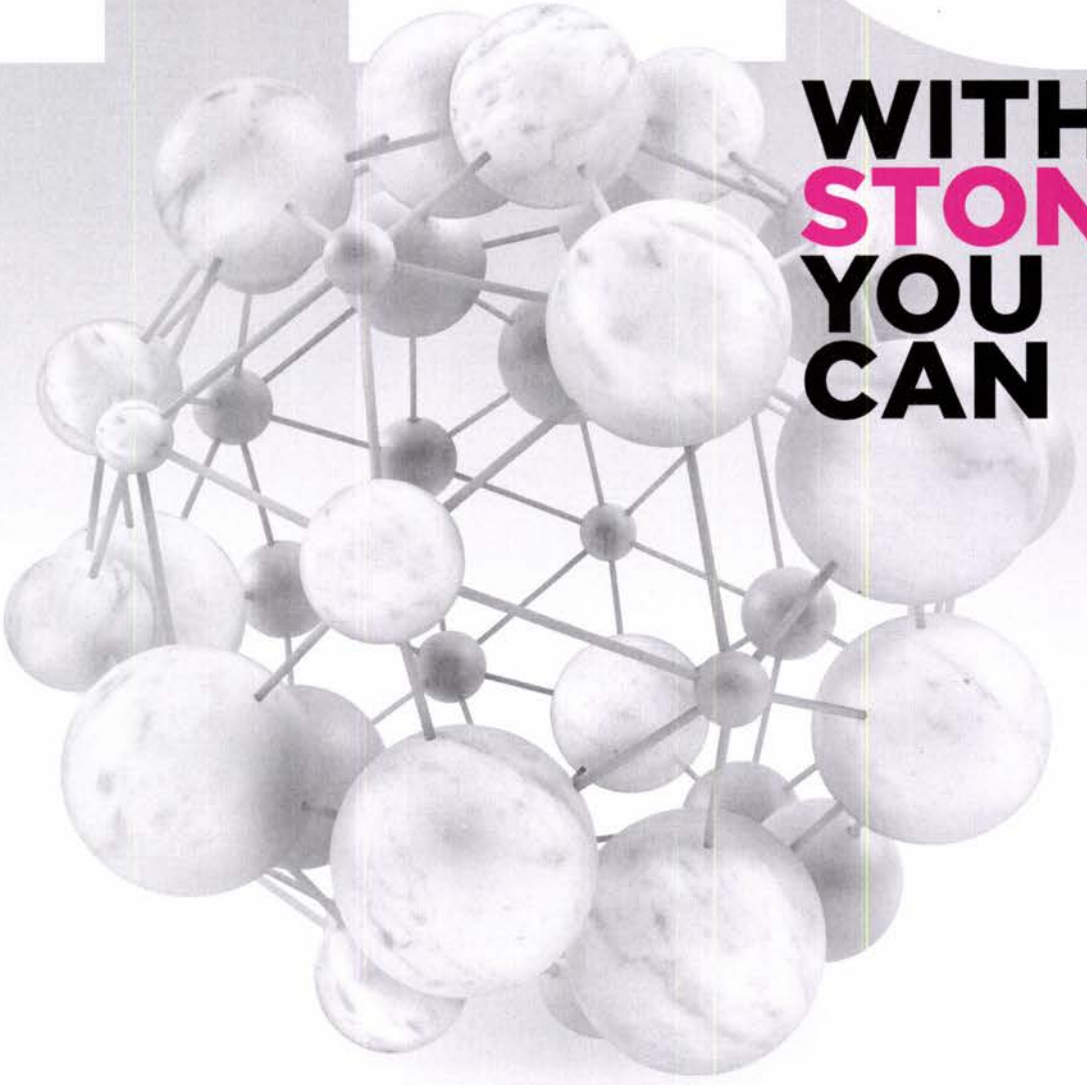

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Young-ian Analysis

Brooklyn-based Young Projects expands the potential of traditional materials.

BY REBECCA SEIDEL

AN ENIGMATIC white material wraps the central volume of the newly renovated Gerken Residence in Manhattan's TriBeCa neighborhood, its folds blending smooth curves and sawtooth edges. The material is plaster, shaped by centuries-old tools typically used to create smooth, uniform extrusions. But, in a contemporary twist, the Brooklyn-based firm Young Projects used digital software to manipulate the tools' movements, allowing for geometric complexity. As with much of the firm's work, the outcome elevates a humble material to elegant new heights.

According to Bryan Young, who founded the firm in 2010, material investigations are central to the firm's work—as are the unexpected effects that result. "For us, there is an allure to making in a manner that isn't revealing of what the material is but is still completely engaged with how the material is formed," he says.

The Gerken Residence, a two-story, 6,000-square-foot loft, is one of three large residential projects completed by Young Projects last year. The firm's portfolio ranges from an interactive Valentine's Day installation in Times Square made of powder-coated aluminum tubes (2014) to a 20,000-square-foot resort complex in the Dominican Republic. The firm was among six winners of the 2016 AIA New Practices New York Award, and it won an Architectural League Prize for Young Architects + Designers in 2013.

Young studied architecture as an undergraduate at UC Berkeley and earned his M.Arch. from the Harvard Graduate School of Design in 2003, where he received the school's prestigious AIA Henry Adams Medal. (For his thesis, he extruded the two-dimensional graphics of the arcade games Donkey Kong and Pac-Man into three-dimensional models.) After the GSD, Young worked at Architectural Research Office (ARO) for two years and then spent five and a half years at Allied Works, where he eventually became a senior associate.

The core volume of the Gerken Residence (above) is clad in pulled plaster, shaped by the tools traditionally used to create crown moldings. Handmade Aguayo cement tiles covering the guest house at the Retreat at Playa Grande (rendering below) will use a curved geometric pattern to play with sunlight and shadows.

Young traces much of his fascination with materials to the Hudson Street Residence, a project he worked on under Allied Works' principal Brad Cloepfil. For a series of wall panels, they poured molten aluminum into a mold that included a layer of burlap, leaving behind traces of the cloth's texture in a range of tones. "It was the first time I began to understand more blatantly graphic effects that might emerge out of real materials," Young says. Rather than clarifying what the material was—as wood does with board-formed concrete—the interaction with burlap added a layer of mystery.

At 35, Young left Allied Works to start his own practice. He worked solo at first, tackling several small projects, before receiving what would become the firm's largest commission to date: the Retreat at Playa Grande in the Dominican Republic. The scope of this project, whose plan includes a main

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Young Projects designed an inhabitable fireplace folly at the edge of a lake in Alberta, Canada, that frames a scenic view while providing a sheltered space for visitors. Built from stacked timbers, this folly is a prelude to the Carraig Ridge development, a collection of residences spread across a 650-acre site, for which Young has designed three spec houses.

house, guest house, and spa, motivated Young to expand his office from one person to eight.

"It's a challenge for us to jump in scale from an interior project in New York City to 20,000 square feet of ground-up construction," Young says.

A year and a half in, the project in the Dominican Republic slowed down as the site developed necessary infrastructure. Young calls this shift fortunate in retrospect, because it allowed his firm to focus on a few large commissions in New York: a renovation and expansion of a townhouse in Williamsburg, Brooklyn; the Gerken Residence in TriBeCa; and Young's own house on a one-acre site in Westhampton, in Eastern Long Island. Young supplemented his work by teaching at Parsons, MIT, and Columbia (he still teaches at Parsons today).

"I've always been interested in pushing our work to be as radical as it can be."

Last year, the team got the green light once more for the Retreat at Playa Grande, and building commenced this March. For this endeavor, as well as more local ones, Young Projects hopes to leverage digital design to enrich its collaboration with local artisans. For the retreat's spa, for instance, the firm is working with a local concrete contractor to explore methods of exposing the many colors and textures of the material's aggregates.

"I've always been interested in pushing our work to be as radical as it can be," Young says, "but I am excited and compelled to work on projects that will be realized."

Despite his firm's engagement with artisanal materials and digital tools, Young steers clear of debates about analog versus digital fabrication. "Our interests are neither digital nor analog," he says. "We're interested in the nebulous, mysterious, strange aesthetics that can come out of real material elements." ■

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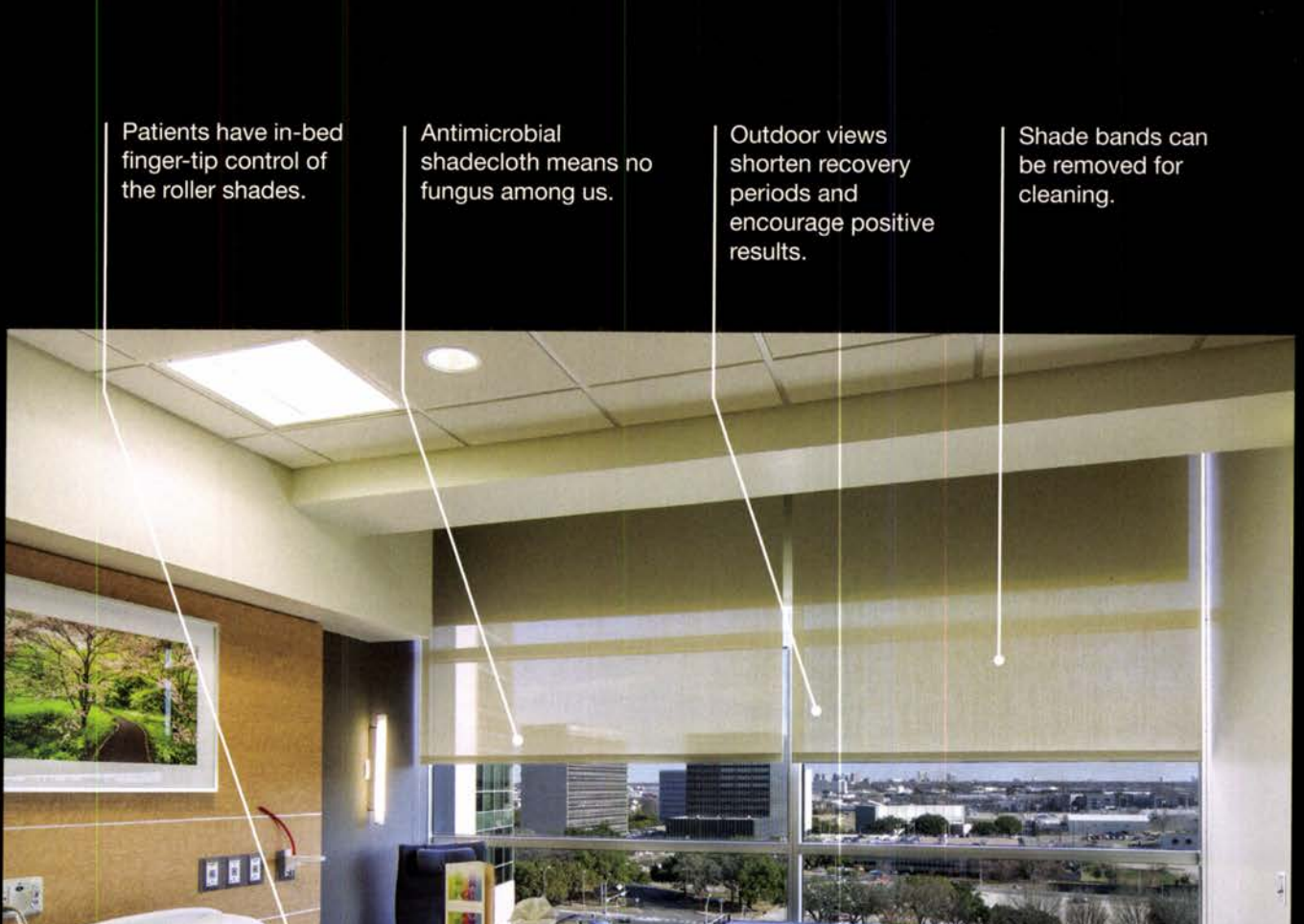

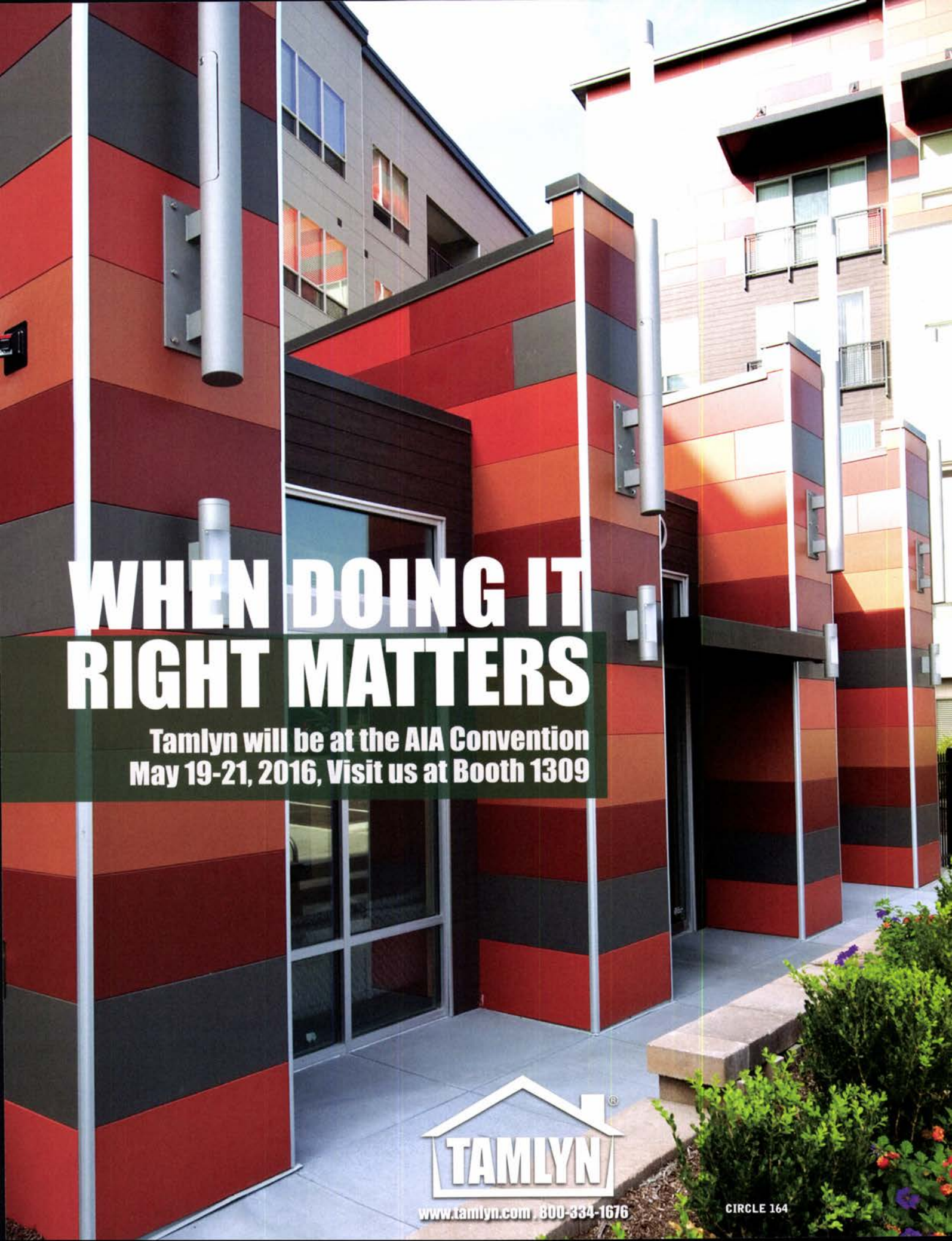
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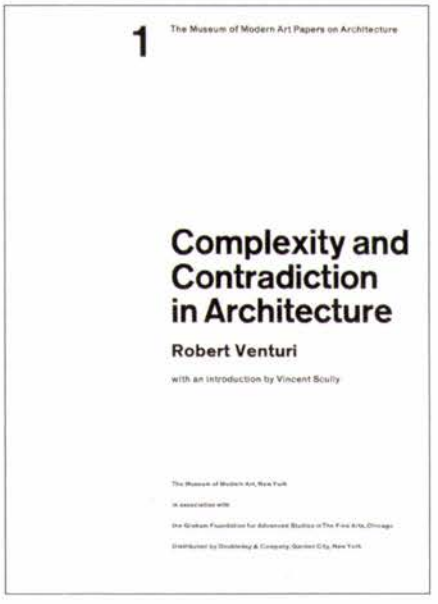
CIRCLE 236

Complexity and Contradiction in Architecture Turns 50

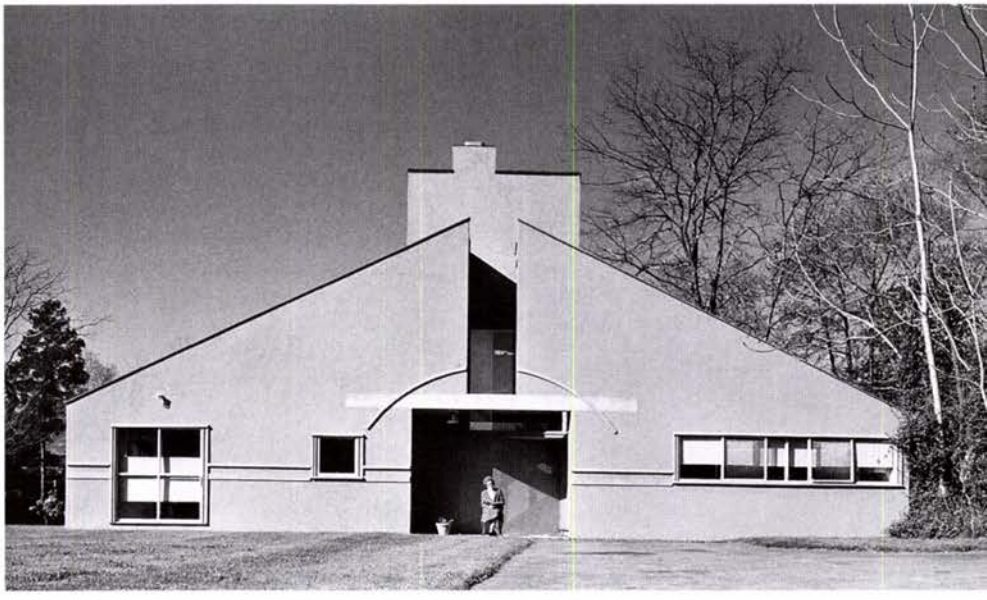
BY CHARLES JENCKS

WHEN ROBERT VENTURI'S *Complexity and Contradiction in Architecture* was published 50 years ago, Vincent Scully announced in the introduction that it was "probably the most important writing on the making of architecture since Le Corbusier's *Vers une Architecture*" of 1923. With this endorsement and its prestigious publisher—the Museum of Modern Art—probably no other tract in American architecture had ever had such a powerful send-off. Spin like that made one bristle, even if it turned out to be true. Venturi's slender white book, with its postage-stamp illustrations, was a well-aimed manifesto that fell on the barren ground of orthodox Modern architecture as very welcome fertilizer. Like Jane Jacobs's polemic of 1961, *The Death and Life of Great American Cities* (page 62), it challenged the hegemony of Modernism by planting the seeds for a future Postmodern argument. Jacobs had attacked the simplified planning proposals of Robert Moses's highway expansions and Le Corbusier's tower-in-the-park urbanism in her last chapter and argued persuasively that, like a biological organism, a city is fundamentally based on "organized complexity." Later, Venturi pushed for complexity in architecture instead of Modernism's generic and simple solutions. While Postmodernism as a movement manifested itself in different forms in dance, literature, and art as well as architecture, the underlying concept—first noted in the environmental-science writings of Rachel Carson and Herbert Simon—proved to be complexity.

Supporting Venturi's argument of a need for an architecture based on "the richness and ambiguity of modern experience" were all sorts of historical insights. Eight precepts called for such approaches as "Both-And in Architecture" (architecture that is inclusive, with various levels of meaning) and "The Double-Functioning Element" (such as the chimneys of Lutyens's Grey Walls that act as sculptural entrance markers). His gentle manifesto overturned Modern architecture's emphasis on simplicity and its Miesian belief that "less is more." For me, the most important concept was "The Obligation Toward the Difficult Whole." As Venturi pointed out, unity is found in multiplicity, where all the diverse elements or fragments of architecture establish a sense of relationship—and this is difficult. It takes effort and skill.



Robert Venturi's landmark book (right) was published in 1966. He used historic examples of architecture to argue that multilayered and even paradoxical principles could circumvent the banality in orthodox modern design. In the final chapter, Venturi presented projects his firm had designed combining asymmetrical and off-center elements within a unified, centered whole, seen in the Vanna Venturi House (below) in Chestnut Hill, Pennsylvania (1964).



Complexity and Contradiction did a good job of identifying the need for an inclusive view but fell into a new trap of exclusionary taste. It emphasized the visual and formal aspects of architecture, but, unlike Le Corbusier's *Vers Une Architecture*, it did not deal with the productive, technical, and communicative aspects. It looked closely at individual aspects of architecture (such as window sills, doorways, pilasters) yet failed to apply the same close reading to a whole building—that is, "the difficult whole." The book's last section was devoted to such brilliant early Venturi schemes as the Vanna Venturi House (1964) and the Guild House (1963) to illustrate the ideas, but did so with crabbed photos and prose that showed a certain lack of confidence (on the Vanna Venturi House, he remarked, "Some of its elements are good on one level and bad on another").

Venturi became the father figure to the Postmodern architects who arrived in the 1970s and railed against the generic modernism of simple methods and universal solutions that had taken over so much design. Yet, much later, in 2001, he made an absurd disclaimer: "I am not now and never have been a Postmodernist." It tells us he may have been disappointed with some of Postmodernism's most avid disciples, such as Robert Stern and Michael Graves. Like many visionaries whose flock deviates from the prophet's tastes, his comment hints at wounded pride—especially when other architects, like Philip Johnson, adopted his insights and got the plum commissions.

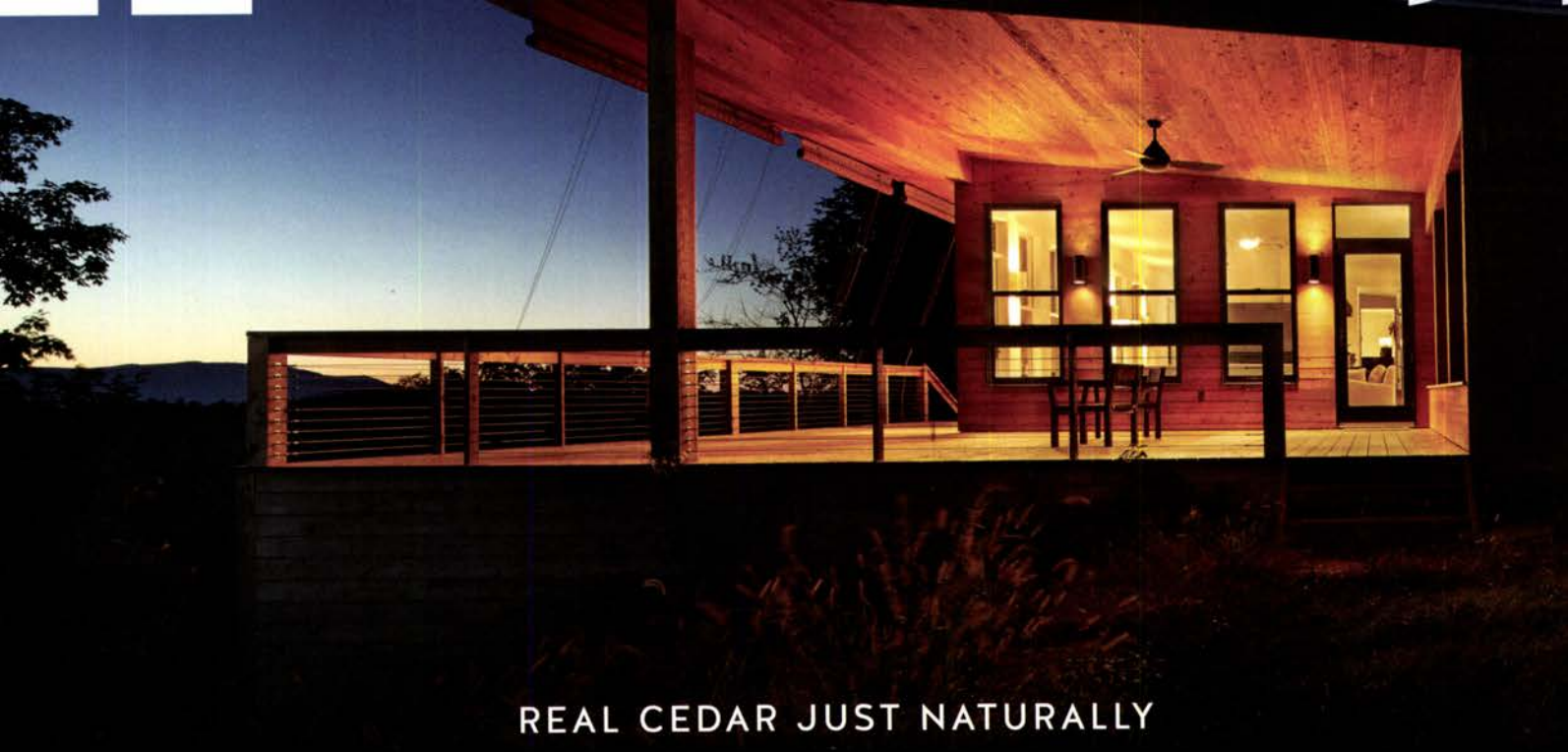
Venturi's preface to his book showed a commitment to Modernist literature, citing T.S. Eliot and Eliot's notion that invention

Venturi's call for ambiguity in architecture is shown in the bifurcated (resolved or not?) facade of Nashdom by Sir Edwin Lutyens in Burnam, England (top), and in the split volumes of Il Girasole apartments (above, left) by Luigi Moretti in Rome (one building or two?). The obligation to effect a difficult whole is seen in Louis Sullivan's Farmers' and Merchants Union Bank in Columbus, Wisconsin, where the entrance is off-center within an otherwise symmetrical composition (above).

builds on tradition, and the New Critics, above all William Empson, who formed a view of close reading as sometimes too close—what Eliot termed "the lemon-squeezer school of criticism." Still, if analysis of details took precedence over the difficult whole, there was so much insight along the way that one forgave the squeezing. Empson's *Seven Types of Ambiguity* became a template Venturi, in his book, took directly from the New Criticism, deftly applying it to the analyses of buildings to justify his own premise of the necessity of complexity—that there are psychological and cultural reasons for preferring depth and multiple readings to cliché and simple order. But Venturi's book is a formal analysis that doesn't deal with sociological truths or, for that matter, the scientific ideas that bolstered complexity theory in other disciplines.

A new paradigm of complexity (which I embrace, writing on multivalence, or layered, pluralistic meanings) has emerged from the Sante Fe Institute, established in 1984. This scientific research organization delves into biology, physics, and the use of computers. The founders believed that this would be "the approach of the 21st century," and the holistic, digitally based developments in architecture and design have proved them right. Complexity II, as I call the second wave of Postmodern architecture, exemplified by Frank Gehry's Guggenheim Bilbao (1997) and the late Zaha Hadid's Phaeno Science Center (2005) in Wolfsburg, Germany, follows directly from Venturi's and Jacobs's ideas but seeks a more continuous micro-complexity made buildable by computer software. All of which is to say, Venturi and his epochal book remain relevant to Postmodern architecture in its second phase, even if Venturi denies his paternity. The styles and methods of Complexity II may have changed, but the desire for a holistic architecture of depth and pluralism remains today. ■

Charles Jencks is a London-based critic, historian, landscape architect, and designer who wrote The Language of Post-Modern Architecture *(1977).*



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Local Heroine

Urban theorist Jane Jacobs was born 100 years ago, but her ideas are as vital as ever.

BY ROBERTA GRATZ

JANE JACOBS is celebrated for many things: her game-changing 1961 book, *The Death and Life of Great American Cities*; her shaking up of urban-development thinking and ideas about the functioning of city economies; her activism in opposition to urban highways and large-scale clearance of buildings; her advocacy of community-based plans rooted in local wisdom; her coining of such terms as "eyes on the street," "human capital," and "sidewalk ballet."

But rarely is she recognized as a true original, ahead of her time, as she should be. As we mark the centennial of her birth this month, it is difficult to remember that as recently as the 1980s, America and much of the world was still wedded to the post–World War II paradigm of urban renewal, with highways slicing through the city. There was a fierce conviction that cities were anachronistic, a holdover from the "romanticized" past, places that had to be reshaped in a "modern" way. The future was in the suburbs, with spacious lawns and entrances through the garage instead of the front door, discouraging neighborly connections.

Jane was not just ahead of the curve in her writing about cities but also in her own life. She incorporated environmentally sustainable principles at home, long before they were part of the public discussion.

I first visited Jane at her Toronto house in 1978, introduced by her editor at Random House, Jason Epstein. I had been a newspaper reporter in New York for 15 years, covering communities that were fighting demolition projects and other big schemes coming down from the City Planning Commission that were destined to undermine the intricate fabric of existing neighborhoods. Jane and I made coffee from the beans we roasted that came in a huge burlap bag from Kenya. We ate tomatoes from her hydroponic roof garden, planted in pots of sawdust. There was a "phone booth" in the kitchen-dining area, designed and built by her architect husband, Bob Jacobs, for soundproof privacy for the family of five.

The Jacobses had departed Greenwich Village in New York in 1968, to avoid the military draft that could take their sons to fight in the Vietnam War, which the family opposed. In Greenwich Village, they had lived in a three-story house with a ground-floor store on a busy street. Jane often biked around the city. In the backyard, her son Ned recently recalled, an infestation of aphids killed off the ivy and flowers. At first Jane used DDT, as was common in the 1950s. All the birds disappeared. Then she read about the chemical's ill effects, well before the 1962 publication of Rachel Carson's *Silent Spring*. She stopped immediately and used a spray made from Ivory soap flakes to kill the bugs. In due time, the birds came back.

Jacobs, an early adopter of sustainable principles, saw a parallel between economic and ecological systems.

Visiting Jane was an early education in aspects of ecology that emerged in a significant way with her sixth book, *The Nature of Economies* (2000). Conversations, even back in 1978, covered the parallels between economic and ecological systems—which were governed by similar principles, she believed, with lessons that could be applied to what she called Urban Ecology.

Her early 20th-century house in Toronto had a front porch and driveway to the side, and it was a block from a lively shopping street and subway, right out of *Death and Life*. The family planted samples of native species in the yard to see what would take root, and, each year, the Christmas tree was put in the backyard to decompose, along with leaves, to simulate a forest floor.

Jane was eager to show me Toronto to demonstrate examples of innovative, positive change—and lessons of unintended consequences. We looked at the new Mies van der Rohe office towers downtown that she thought appropriate for a commercial district but the underground network of retail corridors, she noted, had drained life from the street above. She pointed out the vitality of her neighborhood shopping street, filled with small local businesses, many owned by a diverse group of immigrants. We explored the city on foot and by mass transit, looking at new infill housing side by side with restored historic gems. We visited the construction site of a new dense, mixed-use neighborhood, built on a street grid, with varied building types and income levels, in contradiction to the American suburban "pods," with their hierarchies of "collector roads" and "arterials."

At the time, I was writing my first book, *The Living City: Thinking Small in a Big Way*, and shared with Jane my observation of small

steps toward urban revitalization in New York and other American cities. I saw residents cleaning up and redesigning windswept parks with broken benches and play equipment. I saw local merchants refurbishing their storefronts and organizing Main Street events to bring out shoppers. I met local leaders who responded to the wise proposals of their constituents on how to reverse decay. Even in the notoriously burned-out South Bronx, determined locals helped revitalize Kelly Street rather than be pushed out of the way for urban renewal. Their motto—"Improve, Don't Move"—was an early harbinger of positive change, evolving organically in many Bronx neighborhoods.

Before Jane, almost everyone I talked to about my hopeful observations had dismissed them as too ad hoc or too inconsequential. But Jane validated my assumptions. All that we talked about then, all the things experts dismissed as irrelevant or too small—reclaiming vacant buildings block by block, creating neighborhood parks, installing solar panels—all are now mainstream. This year, for the centennial of her birth, the justified and the unjustified will rush to claim Jane Jacobs. But I believe the greatest tribute possible would be to dispel three persistent myths that distract from the real wisdom of her thinking.

As a Greenwich Village resident, Jane Jacobs made her voice heard at community gatherings and press conferences, including one at the West Village's Lions Head bar in 1961 (opposite). Two years later, she joined Philip Johnson and Aline Saarinen in protesting Penn Station's demolition (above) and participated in a rally in Washington Square Park (below).

Myth No. 1

The biggest myth is that she wrote one great book. But if you read all seven, you will get a more layered understanding of her thinking. Jane felt that her second book, *The Economy of Cities*, was her most important. Ideas introduced in it about "import replacement" instead of "import substitution" are still with us today—just look at the return of small manufacturing and the emergence of start-ups in cities.

Myth No. 2

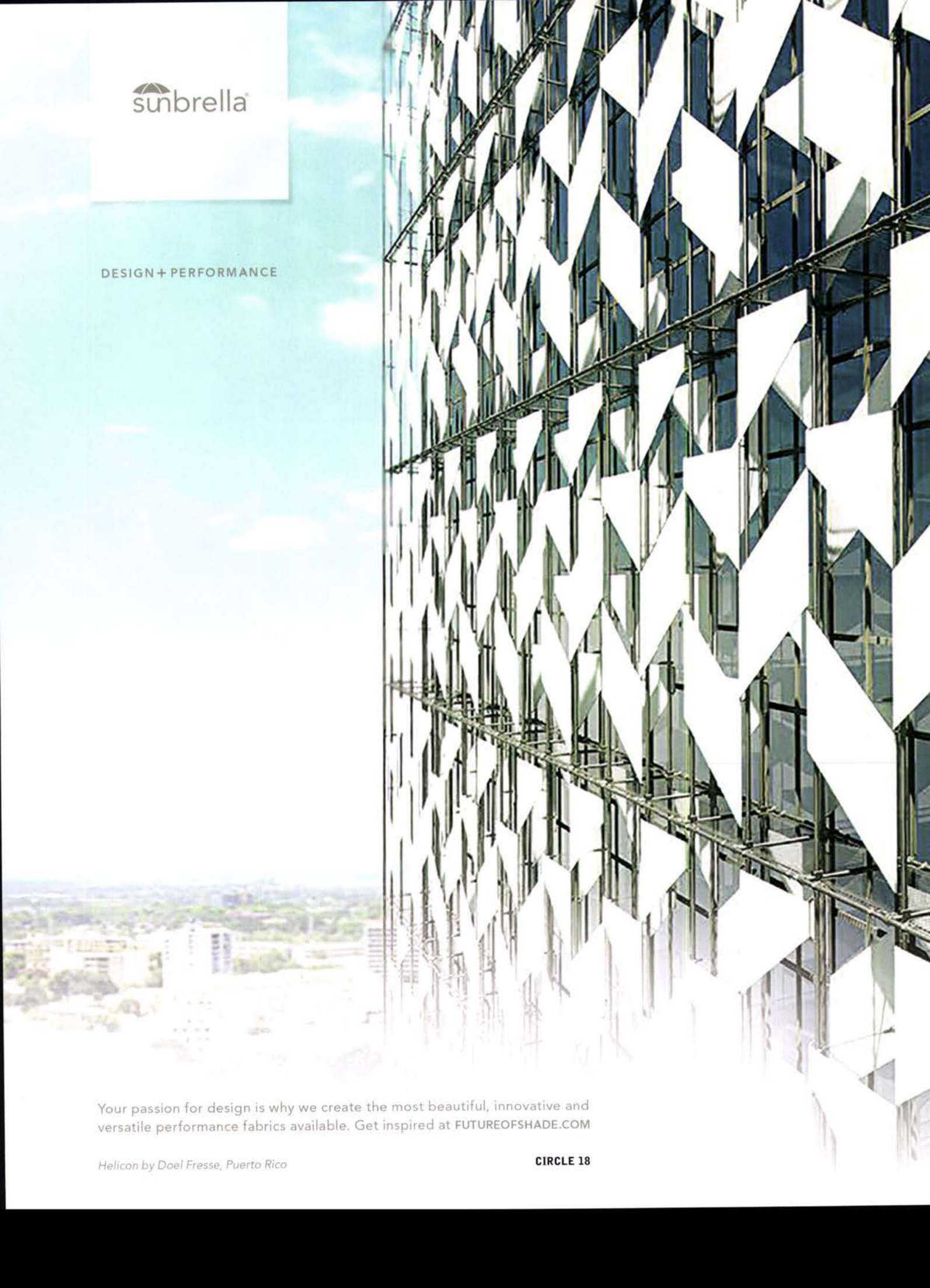
The most outrageous myth is the description of Jane as "the untrained housewife." It is pure sexism, still visible in references today. What could she know without a "planning" or "architecture" degree, her critics asked—or at least a college diploma? From childhood, Jane disdained formal education. She read books about Benjamin Franklin under her desk in grade school instead of paying attention to the teacher. When she arrived in New York in 1934, she started taking courses at Columbia—"on things I was curious about," she said: geography, geology, chemistry, zoology, biology, philosophy, patent and constitutional law, economic geography, and more. She declined to pursue a degree because the requirements were of no interest to her. In her final book, *Dark Age Ahead*, Jane argued that "credentialism" now substitutes for education.

In fact, Jane was an experienced journalist and architecture critic. From her talented husband, she learned not only how to read drawings but to observe the distinction of a design's promise as compared to the constructed result. Her long career included nine years as a writer at *Architectural Forum*—though rarely with a byline—before writing *Death and Life*. Her credentials were no different from her male editors', Douglas Haskell, at *Forum*, and *Fortune* editor William H. Whyte, who borrowed her from *Forum* to write the seminal piece "Sidewalks Are For People" in his collection *The Exploding Metropolis*.

Myth No. 3

Because of the excessive focus on her so-called battles with building czar Robert Moses, she is depicted as the David who slew Goliath. This is not true. Moses's rapid descent, and the exposure of his "public-be-damned" tyrannical ways, was triggered earlier, by a fight in the mid-1950s over a beloved Central Park playground, which he bulldozed in the middle of the night despite the protests by neighborhood mothers with baby carriages—a very photogenic effort that damned him.

And the opposition to Moses's planned road through Washington Square, that would have morphed into an off-ramp for the planned Lower Manhattan Expressway, was started by two neighborhood women long before Jane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Jacobs in the kitchen of her Toronto home in 1980.

got involved. She did become an attention-getting leader, but this was a community-wide campaign. For this effort a recently arrived Village resident, Bob Dylan, collaborated with Jane on a protest song, according to her son Ned. The song starts like this:

Listen, Robert Moses, listen if you can
It's all about our neighborhood that you're trying to condemn
We aren't going to sit back and see our homes torn down
So take your superhighway and keep it out of town.

The expressway fight, after the hard-won Washington Square effort, had been launched by a local priest while Jane was writing *Death and Life*, and she only got involved after she finished the book. The expressway was to go through Chinatown, the south Village, and the manufacturing district that is now SoHo. By 1960, Moses had been compelled to give up his key city positions to run the 1964 New York World's Fair. Other local politicians were leading the effort then—but Jane knew the value for the community-based movement of keeping Moses as the supposed villain.

Moses was truly gone when the later Greenwich Village urban renewal fight began. While weekly evening strategy meetings took place in the Jacobs home, it was a broad-based group of local opponents. The final victory was the community-designed infill project for the West Village Houses, but that solution was fiercely resisted and undermined by officials and developers for more than a decade before the low-rise complex of now-coveted apartments could be built.

Jane, who died in 2006, was never pleased by the exaggerated celebrity she gained in local fights. She knew success stemmed from the involvement of the whole community, and she believed it was harmful to any cause to be identified with one leader.

But local activists learned from Jane that they could initiate improvements that regenerate authentic places rather than replaced them. A host of advocates, planners, designers, and not-for-profit groups—the true descendants of Jane's thinking—have risen to foster the rebirth efforts in cities.

Still, this is not a time to be complacent. The incremental process that Jane advocated and that took root in earlier battles is disappearing. Once again, official "experts" who pay lip service to the ideas of Jane Jacobs are gaining control. They ignore what has made old, historic neighborhoods desirable places to live. They convene neighborhood meetings to present plans without involving local stakeholders in the beginning of the process. They tinker at the edges in response to community critiques, label local protestors NIMBYs, and claim they follow a public process. Instead, they are facilitating developer initiatives in which the bottom line drives everything. They are the ones who do Jane's memory an injustice. ■

Roberta Gratz is the author of The Battle for Gotham: New York in the Shadow of Robert Moses and Jane Jacobs *(2010).*

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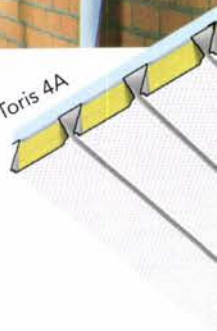

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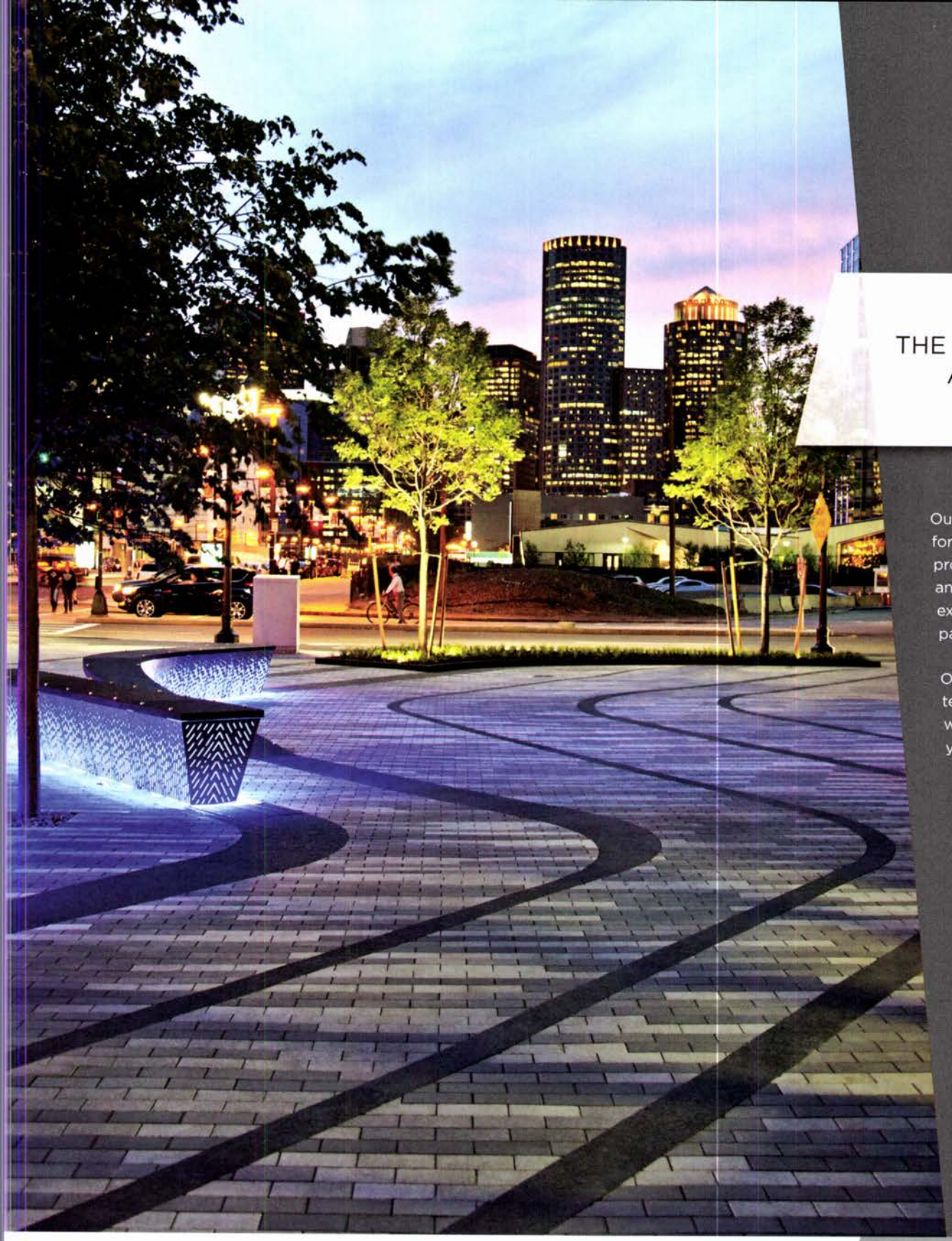

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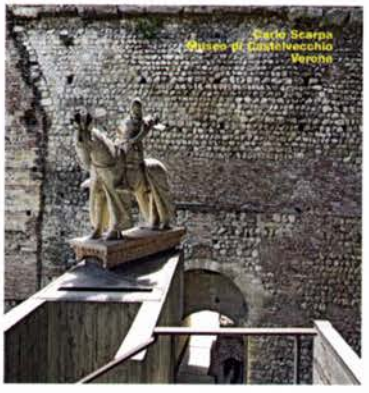
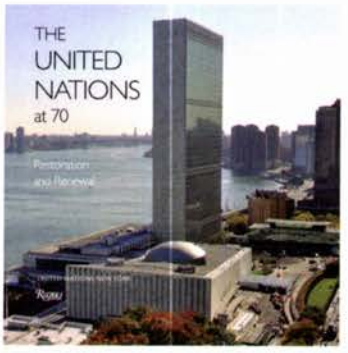


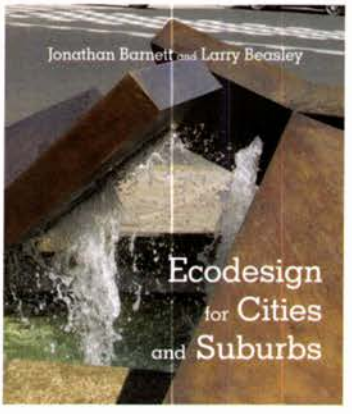
Designing TWA: Eero Saarinen's Airport Terminal in New York, *by Kornel Ringli. University of Chicago Press with Park Books, December 2015, 192 pages, $39.00.*
In the mid-20th century, when "rational," boxlike glass-and-steel skyscrapers dominated the architectural scene, the TWA Terminal at JFK (then Idlewild) Airport appeared on the tarmac, beckoning passengers and symbolizing flight with its birdlike curves and soaring vaults of poured-in-place concrete. More than half a century later, it is still beloved, though it has been out of commission for decades. This complete story about the building of the architect's posthumously completed masterpiece appears just before the building is finally about to be reborn as a hotel and conference center.

EcoDesign for Cities and Suburbs, *by Jonathan Barnett and Larry Beasley. Island Press, June 2015, 280 pages, $80.*
The authors, highly respected and experienced in their field, show how sustainable environments can be created by integrating urban design with environmental conservation using normal business practices' capital programs and regulations. Barnett, a planner and former University of Pennsylvania professor, and Beasley, the planner who revived Vancouver, explain how to revitalize communities while adapting to climate change, preserving natural systems, minimizing congestion, improving public transportation, and animating public spaces. They show successful examples already under way in numerous cities and suburbs.

From the Shadows: The Architecture and Afterlife of Nicholas Hawksmoor, *by Owen Hopkins. Reaktion Books, January 2016, 304 pages, $40.*
History is always written looking in a mirror. Now that individuality and originality are valued again, this gifted, rather eccentric architect, who was admired by T.S. Eliot, James Stirling, Robert Venturi, and Peter Ackroyd, is the subject of this lively new monograph. Though often outshone by Sir Christopher Wren in his own time, Hawksmoor (1662–1736) was involved in the most important projects of the day and designed major London churches, six of which are still in use.

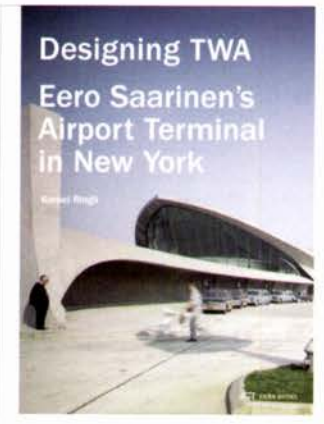
Opus 81: Carlo Scarpa, Museo di Castelvecchio, Verona, *by Valeria Carullo, Alba Di Lieto, Paola Marini. Axel Menges, February 2016, 52 pages, $39.90*

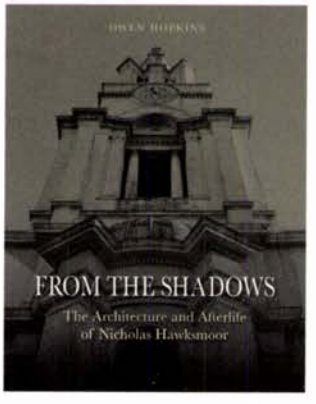




During the 1960s, architects worked with museum directors to creatively renovate museums in historic Italian city centers. The masterpiece of the era was Carlo Scarpa's brilliant and original transformation of the Castelvecchio in Verona. This slim monograph shows how he revitalized the medieval castle, the museum of ancient art, the discipline of museography, and modern architecture in a monument at the heart of an urban UNESCO World Heritage Site.

The United Nations at 70, *by Martti Ahtisaari and Carter Wiseman; preface by Ban Ki-moon. Rizzoli, October 2015, 204 pages, $55.*
The glass-walled tower and low-rise structures that rose from 1947 to 1953 along the East River in Manhattan to house the United Nations (founded in 1945) formed one of the most influential office complexes of the day. It was designed by a celebrated international group of architects, planners, and engineers from member governments, led by Wallace K. Harrison (who worked on Rockefeller Center), with Le Corbusier and Oscar Niemeyer. The United Nations' new home symbolized the optimism about the future, and now, with a recent restoration, this publication aptly commemorates the promise of that time.





Vertical Urban Factory, *by Nina Rappaport. Actar, April 2016, 460 pages, $64.95.*
Rappaport describes the innovations in architecture, engineering, and manufacturing in the early 20th century that freed American factories from rural sites next to water-powered mills so they could rise in cities. The new urban factories created jobs and fostered density, at least until the 1960s, when industry began to move to urban edges, suburbs, and, eventually, overseas. Rappaport also investigates how architects and urban designers, with new technology and the demand for greener industries, today can create urban production facilities to revitalize cities. ■

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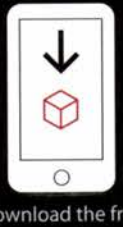

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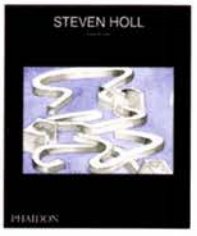

Alluvium: Dhaka, Bangladesh in the Crossroads of Water, *by James Timberlake and Stephen Kieran. ORO Editions, August 2015, 352 pages, $50.*

BIG, Hot to Cold, An Odyssey in Architectural Adaptation, *by Bjarke Ingels. Taschen, March 2015, 712 pages, $49.*

Wendell Burnette Architects, Dialogues in Space, *foreword by Tod Williams and Billie Tsien, introduction by Juhani Pallasmaa, essay by Robert McCarter, epilogue by Brian Mackay-Lyons. Oscar Riera Ojeda, December 2015, 608 pages, $75.*

Studio Arthur Casas: Works 2008–2015, *by Philip Stevens, Fernando Seraplio, and Philip Jodidio. Poligrafa, March 2016, 330 pages, $75.*

The Architecture of Jacques Ferrier, *by Alexander Tzonis and Kenneth Powell. Thames & Hudson, April 2016, 256 pages, $65.*

Thomas Heatherwick, Making, *by Thomas Heatherwick. Monacelli, July 2015, 640 pages, $50.*

Steven Holl, *by Robert McCarter. Phaidon, October 2015, 340 pages, $95.*

Hummelo: A Journey Through a Plantsman's Life, *by Piet Oudolf and Noel Kingsbury. Monacelli Press, May 2015, 400 pages, $50.*

Tom Kundig: Works, *by Tom Kundig. Princeton Architectural Press, November 2015, $65.*

Legorreta, *by Ana Teran; edited by Lourdes Legorreta; foreword by Victor Legorreta, introduction by Felipe Leal. Rizzoli, September 2015, 300 pages, $85.*

Maya Lin, *by Maya Lin, with text by Michael Brenson, William L. Fox, and Paul Goldberger, and a foreword by John McPhee. Rizzoli, October 2015, 400 pages, $75.*

The New Shingled House: Ike Kligerman Barkley, *by John Ike, Thomas A. Kligerman, and Joel Barkley. Monacelli, October 2015, 256 pages, $60.*

People, Place, Purpose: The World According to Mecanoo Architects, *by Francine Houben. Artifice Books, November 2015, 352 pages, $49.95.*

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Morphosis, *by Thom Mayne. Equal Books, December 2015, 372 pages, $68.*

MOS: Selected Works, *by Michael Meredith and Hilary Sample. Princeton Architectural Press, December 2015, $40.*

OAB (Updated): Office of Architecture in Barcelona, *by Carlos Ferrater. Actar, January 2016, 350 pages, $54.95.*

Selldorf Architects: Portfolio and Projects, *by Annabelle Selldorf, with an essay by Ian Volner. Phaidon, April 2016, 256 pages, $79.95.*

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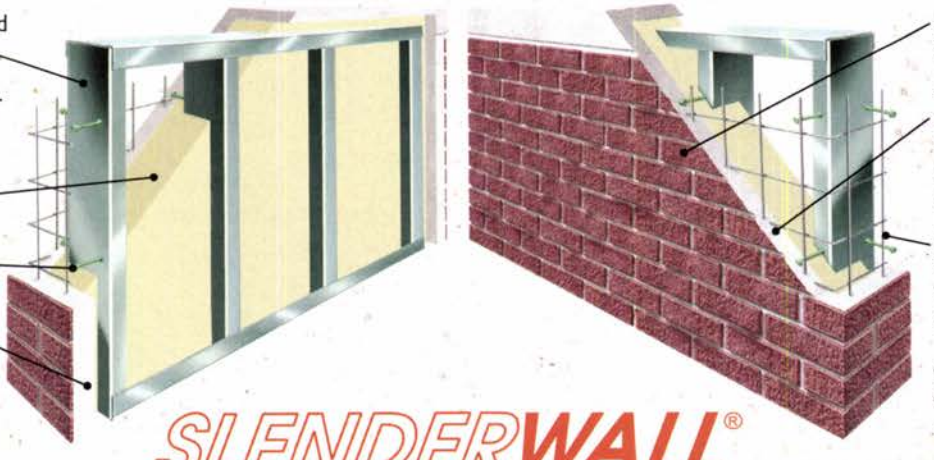

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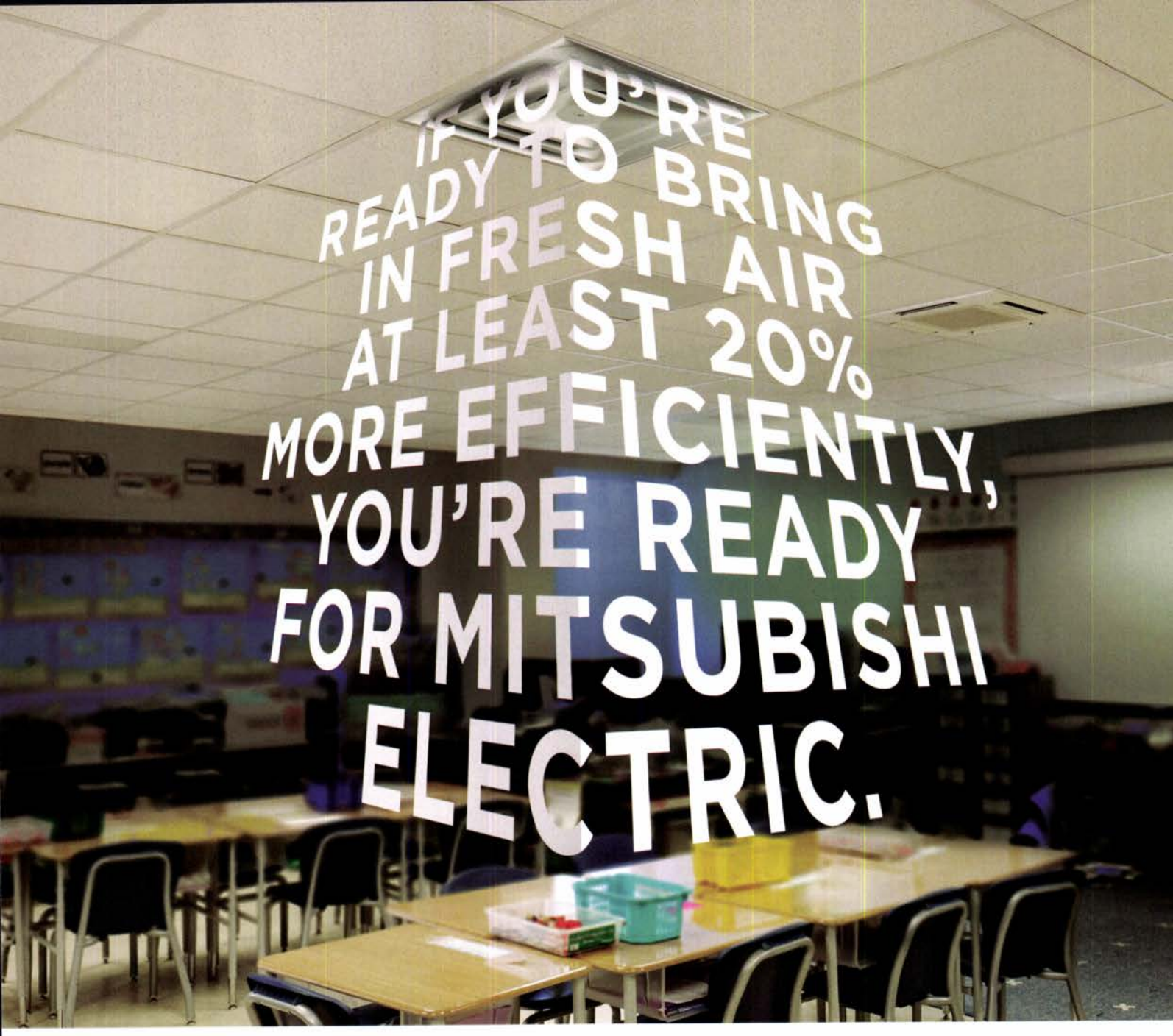

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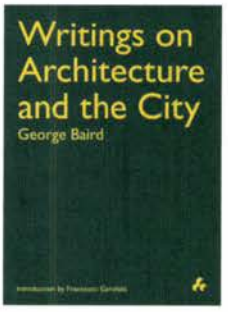
Frampton on Baird/Baird on Frampton

Writings on Architecture and the City, *by George Baird. Artifice Books on Architecture, February 2015, 292 pages, $29.95.*

Reviewed by Kenneth Frampton



IT IS IMPOSSIBLE to do justice in the space available to the critical writing of the distinguished Canadian architect/theorist George Baird. Nevertheless, some of the heterogeneous character of this anthology may be gleaned from the title, ranging, as it does, from semiotics to urban planning. In regard to the latter, the postwar rationalist urbanism of the Italian *Tendenza* movement influenced him in working with students on typological (building type) and morphological (urban structure) studies for the city of Toronto. This mode of beholding underpinned Baird's urban discourse until his book *The Space of Appearance* (1995) showed his turn toward the public realm in a political sense as that was elaborated in Hannah Arendt's *The Human Condition* (1954).

The first piece in *Writings*, arising out of Baird's encounter with the London architectural scene in the mid-1960s, is his essay "La Dimension Amoureuse" of 1968, the title indebted to Roland Barthes, who had identified rhetoric as the amorous dimension of literature. This literary concept, derived from structural linguistics, would eventually prove to be inapplicable to architecture, a fact that Baird and Charles Jencks initially ignored in their anthology *Meaning in Architecture* (1969), such was the promise of semiotics then as a system for decoding architecture. My own essay in that volume emphasized instead the ontological/architectural implications of Arendt's magnum opus, and thereafter Baird and I would remain variously involved with Arendt's discourse, discriminating between the public and private aspects of the built environment.

One of the corollaries of this interest has been Baird's involvement with a phenomenological—visual, haptic, and kinesthetic perception of architecture—an approach that is particularly evident in his exceptionally sensitive appraisal, dating from 1970, of the work of Alvar Aalto. Of the role played by the handrail in Aalto's architecture, we find Baird writing:

> Touching a door crystallizes an experience for a moment, touching a railing extends it in time. Consider the railing leading to the council chamber in the Saynatsalo Town Hall or the one on the staircases in the Otaniemi Institute of Technology. Like Aalto's door handles those forms owe their cross section to the shape of the human hand . . . But while a handle is usually grasped only for an instant, the extent of a railing can be traced by the hand as far as the railing goes... all these railings extend far beyond the physical limits of the steps [and] in penetrating so persuasively the space of the building's interiors they form an elaborate network of touch.

A similar corporeality—that is, a concern with the body's relationship to space—is found in both Hans Scharoun's Philharmonie in Berlin (1963) and Frank Gehry's Walt Disney Concert Hall in Los Angeles (2010), made all

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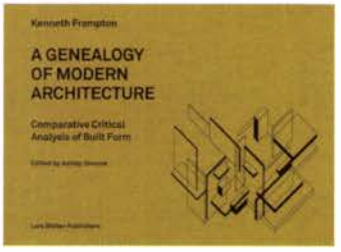
the more poignant by the fact that the latter was consciously predicated on the former. After describing the difficulty he had had in finding his way in and out of Disney Hall during the intermission, Baird recounts his experience of the same passage to and fro in the Philharmonie, recalling concertgoers standing or seated in the intermission on the mezzanines to one side of the belly of Scharoun's auditorium, "basking in the palpable public pleasure of their spectacular visibility" and regaining their seats easily after the intermission. Needless to say, all of this was denied by Gehry's manifest indifference to the promenade as a space of appearance in Disney.

Subsequently, the phenomenological would become increasingly important for Baird as a basis upon which to mount a critique of both modernity and postmodernity, not to mention the pragmatic "post-critical" position advanced by Sarah Whiting and Robert Somol. In his essay "Criticality and its Discontents," Baird summarily disposes of the Whiting/Somol position by pointing out that "the new architecture will devolve into the merely pragmatic and merely decorative with astonishing speed if it doesn't have a supporting body of theory."

The final section consists of intellectual portraits of a number of architects and critics whom Baird admires, including Rem Koolhaas, Ignasi de Solá-Morales, Colin Rowe, and, above all, Joseph Rykwert. Baird regards Rykwert as the most anthropologically informed critic of our time, inasmuch as he was equally opposed to both the metaphysical formalism of Aldo Rossi and the neofunctionalism of the Hochschule für Gestaltung, Ulm. Baird's closely argued criticism seems to be as pertinent now as it was in the late 1960s, although one is less certain that his equally pervasive optimism about the future of the city will prove to be justified.



A Genealogy of Modern Architecture: Comparative Critical Analysis of Built Form, *by Kenneth Frampton; edited by Ashley Simone. Lars Müller Publishers, October 2015, 304 pages, $40.*

Reviewed by George Baird

IN *A Genealogy of Modern Architecture*, the prolific historian, critic, and theorist Kenneth Frampton presents a documentation of a course he used to teach, which involved comparative critical analyses of 14 pairs of more or less canonical modern buildings completed between 1924 and 2007. Frampton systematically analyzes the pairs, which have similar programs and were built about the same times, according to the same categories: type versus context; public, private, semipublic, and service spaces; route/goal; structure/membrane; and, finally, what the author calls a "connotational summation"—an explanatory overview that places each individual building in a historical context. Included are houses, office buildings, civic structures, concert halls, and museums. Even though the ideologies that underpin the designs of many of the pairs differ substantially, Frampton's measured, detailed, and consistently analytical method minimizes attention to design conception in favor of close consideration of the varied buildings' sheer physical, constructed reality. This is why only executed designs for buildings make up the entire set of comparisons, extensively illustrated with photographs and diagrams.

The process of analysis is illuminating in unexpected ways. For example, it contemplates the internal dynamics of the social program of the Willis Faber-Dumas Headquarters in Ipswich, England

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(1975) by Norman Foster—a measure of his work usually ignored by an emphasis on the "high-tech" aspects of the structure and building envelope. By comparing the open plan of Willis Faber-Dumas with the open plan of Herman Hertzberger's Centraal Beheer office building in Apeldoorn, The Netherlands (1972)—a project where the social program has always been its most discussed feature—Frampton points out how Hertzberger's subdivided workspace breaks down the scale to be "personalized in a spontaneous manner" in contrast with the "decidedly panoptic character" of Foster's office layout.

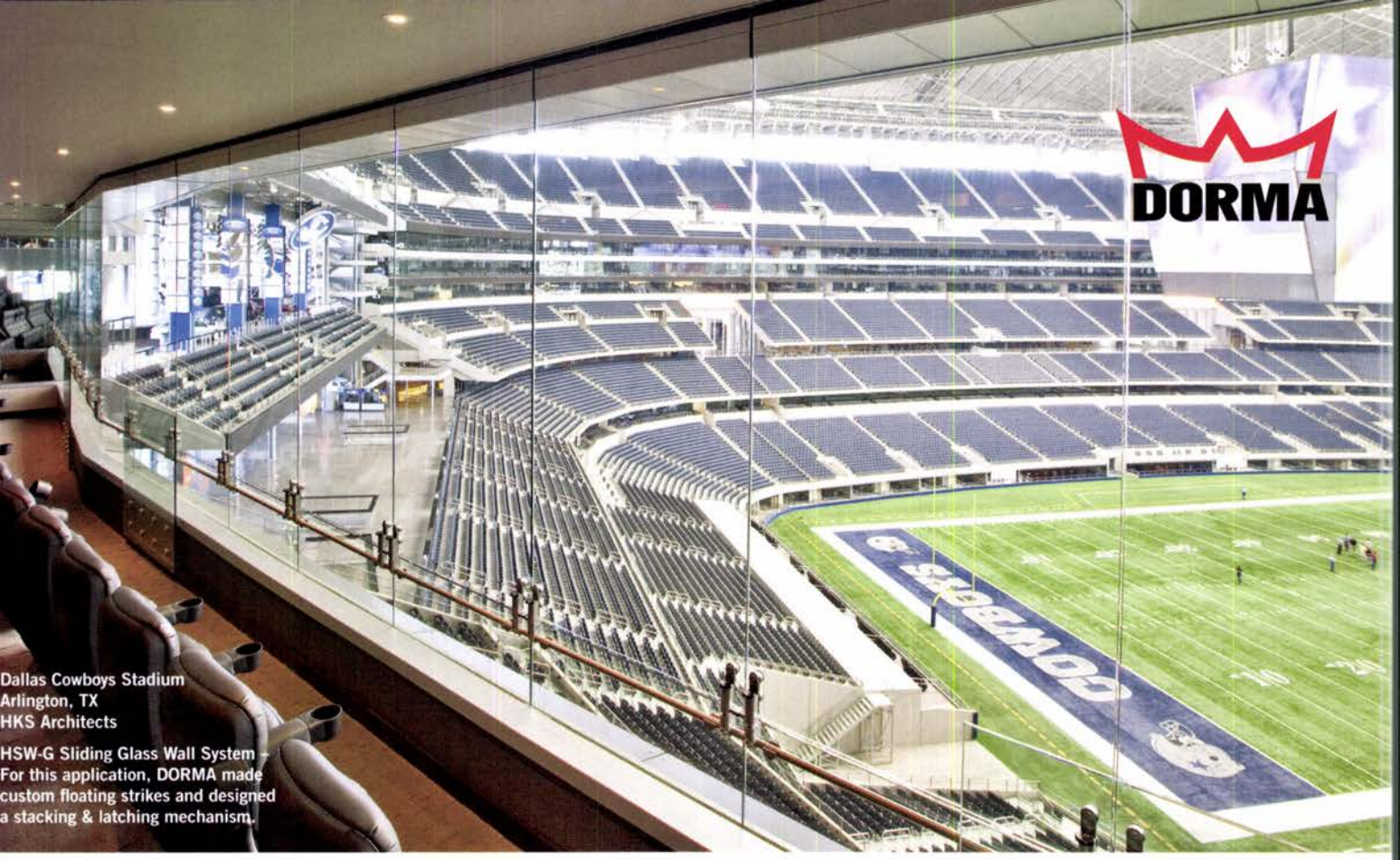
Then too, Frampton's analysis of the structural system of the Villa Mairea of Alvar Aalto points to a dimension of its specific tectonic reality—the hybrid structure, of masonry, concrete floor slabs, tubular steel columns and framing, along with timber cladding and wood poles—that has not received much critical consideration. Even if the paired selected buildings (e.g., Villa Mairea with Mies van der Rohe's Tugendhat House) are just taken individually, you frequently learn things about works of architecture you thought you knew so well. And the overview provided by the so-called connotational summations effectively situate the approaches of the various designers in an informative, historical context.

Preceding the comparative analysis is an extended introduction that is very intriguing, especially its brief history of the relevance of phenomenological philosophy to architecture. It is the best short account of this issue that I have read. For many years now, Frampton has been developing a theoretical position about architecture that owes a great intellectual debt to phenomenology—a philosophical movement that gives primacy to the impact on an individual of his or her intellectual and bodily experience of the world around that person.

Frampton's phenomenological perspective on architecture is somewhat controversial among those who argue it takes insufficient account of architectural form per se. But Frampton has constructed his short precis based on what I would call the mainstream of phenomenological philosophy, stretching from Edmund Husserl and Hans-Georg Gadamer all the way to Meurice Merleau-Ponty, with careful acknowledgement of Martin Heidegger and especially Hannah Arendt along the way. I largely share Frampton's phenomenological perspective on architecture, and his devising of this concise and very judicious overview is an impressive feat. He manages to demonstrate how important it is that his mode of comparative analysis stresses the organization of space, and avoids reducing architecture to mere matters of function and aesthetics. He uses both Merleau-Ponty and Arendt to explain how the human body and its senses are the prime agencies with which to experience a world where the optical, haptic, and kinesthetic aspects of perception are all involved.

Last year, I participated in a public conversation with Frampton about this book, where the topic of the "autonomy" of architecture arose. In the 1970's, certain theorists argued that architecture embodied an almost transcendent status that could only be understood and discussed on its own terms—not as socially, economically, or politically determined. As one would expect, Frampton views the concept warily, given its strong affinity to formalist approaches. Yet Frampton is not entirely averse to consideration of some degree of autonomy for architecture. He might see such autonomy as residing not primarily in its form at all, but rather in its tectonics (a subject of a previous book). It is in this sense that the introduction to his *Genealogy* prompts us to address the tectonics of the buildings analyzed there, in phenomenological terms.

It is an extraordinarily useful book and deserves a place beside the computer of every reflective practitioner, teacher, and student in our field. ■



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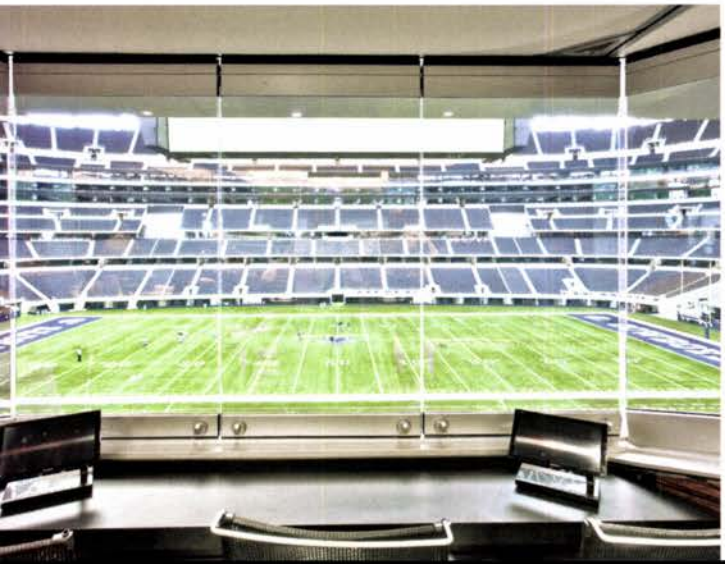

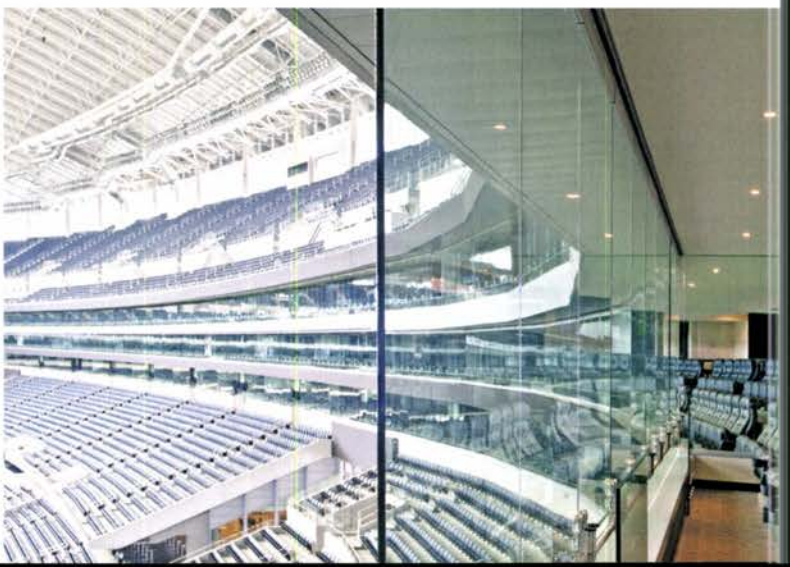

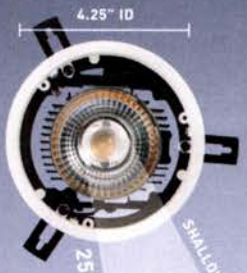

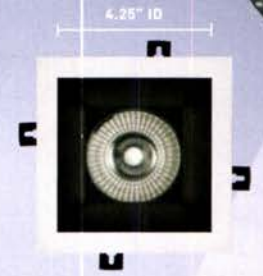

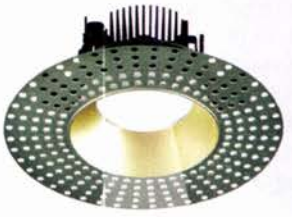

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Born To Design

A couple from the San Francisco Bay Area advanced the cause of modernism using architectural and graphic expertise.

BY KENNETH CALDWELL

Ernest and Esther Born (right) created a multidisciplinary design practice, which included creating covers for RECORD in the early 1930s (opposite). In the April 1937 RECORD, they also presented coverage of new Mexican architecture (below).

CHARLES AND Ray Eames may have been the most famous Midcentury Modern design pair in the Americas, but they were not the only professional couple who contributed to its development. Take Ernest and Esther Born, both from the San Francisco Bay Area. The two played an influential role at RECORD and other publications, as Nicholas Olsberg points out in *Architects and Artists: The Work of Ernest and Esther Born* (2015), which explores their graphic design, photography, exhibition work, typography, architecture, and planning. Yet while this beautifully produced and well-researched book does much to bring the Borns out of obscurity, it doesn't quite explain why they've remained there for so long.

Ernest studied with (and later worked for) John Galen Howard, who, steeped in the Beaux Arts, had founded the architecture program at the University of California, Berkeley. In 1926, Esther also finished her architecture and engineering degree at the university. Although Ernest remained rooted in traditional design, he and Esther, who became a photographer, spent much of their careers spreading the word about Modernism.

After marrying and traveling in Europe, they settled in New York in 1929: Ernest soon joined Shreve Lamb & Harmon, and Esther did a stint at Wallace Harrison. He also got more involved in illustration, she in book design.

Owing to their extensive contacts with journals such as RECORD, the Borns' early independent work focused mostly on graphic design. RECORD, searching to express the magazine's increasingly modernist approach, called upon Ernest to conceive a series of covers between September 1932 and December 1933. He designed a different cover for RECORD each month, using his own typography, playing with scale and configuration, and abstract elements, which "readily attracted attention on the newsstand," Olsberg says. In 1934, Ernest developed a standard cover for the magazine on which only the color changed each month. The modern design was far bolder than the work he did for other magazines.

Throughout the 1930s, Ernest contributed regularly to RECORD with renderings, murals, interiors, and design proposals, even after the couple returned to San Francisco in 1936, where they opened an office. When Esther traveled throughout Mexico with Diego Rivera—she and Ernest had befriended Rivera and his wife, Frida Kahlo, in New York—she recorded new modernist buildings there by noted architects such as Luis Barragán and Juan O'Gorman. Ernest edited these images and laid out a feature in the April 1937 issue o RECORD entitled "The New Architecture in Mexico," and designed a cover that incorporated collage to herald this radical new work.

While World War II disrupted their careers the Borns' work was widely published afterward. Ernest's organization of a seminal exhibition and catalog, *Domestic Architecture of the San Francisco Bay Region*, was presented in ar extensive article in RECORD's September 1949 issue. It codified the Bay Region's approach to modernism using local materials and techniques, a trend pointed out by Lewis Mumford a few years earlier. Although Ernest would design a few distinguished houses in his caree (which his wife documented), their curation and dissemination of work by others marked their most significant contribution to the design disciplines.

In the 1950s and '60s, the Borns continued with design: Ernest created the BART system's graphics program and executed two of its best stations, Glen Park and Balboa Park, in the early '70s, and featured in RECORD. By 1971, they closed the office, although Ernest joined up with historian and former house client Walter Horn to produce an epic scholarly publication of the plan of St. Gall abbey.

The question remains: why was this couple not better known? Despite their significant design accomplishments, the Borns did not focus on self-promotion. They were in love with the art of architecture. ■

Kenneth Caldwell is a writer and communications consultant based in San Francisco.

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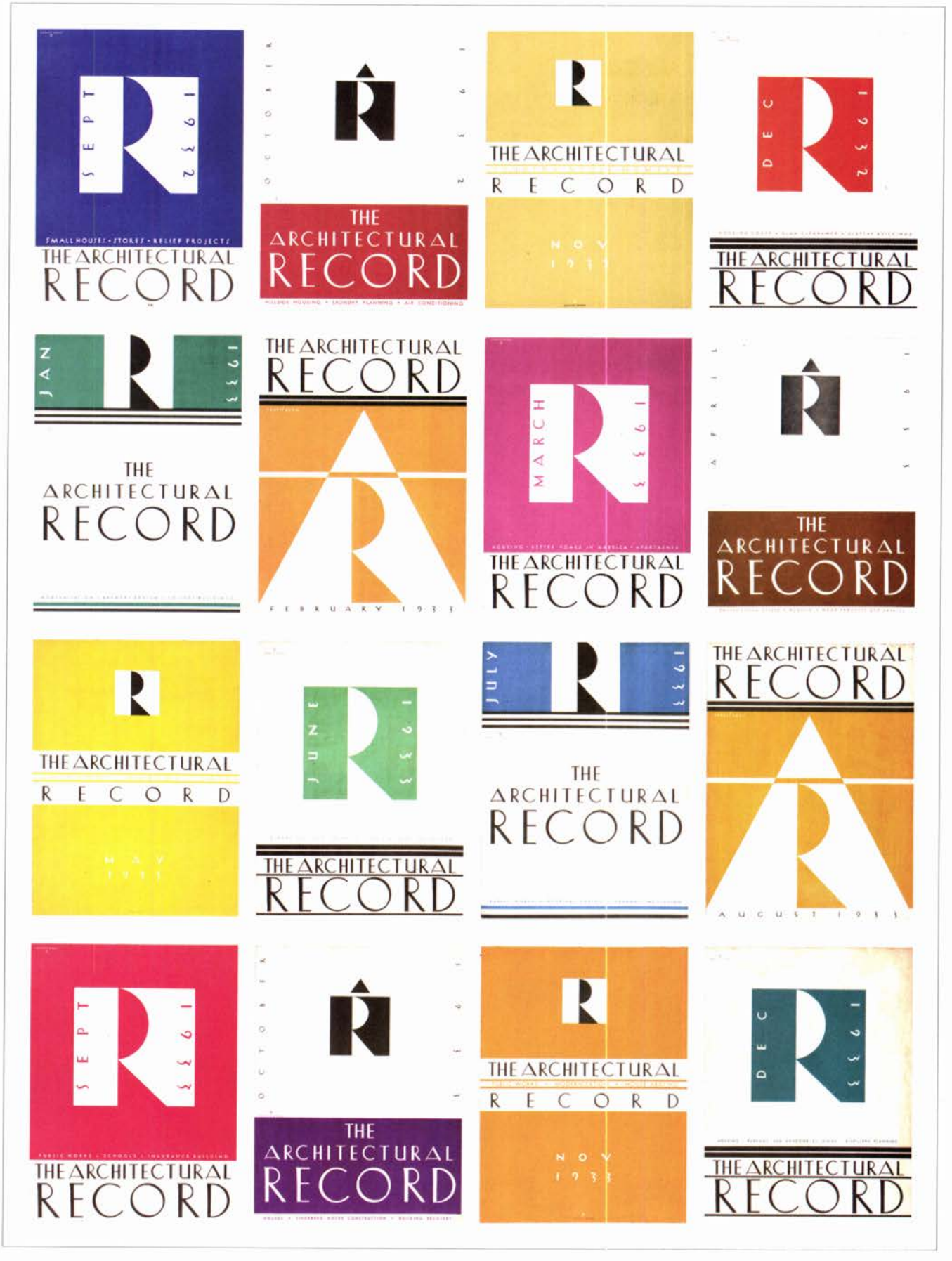

ERNEST AND ESTHER BORN (OPPOSITE, TOP, RIGHT)

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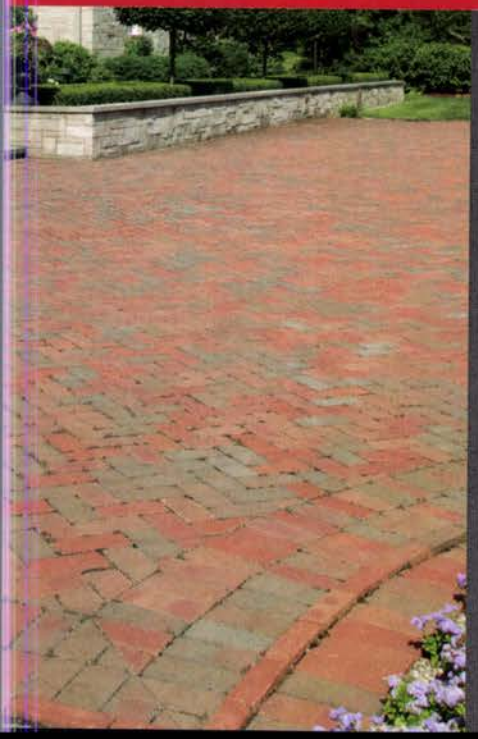

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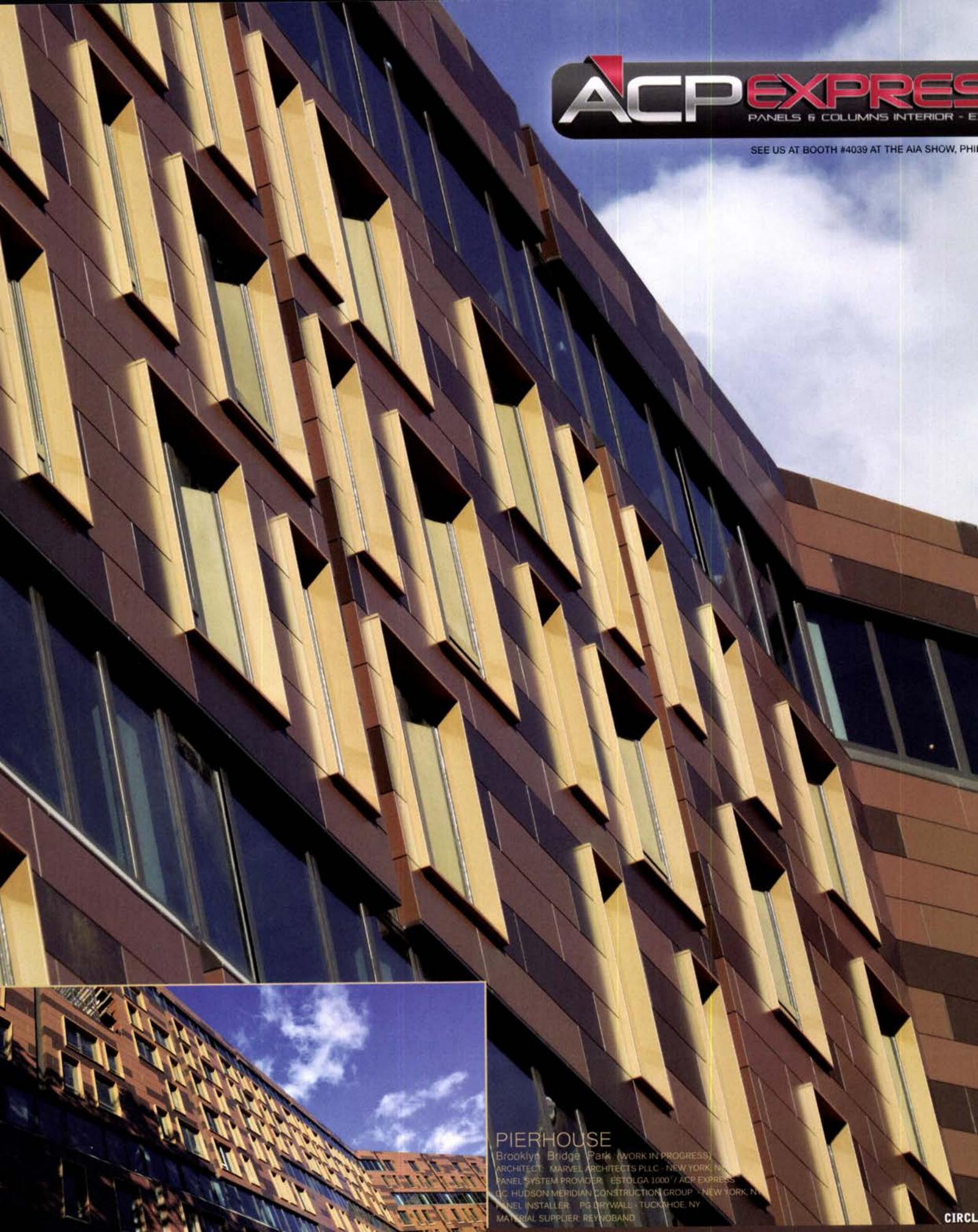

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By Julie Taraska

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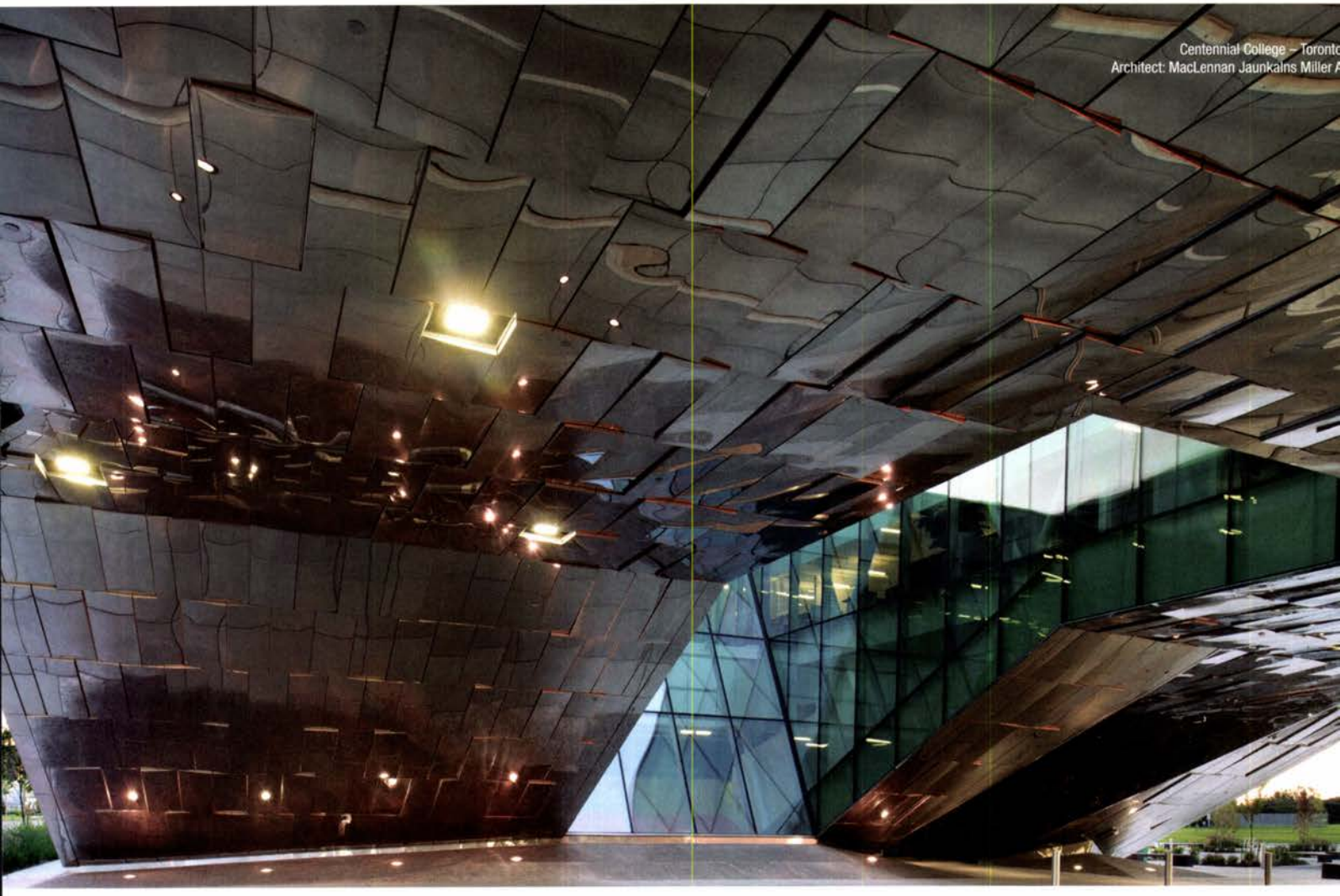

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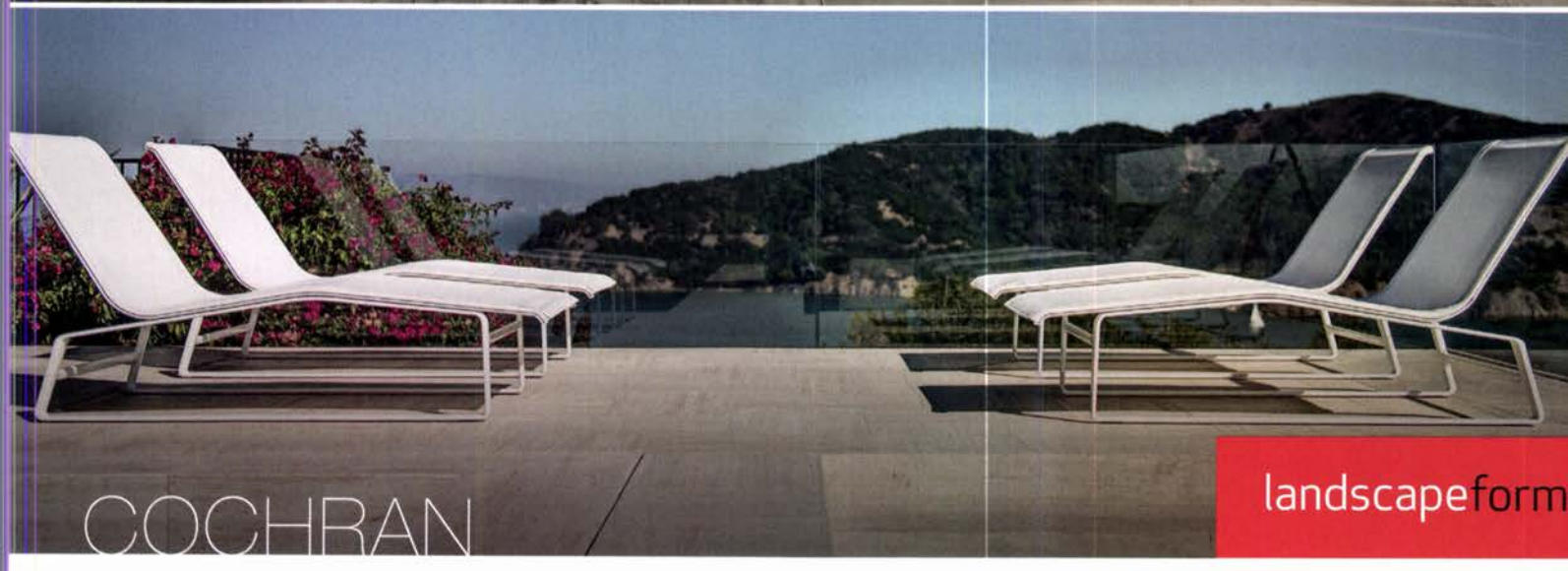

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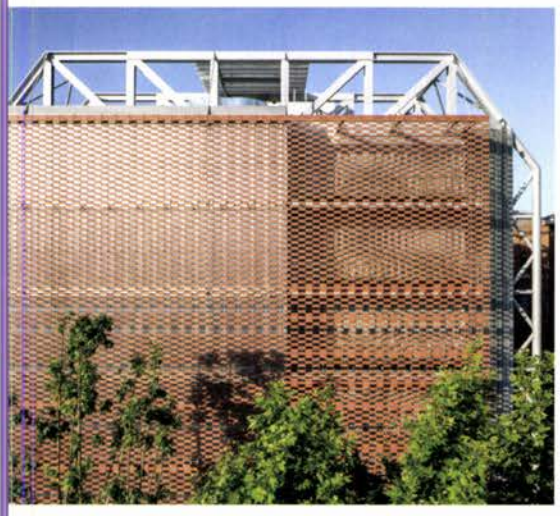
By Julie Taraska



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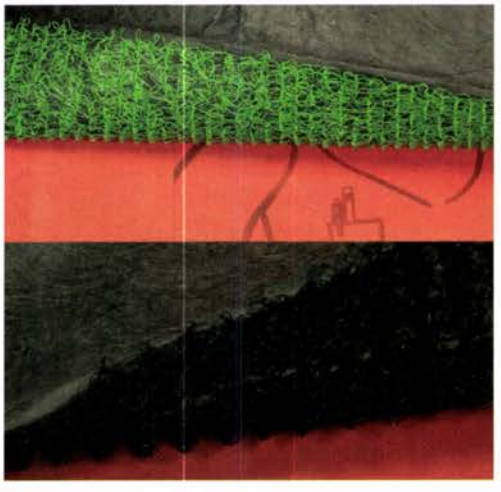

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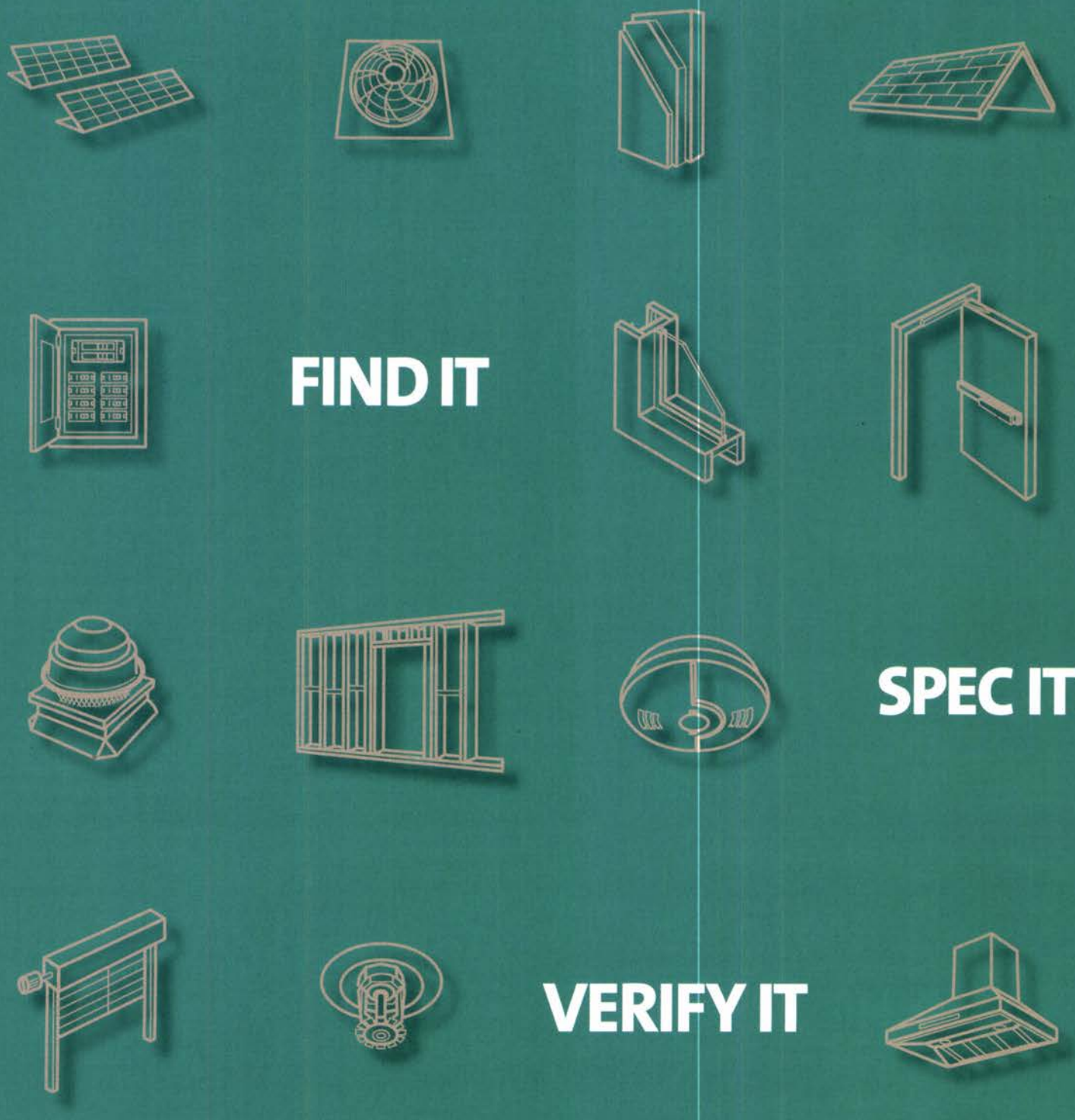

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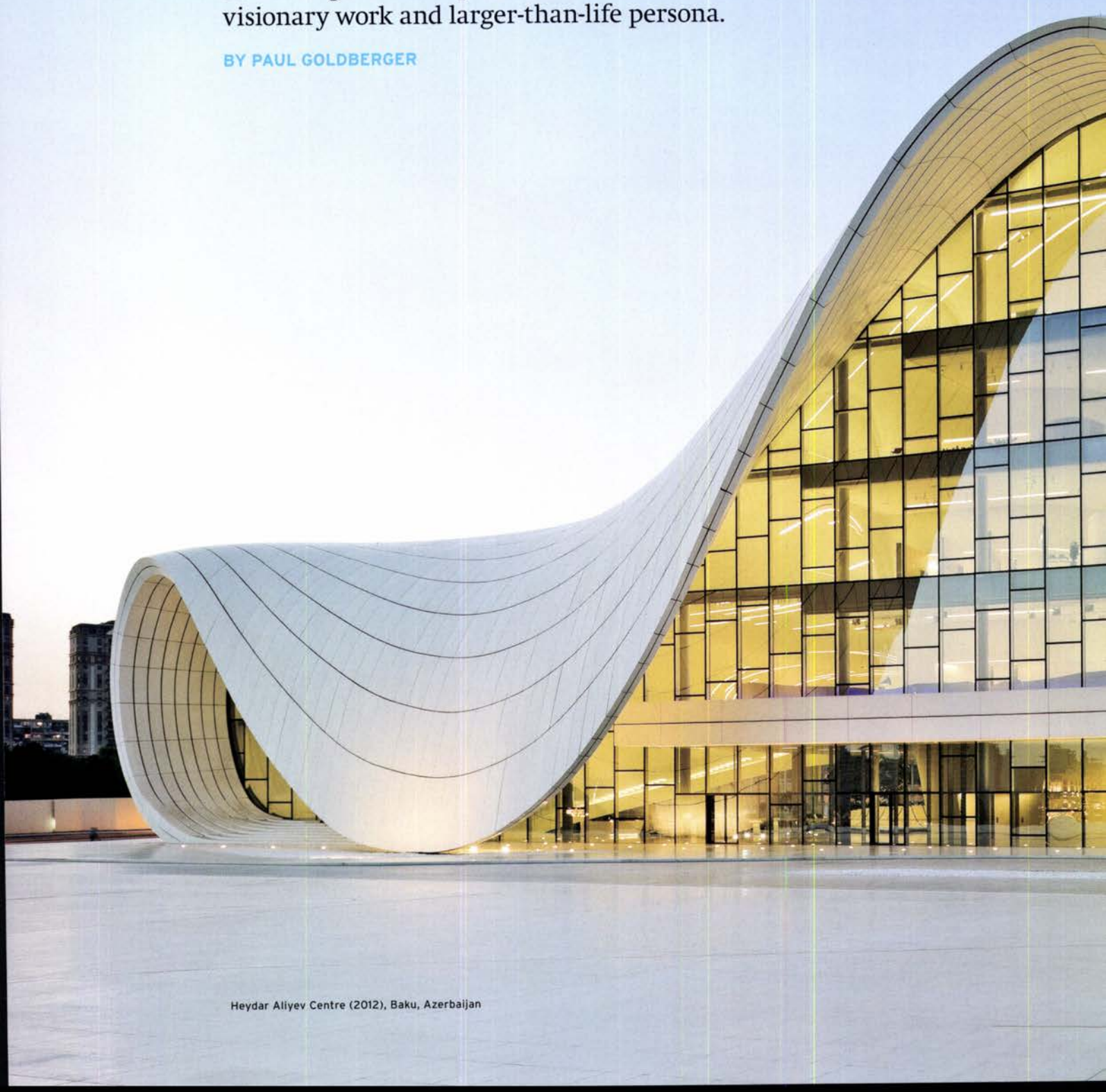
ZAHA HADID

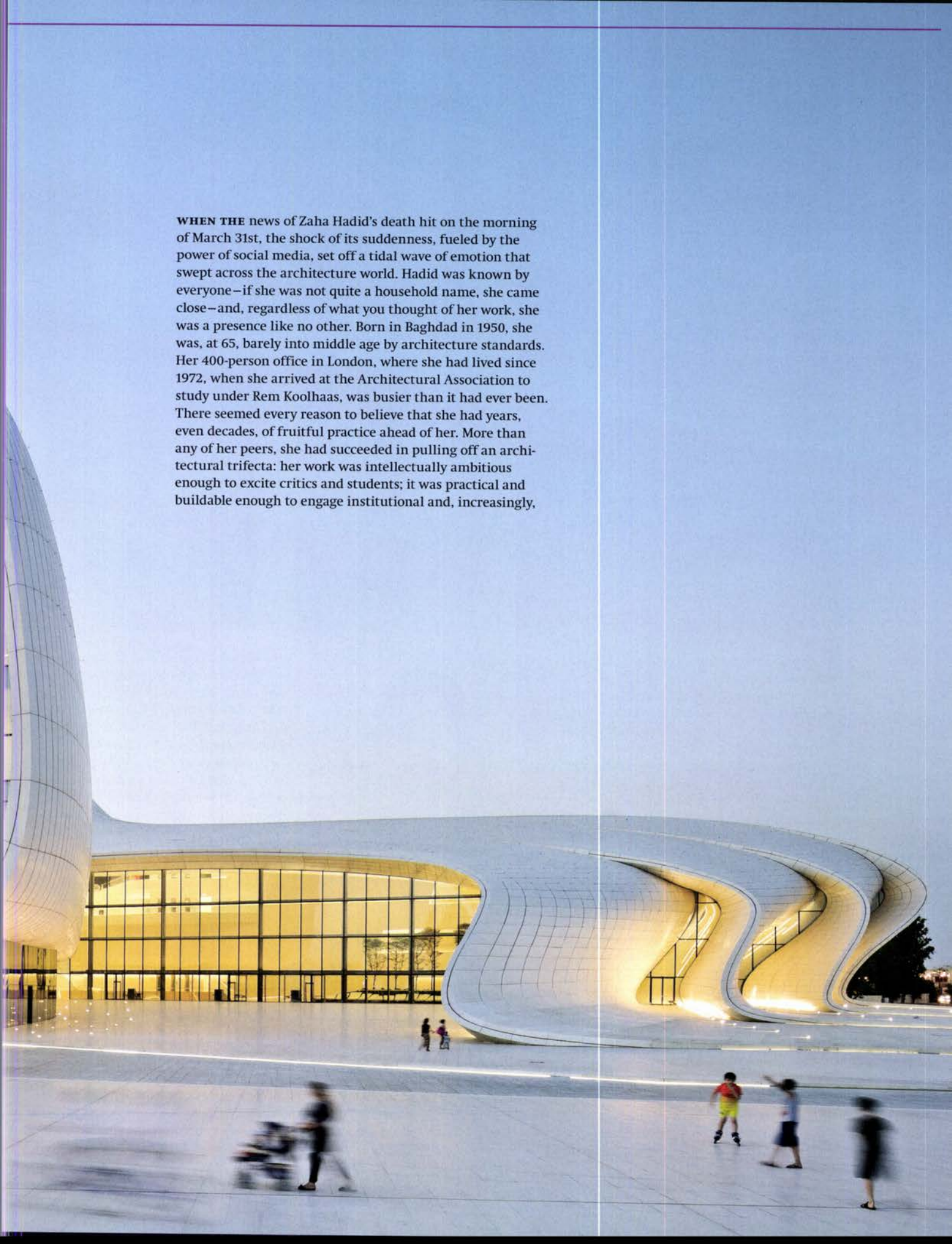
Reflecting on the impact of the architect's visionary work and larger-than-life persona.

BY PAUL GOLDBERGER

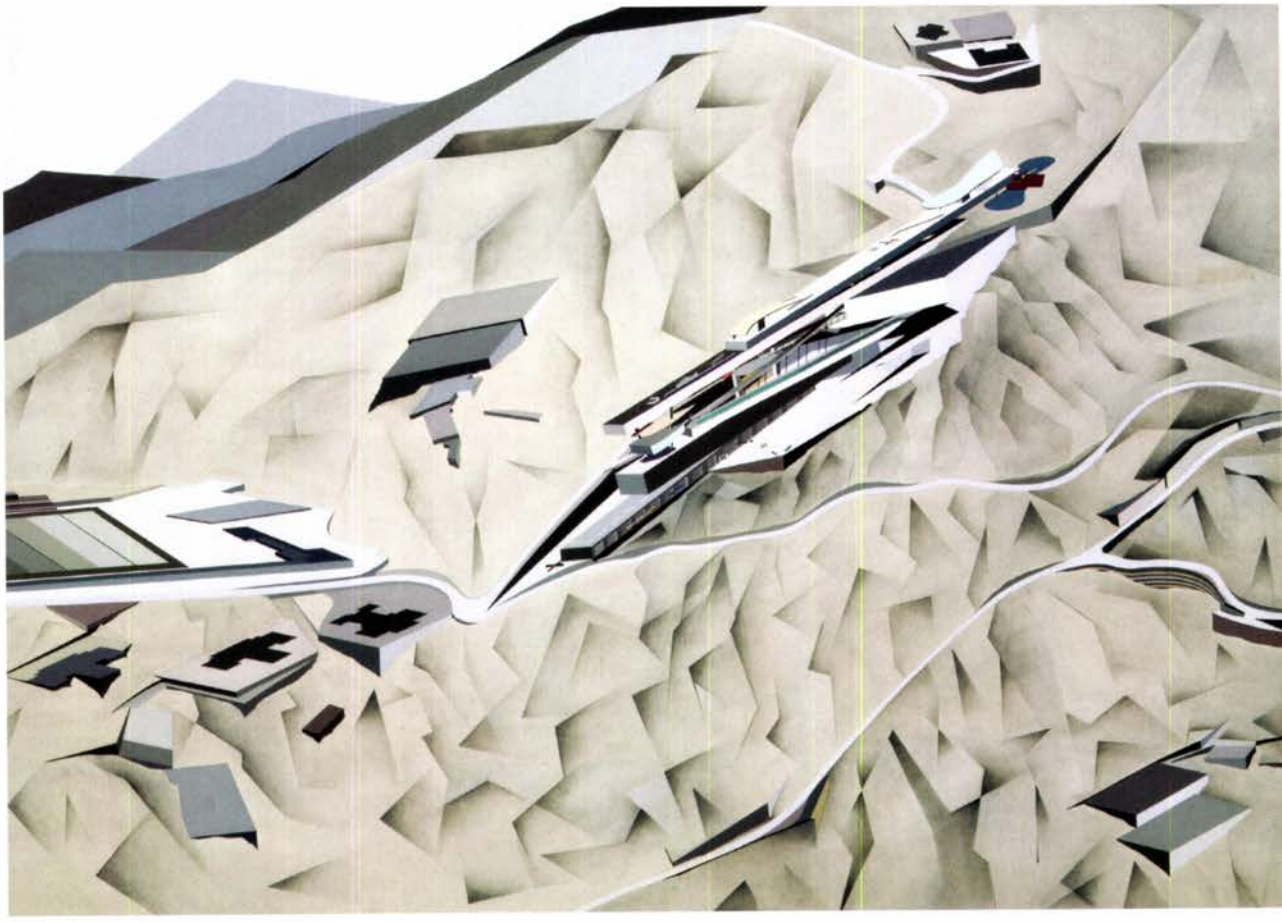


Heydar Aliyev Centre (2012), Baku, Azerbaijan

WHEN THE news of Zaha Hadid's death hit on the morning of March 31st, the shock of its suddenness, fueled by the power of social media, set off a tidal wave of emotion that swept across the architecture world. Hadid was known by everyone—if she was not quite a household name, she came close—and, regardless of what you thought of her work, she was a presence like no other. Born in Baghdad in 1950, she was, at 65, barely into middle age by architecture standards. Her 400-person office in London, where she had lived since 1972, when she arrived at the Architectural Association to study under Rem Koolhaas, was busier than it had ever been. There seemed every reason to believe that she had years, even decades, of fruitful practice ahead of her. More than any of her peers, she had succeeded in pulling off an architectural trifecta: her work was intellectually ambitious enough to excite critics and students; it was practical and buildable enough to engage institutional and, increasingly,



Clockwise from right: Painting by the architect for the Peak Leisure Club (1983), Hong Kong; Guangzhou Opera House (2010), Guangzhou, China; Vitra Fire Station (1983), Weil am Rhein, Germany; Zaha Hadid as a young girl.



commercial clients; and it was, almost always, unforgettable.

That last phrase could describe Hadid herself, of course, and it often was hard to separate her larger-than-life persona from her striking work. Who could forget Hadid, sweeping into a room for a lecture or a meeting, invariably late, vast swaths of Issey Miyake fabric billowing around her? She did not so much enter space as subsume it into her being. It was not by accident. She realized that as a woman architect she was fated to be conspicuous no matter what—she could not fade into the woodwork even if she wanted to. She chose, instead, to make the most of her presence, and she did. Probably not since Frank Lloyd Wright—who, like Hadid, favored dramatic capes—has an architect created as memorable a personal visual image.

Now that she is gone, the process of disconnecting her work from her charismatic presence will begin, and in time her architecture will stand fully on its own, speaking for itself, as it must. That will take months, if not years; at the moment, it remains intertwined with Hadid herself, who still seems present in all of it, as she has from the very beginning, when she burst onto the scene in 1983 with her remarkable, shardlike design for the Peak, the winner of an international competition for a sports club overlooking Hong Kong. It was never built, but it almost didn't matter: thanks to her extraordinary paintings that made it look like something out of science fiction, it became, like Eliel Saarinen's second-place scheme for the Chicago Tribune tower, among the most famous unbuilt designs of the 20th century, the springboard for its architect's career.

A decade later, when she began to build, the work was just as much hers, and hers alone. It is hard to look at the razor-sharp composition of tilted planes that made up the Vitra firehouse of 1994 in Weil-am-Rein, Germany, outside of Basel, Switzerland—not to mention the swirling lines of more recent projects like the One Thousand Museum condominium tower in Miami or her 520 West 28th Street condominium now rising in New York—and not think of Hadid's own flamboyance, as well as that of her buildings. But there are other kinds of more meaningful associations between her and her work. Her Guangzhou Opera House in China (2010) calls to mind an early competition for an opera house in Cardiff, Wales, which Hadid won in two separate rounds in 1995, only to see the project taken from her. It was a professional insult that she did not take quietly, and which

her protests assured would be remembered as an important case of an architect wronged.

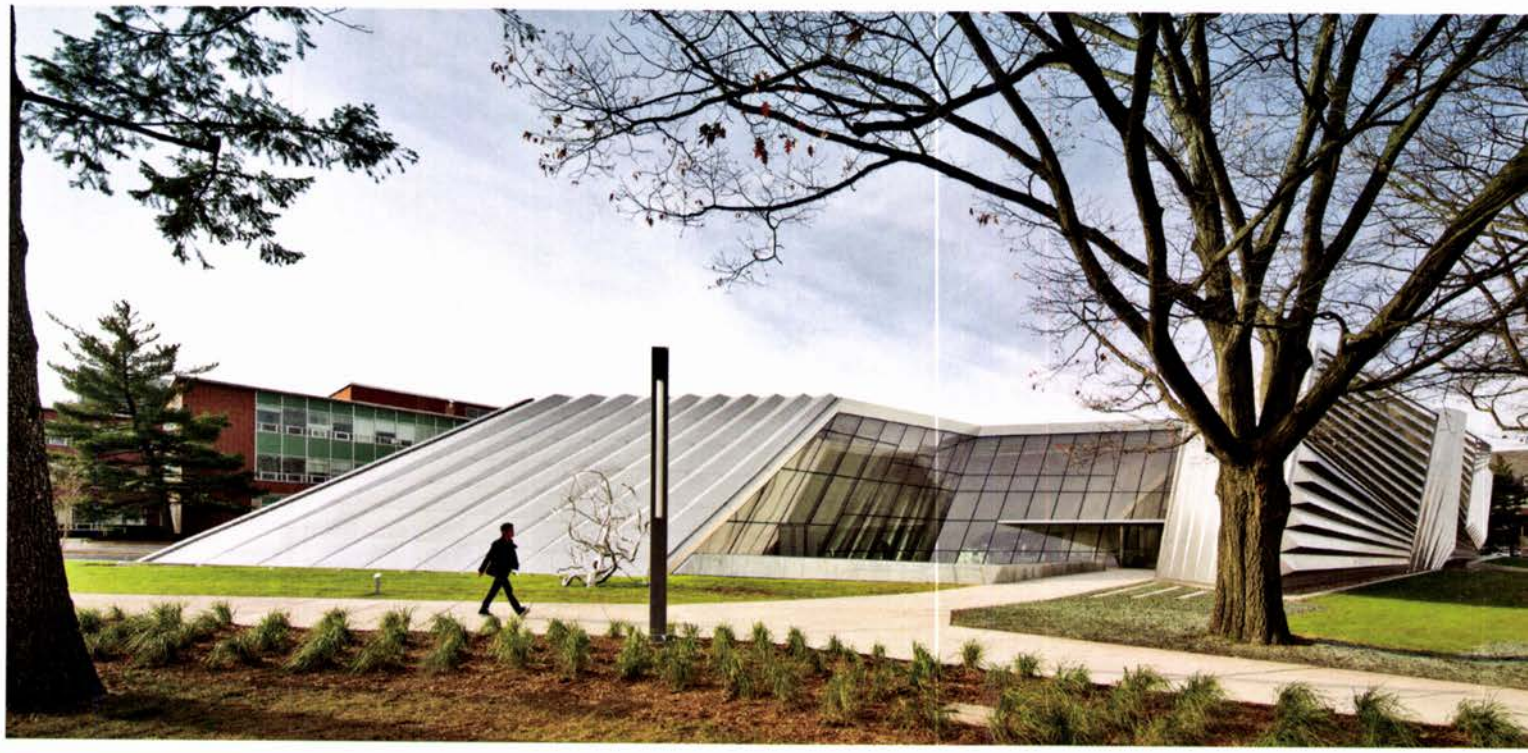
She took few things quietly. When critic Martin Filler wrote in *The New York Review of Books* that Hadid's stadium for the 2022 World Cup in Qatar had caused the deaths of more than 1,000 workers, she sued for defamation. The assertion of deaths was false—construction on the stadium had not yet begun—and the publication issued a correction and a public apology, and ultimately a financial settlement, which Hadid reportedly turned over to a labor-rights organization. Because she had argued that an architect's job was to make architecture and it was the government's job, not hers, to assure better working conditions, she seemed to eschew political correctness, and the issue continued to dog her. Last year, when a BBC interviewer, speaking to her on live radio, pressed her repeatedly with the erroneous allegations about that project and about the Olympic stadium in Japan, she walked out of the studio.

All of this makes her sound tough, demanding, and imperious. Well, yes. It may have been trite to call her

architecture's prima donna, but it was not wrong. Nor is it wrong to acknowledge that male architects who behave as forcefully as Hadid are more likely to be praised for being strong and self-assured than criticized for being difficult. It is an irony that Hadid, as the first woman to win the Pritzker Prize and the first woman to win the Gold Medal of the Royal Institute of British Architects in her own right (others had won in tandem with male partners), will forever be associated with the trail she blazed for other women in her profession, since all she wanted, in the end, was to be identified as an architect.

Hadid, in private, could be funny, ironic, loyal, warm, and even gentle. And her public presence mellowed in recent years as she had more career successes to take pleasure in and less reason to feel the rejection that so stung her. When she won the RIBA Gold Medal, she spoke of the social dimension that she tried to include in her work, and implicitly acknowledged that she had not always succeeded in communicating what she believed her work to be about.

She was not merely "striving for individual expression," she said, and she did not want her work to be seen as "self-indulgent or willful." What she wanted, she explained, was to use architecture as a way of expressing what she called "the intensification and re-urbanization of social life in the city," which she considered to be a prime characteristic of the 21st century. "Buildings and pro-



grams need to break open and embrace each other, even interpenetrate," Hadid said. "This requires spatial complexity and openness." She concluded: "Most of my projects, public and private, aspire to this life-enhancing increase in connectivity."

Her buildings were almost explosive in their energy, and she was unashamedly in the business of producing foreground, not background, architecture. Her showy image often overshadowed her belief in the public realm and in an architecture of social and emotional engagement, and while she often brought a considerable degree of common sense to her architecture, she was rarely given credit for it. In Glasgow, for example, her Riverside Museum, an enormous shed of glass and zinc arranged in zigzagging gables, is perfect housing for a collection of antique vehicles, celebrating the industrial age while moving it forward. In London, her Evelyn Grace Academy, a middle and upper school for underprivileged kids in the South London neighborhood of Brixton—a concrete building with lots of glass and sharp, crisp lines that suggest constant motion—manages to inject into a well-organized modern school building a bracing vigor. It won the Stirling Prize in 2011.

Clockwise from top: Eli and Edythe Broad Art Museum (2012), East Lansing, Michigan; Messner Mountain Museum Corones (2015), Bolzano, Italy; Riverside Museum of Transport (2011), Glasgow; London Aquatics Centre (2011).

Hadid was fascinated by Russian constructivism, and probably no architect of our time has been inspired to greater creative heights by the Russian avant-garde than she. But her work was far more than a contemporary riff on the compositional inventions of constructivism. She was just as influenced by the romantic, sensual modernism of Oscar Niemeyer, whose voluptuous shapes were, for her, the perfect counterpoint to Malevich. Hadid managed, somehow, to synthesize Malevich's explosive fragmentation and Niemeyer's hedonistic exuberance into a new and coherent body of work that was very much her own.

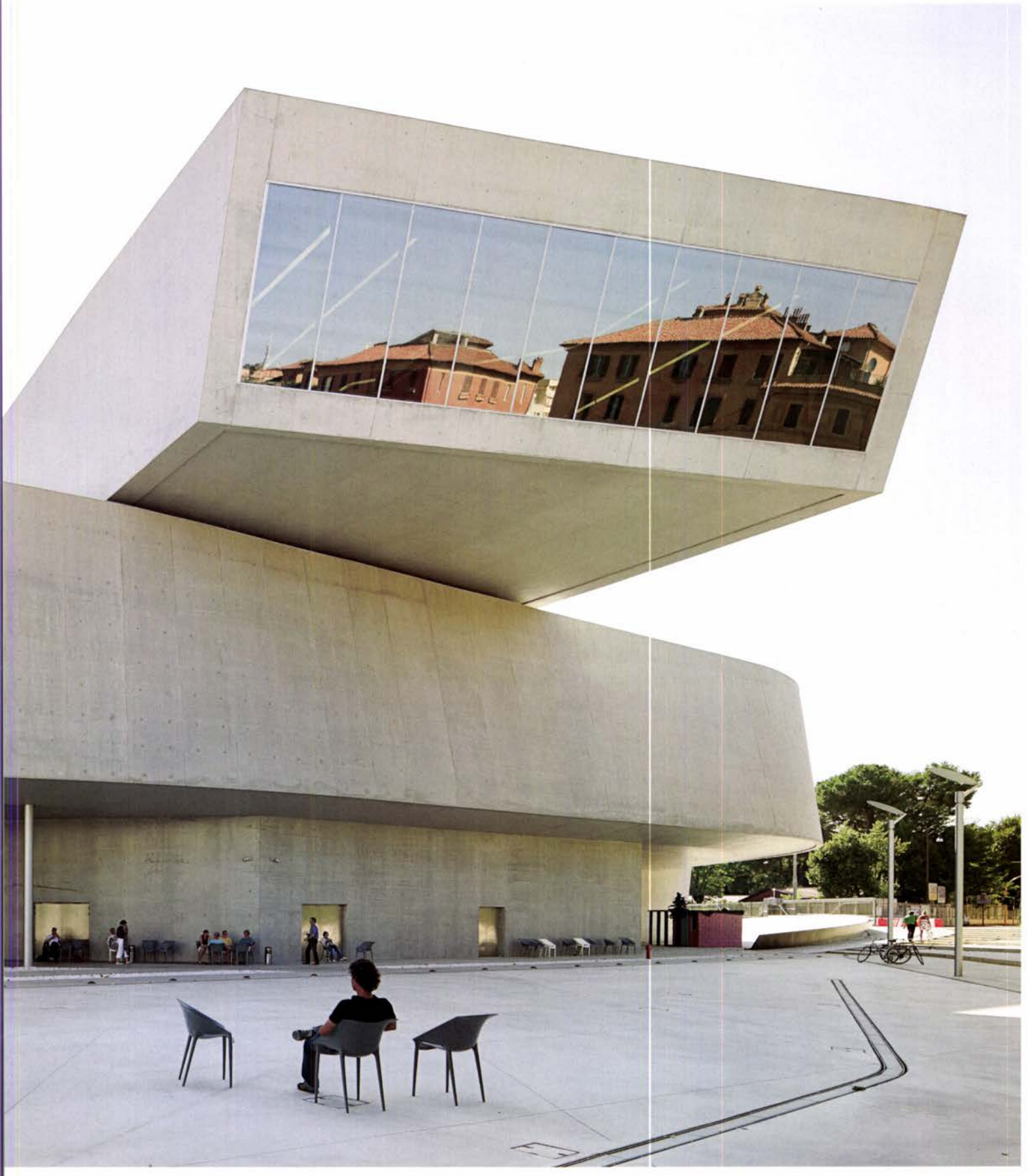
Like every great architect, she was at heart a composer of form, not an ideologue. Encouraged by the computer—and by her gifted partner, Patrik Schumacher, who coined the term parametrics, and who for years has served as the keel to Hadid's sail—her work came to rely more on complex, flowing curves. Many of her late buildings, like the Heydar Aliyev Center in Baku, Azerbaijan, the Maxxi Art Museum in Rome, the Guangzhou Opera House, and the Aquatics Center for the London Olympics, feel almost like waves, as if made of liquid rather than solid. If her architecture began as an exploration of forceful, slashing lines and planes, some of which seemed all but unachievable technologically, it moved toward a fluidity that digital technology made possible.

It is impossible to know where her creative energy, with its mix of power and passion, would have led her had she had the long life that is common among architects. Like James Stirling, Louis Kahn, and Eero Saarinen, who also died suddenly in their prime, Zaha Hadid left a body of work with an early and a middle period, but no late one, and we can only guess what her imagination would have yielded as the world, and the profession she loved, continued to change. We can know only that it would have been different from anything that we had seen before. ■

Critic Paul Goldberger is the author of Building Art: The Life and Work of Frank Gehry *and a contributing editor at* Vanity Fair.

PHOTOGRAPHY: © IWAN BAAN

MAXXI: Museum of XXI Century Arts (2009), Rome



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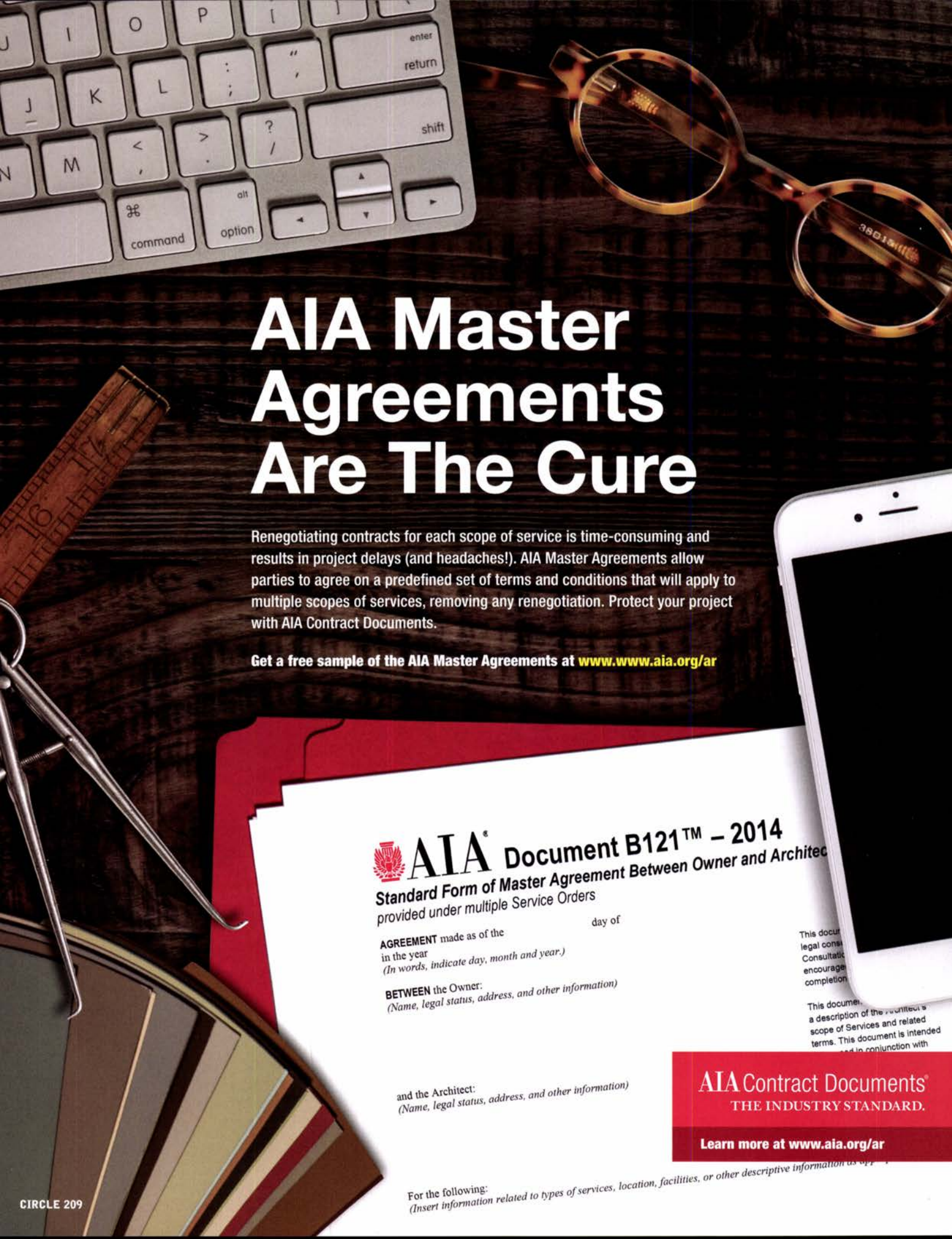

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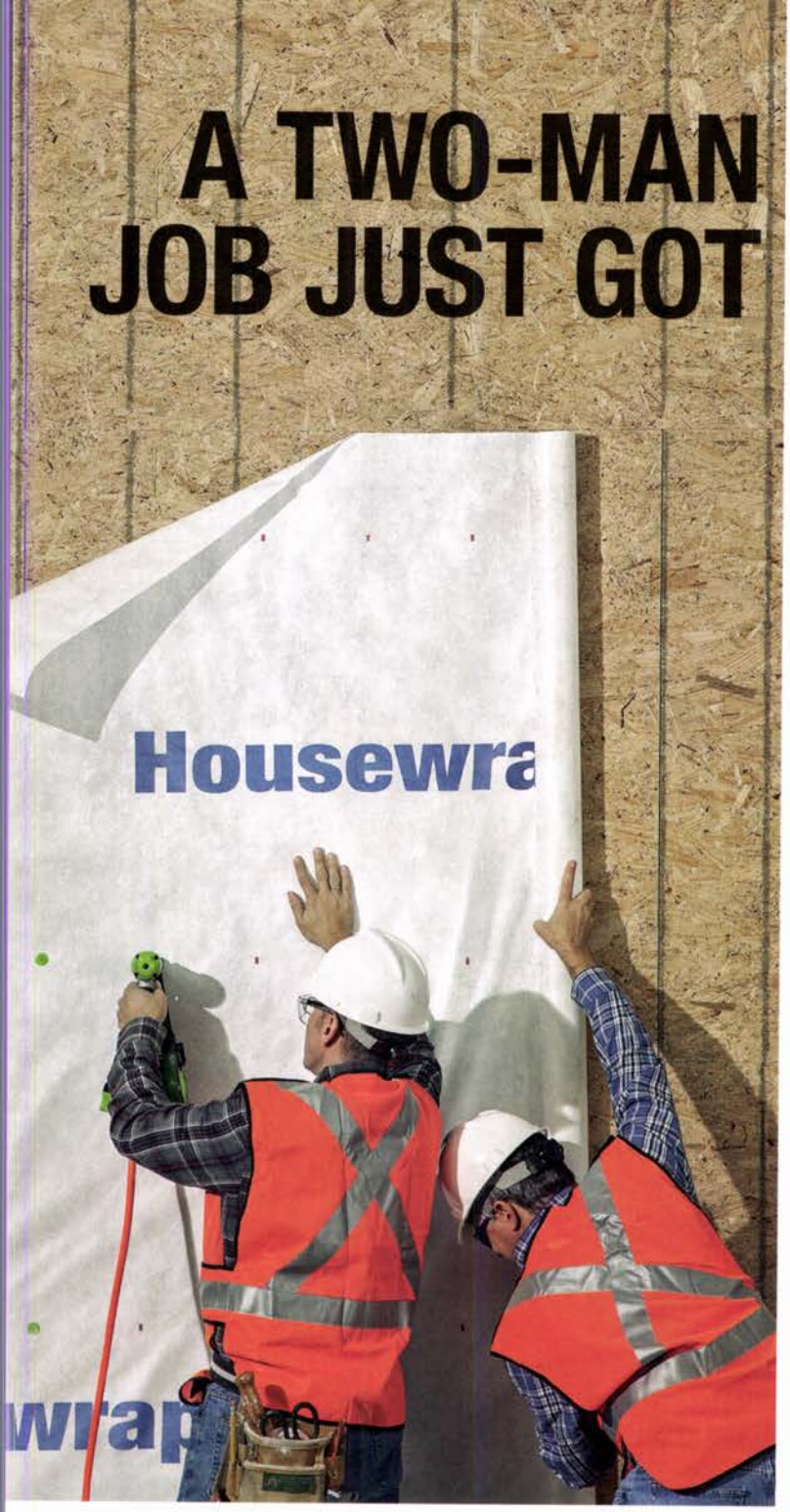

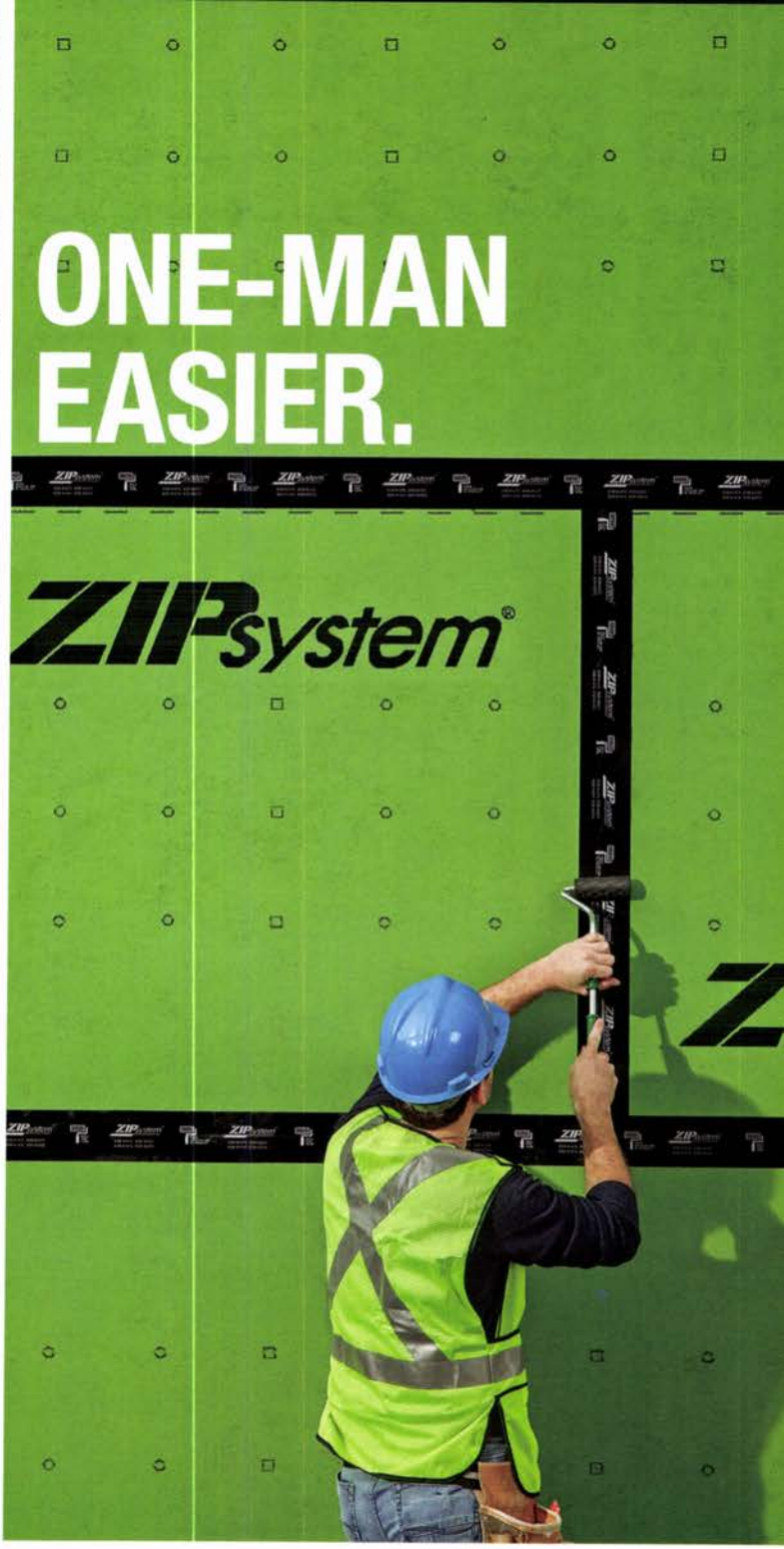

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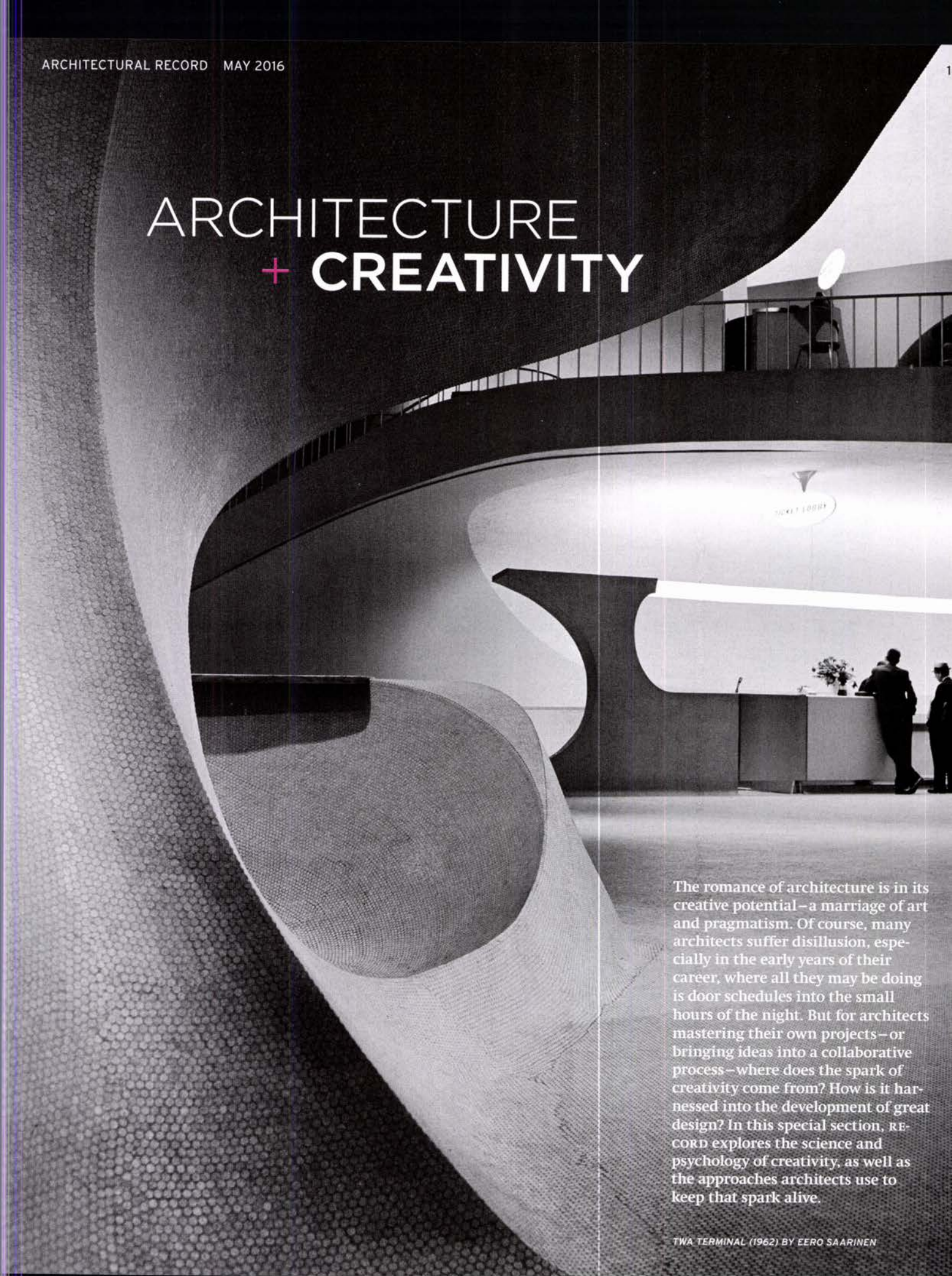


The romance of architecture is in its creative potential—a marriage of art and pragmatism. Of course, many architects suffer disillusion, especially in the early years of their career, where all they may be doing is door schedules into the small hours of the night. But for architects mastering their own projects—or bringing ideas into a collaborative process—where does the spark of creativity come from? How is it harnessed into the development of great design? In this special section, RECORD explores the science and psychology of creativity, as well as the approaches architects use to keep that spark alive.

TWA TERMINAL (1962) BY EERO SAARINEN

Creativity and the Brain

Neuroscientists keep trying to unlock the mystery of what sparks visionary thinking and artistic invention.

BY JERRY ADLER

ILLUSTRATION BY STUART KINLOUGH

It was 60 years ago, at the start of his career, but the architect and educator John P. Eberhard remembers the very moment the idea came to him for what would be his seminal creation: the modular church. He'd been approached to design a chapel for a new congregation in Champaign-Urbana—a kind of starter church that could be erected quickly, disassembled, and moved when the congregation outgrew it. "I remember having ideas roll around in my head about what it could be," Eberhard recalls. "I remember when I got the big idea: visiting my parents, sitting in their bedroom, rocking in a rocker. All of a sudden, into my head came this whole idea of designing a chapel out of wood panels bolted together, with equilateral trusses, two-by-twelves with split-ring connectors, four-by-eight plywood panels. The whole idea was there."

Out of that flash of insight came a business—Creative Buildings, Inc., which in the 1950s sold more than 100 prefab churches around the country—and a lifelong interest in the nature of creativity by Eberhard, former chair of the School of Architecture at Carnegie Mellon. His account of an idea's arriving, fully formed, seemingly out of nowhere, corresponds closely with how at least one classical musician approached composing. While walking or resting, he wrote, melodies would come into his mind "whence and how, I know not," taking root and growing until the piece "stands almost complete and finished in my mind, so that I can survey it, like a fine picture or a beautiful statue, at a glance." The composer was Mozart.

Separated by hundreds of years and the gap between a successful professional and a world-renowned genius, they describe in almost identical terms one of the most sublime and elusive events in human experience, the "eureka moment" of creativity. It has tantalized philosophers and poets, who imagined it could only come directly from God—Ibsen spoke of receiving "the spark of the divine fire"—and more recently scientists, who have begun looking for objective correlates to creativity in the brain, just as they do for perception, movement, and memory.

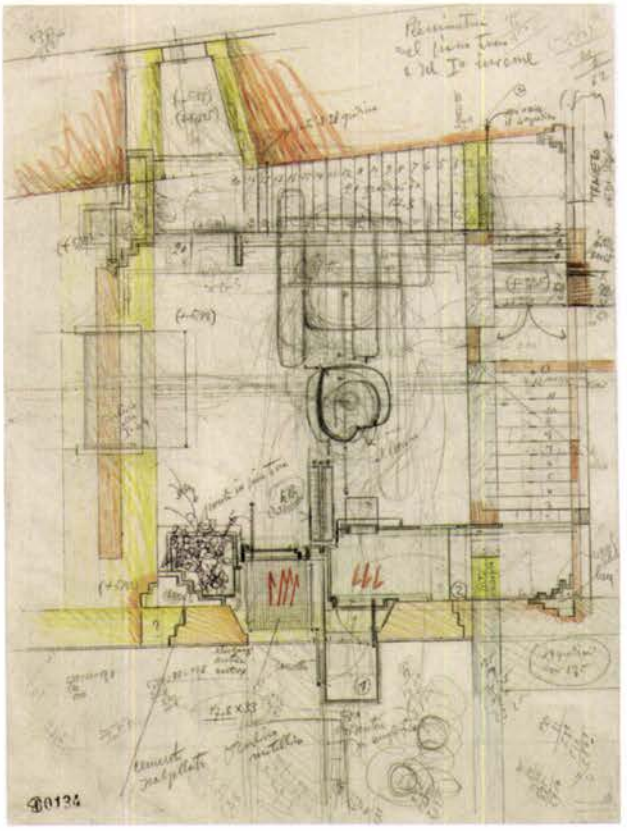
But they haven't gotten all that far, according to Nancy Andreasen, author of *The Creating Brain: The Neuroscience of Genius* (2005). Nineteenth-century theorizing that linked creativity to traits such as left-handedness and stammering haven't been borne out, and neither has the left-brain/right-brain distinction (the one on the right was the part you were supposed to use in artistic ventures) that sold so many magazines in the 1980s. Even the common-sense assumption that originality correlates directly with intelligence has been debunked: the consensus today is that success in a creative field requires a threshold IQ of around 120—equivalent to about the 90th percentile—but, beyond that, you don't have to be an Einstein to be Einstein. One problem, Andreasen notes, is that modern neuroscience relies heavily on putting subjects in MRI machines that measure activation in different regions of the brain under specific conditions, but, once you get them in there, how do you detect creativity? Wait for them to compose a symphony or design a building in their heads?

Andreasen has done some of this research herself; as a neuroscientist at the University of Iowa, she is particularly well situated for it, since the Iowa Writers' Workshop attracts a steady stream of poets and novelists to the campus, a resource she has been supplementing with visual artists whenever she can lure one. (She hasn't had the chance to study an architect yet; anyone reading this with a few days to spare in Iowa can give her a call.) Her early work used stratagems to elicit creative activity, such as giving people five words and asking them to write a story around them. She decided it was a waste of time: the task didn't engage them sufficiently; it activated regions of the brain involved in language processing, which didn't seem to capture anything unique about the creative effort.

Eventually she concluded that there is no dedicated area for creativity in the brain, in the way that, say, the prefrontal cortex handles the planning and decision-making processes neuroscientists call "executive function." Creativity is a function of forging relationships and making connections; it is a way of thinking in metaphors that cut across not just the psychological borders of the mind but the physiological boundaries of the regions of the brain. V.S. Ramachandran, a pioneering neuroscientist at Cambridge University, discovered that artists, poets, and novelists have seven times the normal incidence of synesthesia—the peculiar phenomenon in which one form of sensation (hearing a passage of music, for instance) is experienced as another (a particular color or smell). In *The Architect's Brain: Neuroscience, Creativity and Architecture* (2009), Harry Mallgrave relates this finding to architecture, quoting a disciple of the late Venetian architect Carlo Scarpa, who believed he "worked entirely through a synesthetic process that entailed, on the same pages of sketches, different colors and styles of drawing with different media. It was through these 'bundles of intertwined sensory perceptions' . . . that Scarpa was able to modulate his multisensory ideas—say, red of a waxy pencil from the red of a brick from an identical red of India ink."

The parts of the brain that seem to show more activity in creative people (compared to Andreasen's control subjects) are the "association cortices," regions that are markedly more developed in humans than other animals and also among the last to mature, continuing to develop into the early 20s. Their function is to process the output of the primary sensory areas, identify phenomena, and make connections among them. How do we see a face? The retina receives light and transmits nerve impulses; the primary visual cortex resolves these into a form, with shape and color; the visual association cortex recognizes and categorizes it and compares it to a summer's day.

And it is these areas, Andreasen found, that are most active during the condition she describes as "randomly wandering unconscious free association"—the condition described by Eberhard, rocking quietly in his parents' bedroom, Mozart strolling through the streets of Salzburg, or the 19th-century chemist August Kekule dozing off in front of the fire and waking with the structure of the benzene molecule dancing in front of his eyes.



STROKES OF BRILLIANCE
A Carlo Scarpa sketch exemplifies a synesthetic process, expressing his multisensory ideas in varied colors and styles of drawing, with different media.

Of course, dozing by itself isn't enough to guarantee immortality. The eureka moment, as described by Andreasen and others, is only the third of four steps in a creative process: preparation—acquiring the basic background knowledge to make a contribution to a field; incubation—trying out various ideas and approaches; insight—the sudden apprehension of a solution; and production—putting the idea into practice. Naturally, insight gets most of the attention from researchers, and it's the part that aspiring artists tend to focus on, as having the highest ratio of psychic reward to effort.

But even Mozart needed to study and practice, despite his phenomenal and precocious natural gifts. In fields less abstract than music—such as physics or architecture—that is especially true: almost any idea in science, however original, must at least partially fit into the framework of existing knowledge, and a building has to stand up. "Creativity is a process of focusing on something with discipline, of training the brain to think while working," says Mallgrave. Faced with a difficult problem, "we sleep on it, take a shower, and suddenly we have an answer to where to put that door."

Ah, yes, the eureka moment, the idea flitting at the edge of our consciousness, just beyond our apprehension. It will come to us when we are prepared to receive it—though it often comes with a price; the idea that creativity bears a relationship to mental illness is not without foundation, says Andreasen. The characteristic affliction is mood disorder, which she finds extremely common among the writers and artists she has studied, in their siblings and offspring, and in the historical record. Among her first subjects was Kurt Vonnegut, who suffered from depression, and whose immediate family had both a high incidence of mental illness and creativity in numerous fields. (His father was a successful architect.)

And there is at least a metaphoric connection, if not a definitive statistical one, between creativity and schizophrenia, both of which involve a state in which mental lines break down and free association reigns. Researchers at Berkeley back in the 1950s and '60s administered the standard test of mental health, the MMPI, to writers and architects who were considered especially creative and found they scored suspiciously high on the scales of schizophrenia and paranoia (page 113). But, as the Harvard psychologist Shelley Carson points out in an essay with the provocative title "Creativity and Psychopathology," that reflects a tendency, not an actual diagnosis. Patent schizophrenia is incompatible with productive work in most fields, especially those whose end products have to meet safety and fire codes. The other mental state characterized by hyper-free association is, of course, the one we enter into when we take drugs. Perhaps the most celebrated eureka moment in history was the opium-induced dream of Samuel Taylor Coleridge, out of which came the psychedelic thunderstorm of the opening stanzas of "Kubla Khan." It was a dream, of course, about architecture.

Jerry Adler, a former senior editor at Newsweek, *writes about architecture, among other subjects.*

Genesis of Genius

A 1950s study tried to find what makes architects creative. The results are surprising and telling.

BY PIERLUIGI SERRAINO

Editor's Note: In June, The Creative Architect: Inside the Great Midcentury Personality Study, *by Pierluigi Serraino, will be published by Monacelli Press. The book is based on psychological tests conducted by the University of California, Berkeley, in 1958–59 to try to determine what promotes creativity in architects.* RECORD *presents excerpts of three case studies of the leading architects of the day—Eero Saarinen, Philip Johnson, and Richard Neutra—along with the author's summary of the goals, methodology, and findings of this unusual, almost-forgotten investigation.*

In 1958, the Institute of Personality Assessment and Research (IPAR) at the University of California, Berkeley, embarked on an ambitious endeavor to closely study 40 of the most creative architects living in the U.S. or working in the country at the time. This was part of a broader inquiry whose overall mission was to learn the personality characteristics of well-known creative people by observing them in a controlled setting. The ultimate goal was to develop a pedagogical environment that could foster creativity in future generations. The head of IPAR and this project was Donald MacKinnon, a former Office of Strategic Services (OSS) psychologist in World War II, who was in charge of identifying soldiers to carry out espionage in Europe and the Far East.

MacKinnon used his assessment method to spot and psychologically dissect creative people of different groups, including writers (such as Truman Capote, Norman Mailer, and Arthur Koestler), research scientists, mathematicians, and even Mount Everest climbers. The psychologist had a love of architects: he believed they exhibited a unique set of cognitive skills, from the artistic to the scientific, making them particularly suitable subjects to understand the conditions that triggered creativity. William Wurster, then dean of the architecture school at Berkeley, was asked to put together a list of the most talented ones. He formed a panel of five people, each of whom separately listed and ranked their favorites. Elizabeth Kendall Thompson, at the time the West Coast editor of RECORD, who closely advised MacKinnon on design matters, acted as an unofficial panel member.

Letters of invitation went out to the listed men. On the top was Frank Lloyd Wright, then 91, who never answered (he died in 1959). Mies van der Rohe tersely declined, as did Walter Gropius, Marcel Breuer, and Paul Rudolph, albeit in a more polite manner. Eames said yes, but withdrew later because of scheduling conflicts. Eero Saarinen, who ranked third after Mies on the invitation list, accepted after Wurster's relentless insistence. Louis Kahn, Richard Neutra (then 66 and the oldest in the study), and many others followed suit. When the word spread that Saarinen was coming, Philip Johnson, Victor Lundy (36 and the youngest), John Carl Warnecke, and Ralph Rapson asked to be scheduled in the same slot. Arriving in groups of 10 on four separate weekends, a parade of top architects entered the front door of IPAR's home in a former fraternity house. MacKinnon had alerted the invited guests that the weekend was "not going to be relaxing." But nothing could prepare them for the 22 hours of grueling testing—of which making mosaics was the most visually oriented procedure. On an 8-by-10-inch background, the subjects needed to fill out in its entirety a field of 1-inch mosaics from a choice of 22 colors. Each had 30 minutes. Saarinen used only white, while Johnson relied on black and white. Evaluating the mosaics' quality were other specialists, including noted architectural historian James Ackerman, who argued that the most creative showed a propensity for complex patterns and rejected predictable formal solutions.

In the individual psychological interviews, architects often confessed or revealed provocative insights. Saarinen said about his famous architect father, Eliel: "I aped him, read history. He was my image–I would try to follow him." When asked what were the most important elements for professional advancement in architecture, Kahn said, "I am conflicted—a broad understanding of relationships and order, but [you] must have an opportunity to work." A profoundly humane portrait emerged from all this. These much mythologized personalities, deeply torn in their personal histories, found a satisfying integration of self with architecture.

The study confirmed that I.Q. was important yet not decisive. Beyond a threshold, being more intelligent does not equate to being more creative. IPAR scientists realized that creativity starts with sensing a problem others do not see, a type of intuition in making connections that few have. It also turned out that nonconformity is a pillar of creativity. When applied to real problems, it naturally unsettles established norms. Solitary investigation is a common modus operandi with creative people, and they pursue their vision regardless of others' opinions. As MacKinnon pointed out, they had the courage to act on their insights. But this group, MacKinnon felt, is not well adjusted, since the quest for creative solutions emanates from a certain temperamental turbulence.

For these creative architects, teamwork was out of the question, in that it would lower their standards, a message opposite to what Walter Gropius was then staunchly advocating. Most important, architecture was, above all, an art form, not a socially conditioned response to the world.

Ultimately, IPAR achieved what it was after. The study spelled out characteristics and conditions for the production of creative work and the nature of its makers. Those findings made explicit often hidden factors of subjective mental states. They are still worth our attention. ■

Pierluigi Serraino is a practicing architect, author, and educator living in the San Francisco Bay Area.

The Creative Architect

Inside the great midcentury personality study.

CASE STUDY

Eero Saarinen

In this excerpt from *The Creative Architect*, Serraino reveals the intriguing findings that both motivated Saarinen and made him insecure.

Saarinen was dyslexic. As a coping mechanism, he sketched his thoughts and ideas during his interview with psychologist William Smelser, who noted Eero's quest for enduring acknowledgement for his work. He needed to assert his own autonomy independently of his father, Eliel: "He answered the question about his 'best work' in terms of what his father said and what St. Peter might think," Smelser wrote. "The subject is closely identified with his father (a famous architect) but received little affection from him." Smelser also observed: "He has strong status concerns about his own greatness, and apparently this is a function of his concern about being independent of his father's name."

Smelser depicted a rather guarded individual, with peculiar views on women: "He is rather contemptuous of women in a rather tactless way," he wrote, and explained in some background notes, "He has a rather European view of women as non-intellectual, nurturing, and subordinate to males. He is also fearful of them because of his own unresolved dependency needs . . ." Smelser noted that Saarinen "has a penchant for pointing out faults in others." Furthermore, according to the psychologist, "There is also a psychopathic element to the subject in that he is somewhat manipulative and devious and tries to see what he can get by with. At the same time there is a feeling of responsibility to communicate and to teach and persuade others."

Saarinen worked deep into the night, retiring around 1:30 a.m., and waking up tired at 8:30 a.m. In earlier years he used to arrive at the office at 10 a.m., but after his second marriage [to art and architecture critic Aline Louchheim], he would get there earlier. He stated that none of his creative output would occur in the morning.

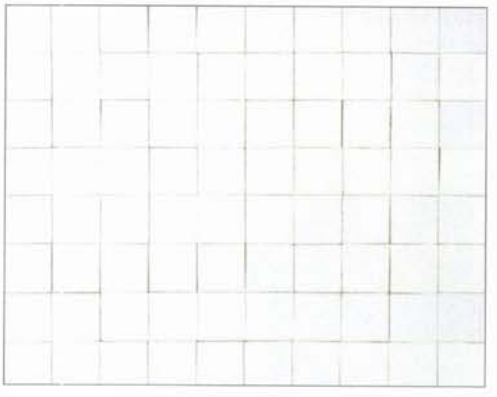
When asked to "list those things which you have done which you consider innovations in the field of architecture or design," he replied: "Innovation is the wrong word but I believe I have contributed much to architecture and furniture design—myself and my associates created the first curtain wall, first neoprene gasketing of architectural windows and first in many other new developments." It is unclear why Saarinen believed himself to be the inventor of the curtain wall system, given that projects completed earlier in the century already featured that building skin technology. In listing his own accomplishments, Saarinen—age 48 at the time of the study—exhibited no doubt about his own central role in modern architecture.

Saarinen's childhood was trying. Regarding his first 12 years in Finland, he said he was the favored child in the family but did not have many playmates. He was essentially homeschooled and learned to read from the house servants, but was never fast at it. He eventually went to school at age 10, where he was "teased" because he was fat. "School was more difficult than here. I was unhappy," he recalled. When Eliel moved his family to the U.S., Eero entered the fifth grade at age 12. By the end of high school he had barely five and a half years of formal schooling.

His father sent Saarinen to study sculpture at the Académie de la Grande Chaumière in Paris for one year. When he returned, he entered the architecture program at Yale, earning a Bachelor of Arts after three years. Contrary to what is typically stated about his apprenticeship period, Eero wrote that he spent barely three weeks as a designer for Norman Bel Geddes and just four months as a draftsman in his father's office. He seemed to think the question didn't apply to the years from 1938 to 1950 when son acted as a partner of the father.

With his drawing skill Eero stood out from the beginning: "I could get through anything with drawings," he pointed out. His precocity helped build his self-esteem and was a way to connect with his father, who "was always remote to me." The yearning for his father's attention and the concurrent need to be seen independently from him were the recurrent themes of his

SUPER TALENT
Of the 40 architects who agreed to participate in the study, Eero Saarinen (opposite, right, top) was considered by many the most creative. He had designed the sleek, glass-curtain-walled General Motors Technical Center in Warren, Michigan (above), in 1956. In his "mosaic construction test," Eero dared to make the entire work white (opposite, right, bottom).



life; this strenuous emotional race with Eliel partially explained his legendary stamina and ability to work relentlessly on his projects. At Yale Saarinen started finding himself: "I value what I do with my hands—not reading. During these three years I did very well. It was the first time the gap was closed between friends and work."

Additional remarks about his father displayed Eero's continuous focus on him and give insight into his own artistic trajectory: "We ate together [but outside of that] he was concerned with his work . . . He was a prima donna—he could only build monumental buildings . . . My father's and my birthday were on the same day—further identification [smiles slightly]." His need for social recognition was very strong during his adolescence: "[My] dominant conflict was to be liked—not by lesser members of the class though." As his confidence in his talent grew, he acted defiantly. At Yale he would deliberately sleep in the first row of non-architecture classes. Asked if he considered himself to be a creative architect, he responded unabashedly: "Yes. Well, both in invention and form . . . I am fairly aware of what's going on. I have sensitivity." Of his peers participating in the creativity study, he deemed that only five or six were good architects: "you have got them all in your program."

At the end of the interview, Saarinen asked Smelser if he found anything "unusual or odd" about the architect. In the personality assessment test of 10 traits, with rankings on a scale of 1 to 9, Smelser gave Eero only a 3 for Maturity and Responsibility and a 4 for Personal Stability and Adjustment. Eero fared much better for Sense of Destiny with a 9, and an 8 for Intellectual Competence. As an architect at the top of his game at 48, Saarinen seemed to pay an inordinate amount of attention to how others perceived him. He was indeed independent in his architectural exploration, yet peculiarly dependent on others' approval for his own self-acceptance. ■

GETTY IMAGES (TOP, RIGHT); IPAR (BOTTOM, RIGHT)

CASE STUDY

Philip Johnson

In a second excerpt from *The Creative Architect*, Serraino tells how difficult a subject Johnson was for the psychologist interviewing him. Those who knew him may have been surprised that someone so mercurial agreed to participate.

Of the 40 architects in the creativity experiment in 1958–59, Johnson was the most challenging to interview. Often he stood silent for three to four minutes without answering the questions that his interviewer, psychologist George S. Welsh, had posed, therefore compromising the potential of this evaluation. At other times, Johnson's behavior, ranging from the erratic to the peculiar during the interview, baffled Welsh, who wrote a descriptive two-page summary: "Occasionally he jumped up from his chair and looked at things on the wall or stared out the window . . . The subject seems like a controlled psychotic . . . He showed many classic features of the manic: self-centered, irritable, jumpy, flighty in ideas, arrogant, and using humor to defend himself against serious consideration of anxiety-producing topics."

Contrary to the persona Johnson created in the public domain and the media, which was characterized by gregariousness, intellectual brilliance, and cultivated vocabulary, he appeared circumspect and stubbornly speechless during much of the interview. The architect was hostile toward Welsh, and started turning questions around to his interviewer. While his intelligence and fluency came across in a few instances—he used a wide and varied vocabulary, was witty, animated, and an interesting conversationalist—he often was ill at ease. On the 10 personality traits, Welsh gave him a 3 for Personal Stability and Adjustment and a 4 for Maturity and Responsibility and Sense of Destiny. On the upper end of the rating scale, Johnson, who did not receive an 8 or 9 in any category, received a 7 for Intellectual Competence.

While Welsh acknowledged Johnson's legendary verve, Johnson came across as roundabout in his speech. He seemed to hold unrealistic standards for himself and others, and was preoccupied with sexual matters, as well as being arrogant and overbearing, failing to see his own deficiencies and limitations. In such a wide spectrum of behaviors, he was perceived as unusually self-confident, feeling able to meet nearly any situation.

If Johnson's inner life seemed in turmoil, his daily routine was conservative. He slept between eight and nine hours each night, going to bed at 10:30 p.m. and waking up at 7 or 8 a.m. In the

MIES ON MY MIND
In the 1950s, Philip Johnson (opposite, top) was still a card-carrying Modernist. He designed the Robert C. Wiley House in New Canaan, Connecticut (below), in 1953 using massing that evoked several stages of Mies van der Rohe's work. His mosaic (opposite, bottom) for the experiment brings Mondrian to mind.

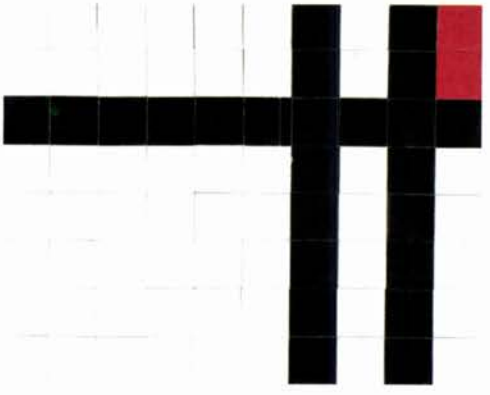
morning he would feel refreshed, stating that he would be alert all at once and begin to work immediately. He felt most effective in the mornings, "10 to 11 or so." Johnson was a nonsmoker and liked to drink and "did not like people." He claimed that he resented his older sister, who was similar to his mother: "I never liked her and still don't." When asked about his earliest memory, he replied, "My father threw a glass of water in my face once."

At 18 Johnson suffered a severe case of mastoiditis, an illness that had taken the life of his brother when the architect was 1 or 2. His academic performance was honorable—he graduated second in his high school class. His interests were literary, musical, and dramatic, and his love for the arts and ideas followed him throughout his academic meandering.

Philosophy was Johnson's main interest at Harvard College, but he took time off from his studies due to a manic-depressive episode. At age 22, he became passionate about architecture and at 24 was named a co-curator of *Modern Architecture: International Exhibition* along with Henry-Russell Hitchcock, which opened in 1932 at the Museum of Modern Art in New York City. Shortly afterward Johnson became the head of the architecture department. But by age 28 he left for populist and fascistic political journeys—first to Huey Long's Louisiana, then to Hitler's Germany. Six years later, he decided to enroll at Harvard's Graduate School of Design: "The first day in architecture school was the worst in my life. I did not see how I could stand it," Johnson said. He was in graduate school from 1940 to 1943 and "fought the administration, so the kids were for me. They actually used my book [*International Style: Architecture since 1922*] as a text."

A combination of confidence and scorn permeates his statements. Being well off, he built a house for himself in Cambridge in 1942 as a thesis project. After Harvard, he was stationed in the U.S. Army Corp of Engineers near Washington (so the FBI could watch him, he said). In 1946 Johnson returned to the Museum of Modern Art as head of the architecture department, and started his own firm in 1949, without any prior professional experience in other offices. Johnson considered his unusual talents to be design and selling. When asked what he considered to be the most important things for professional advancement in architecture, he responded, "It's all luck," then continued, "A glass house in Connecticut is the reason for my success." On the subject of creativity, he was blasé: "It doesn't help to work too hard . . . You can't get through the thought process. Sometimes you drop your ideas and then you pull one out." And when it came to his largesse, he just as casually replied, "I give most of my money to museums, and I give scholarships from time to time—$500,000 or so. But I am really stingy."

> "Johnson appeared circumspect and stubbornly speechless during much of the interview. . . . He described himself as deceitful, moody, and cowardly."



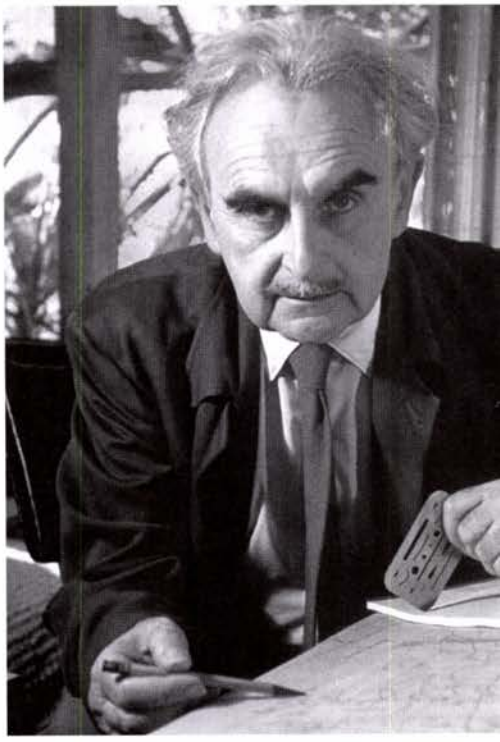
In describing his personality through a checklist of adjectives, Johnson—maybe as an expression of self-deprecation—claimed to consider himself autocratic, bitter, boastful, bossy, complaining, cowardly, cruel, deceitful, immature, intolerant, irresponsible, moody, opportunistic, prejudiced, sarcastic, tactless, and unfriendly. None of these adjectives did he provide to describe the ideal architect. On the contrary, he saw that unique individual as assertive and fair, entrepreneurial and emphatic, displaying the type of consistent thoughtfulness he saw himself lacking in. Despite this rather unflattering self-portrait, Johnson's lifelong commitment to architecture as an art form is evident in his interview responses and his performance at the IPAR study.

Just as legendary was Johnson's financial wealth, inherited from his father, a lawyer in Cleveland, Ohio. Affluence was at the forefront of his childhood memories: "We were 'rich kids,'" he told the psychologist. His father, "prosperous, gregarious, and jovial," spoiled him. He grew up in various large houses, and moved from one resort to another both in the United States and Europe. Because of these ongoing travels, he often played alone and read a great deal, although he failed to mention any titles when asked. Characteristic of Johnson's way of packing contradictions and broadcasting them, he identified with his mother, who "did not like us kids." ■

CASE STUDY

Richard Neutra

In *The Creative Architect*, Serraino's description of Neutra, based on the questionnaires and the psychological interview, points to an imposing but insecure figure.



That Richard Neutra was exceptionally driven to self-affirmation is part and parcel of the mythology he created around himself. The interview and creativity measurements provide an insight into that drive. Neutra's interviewer, Sarnoff Mednick, wrote "One can understand a significantly large portion of Neutra's behavior and attitudes by knowing two things: he must have people love him and be thoroughly devoted to him. Anything less than this is extremely disquieting. Second, to simply say that he has a high need for achievement would tend to be misleading. That statement is too mild. There is no room for question regarding his ability to solve any problem that might interest him. Not only must he be able to solve them all, but he must solve them better than anyone else. He almost literally thinks of himself as a superman."

Neutra received very high scores—the highest of the 40 architects—for the 10 personality traits. Mednick awarded him a 9—the top score—for Inquiringness, Esthetic Sensitivity, Sense of Destiny, and Maturity and Responsibility. He also fared well in Personal Stability and Adjustment (8) and Ability to Evaluate Ideas (8). Strangely, his lowest score was a 6 in Originality.

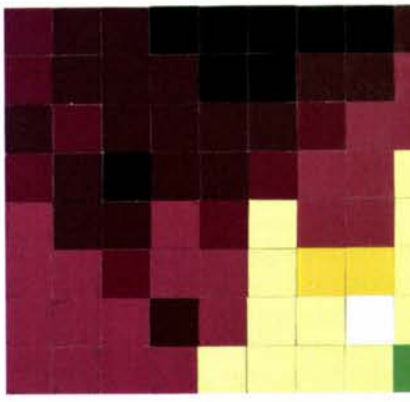
In terms of work and sleeping habits, Neutra was unusual by American standards—bedtime at 11 p.m., up at 4 a.m., and a nap in the afternoon from 2 to 4. Shortly after waking, he would be able to start his day. He considered that since high school he was at his most creative early in the morning, although he could work late into the night, but with less confidence.

While in Vienna, Neutra did meet Freud, probably due to his friendship with the psychoanalyst's son, Ernst. When asked if he had ever had an intense experience of mystical communion with the universe, life, God, etc., Neutra answered,"I think so, quite often." The same reply was given when he was asked whether he experienced desolation, emptiness, or loneliness. His fear of abandonment was palpable throughout the interview and his dominance appeared as a coping mechanism to circumvent a paralyzing fear of rejection. In his youth, whenever he was left alone, he feared that his parents would not come back, although there was no rational basis for this anxiety.

The architect described his family background in the most harmonious terms. He was raised in an apartment in Vienna—the same throughout his entire youth—by loving parents, and with older siblings who disciplined him more than his father and mother did. Free from financial worries, the household valued cultural pursuits; religion had no place whatsoever in his upbringing, despite his Jewish heritage. His father often reminded the young Richard to be a star student, yet both parents gave him a significant amount of autonomy, and the atmosphere at home was laissez-faire. There were neither punishments nor strict rules, but certainly the importance of education and knowledge was stressed. When Neutra spoke of his brothers, he mentioned they were well educated: one was a neurologist, the other a mechanical engineer. He also had a sister, but being the youngest of them was lonely while growing up. Neutra did not identify with either parent.

An excellent student in high school, Neutra stated that his professors were a great influence on him. His reading preferences anticipated his theoretical leanings in his architectural career—cosmic physics, chemistry, and poetry—Baudelaire in particular. His

> "His fear of abandonment was palpable throughout the interview, and his dominance appeared as a coping mechanism to circumvent rejection."



penchant for debating, sharing ideas, and discussing was the glue between him and his peers. During this period he hesitated over a career in mechanical engineering, but eventually chose architecture during military service. This idyllic balance between living and learning changed in architecture schoo at the Technical University of Vienna. He found his professors there most ineffective, "the curriculum was stupid," and he engaged himself wholly in philosophy courses at the university. Vienna was at the peak of its cultural and artistic power when Neutra was maturing, and the young student immersed himself in theater, opera, concerts, and readings. When asked about his heroes, he listed Victor Adler a psychiatrist who was the leader of th socialist party of Austria, Nietzsche,

Hugo von Hofmannsthal, and Hamlet-type actors.

Neutra declared the work of Otto Wagner to be the trigger for his interest in architecture. He saw his buildings while in elementary school, and Wagner remained his hero ever after. Additionally he internalized Wagner's fighting for modern architecture in Vienna: "He had a great battle with the city to put in modern stations on the railroad. He won." He stated that he was the favorite pupil of Adolf Loos and added, "I am now the architectural hero of Vienna. I have taken Otto Wagner's place as a hero. They awarded me the prize." Early in his career Neutra was an associate of Erich Mendelsohn in Berlin, which made his emigration to America in October 1923 very rough. As he recalled: "I didn't see how I would make a living. I started in Brooklyn as the lowest paid draftsman. Quite a change from [being an] associate of Mendelsohn."

When Neutra went to Los Angeles in 1925 and began designing the Lovell Health House, he felt that he had found his voice and a chance to demonstrate his own architectural principles. He gave 1927 as the house's completion date, although it was actually finished in 1929 and showcased in an article written by the client, Dr. Lovell, for the *Los Angeles Times,* published toward the end of 1929.

Architecture was the fusion of Neutra's interest in art and science, although he expressed frustration over his inability to "get a team together that functions." His heroic stance became once again evident when he was asked about the value he placed on creativity in architecture: "Not being exotic about forms, but taking a battle memorial and making it into a shrine of the free world."

When pressed to pick his best work, he chose the Kaufmann House in Palm Springs (1947): "It is a building outside of cultural precedence. No one has built on a desert. Only nomads live in the desert." But his immediate outlook was "desperate." His then partner, Robert Alexander, was leaving him, and he feared the impact this would have on clients. More likely this anxiety over impending change was a result of the tension that affected his entire emotional life: an overwhelming intellectual energy fueled by an anxiety over being abandoned, whose origins might never be known. ■

SUN KING
After arriving in Los Angeles in 1925, the Viennese-born Richard Neutra (opposite, top) quickly became known for his elegantly Modernist design. Neutra's 1955 Kronish House (above) exemplifies the continual refining of his vocabulary. In his mosaic for the creativity test, Neutra shows a willingness to deal with color.

The Creative Process Observed

German photographer Thomas Demand has frequently created his own art by interpreting the creative process of others. His recent book *Model Studies: Koto-ku* reflects his many visits to the SANAA office in Tokyo, where he selected and photographed architectural models from among the heaps of paper and cardboard mock-ups, discarded and jumbled all over the studio. The repeated making of such simple models is central to the architects' generation of designs. "Since they don't aspire to a tidy and empty workshop," he writes in the book's introduction, "the thought process of every project survives. Both past moments of abandonment and sparks of inspiration are all parked somewhere in remote corners." Two of Demand's images of models for SANAA's Grace Farms are among the major artworks that have been installed at that new institution in rural Connecticut. ■

Kindergarten 22, 2015, framed pigment print, 122.5 x 156.1 cm

Foundation 88, 2015, framed pigment print, 81 x 61.2 cm © Thomas Demand, VG Bild-Kunst, Bonn/ARS, New York
Courtesy Grace Farms Foundation, New Canaan, Connecticut

Eureka!

Designers from five firms share their very different creative processes, from research to playing with clay and camping out.

Steven Holl and Raphael Mostel

Steven Holl Architects, New York

"IT ALL STARTED with a very slow bartender at a gallery opening," says composer Raphael Mostel of his longtime collaboration with architect Steven Holl. The two met about a decade ago while waiting in line for drinks at the opening of an appropriately interdisciplinary event, a show featuring the work of composer John Cage and video artist Nam June Paik. Since then, the two have worked together, consulting with each other on myriad projects including one of Holl's commissions, set to open later this year, a Maggie's Centre at St. Bartholomew's Hospital in London.

Mostel recalls discussing the project over dinner with Holl, who was "searching for a way to honor the history of the place." Their conversation touched on topics such as the Guidonian hand (a medieval mnemonic that helped musicians learn to sight-sing) and neume notation (a predecessor to the five-line staff), "all of which Steven began sketching or noting in his sketchbook," says Mostel. "That became the kernel for his magnificent realization of the project."

Well known for his prolific architectural watercolor sketches, Holl's creative process always begins on a 5-by-7-inch pad. "When I draw and paint, I connect the subjective and the objective. It's a way of open thinking and free-feeling, and it's unpredictable," he says. "In order to get closer to a dreamlike subjectivity, I like to make these little drawings and paintings at dawn, before breakfast. There is a joy in this way of beginning."

Holl values quick sketches for the experimentation they allow. "These subjective studies open paths to be tested in the studio." More than 25,000 paintings in his firm archive testify to his dedication to the practice.

Similarly, Mostel ignites the creative spark and disrupts fallow periods through dogged perseverance. Polish composer Witold Lutosławski once told him, quoting writer Sławomir Mrożek, "Inspiration begins on page 60." In Mostel's own words, that advice means one shouldn't wait for inspiration to strike. "Once you're focused enough through working, it comes of its own accord."

Along with Dimitra Tsachrelia, an associate in Holl's firm, Holl and Mostel teach a series of studio classes at Columbia University called the Architectonics of Music. During the first weeks of the course, students select works of 20th-century composers and geometrically translate them into architectural designs. "It's very different working with Steven as opposed to working with anybody else," says Mostel. "There's always a sense of play, as if the terms of the game can change on a dime. He's constantly just turning the soil over, and you're all of a sudden sowing a completely different crop." *Miriam Sitz*

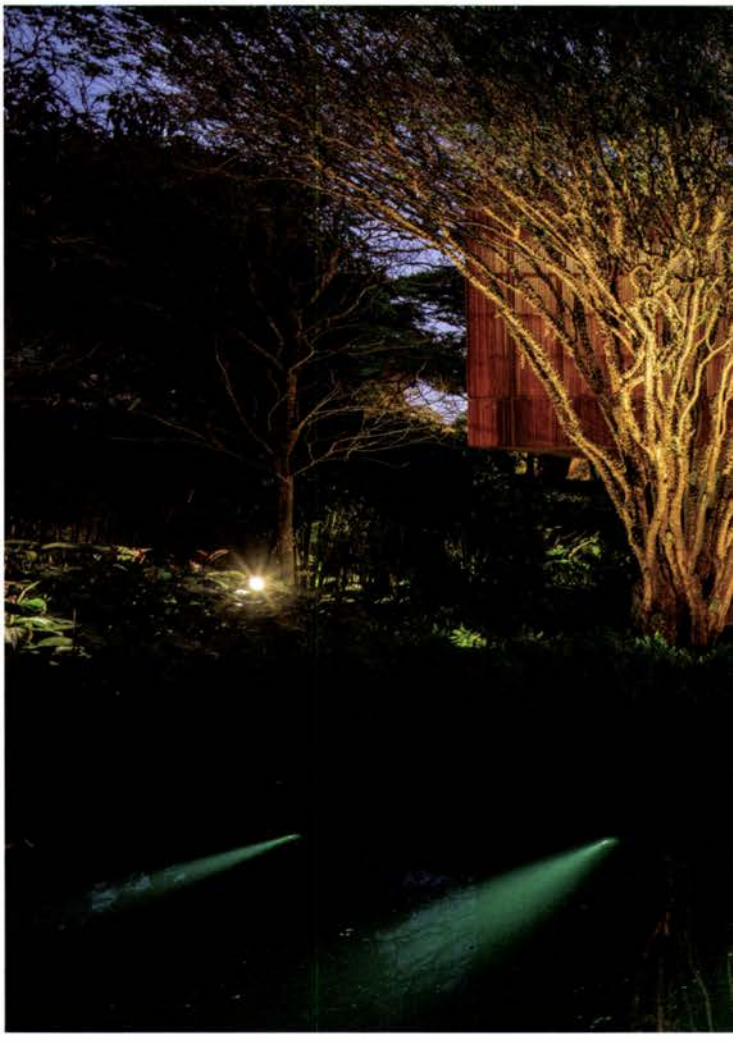
IN HARMONY Steven Holl (opposite, top) and Raphael Mostel (above) are on the same wavelength. In Holl's final design for the Maggie's Centre St. Bart's (opposite), colored glass scattered across the white glazing of the building's exterior evokes neume notation, while the concrete frame branches outward like a hand. The Lewis Center for the Arts at Princeton University (right), slated for completion in 2017, also has music in its DNA: one of Holl's early sketches (top) of the design quotes Mostel's description of Morton Feldman's music.

Marcio Kogan

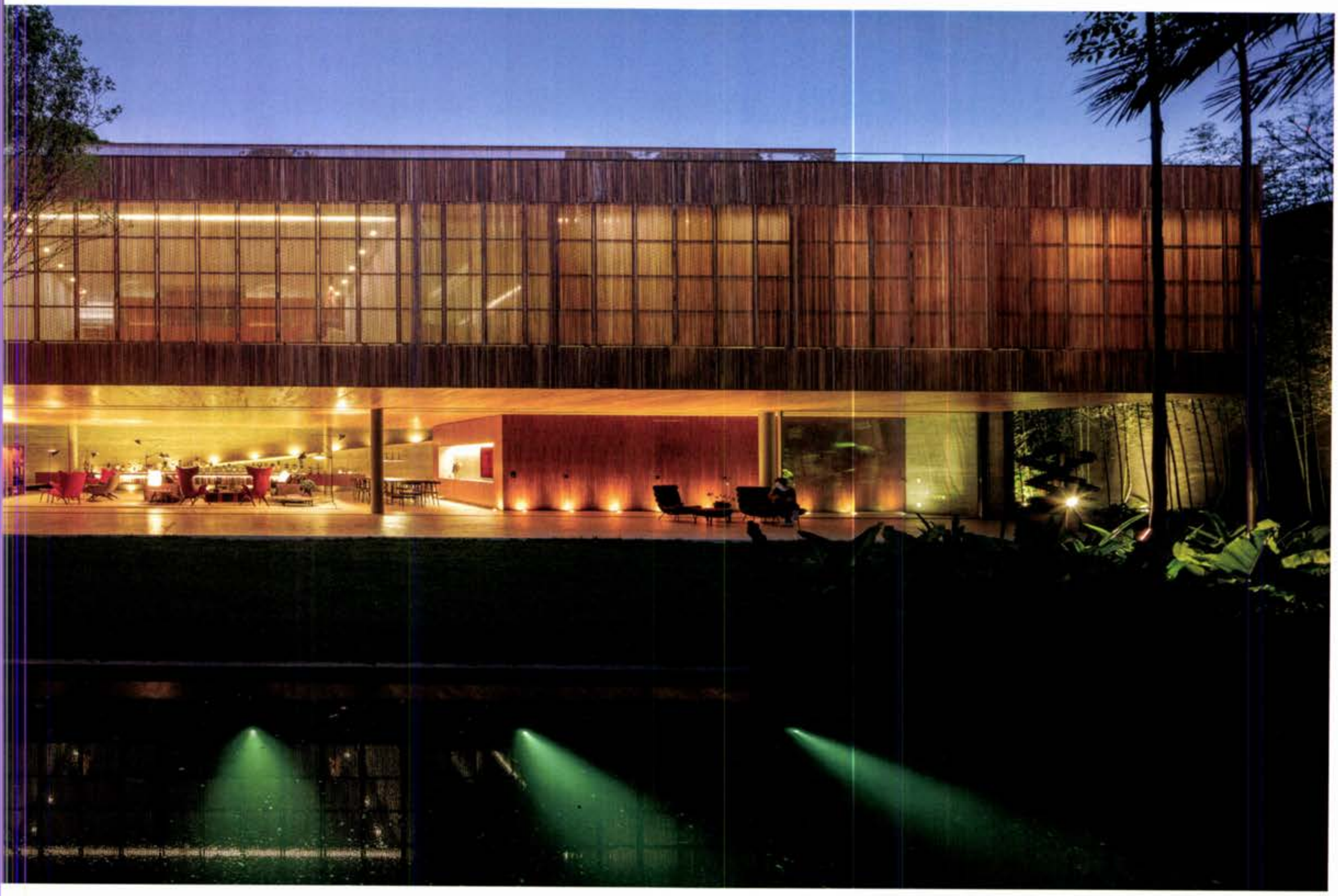
Studio MK27, São Paulo

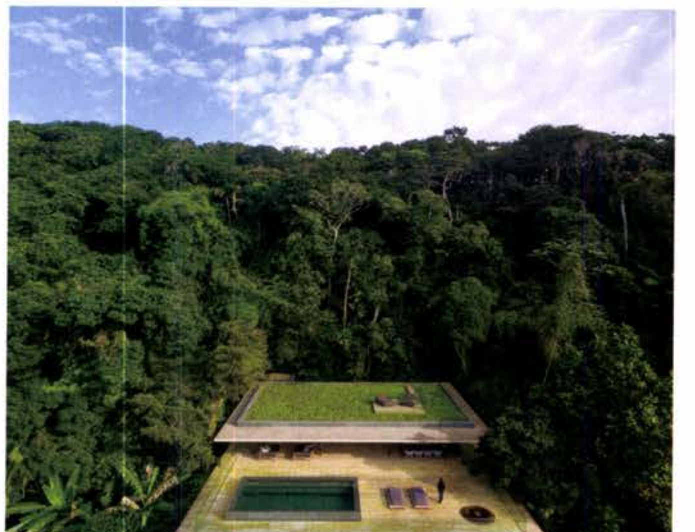
FOR MARCIO KOGAN, the São Paulo–based architect who has been obsessed with film from a very early age, making movies and making architecture are inextricable pursuits. "For me, a new design project is like a huge fog—I can't see anything," says Kogan, who is known for his opulent though understated houses and the madcap short films he creates that star these buildings. "I get a bit anxious about solving the problem—I become a little afflicted." To navigate these mysterious landscapes, he imagines himself as a character walking through the haze. He might envision a white wall; beside this white wall he sees a spiral stair and may decide, in his mind, to put a window in this wall. Then he might shift its position and change the facade again. "I create stories about these imaginary projects, picture someone passing by who is looking at or thinking about this facade," he says. "It's the way my mind works—I am addicted to thinking as if I'm writing a script." At night he lies awake in bed ruminating on his stories. But once he is ready to bounce ideas off his team and build a conversation, things become more concrete. "At this point, the stories are becoming sketches," says the architect. His team then transforms his ideas into drawings, computer models, and renderings.

Kogan says he sees the world as if looking through a viewfinder. "I imagine things in my life on a screen. In my projects, there is this wide perspective: forms are low-slung and very broad," he says. Kogan uses the moving image for more literal versions of his stories; once a house is complete, he might film an eccentric tour, guided by a maid or a cat, for example. Architecture tells an abstracted version of the tale, one that is communicated by triggering emotions. But there is one emotion he is unable to spark with his built work, and moviemaking fills this void for the architect. "All my films have humor—I have a lot of humor in my life," Kogan notes. At a lecture a few years ago, a student asked him to explain the comedy in his architecture. "I stood in silence for five minutes. I left the university and kept thinking and I had no answer," he says. "Architecture is a very serious thing—there is no humor." *Beth Broome*



CINEMATIC SPACES Kogan (top, left) frames a shot of the cat that stars in his 2013 film on Casa Toblerone (2011) in São Paulo. He has given several of his houses, such as Casa Redux (São Paulo, 2014) and Casa P (São Paulo, 2012), top billing (above and opposite, bottom middle). Other recent projects include 2015's Casa da Rampa in São Paulo (top) and Casa na Mata (Jungle House) in Guarujá, Brazil (opposite, bottom right).





PHOTOGRAPHY (CLOCKWISE FROM OPPOSITE, TOP LEFT): © LEA VAN STEEN;

David Darling and Joshua Aidlin

Aidlin Darling Design, San Francisco

WHEN JOSHUA AIDLIN was a freshman in college studying architecture, he brought a project home to show his father, who was then the head of the sculpture department at the Cleveland Institute of Art. As Aidlin described how he arrived at the form, his father stopped him to say, "The day you define your process is the day you should hang it up."

After recalling the anecdote with a laugh, Aidlin, who runs the San Francisco firm Aidlin Darling Design with principal David Darling, doesn't hesitate to describe a variety of approaches he uses for leading the firm of about 20 people to successful designs.

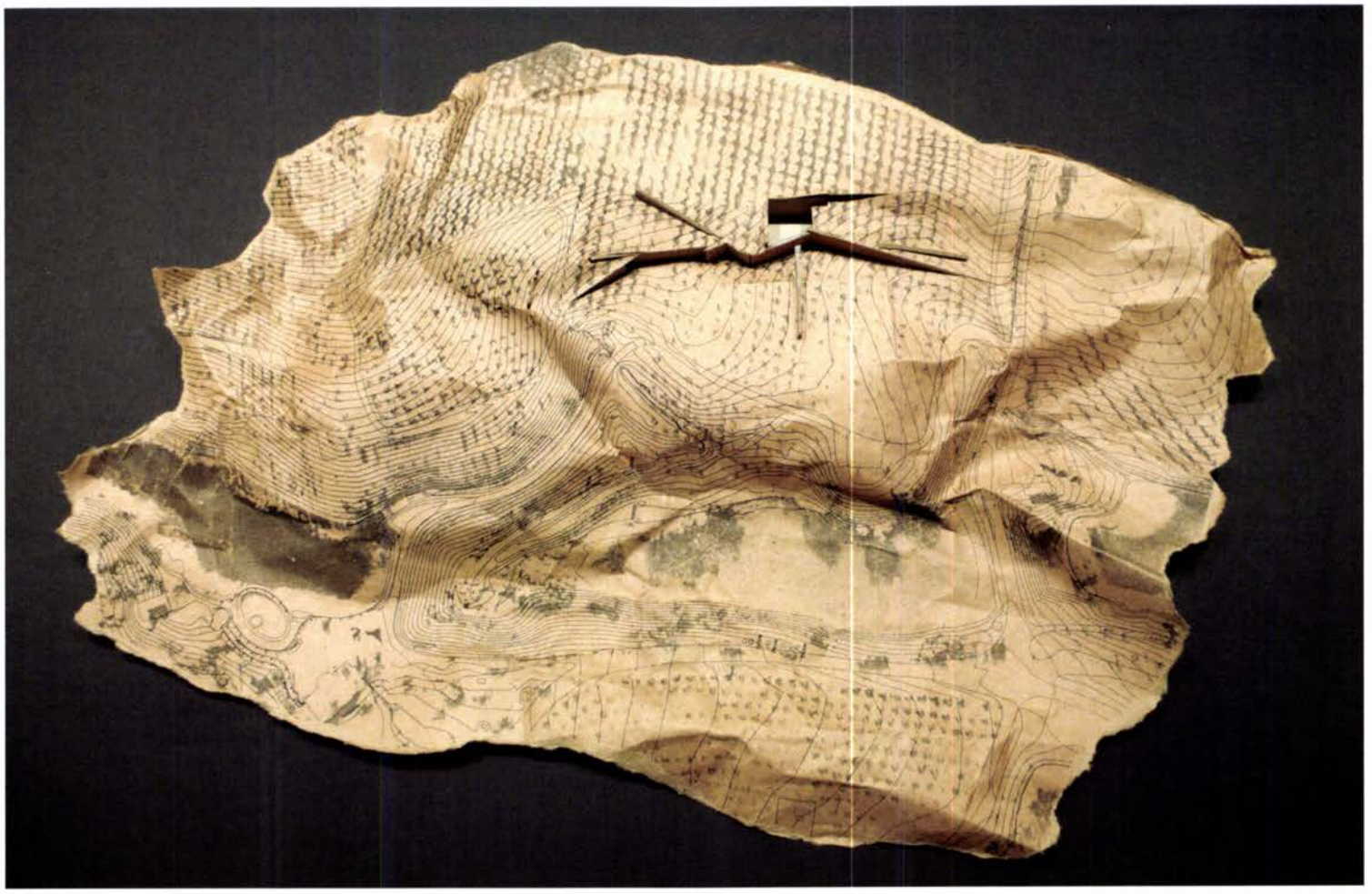
For a courtyard residence, the team did a series of bas-reliefs to better understand the threshold and "engage the concept of foreshadowing." For a house in Doha, Qatar, they completed string and sculptural studies to figure out how to carve the flat, barren landscape. For a winery, the architects used a paper bag to create a model, mimicking topography with the bag's folds. "We fully embrace the computer as a great tool, but we typically don't start there," says Aidlin.

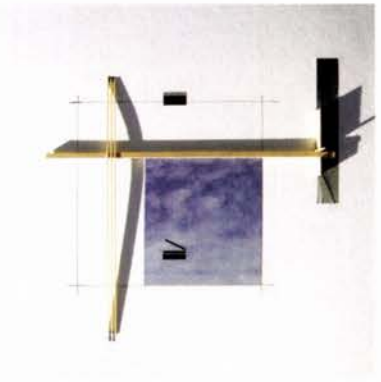
One constant in the beginning stages of a project is camping out on the site. It's a way for Aidlin, Darling, and the project architect to become immersed in the context and read the site with all five senses before coming up with early design schemes. "We're not adding buildings to a context; we try to listen carefully to extract a building. It's much more sensitive, we hope, in its end result," says Aidlin.

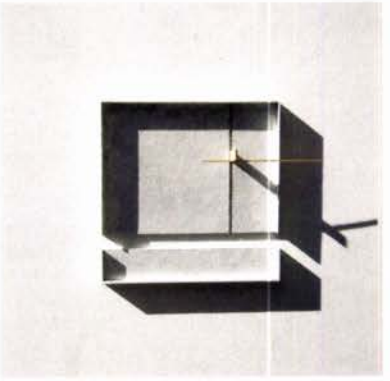
The firm also holds office-wide critiques. For a 30,000-square-foot high school in Santa Rosa, California, that recently broke ground, the entire staff pinned up their ideas after learning about the project's constraints. "It's interesting how much we unconsciously absorbed from that session," says Aidlin. Most project teams include either Aidlin or Darling—but not both. "The second principal only comes in during major critiques. Some of the most important insights are from that person who's been in on it for just an hour," notes the architect.

Aidlin Darling also relies on outside contributors—artists, fabricators and consultants—with whom they brainstorm and shape designs. "If you actually broke down where an idea came from . . . the web is massive," says Aidlin. "That is the beauty of architecture." *Laura Raskin*

MULTIMEDIA MUSINGS For a winery, the architects David Darling and Joshua Aidlin (above) used a piece of crumpled paper bag (opposite, top) to mimic the site's topography. The firm sketched out their design for Stanford University's Windhover Contemplative Center with watercolor (opposite, bottom). The final form of a courtyard residence (left) was informed by a series of bas-reliefs (opposite, center).







Anna Heringer

Studio Anna Heringer, Bavaria

ANNA HERINGER has to wash her hands before she takes a phone call in Venice because she is in the midst of constructing an installation there with 25 tons of mud. To come up with the form for her project, which she is crafting for the main exhibition of the Venice Architecture Biennale (and of which she cannot reveal details), Heringer has been doing what she likes to call "claystorming"—shaping a hunk of clay until it "feels right."

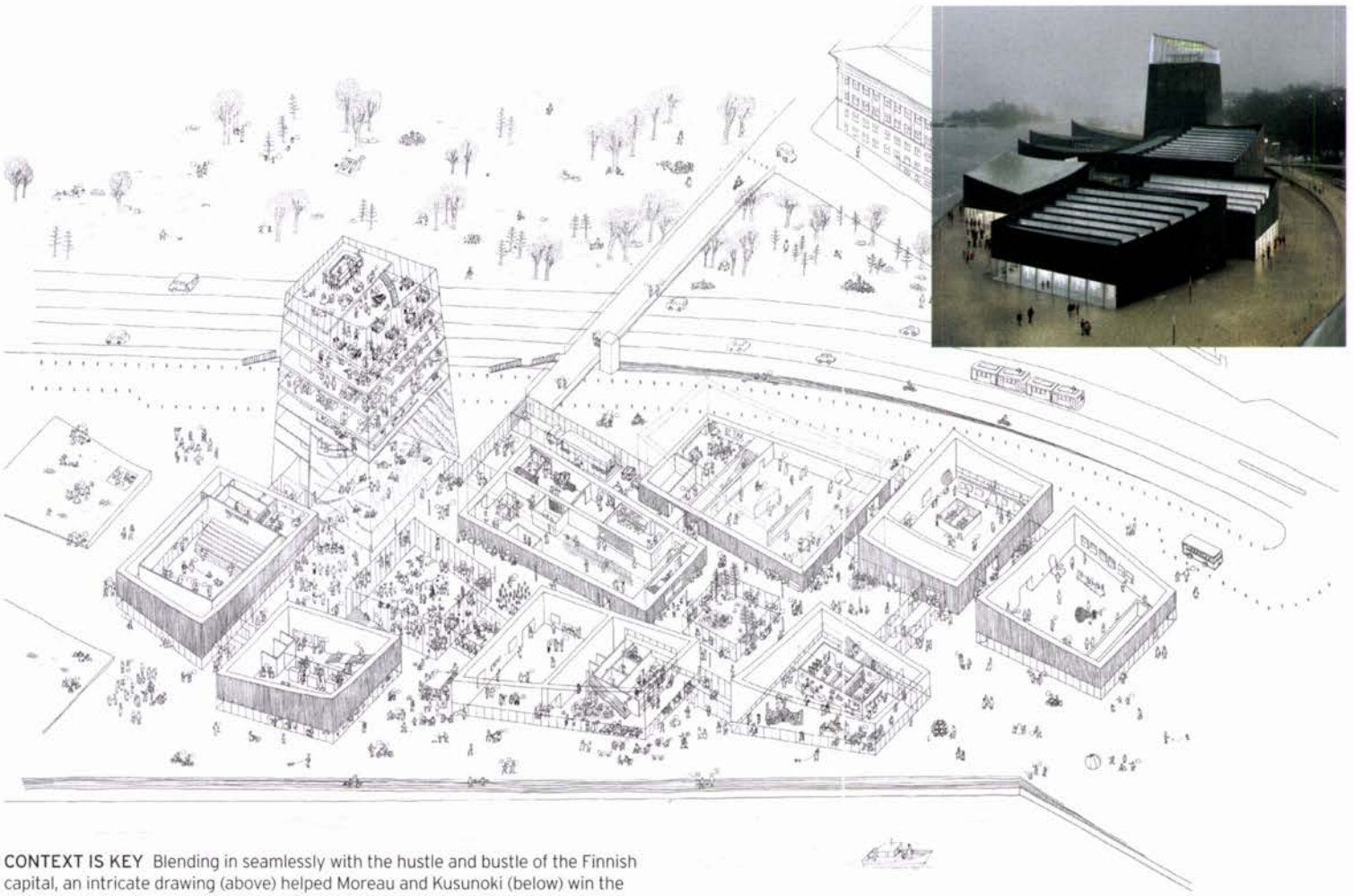
Heringer, a German architect whose practice is based in Laufen, talks a great deal about following her impulses, something she says that she lost as a student, when she felt pressured to make even the simplest sketch perfect. "I was coming from an emotional place, and it was not appreciated. And now what I'm using is common sense and intuition."

Heringer won an Aga Khan Award for Architecture in 2007 for her earth and bamboo school in Rudrapur, Bangladesh, built with the help of local craftspeople, students, and teachers. The project was not an outlier for the architect: her focus is on sustainable design, often in places where resources and basic services are limited. She takes cues from the climate, the skills of local laborers, and readily available materials to help guide a concept. "I create my architectural dialogue within these parameters," says Heringer. She laments the fact that so much of what is built today ignores its context. "You can build with concrete anywhere."

The architect begins each project by thoroughly investigating the potential of a site. "Then I just let go of the ego and the strife," she says, and the design solution comes naturally. She honed this intuition while building a training center and residence for electrical engineers, also in Rudrapur, orchestrating laborers without drawings or plans. "I had a feeling in my belly, and it was absolutely fascinating," she says. (She rarely uses a computer as a design tool.) Her approach combats what she observes as an excess of rigid, unemotional architecture in the world—something she suggests might be a bit "male."

Heringer not only uses "claystorming" in her own work, but also in her role as a visiting professor at the ETH in Zurich, where she teaches alongside Austrian architect Martin Rauch, an expert in rammed-earth construction. "Working with clay is so immediate," she notes, "and at some point the hand—rather than the brain—is taking over the design." *LR*

GETTING THEIR HANDS DIRTY Heringer (top, left) uses a process she calls "claystorming" to conceive designs. She and architect Martin Rauch designed a series of sculptural meeting rooms with stabilized clay walls (above) for employees of Omicron Electronics in Klaus, a municipality in Vorarlberg, Austria. At the ETH in Zurich, she has her students "sketch" with clay (right).



CONTEXT IS KEY Blending in seamlessly with the hustle and bustle of the Finnish capital, an intricate drawing (above) helped Moreau and Kusunoki (below) win the Guggenheim Helsinki design competition. Kusunoki says she is more "skeptical" of the corresponding computer renderings (above, inset).

Nicolas Moreau and Hiroko Kusunoki

Moreau Kusunoki, Paris

PARIS-BASED ARCHITECTS Hiroko Kusunoki and Nicolas Moreau founded their eponymous husband-and-wife firm in 2011 and seemed to come out of nowhere when their design won the Helsinki Guggenheim competition last year. In addition to photo-quality renderings of a cluster of pavilions clad in charred timber, the architects presented Kusunoki's mind-boggling, Richard Scarry–meets–*Where's Waldo* drawings of the museum and the surrounding city in their competition entry.

Using fine-tipped black pens on white paper, one of Kusunoki's flat-looking drawings of the Helsinki waterfront is not only a meticulous and exhaustive aerial view, it is also populated with rounded, miniature people. Some are walking dogs, one is teaching children on the grass, and another takes his bike across a bridge. Many have speech and thought bubbles above their heads, implying the collective hum of the city.

Rather than creating drawings like these at the beginning of projects, to help articulate the concept, Kusunoki conceives them after the initial design has been completed, to help them refine it. "All of the animation that I draw is kind of a summary," she says. The illustrations help her and her team test how well a project sits in the context of a city, and how the negative space around it might be used. "We are quite skeptical about 3-D renderings," she says. While such images are

lush, and easily absorbed by clients and others, Kusunoki says she has a hard time imagining herself as the "beautiful woman" often found in them. She hopes people will spend time with her drawings and will be able to envision themselves inside of a project by identifying with the characters.

As for the firm's initial dive into a project, Moreau says that they always begin by studying the site in order to judge the appropriate size and scale for a building—one of the hardest things to get right. After fine-tuning a project's dimensions and scale on the computer, the architects break out scissors to start modifying the plan and sections and assembling the pieces like a collage. Model-making over dinner and some drinks helps keep the mood playful and everyone motivated. (Moreau previously worked for SANAA, another firm dedicated to model-making.) "We are a young studio," says Kusunoki. "We can provoke something that does not seem possible. We can make something quite weird." *LR*

Avant-Grade School

Two teachers have been bringing out the inner architects in Moscow children since the Soviet era.

BY FRED A. BERNSTEIN

Vladislav Kirpichev believes that all children are creative geniuses. For 40 years, he and his wife, Liudmila, have been proving it at EDAS—the Experimental Children's Architectural Studio, in Moscow. Kids as young as 2 come to the Kirpichevs' classes to learn about the basics of architecture—form, space, rhythm, texture, color. With their enthusiasm, the Kirpichevs have not only inspired several thousand Muscovite youngsters to paint, draw, and build models, but they have won a long list of admirers in the grown-up architecture world. "It's a rare and beautiful thing," says architect Steven Holl, who has been observing EDAS classes for at least 20 years. Calling it a "miniature Black Mountain College," referring to the legendary progressive arts institution, Holl says the work that comes out of EDAS is extraordinary: "I'm not exaggerating. It's as good as many first-year architecture studios."

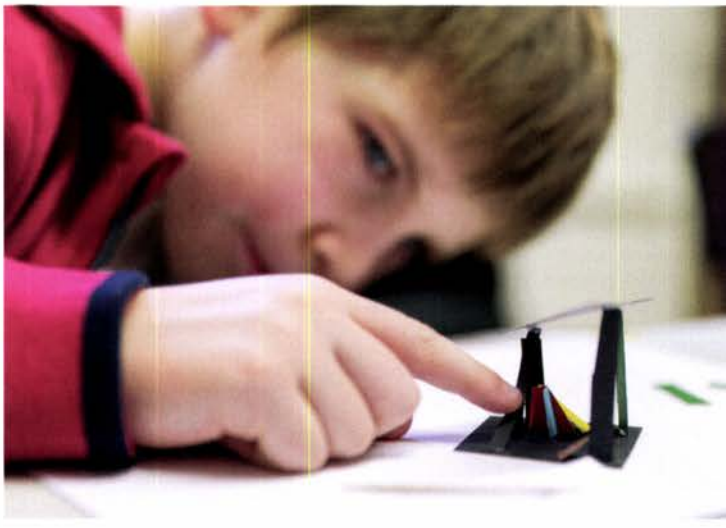
The key to the children's talents, Liudmila says, is that they are "more anarchistic" than grown-ups. "The smaller ones are less limited by obligations. They don't know the correct answers to the questions. That's why their work is never boring."

The program was begun in the Soviet era, which may explain why Vladislav has called education in Russia "child abuse." Liudmila and he, both of them architects, presented an alternative, which flourished despite political repression. "Creative people always find a way, no matter what," says Liudmila. These days, she says, EDAS is thriving, because of the country's relative openness. Some students come once a week for classes at the studio, others several times.

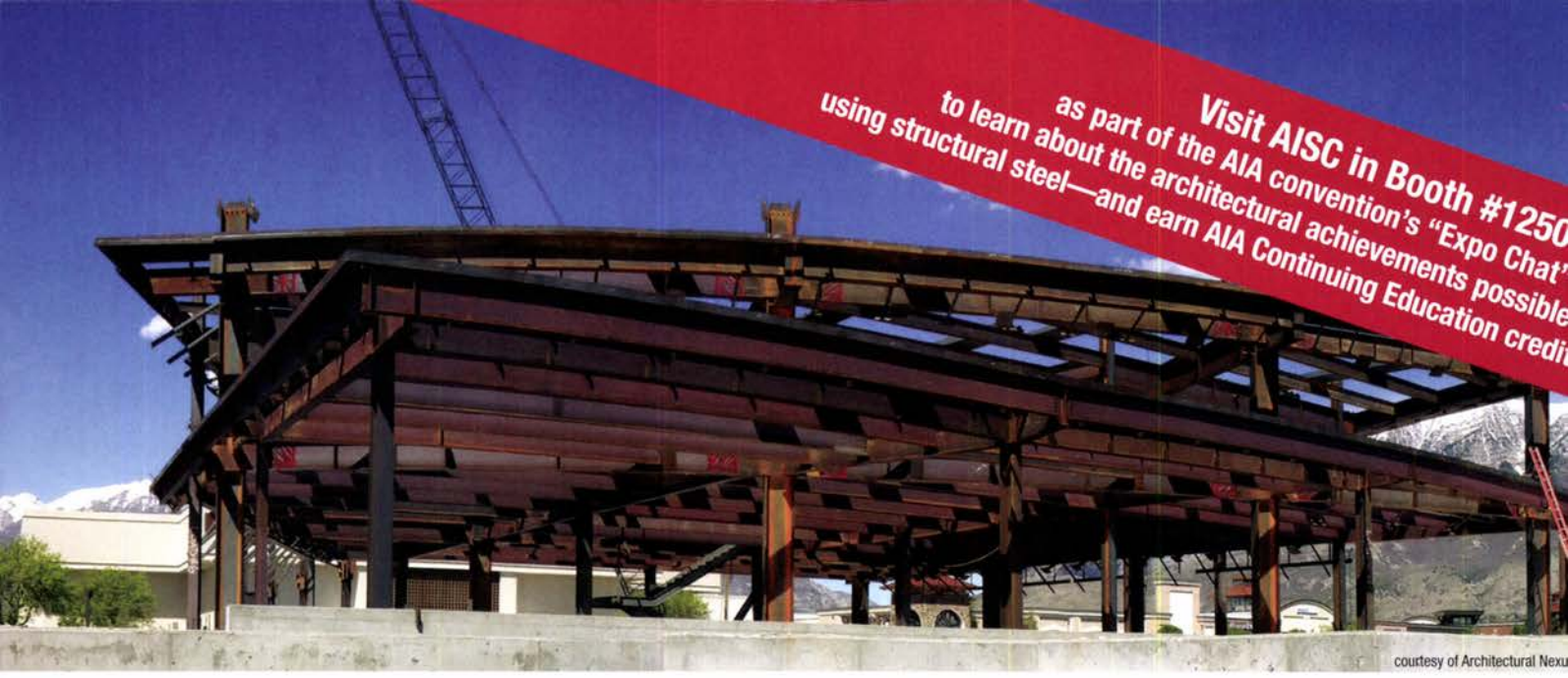
The school is run for profit. "People in the know in Moscow send their sons and daughters to this class," says Holl. Many are wealthy. But there are also students who can't afford to pay, and don't, Liudmila said by phone from Frankfurt, where the couple had taken a group of youngsters to see buildings by Coop Himmelblau, Frank Gehry, Richard Meier, and others. (They will also make a school trip to the Venice Architecture Biennale this summer.)

The Kirpichevs plan to publish a book, as early as this fall, documenting 40 years of student work at EDAS. The book, they say, will contain thousands of images.

Greg Lynn, the Los Angeles–based architect and theorist, has participated in EDAS classes in Moscow and during the Kirpichevs' occasional visits to the U.S. He calls the couple amazing: "They get kids thinking about transportation, energy, landscape, and urban living, all through drawings, paintings, and room-scale models, and then they have international architects and urbanists come in and talk to them about it. It is as inspiring for the architects as it is for the kids." ■



HEAD START
Vladislav Kirpichev (above) and his wife, Liudmila, work with students at the Experimental Children's Architectural Studio to produce vibrant sketches and models.



THERE'S **ALWAYS** A SOLUTION IN STEEL.


courtesy of Architectural Nexus

Ethan Bedingfield
Architectural Nexus

The AISC Steel Solutions Center is a free service for people who need technical assistance, innovative ideas or tools to make structural steel design easier.

Just ask Ethan Bedingfield, AIA, NCARB who works at Architectural Nexus in Salt Lake City, Utah. Ethan was designing University Place Building One in Orem, Utah, part of the University Mall being developed by Woodbury Corporation, one of the West's largest and most experienced full-service real estate development firms.

"Building One includes about 26,000 square feet on the ground level, and then approximately 139,000 square feet on levels two to five," he says, "and sits in the parking lot of the existing mall, which meant we had to replace and add parking by going below ground. The changing axis of the building as it rises (the parking level below a level of retail with 4 levels of office space that have a separate axis) is what made the steel design so complicated."

His inspiration came from the site constraint itself. The project used all steel moment framing, affording him extraordinary flexibility. Costs also played a role, and was one of the reasons he reached out to the AISC Solutions Center.

"The base is a rectangle that fills the whole site we had available to us," Ethan explains. "We are within a foot of hitting utilities. We twisted the top of the building rather than following the grid of the immediate context, relating it to the major additions that will happen behind the mall and also facing it to the extremely busy intersection on which the project sits. That's where we landed in our initial studies. Once we had it to that point, I remembered meeting Tabitha Stine, S.E., P.E., LEED AP from the AISC Steel Solutions Center at a conference. I called, and we sent over Revit files and the narrative we had describing our intent. University Place was the first time I used the Solutions Center. I've used it a few times since, but this was the most impactful experience. I will definitely use them again."

Ethan explains that some of the options they received were unexpected, but they all stimulated his thinking, including the one that grabbed their attention the most. "It was the use of SidePlate for our moment frame for the lateral system," he says. "We ended up saving around $70,000 because of it and the aesthetic design was unimpacted."

Ethan says the AISC Solutions Center does two things: adds to creative thinking and validates your own design. "I don't know why you wouldn't call them on every project for the second set of eyes," he adds.

From typical framing studies to total structural systems, including project costs and schedules, the AISC Steel Solutions Center can provide you with up-to-date information and innovative solutions for your project. The AISC regional staff covers eight different geographic regions across the U.S. They give more than 50 presentations a year on various steel topics. Learn how our regional staff can work with your company. Call 866.ASK.AISC (866.275.2472) or email us at solutions@aisc.org

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Musée Unterlinden | Colmar, France | Herzog & de Meuron

MEDIEVAL MAKEOVER

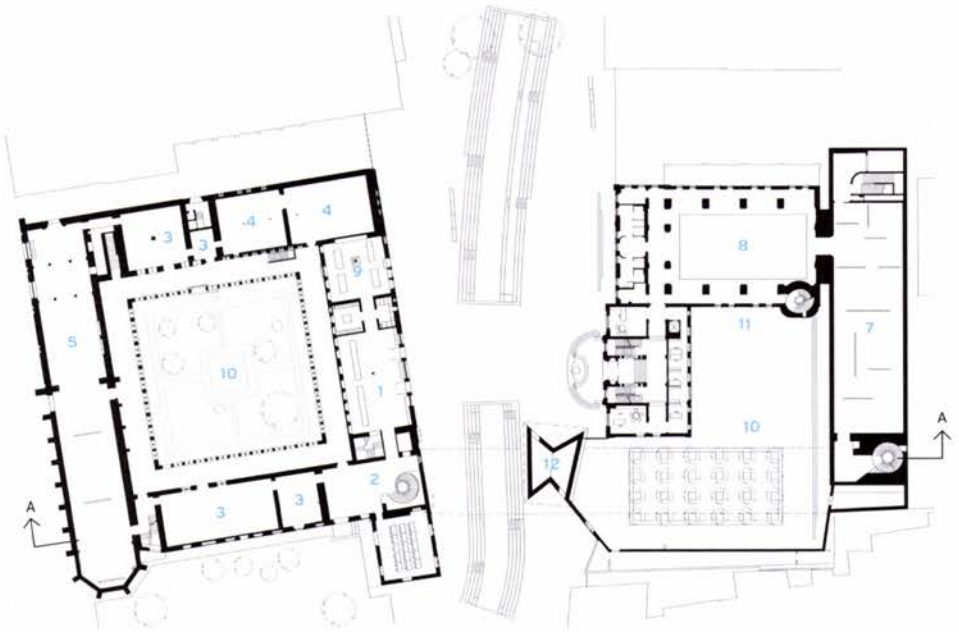
With a few carefully considered interventions, Herzog & de Meuron expands a storied museum.

BY JANELLE ZARA

The picturesque Alsatian village of Colmar is a rare gem; throughout the destructions of the French Revolution, the two world wars, and the various territory disputes over Alsace between Germany and France, Colmar's medieval timber rowhouses and Gothic cathedrals remained intact. Rumor has it that the quaint town inspired the architecture in Disney's animated film *Beauty and the Beast*. But in a recent renovation of the city's Musée Unterlinden, Herzog & de Meuron made a conscious effort to avoid the preciousness of a Disney film.

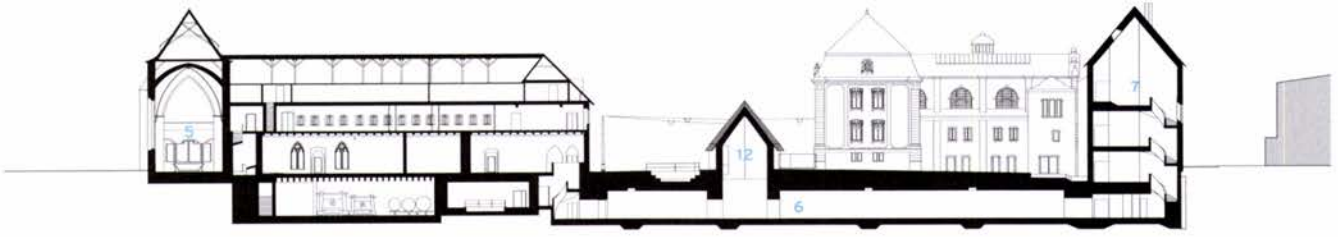
In late January, the Swiss firm completed an extensive six-year expansion of the museum in collaboration with chief architect of French National Monuments Richard Duplat. Unterlinden and its collection of early-Renaissance works had occupied the same cloistered 13th-century Dominican convent since its founding in 1849, but after several sizable donations of modern art over the years, the

HISTORY REVEALED
As part of the project, the architects unearthed the previously covered Sinn Canal (opposite) and created a new public space between a former swimming pool and the old convent. They designed a new brick-clad wing, the Ackerhof (background, below), to house modern art. A copper-roofed Petite Maison recalls an ancient mill that once stood on the site.



1 ENTRANCE
2 ORIENTATION
3 11TH-16TH CENTURY GALLERIES
4 SCHONGAUER GALLERY
5 CHAPEL
6 19TH-20TH CENTURY GALLERIES
7 ACKERHOF
8 EVENT SPACE
9 MUSEUM STORE
10 COURTYARD
11 CAFÉ
12 PETITE MAISON

GROUND FLOOR



SECTION A - A

collection began to outgrow its home. Seeking more space, the museum acquired the early-20th-century neo-baroque indoor swimming pool across the street in 2003. And in 2009, Unterlinden launched a design competition seeking an architect who could integrate this unusual new space with its existing structures.

One of the main challenges of the project was to honor the original architecture "without falling into the trap of postmodern kitsch," says Herzog & de Meuron senior partner Jacques Herzog. To create a foil in size and scale to the convent's centuries-old chapel, where the early-Renaissance collection still resides, the firm designed the Ackerhof. This new wing for modern art, placed behind the bathhouse, is clad in rough-hewn, hand-split bricks and has a copper roof. In contrast to the chapel's soaring, groin-vaulted ceiling and heavily ornamented interiors, however, the Ackerhof has been divided into three floors of pristine white modern galleries. The roof, not vaulted like the convent, encloses a top-floor gallery under a gable.

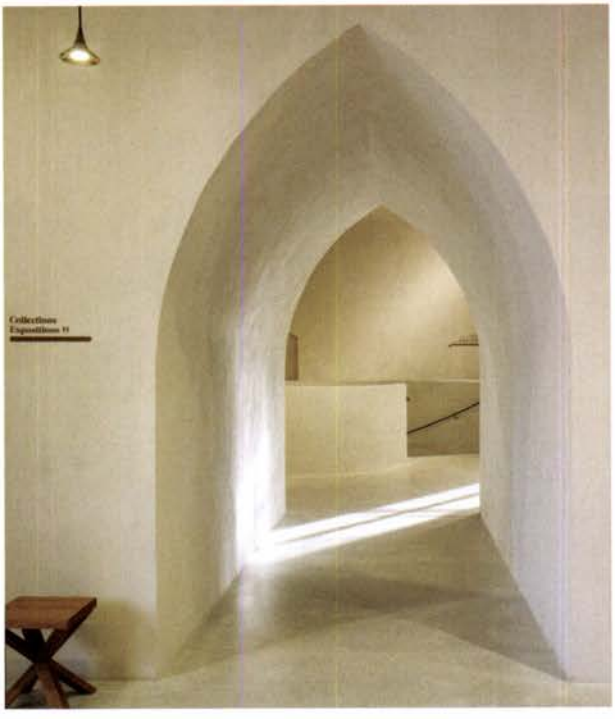
The two buildings bookend the newly expanded Unterlinden campus, but its core required some urban intervention. When the architects arrived, the pool house and convent were separated by a bus stop and parking lot. To create a new urban public space, they unearthed the previously covered Sinn Canal, which now marks a boundary between the nearly symmetrical old and new wings. They lined the canal's banks with limestone steps ideally suited for picnics.

For visitors, the circulation path begins at the convent, whose lancet doorway has been resituated to face the new public square. In the entrance hall and bookshop, the architects undid aesthetically unsympathetic interventions, peeling away layers of plaster ceiling to re-expose medieval wood beams. Throughout, new lancet windows invoke a recurring medieval architectural form seen both in the original doorway and in the ornate gothic arches of the convent's cloisters.

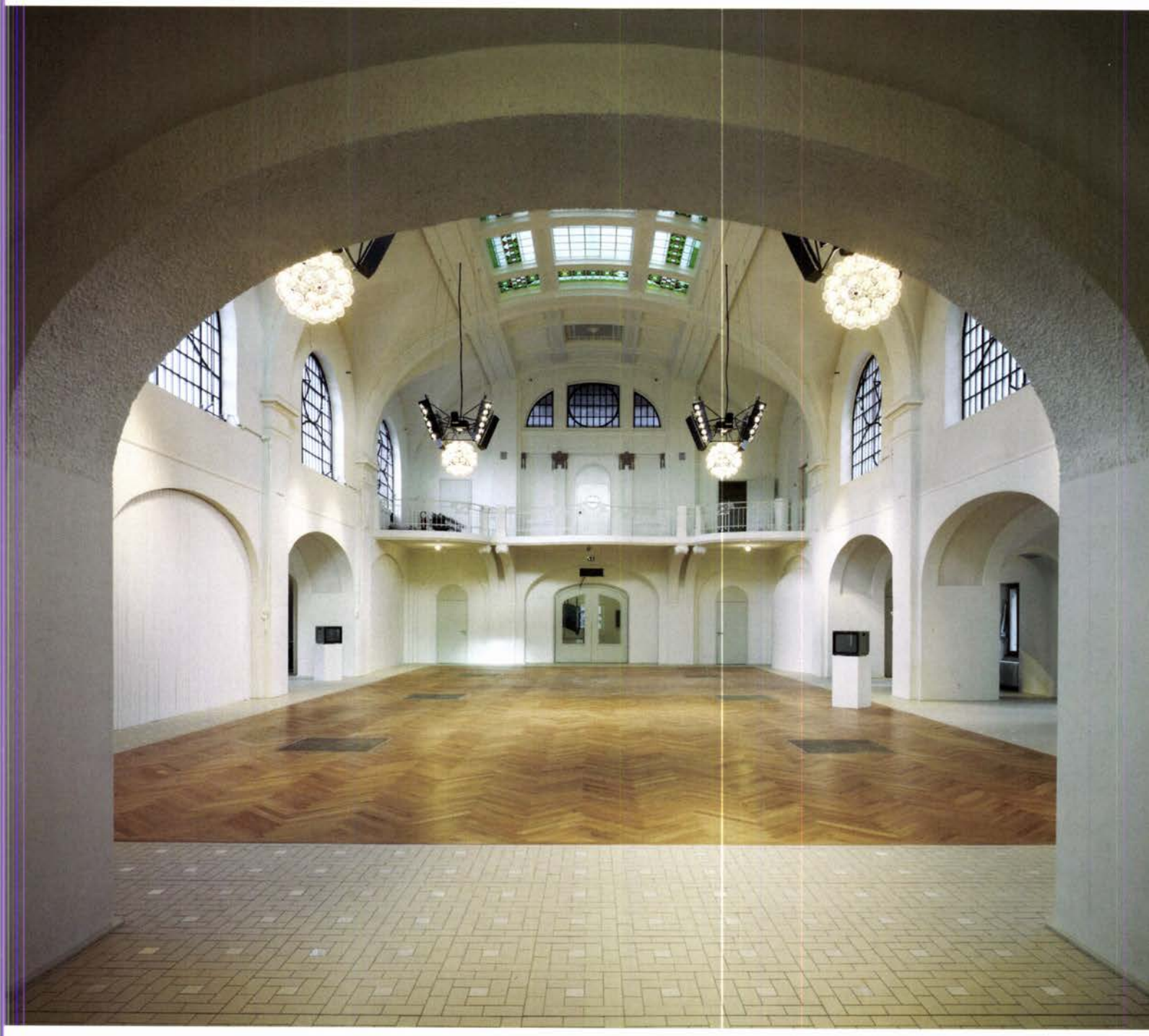
Refurbished galleries lining the perimeter of the cloisters lead visitors to the convent's chapel, which houses Unterlinden's pièce de résistance: Matthias Grünewald's carefully preserved 1516 Isenheim Altarpiece, which now sits under a new roof and on top of a refurbished oak floor

MUSÉE UNTERLINDEN COLMAR, FRANCE HERZOG & DE MEURON

PRIZED POSSESSION The convent's former chapel, with its groin-vaulted ceiling, is the home of the carefully preserved Isenheim Alltarpiece, painted by Matthias Grünewald in 1516.



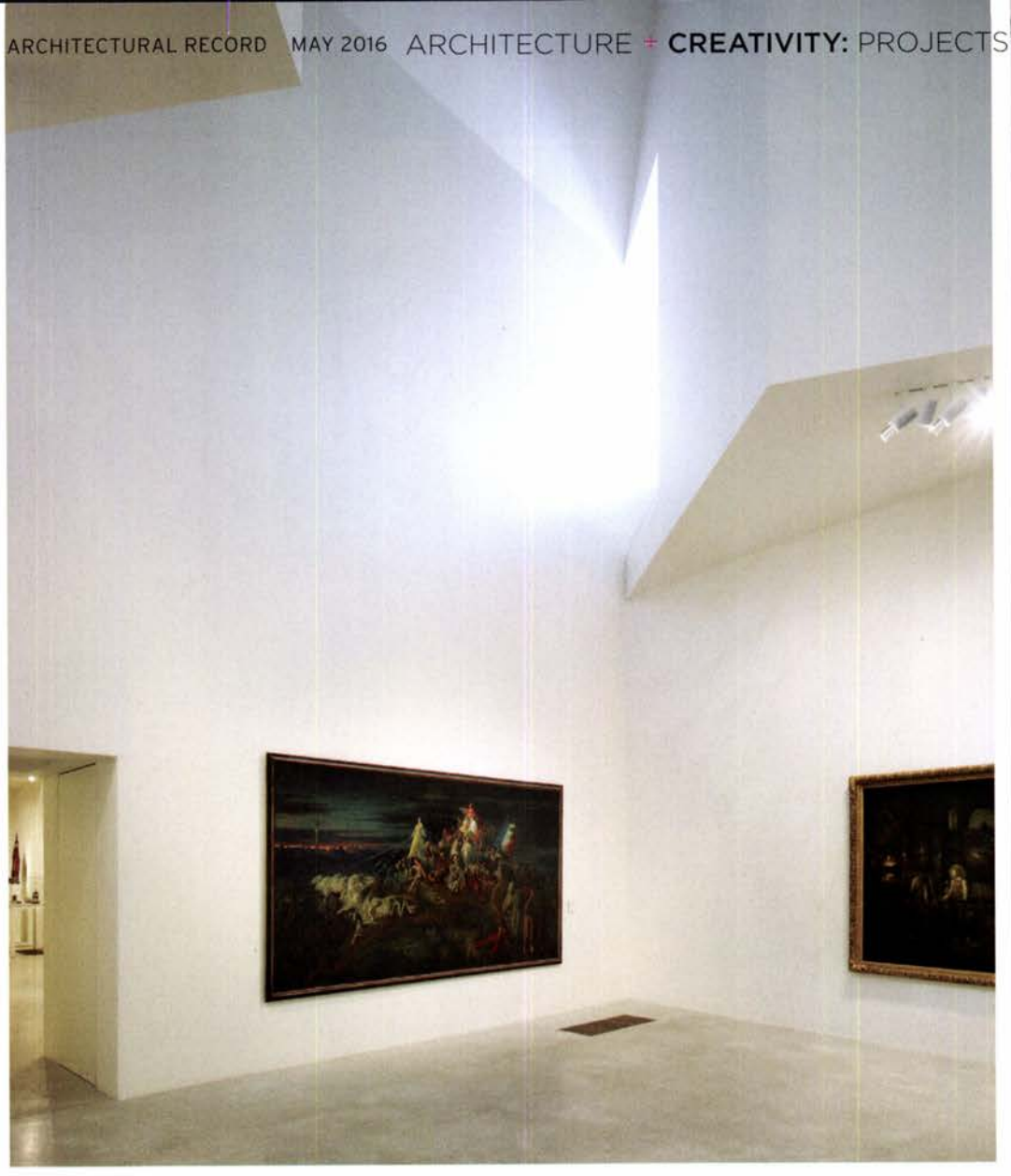
GOTHIC CURVES
Throughout the Unterlinden campus, Herzog & de Meuron has deployed forms that are sympathetic to the existing medieval architecture, including several sculptural stairs (above and left) and lancet-arched doorways (far left) and windows. With the addition of a parquet floor, the architects have transformed an early 20th-century swimming pool (opposite) into an event space.



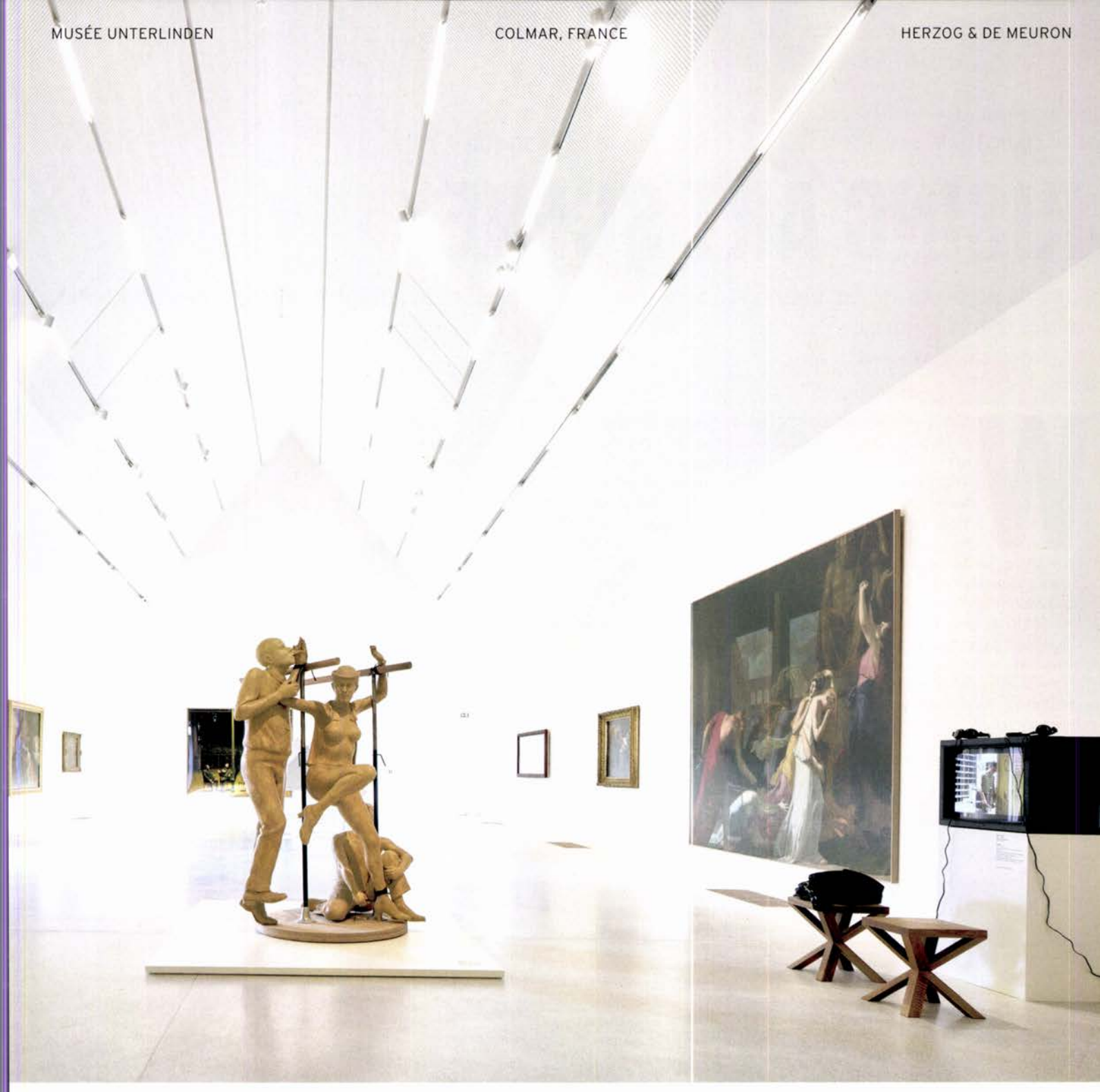
From there, visitors descend a new cast-in-place concrete spiral staircase to enter a subterranean gallery. The rectangular corridor traces a loosely chronological history of French modern art that leads to another spiral staircase waiting at the opposite end, and ascends into the Ackerhof, where the museum's powerhouse collection of works by Picasso, Dubuffet, Delaunay, and others, hangs from what they call "floating picture walls": partitions which stop short of the floor and ceiling that are supported by slender cylindrical posts. The resulting airiness is a departure from the stone and brick of the convent.

The Ackerhof adjoins the former bathhouse, home to the museum's administrative offices, library, and coffee shop. Under the stained-glass skylights of the central atrium, the parquet floor of a new event space inhabits the footprint of the former swimming pool.

Subtle references like this abound, most poignantly in la Petite Maison, a copper-roofed allusion to an ancient mill that stood adjacent to the bathhouse until the 1960s. The ground-floor slab has been omitted so that the diminutive structure can funnel daylight through its windows and into a lower gallery where the museum's modern and religious artwork intersect. The "little lantern," as the architects call it, unites past and present, aboveground and below.



LIGHT AND BRIGHT The galleries in the new Ackerhof building (left and above) feel airy, thanks to "floating" display walls, skillfully designed electric illumination, and the occasional window. Some of the museum's new below-grade spaces also have access to daylight, such as the gallery beneath the Petite Maison (top, left).



The overall intervention is three-pronged, combining architecture with urban intervention and a bit of curatorial choreography, all infused with metaphor. The architects have demonstrated a thorough understanding of the site's history, down to the historical context of individual pieces within the collection. As such, they've managed to build a modern institution firmly rooted in medieval heritage, but have avoided building, what Herzog describes as "a medieval Disney World." ■

Janelle Zara is a freelance art and architecture writer based in Los Angeles.

credits

ARCHITECT: Herzog & de Meuron

ASSOCIATE ARCHITECTS: DeA Architectes

CONSULTANTS: ARTELIA (structural); PPEngineering, Jäger Ingenieure (facades), Echologos (acoustics); Arup (lighting); Cap Vert Ingénierie (landscape)

CLIENT: City of Colmar, France

SIZE: 83,000 square feet

COST: $54 million

COMPLETION DATE: December 2015

SOURCES

BRICK: Gima

TILE: Topcer

OAK FLOORS: Singer Parquets

LIGHTING: Artemide, Regent, Salvi, Flos

San Francisco Museum of Modern Art | San Francisco | Snøhetta

RISING ART SCENE

Like its predecessor, an addition to SFMOMA asserts itself in a rapidly developing neighborhood

BY JOSEPHINE MINUTILLO

PHOTOGRAPHY BY HENRIK KAM

When it was founded in 1935, the San Francisco Museum of Modern Art (SFMOMA) occupied one, then two floors of the War Memorial Veterans Building in the Hayes Valley neighborhood before moving into its purpose-built, Mario Botta–designed home in nearby SoMa in 1995. That building was almost immediately maligned for looking dated in its Postmodern imagery and for not functioning well in terms of circulation. This month, the museum unveils its newly expanded facility, designed by Snøhetta. With the $305 million addition, which increases gallery space to 170,000 square feet, SFMOMA now has more exhibition space, if only temporarily, than the still-inflating MoMA in New York. That astronomical growth in just over 20 years may be the result of dramatic changes in the city itself—its population and economy boosted by the tech industry—but it also speaks to a spirit of innovation, both curatorial and architectural, in the institution.

On the outside, the New York– and Oslo-based Snøhetta has found more success than most in adding to an iconic, or idiosyncratic, building. Rather than adjoining a quiet box, as minimalist David Chipperfield did at Cass Gilbert's classical St. Louis Art Museum, Snøhetta designed an addition that asserts itself as a work of architecture in its own right, while showing the appropriate amount of deference to Botta's aggressive pile. It does so by turning its back on Botta.

The most dramatic facade of Snøhetta's building—a bowed wall composed of over 700 unique sculptural panels of glass-fiber reinforced polymer (for more details on the facade, see RECORD, September 2014, page 136)—faces in the opposite direction from Botta's terraced red-brick frontage along the open area of Yerba Buena Gardens. In fact, views of Snøhetta's 10-story undulating screen, inspired by the rippling water of San Francisco Bay and the Art Deco ornament of the PacBell tower behind it, are partially obstructed by lower buildings. It only

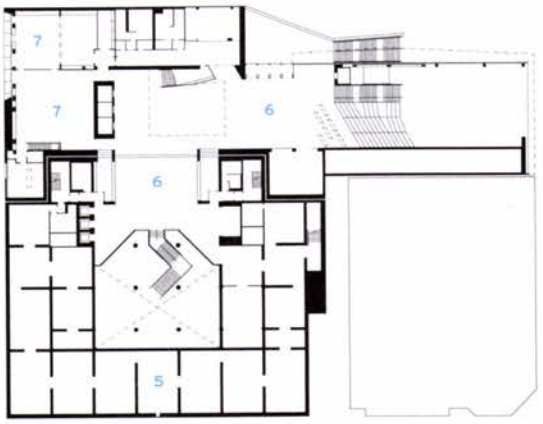
CITY SLICKER
The 200-foot-tall addition is sandwiched between the museum's original red-brick building fronting Yerba Buena Gardens and the PacBell Building behind it (opposite). The new structure offers an additional entrance from busy Howard Street and the quiet alley facing its pristine white undulating facade (this page).

THICK-SKINNED The addition's undulating facade (left) tops the glazed Howard Street gallery, free to the public, whose opening exhibit is Richard Serra's 2006 *Sequence*. Visitors can gather on the stepped seating (opposite).

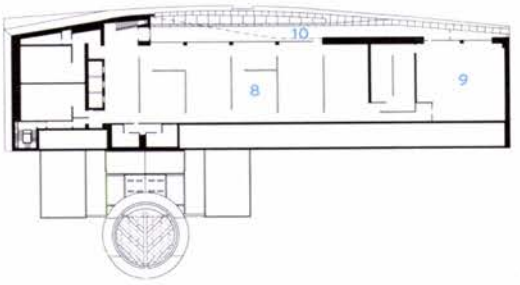
comes into full view when approached from the narrow Natoma Street. The effect evokes similar experiences walking around San Francisco, as fanciful facades or public art—Union Square's Dewey Monument, for instance—appear almost as surprises where the city's many alleyways come to an end.

At the heart of the new expansion is a groundbreaking partnership with the family of Doris and Donald Fisher, who together founded the Gap in San Francisco in 1969. After they lost their battle to build a museum designed by Richard Gluckman at the Presidio, they entered into an agreement with SFMOMA that gives the museum access to more than 1,100 works in their collection for 100 years. Dedicated galleries in the new building are currently showcasing 260 of these paintings and sculptures.

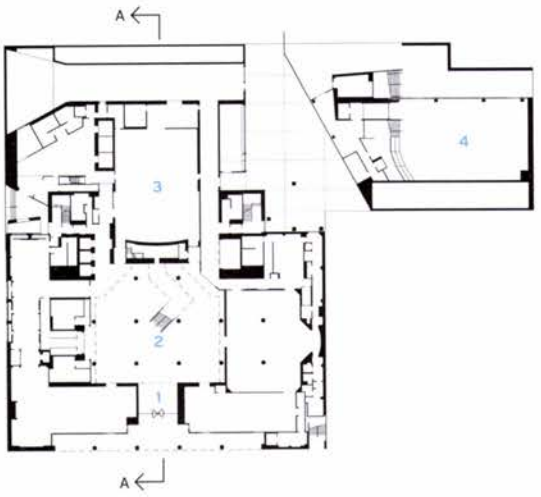
1 EXISTING MAIN ENTRY
2 BOTTA ATRIUM
3 THEATER
4 HOWARD STREET GALLERY
5 MODERN PAINTING AND SCULPTURE
6 NEW LOBBY
7 EDUCATION CENTER
8 FISHER GALLERY
9 PAINTING AND OBJECTS LAB
10 TERRACE
11 PHOTOGRAPHY GALLERY
12 SCULPTURE TERRACE
13 OFFICES



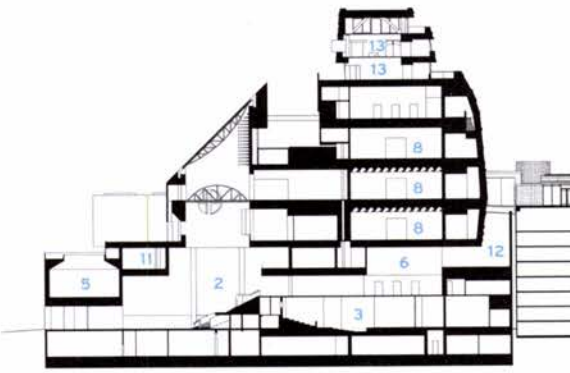
SECOND-FLOOR PLAN



SEVENTH-FLOOR PLAN
(WITH PARTIAL VIEW OF BOTTA BUILDING)



FIRST-FLOOR PLAN



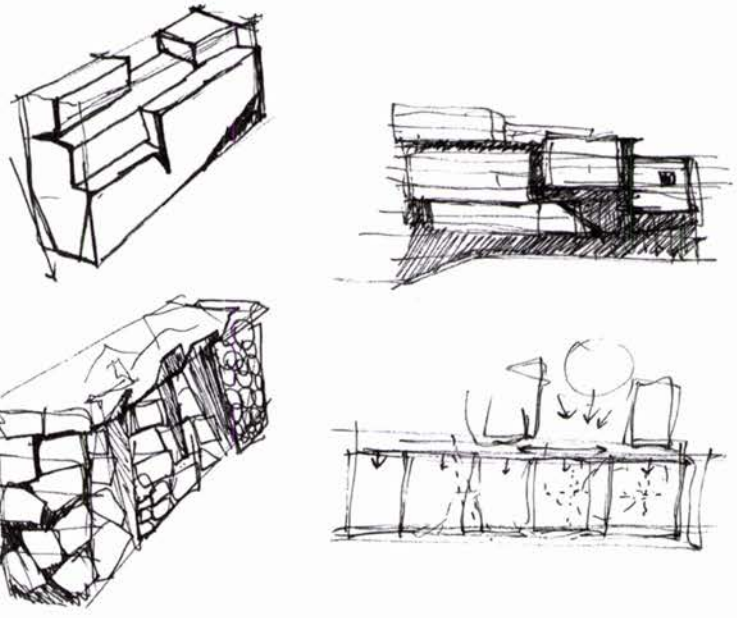
SECTION A - A

THE CREATIVE PROCESS

CRAIG DYKERS

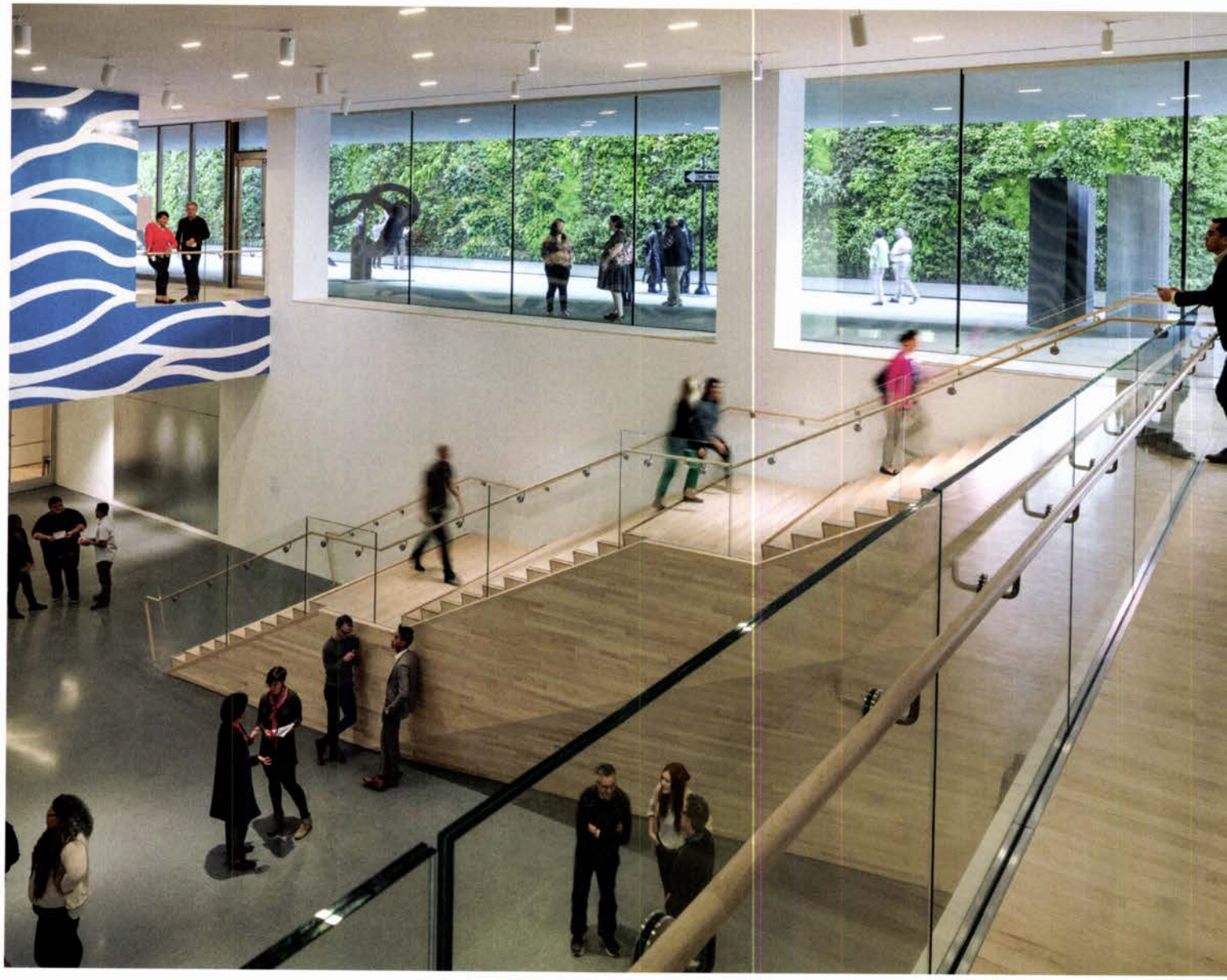
"I SKETCH all the time," explains Craig Dykers. He and his team at Snøhetta move back and forth between analog and digital ways of working when developing a design. "The passage between those two worlds is important." For the design of SFMOMA, some of the most important models were handmade ones that were not very precise, including a small concrete model made using paper formwork. "It was their imprecision that helped us see new ways of thinking about the project," Dykers says. "That's the challenge often with computer-aided design—there's a great deal of information required to render the design."

Dykers says that another key aspect of the design process, particularly for SFMOMA, is conversation. "Before anything was drawn or we had any physical models or ideas of what the building should look like, we talked a lot about the maritime climate and how unusual it is in San Francisco." The team decided that whatever the design ended up being, it needed to emphasize that unique character. "We recognized that, if we pulled the building back from the property line, it would allow more light to hit the surface of the building and more light to illuminate the ground plane," recalls Dykers. "And that's when the building started to take shape."



DRAWN OUT Early sketches and massing studies for the building's skin, galleries, and landscape.

STEP BY STEP Circulation along the bowed facade, with windows overlooking the city in places, encourages taking the stairs (above). A Sol LeWitt drawing blankets the upper wall of the new lobby (opp which is accessed from the Howard Street gallery and the outdoor staircase perpendicular to a narrow alleyway (left).



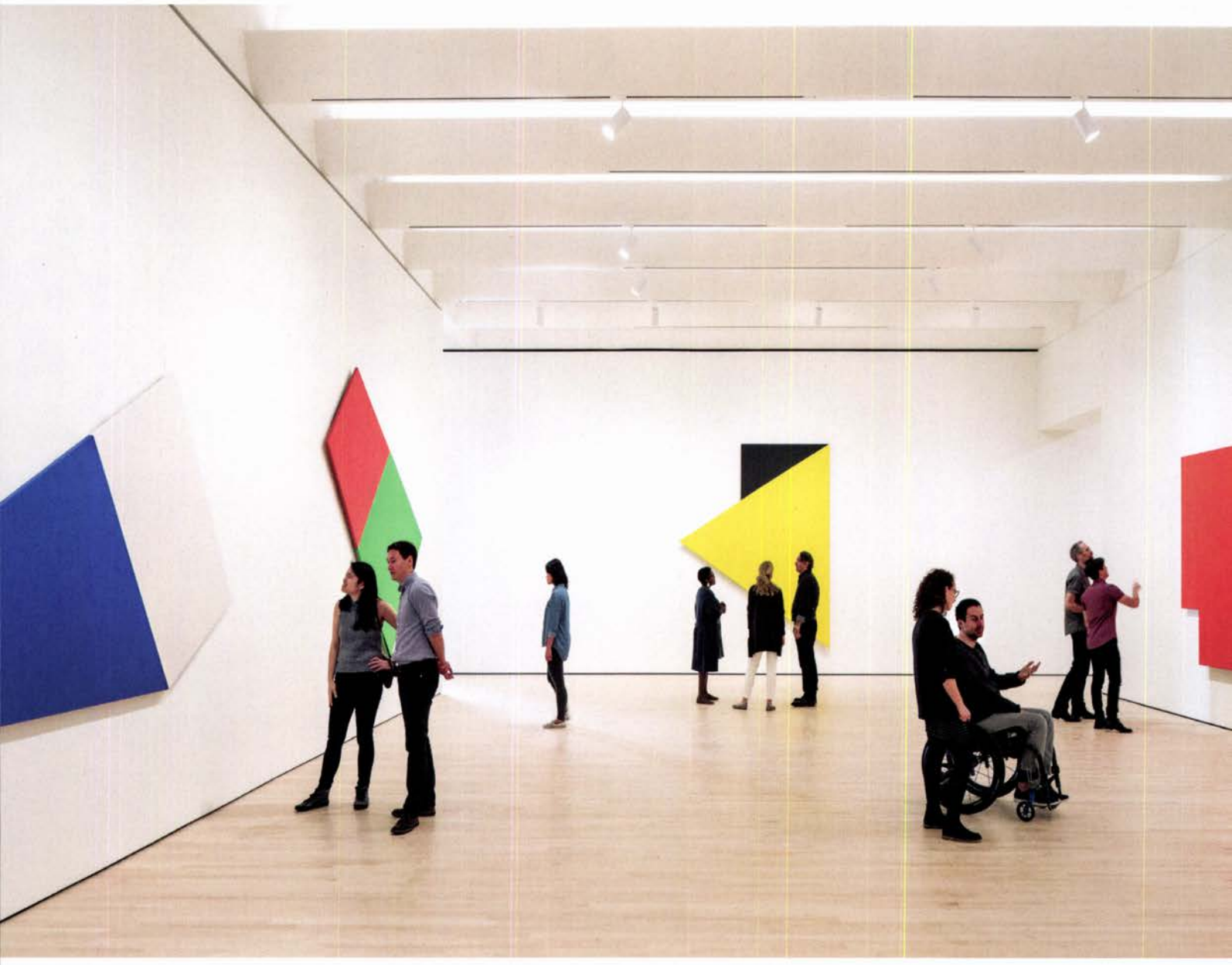
For those exhibition spaces, Snøhetta took as a starting point the existing ceiling heights and maple floors of Botta's galleries to create a seamless internal transition from old to new. Air handling is also seamless, with displacement grilles discreetly located above gallery walls rather than on floors. Ambient lighting, acoustic treatments, and electrical and plumbing hardware are hidden within ceilings, which are coved on lower levels.

Offices occupy the upper portion of the building. "In terms of museum design, the highest, most distant area from the entrance is not prime real estate—you have to get people there," explains Snøhetta founding partner Craig Dykers. "Placing the staff on the top floors was a win-win for everybody. They need views and daylight; the art does not."

In fact, there are few precedents for such a tall urban museum. (The addition reaches 200 feet. By comparison, SANAA's New Museum in New York is about 175 feet.) Snøhetta has designed a series of exquisite, elongated stairwells with views above and across and out to the city along the bowed facade, to move visitors naturally through the building. Curiously though, the firm's biggest intervention in the original museum was to remove Botta's monumental staircase from beneath his iconic oculus—in order, it seems, to allow more daylight in from that strange circular skylight and open up the atrium space. In other areas, however, Snøhetta enhanced Botta's design—for instance, uncovering select gallery windows to allow 360-degree views of the city as you make your way through both buildings.

The expansion dramatically increases amenities, including free public-access areas, rooms for education, and performance and event venues. Restaurant space increased more than threefold, while only a few hundred square feet were added to the museum store—a clear indication of where revenue comes from or is expected to, these days, as more and more museums become entertainment centers in addition to places for viewing art. In Situ, the museum's ground-floor restaurant set to open in June, will feature a rotating menu curated by three-Michelin-star chef Corey Lee, with contributions from over 80 other world-renowned cooks.

The greatest achievement of the project is the way it is rooted within place, with its grand white facade of silicate crystals from Monterey Bay embedded in its panels' surfaces catching the city's dramatically changing light. It is one more voice in the cacophony of singular



buildings, its own predecessor not the least of these. But orienting the addition toward the alley means that the more visible face, and new entrance, along busy Howard Street, suffers for its positioning—its wall is rather bland, as if it were the plain side of a slice of frosted cake, with the many layers, or floors in this case, clearly delineated. The other odd thing about directing the "frosted" side away from the main street is that it runs the risk of one day being almost completely obscured. In this rapidly developing neighborhood—prominent modern art dealers Larry Gagosian and John Berggruen are opening galleries across the street, and the huge Trans Bay Center, now under construction, is visible from the museum's upper floors—the three- and four-story buildings directly adjacent to SFMOMA are likely to be turned into towers by developers.

Turning inward allows Snøhetta's building to be distinct from Botta's, but, in a sense, just as eccentric. By taking as many cues as it does from the city, and its neighbors, Snøhetta's addition is pure San Francisco, quirks and all. ■

credits

ARCHITECT: Snøhetta

ASSOCIATE ARCHITECT: EHDD

ENGINEERS: Magnusson Klemencic Associates (structural); Taylor Engineering (mechanical/plumbing); The Engineering Enterprise (electrical); KPFF (civil)

CONSULTANTS: Arup (lighting, acoustical, AV, facade); Enclos (facade); Habitat Horticulture/Hyphae Design Lab (living wall); Turk Technologies (security)

GENERAL CONTRACTOR: Webcor Builders

SIZE: 235,000 square feet (expansion)

COST: $305 million

COMPLETION DATE: May 2016

SOURCES

FRP RAINSCREEN PANELS: Kreysler & Associates

ENTRANCES: Ellison, Dorma

INTERIOR GLAZING: Silicon Valley Glass

FIRE-CONTROL DOORS/SECURITY GRILLES: Smoke Guard

INTERIOR GLAZING: Silicon Valley Glass

ACOUSTICAL CEILINGS: StarSilent by Pyrok, Rockfon, Geometrik

SUSPENSION GRID: Armstrong

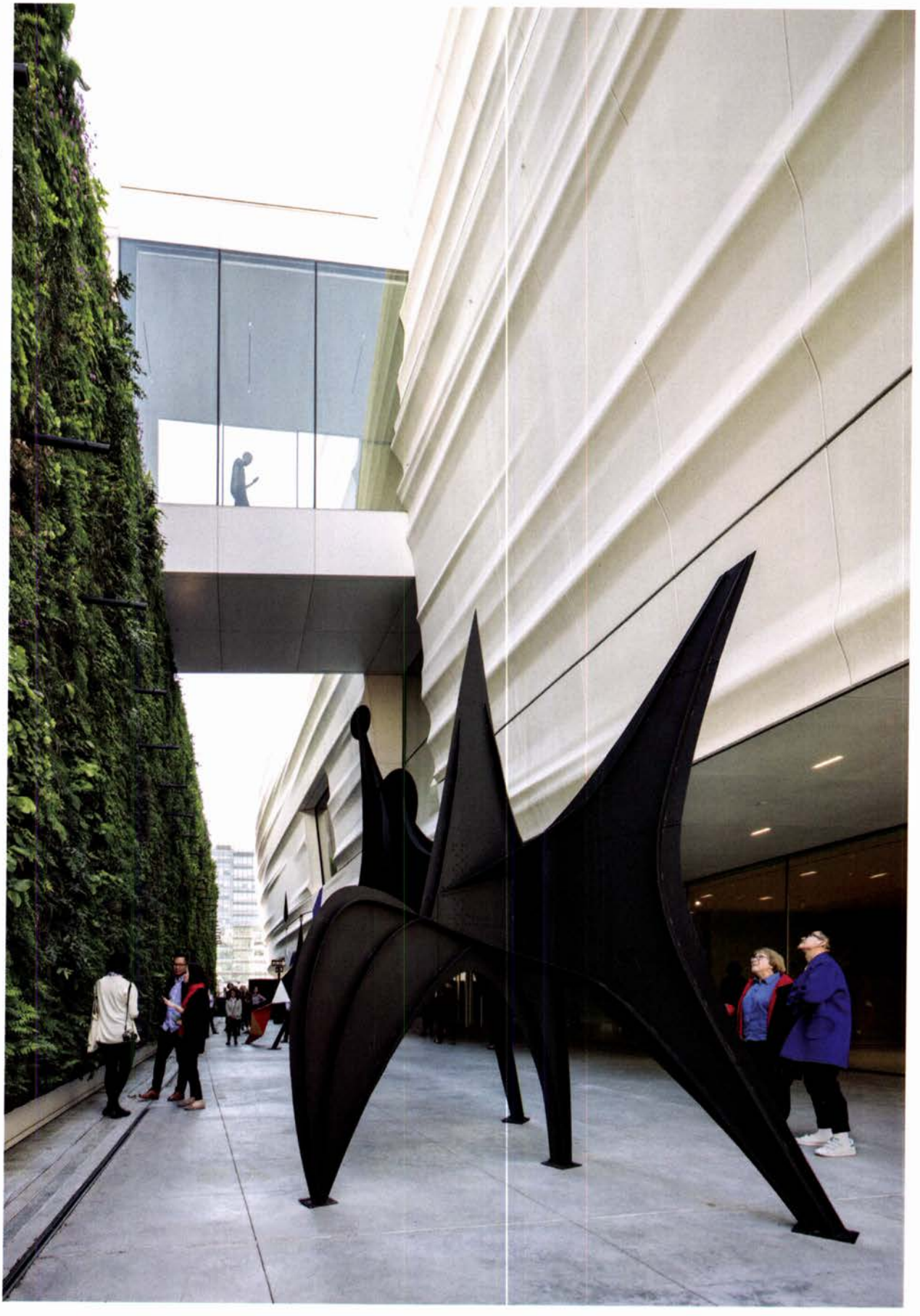
INTERIOR AMBIENT LIGHTING: Cooper Industries, Feelux

TRACK LIGHTING: LSI Industries

EXTERIOR LIGHTING: BK Lighting, ACDC

LIGHTING CONTROLS: Lutron

INSIDE AND OUT
Several galleries on the fourth floor highlight the work of Ellsworth Kelly. The modular, coved ceiling system evenly diffuses ambient light (opposite). Visitors can access a terrace from the dedicated Alexander Calder gallery for close-up views of the living wall, which contains 15,000 plants. The bridge above it leads to a café and sculpture terrace (right).



Valletta City Gate | Malta
Renzo Piano Building Workshop

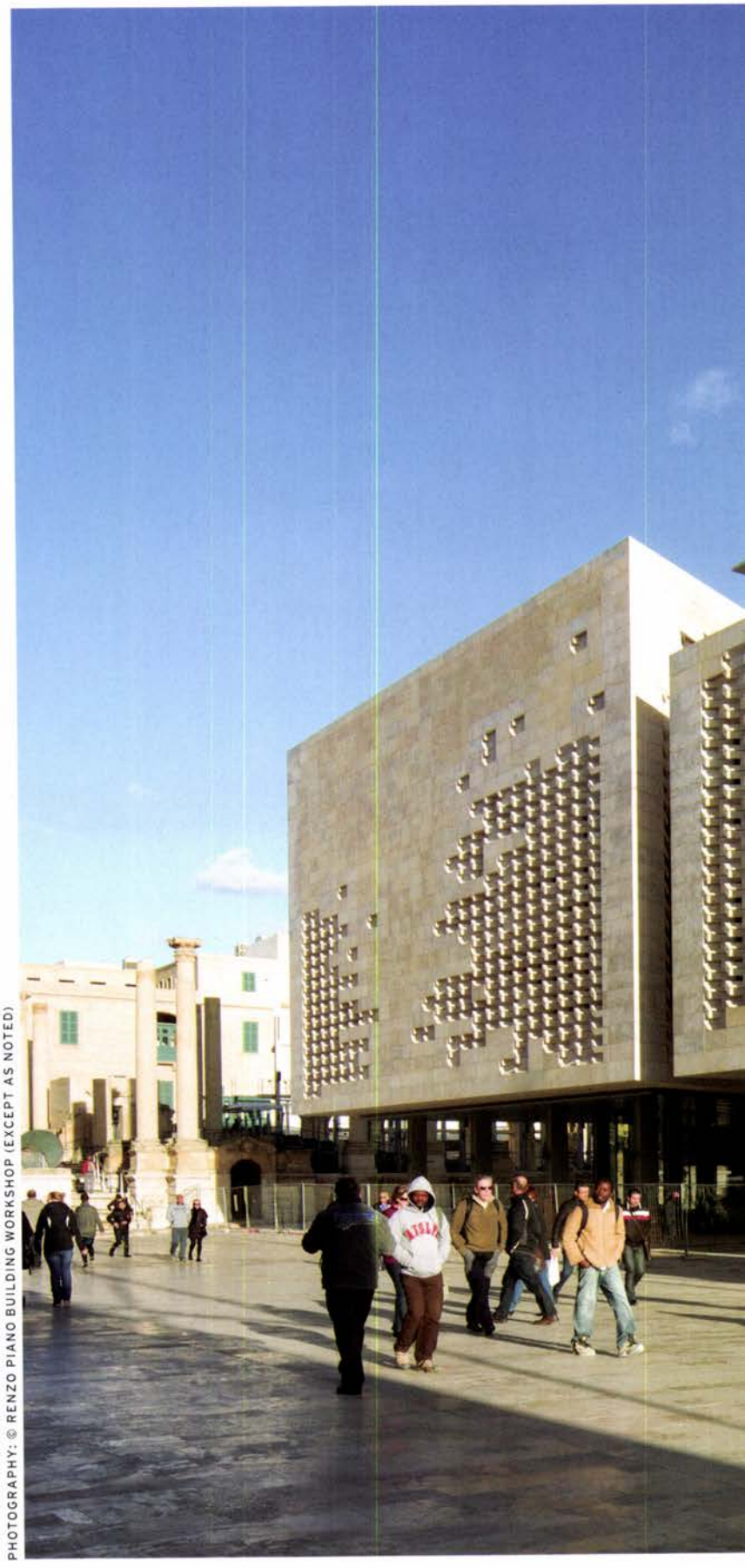
GATEWAY TO THE PAST

The entrance to a capital city responds to topographical and historical layers.

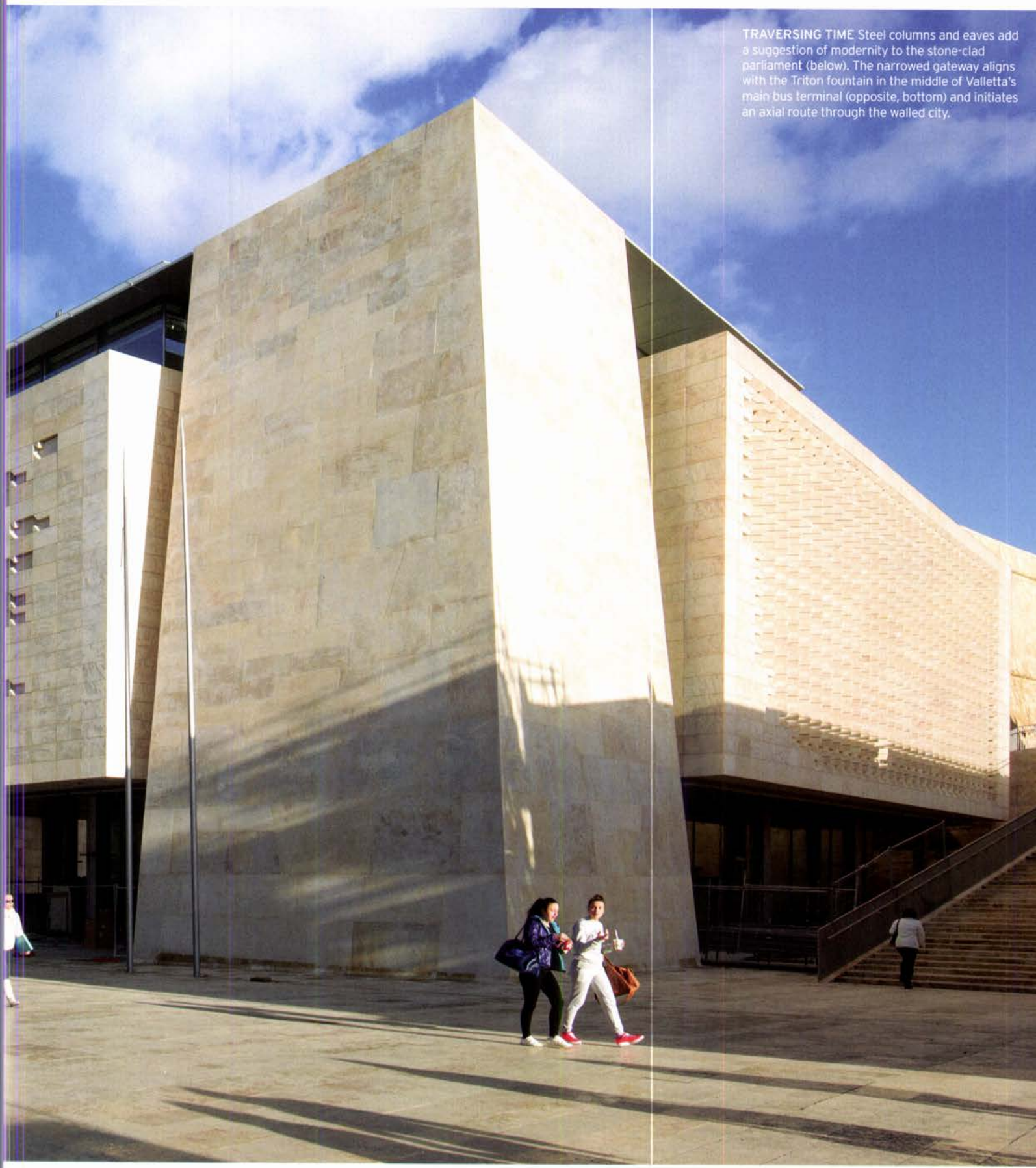
BY CHRIS FOGES

The completion of Renzo Piano Building Workshop's (RPBW) Valletta City Gate comes 30 years after the architect was first invited to remodel the main entrance to Malta's walled capital. Controversial at the time, the project was abandoned but resurrected in 2008, to Piano's surprise, with a governmental invitation to look again at the gateway, along with the commission to build the island's first purpose-built parliament nearby. The work has benefited from its long gestation and the enlarged remit, and RPBW has produced an assured but sensitive response to a situation of rare topographic and cultural complexity.

Set on a promontory between two Mediterranean harbors, Valletta's unique character derives from the conjunction of its hilly terrain, orthogonal Renaissance street grid, and historic fortifications and structures. Its main gate, at the southern end of a central axis, sits at a point of particular intensity in plan and section. Twentieth-century alterations had diluted and distended the spatial



PHOTOGRAPHY: © RENZO PIANO BUILDING WORKSHOP (EXCEPT AS NOTED)

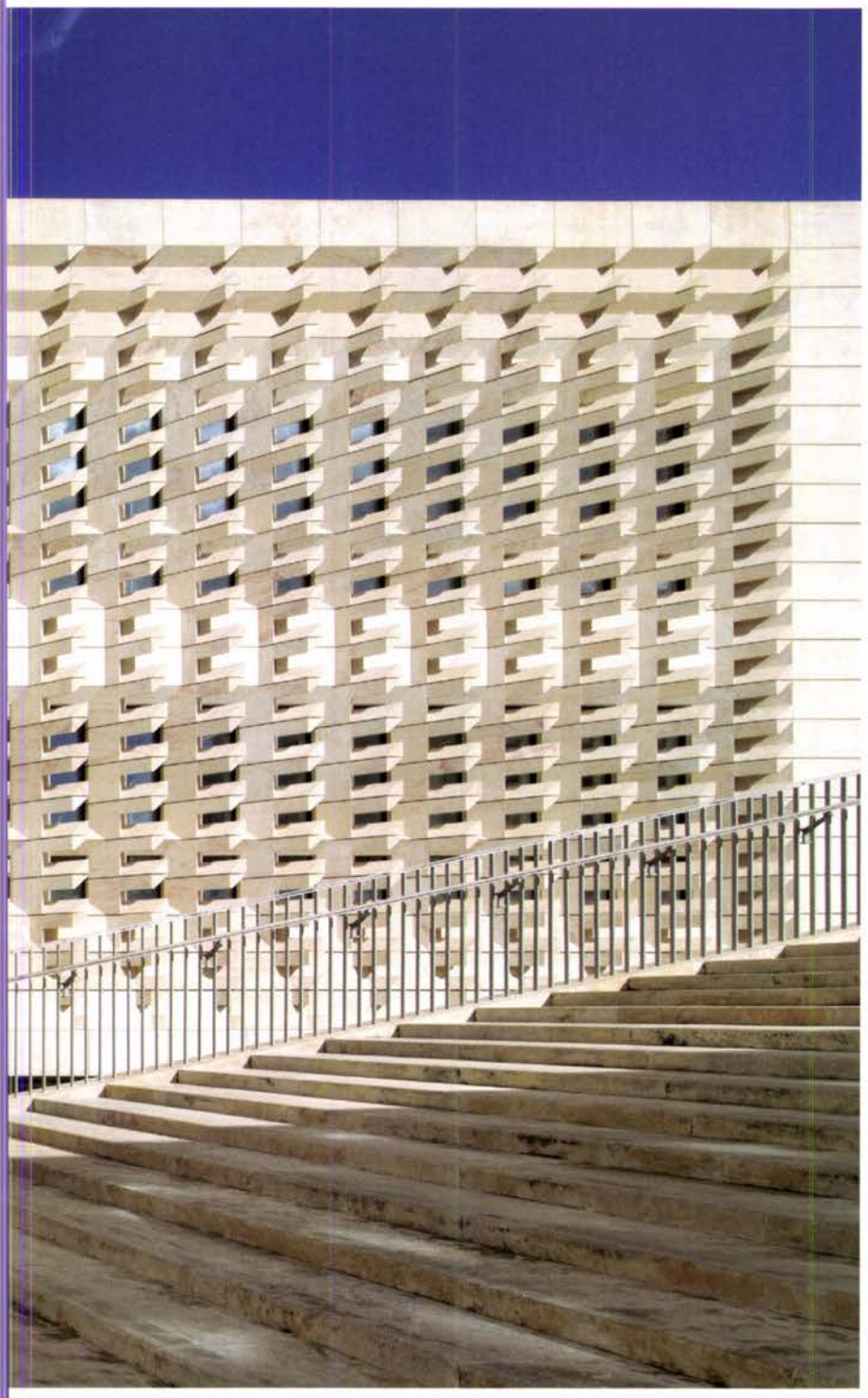


TRAVERSING TIME Steel columns and eaves add a suggestion of modernity to the stone-clad parliament (below). The narrowed gateway aligns with the Triton fountain in the middle of Valletta's main bus terminal (opposite, bottom) and initiates an axial route through the walled city.

sequence leading into the city, but RPBW has restored focus through surgical subtraction and judicious addition.

The 17th-century bridge leading to the walls across a surrounding dry moat (known as the "ditch") had been widened for cars, but is now returned to its original proportions and pedestrian use. Having removed an existing 1960s neo-rationalist gate, the architects reduced a 100-foot-wide breach in the walls by three-quarters with the insertion of two giant, faceted shoulders of stone. Passing through the deep cleft in the rock is a powerful moment of compression followed by release into Freedom Square.

This public space was "a void, out of scale, surrounded by funny 1960s arcades and occupied by cars," recalls RPBW partner Antonio Belvedere. The architects excised the arcades and a high-level roadway over the gate, revealing the old ramparts and the flanks of two "cavaliers"—tall fortifications within the city walls—that abut the square. Broad flights of stone steps now ascend through limestone canyons from either side of the gate to the ramparts 30



DYNAMIC FACADE The depth and angles of the parliament building's stone louvers vary in response to the position of the sun, so the west-facing elevation overlooking the city wall (left) differs from those facing the central courtyard (below), or north onto Freedom Square. Carving solar shading from the stone cladding required deep facades, and the walls are 33 inches thick.

feet above. An inclined elevator, accessed though a steel-lined slot in the wall, descends to the moat, where gardens will replace yet more parking.

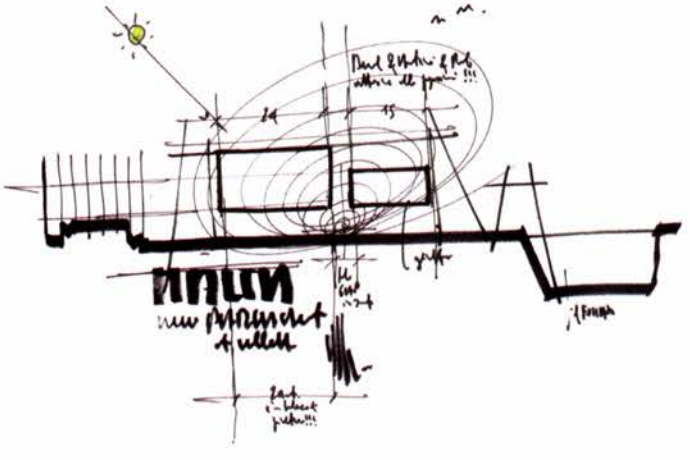
This network of pedestrian routes, tying the square to higher and lower ground and embracing the cavaliers, form the "system" into which the stone-clad, freestanding parliament building was inserted, says Belvedere. Occupying the southern side, it perceptually narrows the square, reinforcing the axial route from the gate, but it has been lifted on steel columns and split into two blocks to preserve public space below and views of one of the cavaliers behind. The blocks, each trapezoidal in plan, are linked by steel bridges across a shady courtyard. One contains ministers' offices, and the other the debating chamber. Recessed, glazed entrance lobbies imbue a sense of lightness that is a counterpoint to the stair towers at two corners—articulated as tapering stone buttresses reminiscent of the adjacent fortifications.

Deference to the urban context trumped programmatic concerns. "The functional split is not ideal," says Belvedere

SECTION A-A

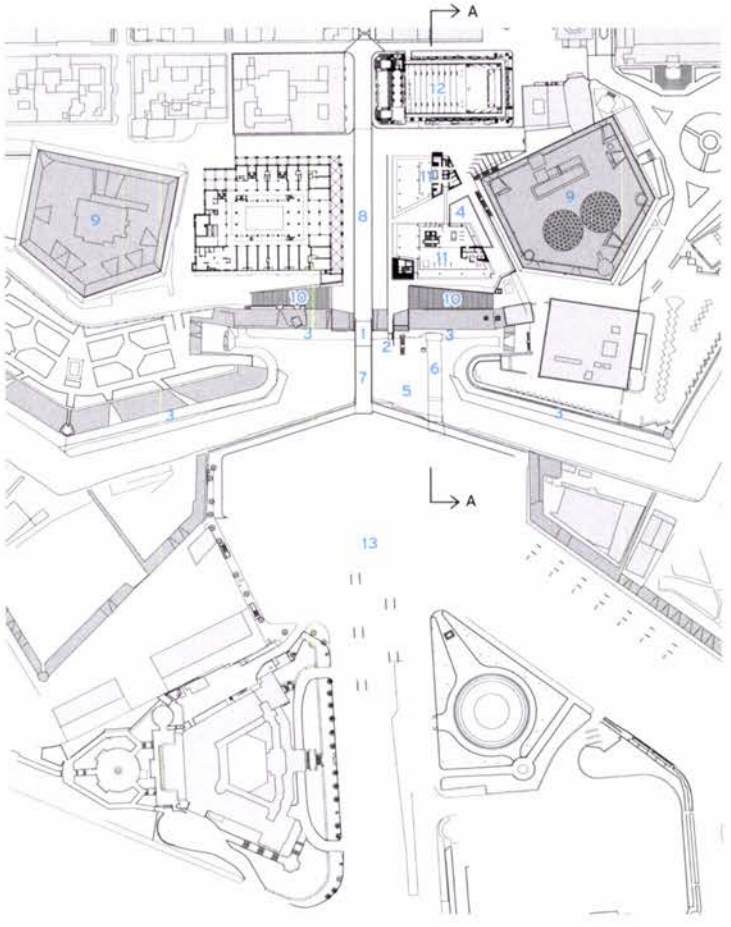
THE CREATIVE PROCESS
RENZO PIANO

"ARCHITECTURE IS about time," says Renzo Piano, and, because the Valletta project unfolded over many years, he repeatedly walked the site. "Everything starts with wandering around, getting the sense of history or the way the sun touches the surface of stone," he says. "Every place has a story, and in Malta the story was stone." Finding the right quarry on the island became the quest: the stone had to be massive enough to frame the gate, but delicate enough for the richly textured walls of the parliament building. "We wanted to carve the stone to play with the light," says Piano. When he walks, he keeps three tools handy: paper folded to fit his shirt pocket; a pen (often a green felt-tip); and a tape measure. "The sketch is something I do quickly, a little like a writer's notes—it is a memorandum, a reminder of emotion." He doesn't like beautiful drawings—or perfect renderings: "You fall into a trap," he says. "The computer never tells the truth." Besides his tape measure, he uses his stride. "I walk with wide steps, like a soldier, and it is exactly 1 meter. The time you spend walking around and measuring and projecting is like taking a mental picture. You try to record the space. And when you go back to the office, you will have the capacity to project in that space, using all the proportions. It's almost like making a hologram."



WALK THE LINE While visiting Valletta Gate's site, Renzo Piano sketched its topography, using his own stride as a measurement tool.

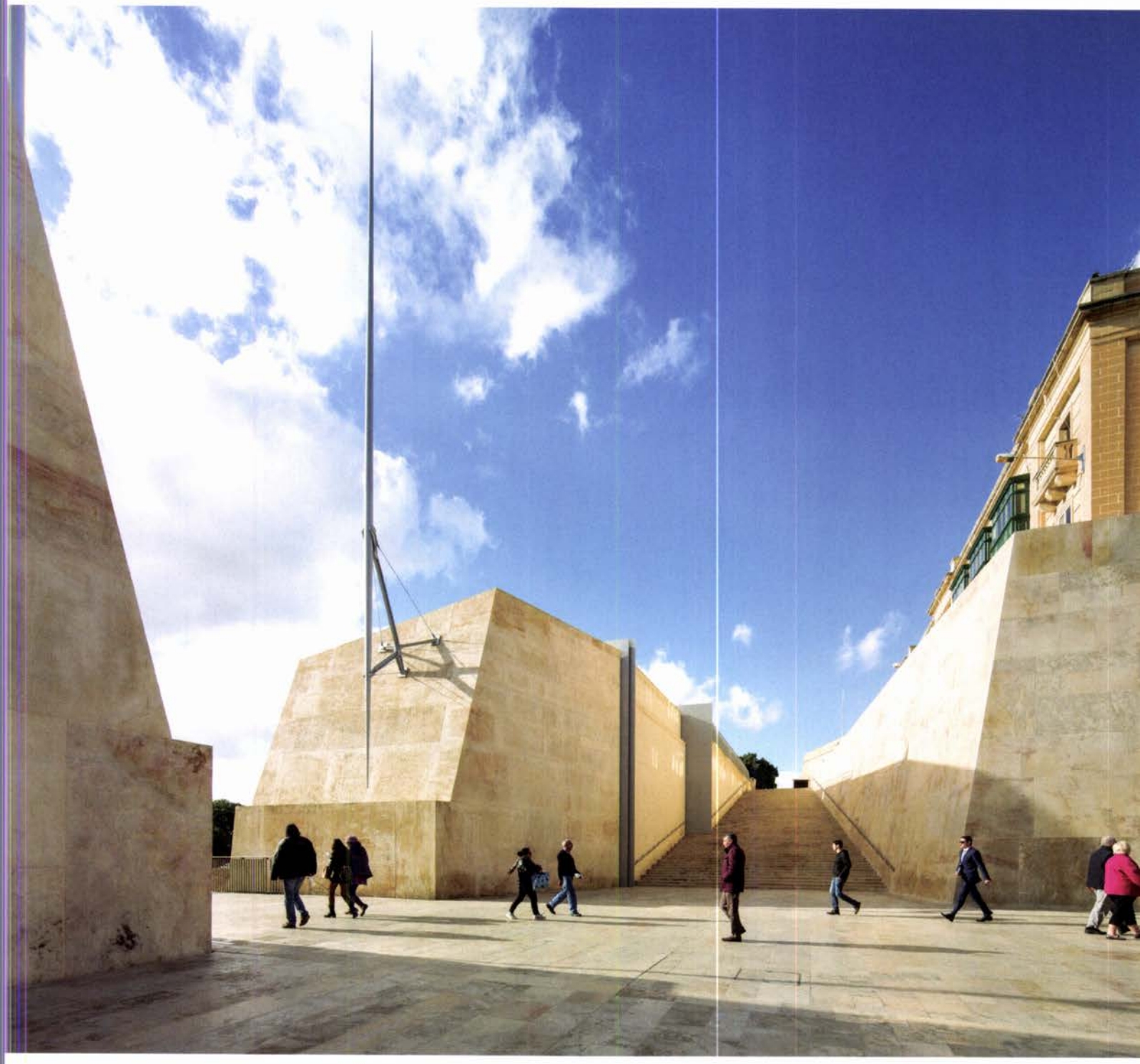
NEXT LEVEL An earlier rendering (above) shows that RPBW intended one of the parliament's two glazed foyers to have a public use, but both have been adopted as secure entrances. The project exploits the site's stratification, taking advantage of a disused rail tunnel below the parliament and creating new stairs rising from the square to the ramparts on either side of the gate (opposite). Thick steel plates set into the city wall record the gate's former extent, and 82-foot-high steel masts flank the opening.



SITE PLAN

0 150 FT. 50 M.

1 GATE
2 ELEVATOR FROM DITCH TO FREEDOM SQUARE
3 WALL
4 SUNKEN COURTYARD
5 DITCH
6 DISUSED RAILWAY BRIDGE
7 BRIDGE
8 FREEDOM SQUARE
9 CAVALIER
10 NEW STAIRS
11 PARLIAMENT
12 OPERA
13 CITY GATE SQUARE
14 PARLIAMENTARY ARCHIVE
15 BAR
16 M/E PLANT (IN DISUSED RAIL TUNNEL)

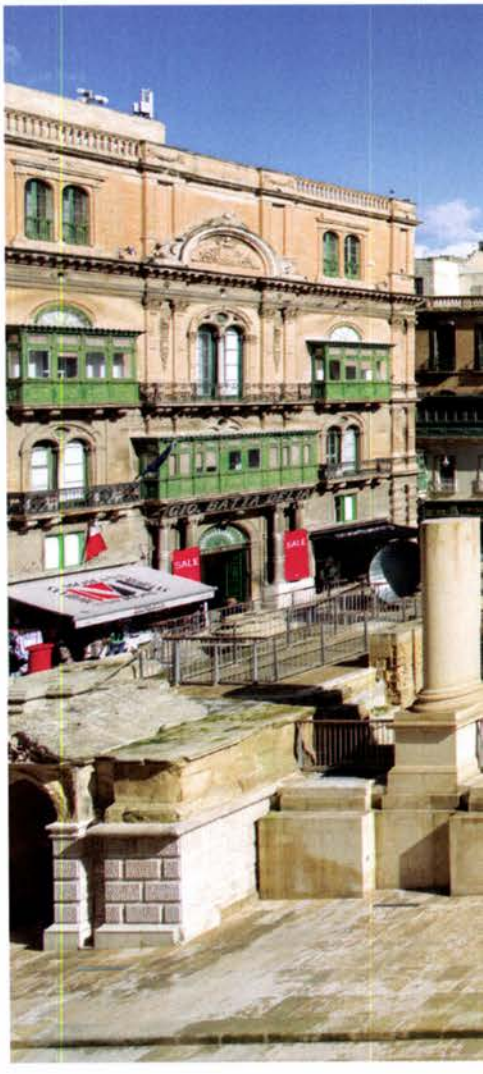


of the plans for the building, and there are fewer offices than the brief demanded, "but if the parliament was to be on Freedom Square, it had to be shaped and scaled by the site." Architectural ingenuity kept the triple-height octagonal debating chamber compact without losing functionality or appropriate grandeur. Stone walls slope inward to maximize floor space while creating public and press galleries above. Administrative offices are neatly hidden in a basement, around a sunken courtyard. And two stories below grade, a disused train tunnel has been colonized by mechanical equipment, an archive, and a bar.

Having composed the building's massing with due respect to its historic neighbors, RPBW underscored its connection to place by insisting on Maltese limestone for the facades. The design required a hard coralline variety that was not readily available. Undeterred, RPBW opened a new quarry and imported cutting technology and expertise from Italy.

Seismic risk ruled out load-bearing-stone construction, so blocks are hung from a steel frame as both cladding and interior lining. Inspired by the weathering of softer limestone, the architects "wanted to work by erosion" in the treatment of the material, says

TUNE UP
Cherry wood reflectors adjust the acoustics of the quarrylike parliamentary chamber (right). In the open-air theater (far right), an acoustic enhancement system bounces amplified sound off peripheral reflectors to simulate the experience of an enclosed hall and reduce disturbance to neighboring streets. A steel structure (opposite, bottom) carries tiered seating and access walkways over the exposed foundations of the opera's ruins.



Belvedere. Solar shading is not added to the facade but carved from it. Angular louvers create a dynamic play of reflection and shadow, and the densely textural surface recalls the Baroque richness of local churches and palaces.

The gate and parliament are contemporary interpretations of the forms and material of the historic city, but the project's third major component—a 1,000-seat open-air auditorium at the north end of the square—takes a more archaeological approach to the past. On the site of a 19th-century opera house, bombed out in 1942, a skeletal steel "theater machine" was installed behind the stabilized ruins of stone walls and columns, perched above the exposed remains of rooms.

The theater gives an important cultural dimension to the project, but was a late addition. RPBW's brief stipulated that parliament should occupy the opera site, thereby "erasing two pages of Maltese history, construction, and destruction," says Belvedere. "We refused." This resolve was encouraged by the client, who recognized that every aspect of the project would be locally contentious and, so, put its trust in an outsider's perspective. "Courageously they said, 'Do what you think is best for the country.'" But, if considerable self-confidence was required to operate amid noisy opposition, the City Gate shows no evidence of architectural ego. Instead, it is an essay in careful judgment, weighing the claims of program against those of place, and the claims of the past on those of the future. ■

credits

ARCHITECT: Renzo Piano Building Workshop – A. Belvedere, B. Plattner, partners in charge; D. Franceschin, P. Colonna, P. Pires da Fonte, S. Giorgio-Marrano, N. Baniahmad, A. Boucsein, J. Da Nova, T. Gantner, N. Delevaux, N. Byrelid, R. Tse, B. Alves de Campos, J. LaBoskey, A. Panchasara, A. Thompson, S. Moreau, O. Aubert, C. Colson, Y. Kyrkos, team

ASSOCIATE ARCHITECTS: Architecture Project

CONSULTANTS: Arup (acoustics, civil, structural, m/e/p); Kevin Ramsey (stone); Daniel Abbado (theater); Franck Franjou (lighting); Studio Giorgetta (landscape); Silvano Cova (theater equipment)

CLIENT: Grand Harbour Regeneration Corporation

SIZE: 431,000 square feet (site area); 75,000 square feet (parliament); 30,000 square feet (opera)

COST: $91 million

COMPLETION DATE: August 2015

SOURCES

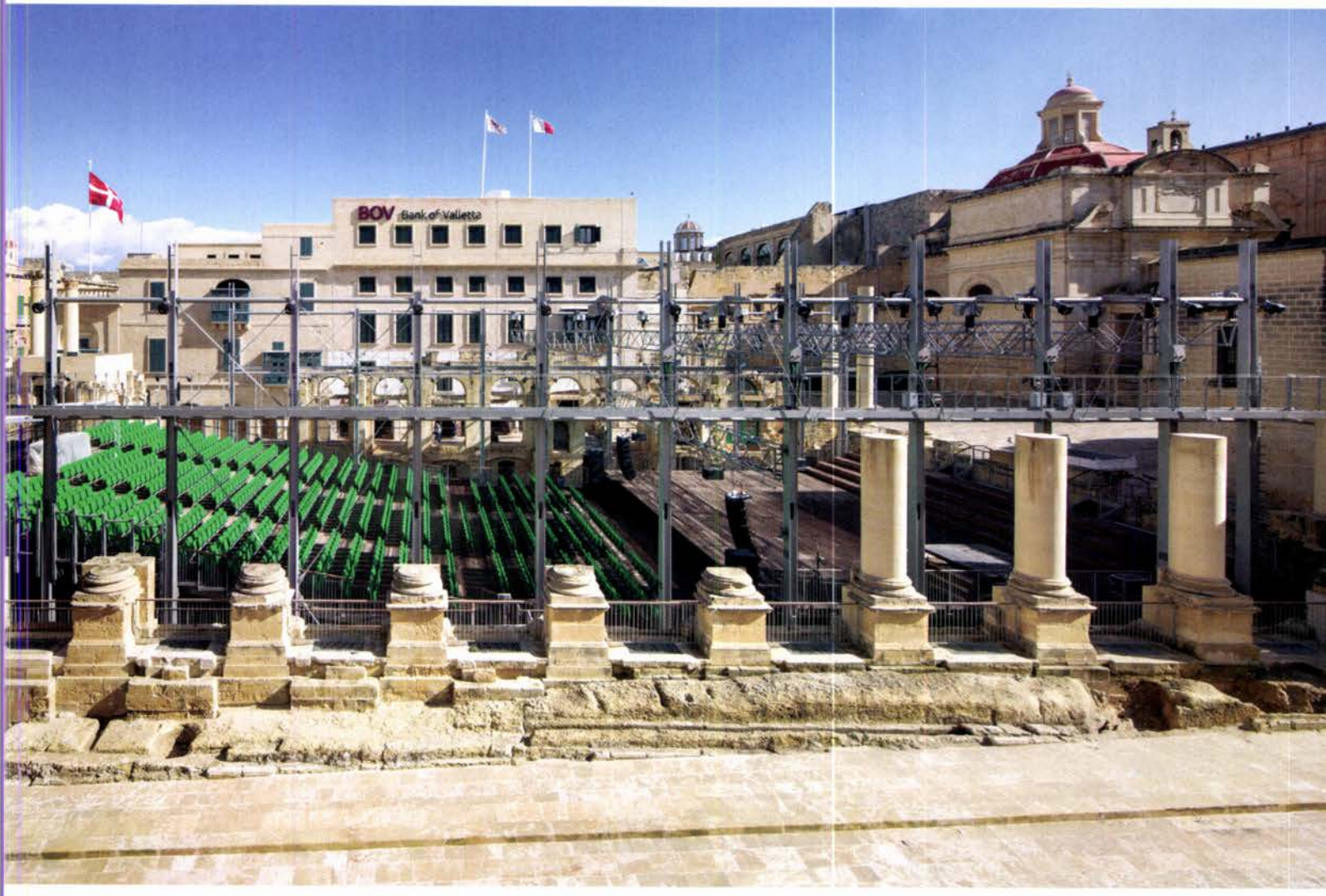
TILE: Refin

LIGHTING: iGuzzini

FURNITURE: UniFor, Vitra

ELEVATORS: Schindler

PLUMBING FIXTURES: Antonio Lupi


BOV Bank of Valletta

Speed Art Museum | Louisville | wHY

SQUARED AWAY

Topped by cantilevering walls of folded aluminum, a bold addition opens up the Speed Art Museum to its surroundings.

BY JAMES N. GAUER

PHOTOGRAPHY BY RAFAEL GAMO

According to architect Kulapat Yantrasast, "You can't get a good answer if you don't start with a good question." The former protégé of Tadao Ando is founding partner and creative director of wHY, an interdisciplinary design studio based in Los Angeles and New York, whose ambitious expansion of the Speed Art Museum in Louisville opened in March. Yantrasast won the commission in 2009, after having completed a new building for the Grand Rapids Art Museum, in an international competition whose short list included Bernard Tschumi, Bjarke Ingels, and Jeanne Gang.

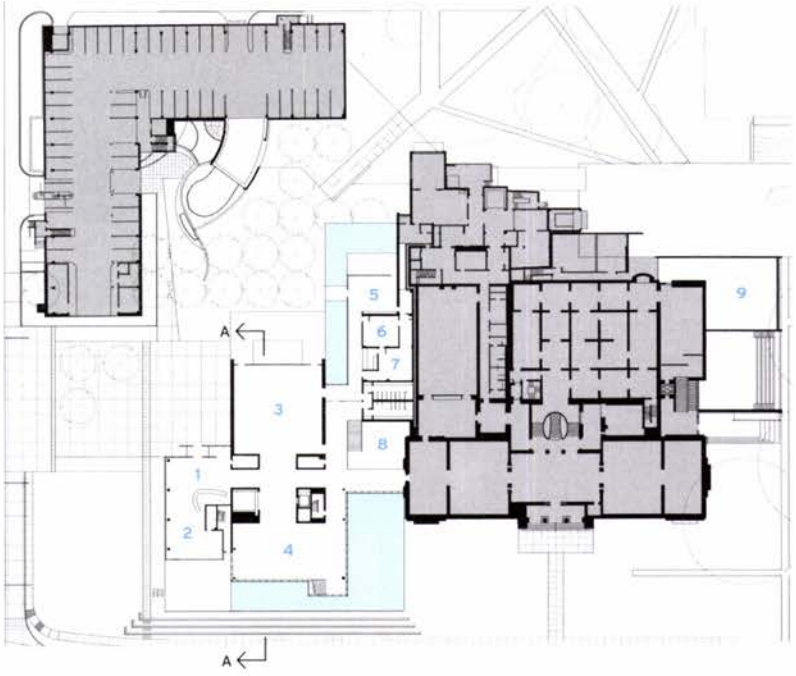
Hattie Bishop Speed, who believed in the power of art to change people's lives, established the museum, Kentucky's oldest and largest, in 1925 as a memorial to her industrialist husband, James Breckinridge Speed. Local architect Arthur Loomis designed its first home, which opened in 1927 next to the University of Louisville's Belknap Campus, as an erudite if hermetic Beaux Arts monument, rendered in champagne-colored limestone. Additions followed in 1954, 1983, and 1995. The recent expansion encompasses approximately 80,000 square feet of renovation and 75,000 square feet of new construction.

Yantrasast's first question was, "What would Mrs. Speed do?" It might seem unlikely that she would choose to nestle her discreet classical temple between two assertive modernist pavilions of glass, aluminum, and concrete. But Yantrasast thought otherwise: "I wanted to touch the life of the Speed with a vibrancy and variety that enhance its integrity and accessibility and bring it into the 21st century. Mrs. Speed would be very excited about it."

The 62,500-square-foot, three-story North Pavilion, much of it bordered by shallow reflecting pools, is an instant landmark that nearly triples exhibition space and gives the museum a compelling new identity. Intended to appear freestanding and in asymmetrical counterpoint to the original museum, its massing spirals to reflect its vertical circulation. The first level is carved out below a substantial stair, while the second and third levels are articulated as cantilevered masses.

The free-flowing but axially planned ground floor, clad almost entirely in glass, reorients the institution to engage the city and the university equally. Accessed from a new plaza open to both, the entry hall places visitors on axis with the 1927 building. Positioned on a cross axis that links the campus to South Third Street, a major boulevard, are two imposing public spaces. Parallel to the street is the lobby, an ample atrium with the floating grand stair to the contemporary galleries above. Flanking the campus side is the auditorium, an expansive hall opening

ALL ACCESS
The boxy, aluminum-sheathed galleries of the second and third levels, slightly askew, sit atop the glass-clad ground-level spaces, which are accessed from a plaza open to a main boulevard in one direction and the nearby university campus in the other.



GROUND-FLOOR PLAN

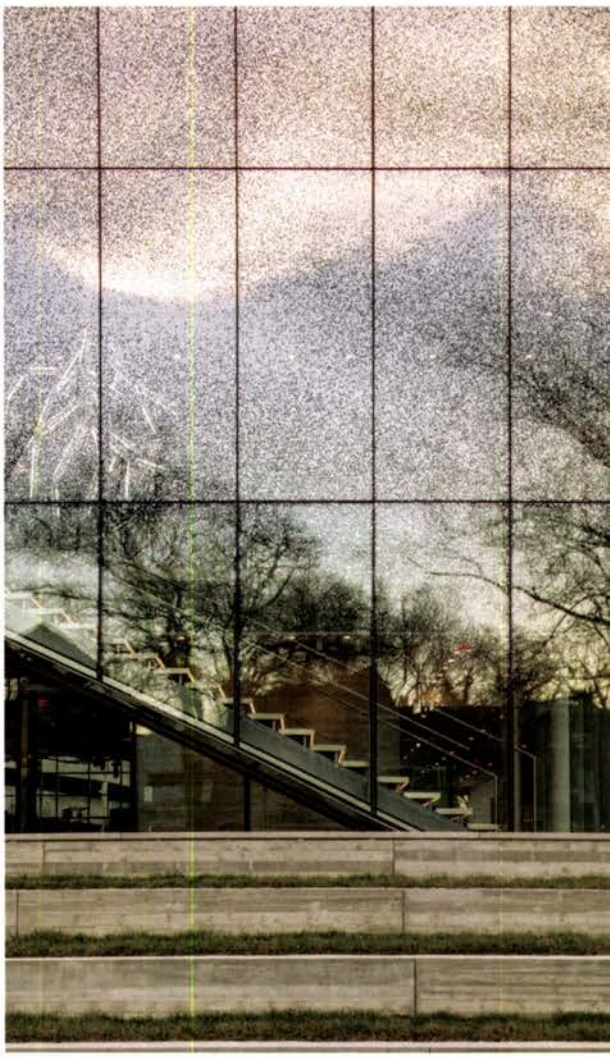
0 60 FT. 20 M.

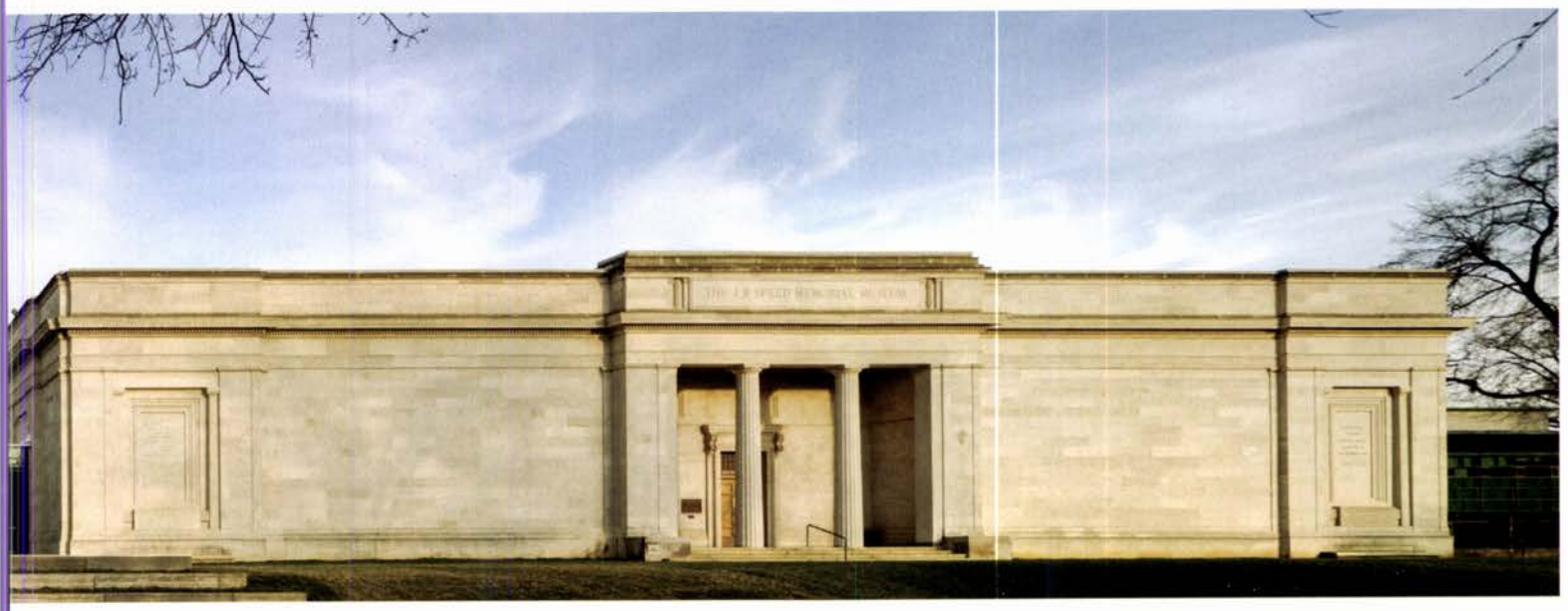
SECTION A - A

0 30 FT. 10 M.

1 ENTRY HALL
2 MUSEUM SHOP
3 AUDITORIUM
4 LOBBY
5 CAFÉ
6 KITCHEN
7 CATERING
8 EDUCATION COURT
9 SOUTH PAVILION
10 GALLERY
11 MECHANICAL
12 ART STORAGE

SIDE BY SIDE The aluminum and glass facade of the addition matches the champagne color of the original building's limestone walls (above). The insulated glazing units are fritted in a wavy pattern to give a sense of depth and provide additional light control to the lobby (below).





to a terrace via a hangar door that can lift the room's exterior glass wall to make a giant awning.

The separate 12,500-square-foot, one-story South Pavilion, which abuts and partially conceals previous additions behind the Loomis building, provides more galleries and a 145-seat cinema while enclosing an outdoor sculpture garden. To further the goal of community engagement, the cinema—like the café in the North Pavilion—is accessible to the public without their visiting the museum.

Both pavilions share a spare but refined palette of materials. Vertically modulated curtain walls—predominantly of glass fritted in a pattern that becomes denser as it goes higher to control light—enclose the full height of the lobby and most ground-level spaces, which have floors of honed terrazzo. Irregularly corrugated panels of anodized aluminum clad the exterior walls of upper-level galleries, which have floors of white oak. Interior cores and the few entry-level exterior walls that aren't glass are board-formed concrete. The warm gray color of both concrete and aluminum is keyed to the champagne color of the 1927 landmark's limestone walls.

Seamless circulation provides serene passage from light to dark and from new to old. In the contemporary galleries—vast open-plan volumes scaled for rotating exhibits of large pieces—careful placement of interior walls facilitates smooth transitions between spaces and also modulates light levels from 80 foot candles in zones adjacent to the sunlit lobby down to 10 foot candles in areas that display works on paper. A glass bridge overlooking the education court—a second atrium newly excavated from a former basement—completes the axial procession from the bold, glassy transparency of the North Pavilion to the subtle limestone opacity of the original building.

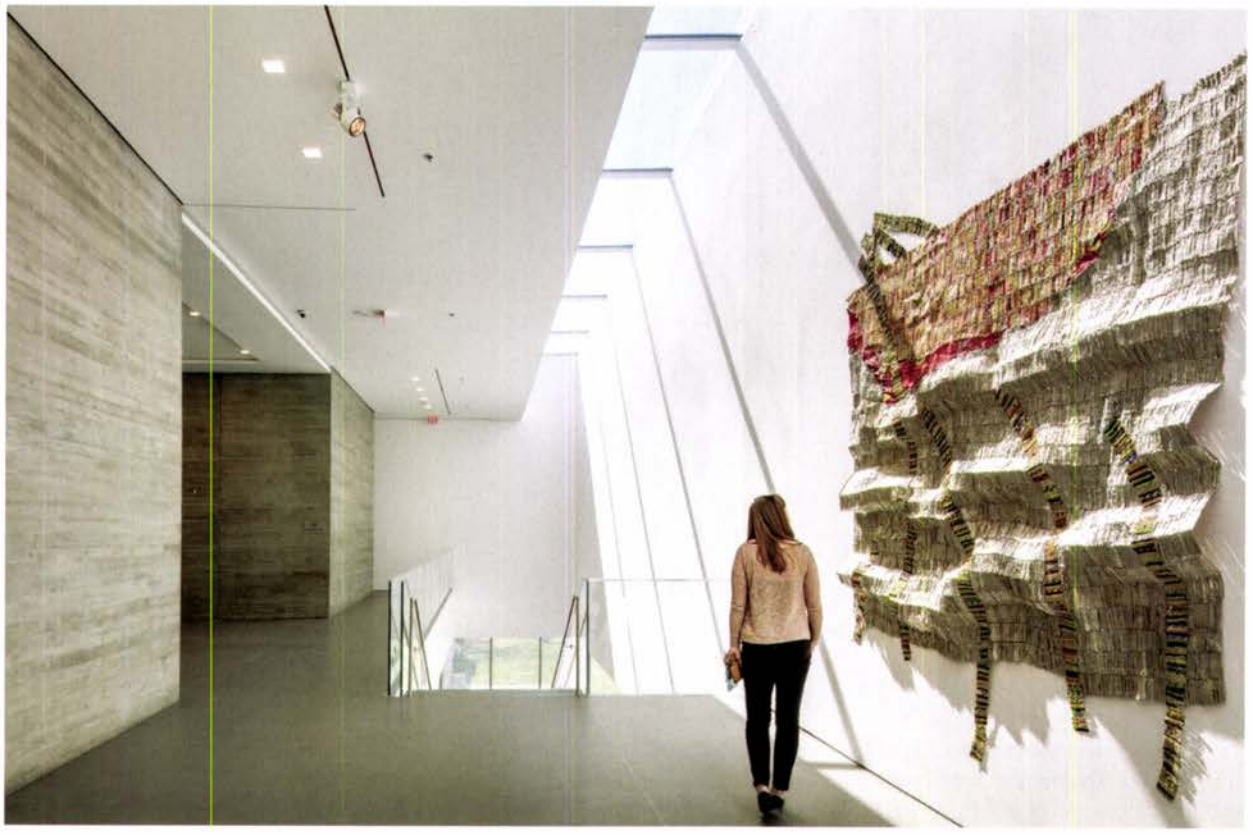
"The bridge is very grand," says museum director Ghislain d'Humières. "It provides a vista into 6,000 years of creativity." Visitors come down

THE CREATIVE PROCESS
KULAPAT YANTRASAST

KULAPAT YANTRASAST describes wHY's creative process at the Speed Museum as "acupuncture architecture." "I came up with the notion," he recalls, "when I was preparing for the design competition. I felt that museums are like old souls that have lived before us and will live long after us. So I think our efforts at rehabilitation and expansion should be like acupuncture and not like plastic surgery. This approach is about precise interventions at key spots in and around the museum in order to help rejuvenate and improve its flow and vitality as it gets bigger. There are so many museums that have become victims of their own enlargement by losing their clarity and vibrancy. I wanted to avoid that."

Another key aspect of wHY's creative process is a contextual yet inventive attitude toward materials, linking new to old. A good example is the folded anodized aluminum paneling that clads the exteriors of the galleries. wHY developed the panels by taking profiles of the classical moldings that give human scale to the monumental 1927 building, combining them horizontally, and then abstracting the resulting pattern to create an irregular zigzag corrugation in plan. The panels evoke the original limestone in both their color and their play of light and shadow.

INTO THE FOLD wHY developed the pattern for the folding aluminum panels of the addition's facades by taking profiles of the classical moldings from the original building and combining them horizontally.



ARTFUL NEIGHBOR
Contemporary galleries are vast open-plan volumes scaled for rotating exhibits of large pieces, and feature white oak floors and board-formed concrete walls at the elevator core (this page). The axially planned ground floor, clad almost entirely in glass, reorients the institution to engage the city (opposite).

from the bridge into the 1927 enfilade of classically configured galleries, anchored at their center by a hypostyle hall, which is linked by a new glass stair to a reorganized series of rooms that house permanent collections of European and American paintings above and Kentucky decorative arts below.

The Speed's new transparency and accessibility mesh well with d'Humières' vision for the future. "It's exactly the tool we need," he explains, "to create a hub of creativity, a place for every generation, where you can bring art from around the world into an open, welcoming environment."

Contemporary museum design can run the risk of creating containers so audacious that they upstage their contents. At the Speed, Yantrasast's characteristic modesty helped him avoid this pitfall. "The job of a museum architect," he explains, "is that of matchmaker between two good friends—art and people. You set the best environment for the encounter, and then you leave the room." At the Speed, the architect may have left the room, but his elegant legacy of light, connection, and spatial clarity remains. ■

James Gauer, based in Victoria, British Columbia, and Chicago, is an architect and the author of The New American Dream: Living Well in Small Homes.

credits

ARCHITECT: wHY – Kulapat Yantrasast, principal in charge; Andrija Stojic, project architect

ARCHITECT OF RECORD: K. Norman Berry Associates Architects

ENGINEERS: Thornton Tomasetti, Brown + Kubican (structural); IBE Consulting Engineers, Kerr-Greulich Engineers (m/e/p); Sabak, Wilson & Lingo (civil)

CONSULTANTS: Reed Hilderbrand, Carman (landscape); Renfro Design Group (lighting); Newson Brown Acoustics (acoustics)

GENERAL CONTRACTOR: F.A. Wilhelm Construction

SIZE: 75,000 square feet (new construction)

COST: $50 million

COMPLETION DATE: March 2016

SOURCES

METAL PANELS: MG McGrath

METAL CURTAIN WALL: Kawneer

GLASS: Cristacurva

FOLD-UP DOORS: Schweiss

FLOOR AND WALL TILE: Rosa Mosaic & Tile, Louisville Stoneware

TRACK LIGHTING: Edison Price

ACOUSTICAL CEILINGS: Armstrong, Crane, Hunter Douglas

CARPET: Mohawk, Shaw

FURNISHINGS: Kartell, Herman Miller, Haworth

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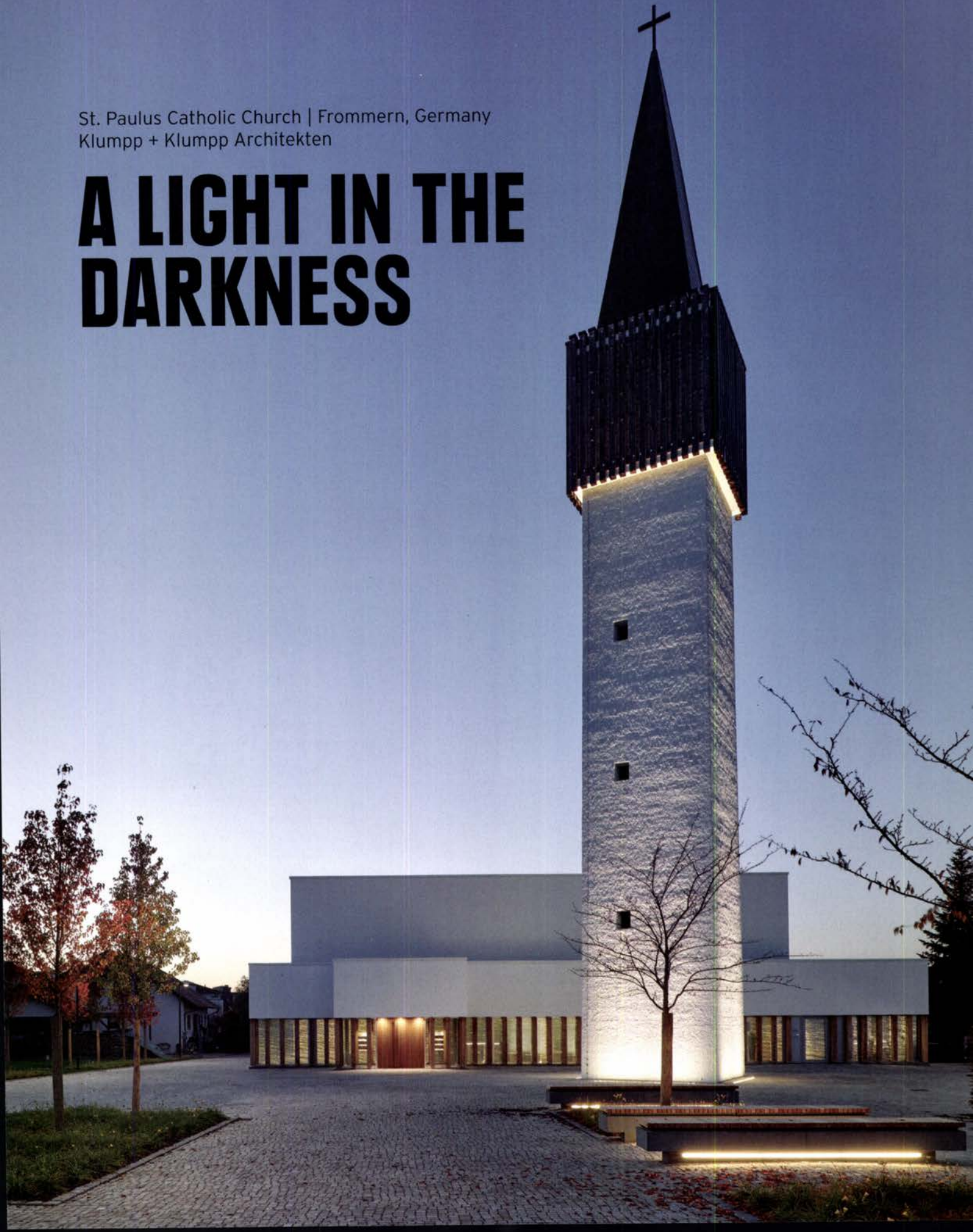
St. Paulus Catholic Church | Frommern, Germany
Klumpp + Klumpp Architekten

A LIGHT IN THE DARKNESS



A church in the Black Forest provides a tranquil retreat for parishioners.

BY MARY PEPCHINSKI

PHOTOGRAPHY BY ZOOEY BRAUN

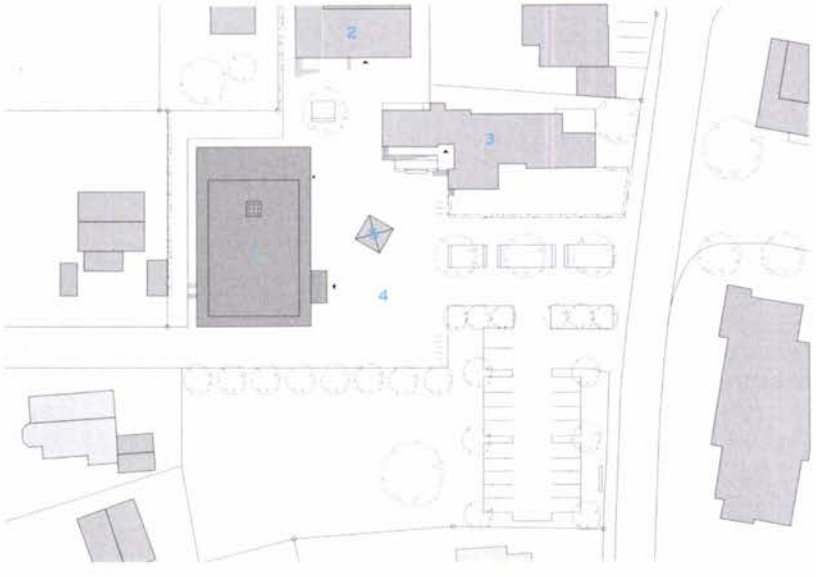
The remote, rural town of Frommern, in Germany's Black Forest, is hardly the place one expects to encounter finely crafted works of architecture. Yet the recently completed St. Paulus Catholic Church there brings design excellence to this enclave while offering its congregation a retreat from the trials of everyday life. "The community needs a spiritual *Heimat*," says Father Ewald Ginter, the parish priest, "a place to take time out from an increasingly hectic world."

The new church occupies the site of a former house of worship. Designed by architect Paul Nagler and completed in 1965, it was destroyed by arson in 2011. The original building stood at the center of a wide block and was poorly integrated into its fragmentary context: social housing and a commercial strip to the east, senior housing to the west, and single-family homes to the south. Only a narrow, through-block street led to the small entry plaza lodged between the church and its 115-foot-tall bell tower, while gardens that adjoined the parish's community center and rectory inhibited pedestrian access from the eastern edge of the block that had a high volume of foot traffic.

The new scheme required a master plan for the existing parish buildings and a 250-seat church with auxiliary religious and support services, totaling 6,000 square feet. Stuttgart-based architects Hans Klumpp and Julia Klumpp, who won a competition in 2012 for the project, understood that a sensitive site design was essential to link the building to its environs and inspire parishioners in this rural community to visit it. "It is easier for residents to accept the addition when it is well-integrated into the context," says Julia.

HIGHER CALLING
The architects applied the same rough-trowel plaster found on the existing bell tower to the nave of the new church (opposite). Hidden luminaires accent the vaultlike ceiling structure (below), and natural light enters the interior through generous windows and gaps between the ceiling and walls.

RAISED SPIRITS
White-bleached oak pews and benches seat 250 congregants (right). Untreated oak posts suspended over the altar have LEDs embedded in their ends. Ledges in the Chapel of the Virgin Mary hold votive candles, and small incisions in the wall contain messages to God written by parishioners.



SITE PLAN

0 30 FT.
10 M.

1 NEW CHURCH
2 EXISTING MEETINGHOUSE
3 EXISTING RECTORY
4 PLAZA
5 EXISTING BELL TOWER

The architects eliminated the gardens and situated the church, rectangular in plan, at the block's interior, perpendicular to the community center and rectory. Its long facad defines the western boundary of a new plaza, which extends to the eastern edge of the block. The team turned the through-block street into a pedestrian path that connects t the plaza, and gave old and new buildings white stucco facades. The bell tower dominates the new plaza and provides continuity between past and present.

Just as the architects created a sense of retreat with thei well-conceived site work, they also hoped to fashion a refuge with the building's design. In the 1960s, Hans worked for Gottfried Böhm, the 1986 Pritzker Prize recipient known for his expressionist religious architecture rendere in reinforced concrete. Like Böhm, Hans understands sacred spaces as transformative places "where people have a chance to experience life more intensely," says the architect. It is this quality that he and Julia aspired to achieve in Frommern.

On the church's exterior, untreated oak posts, like squat pilotis, surround the base. Behind them, continuous floor-to-ceiling glazing, screen-printed with a pattern of waves, encloses the ground level. From afar, this level looks open and inviting; from within, the translucent graphic obscures the surroundings, temporarily disconnecting occupants from everyday life while allowing light to penetrate the interior.

A bright and serene nave greets visitors entering the church; religious art appears ancillary to the architecture and the carefully orchestrated effects of light and shadow. The pulpit, baptismal font, and altar, constructed from matte-finished black steel plate, by artist Sabine Straub, seem to rise from the anthracite-toned terrazzo floor. Intimate, cream-colored plaster reliefs depicting the Stations of the Cross, by Matthias Maria Heiermann, are embedded in the columns facing the side aisles; at first glance, they are hardly evident. Thin horizontal bands of gold leaf inlay on the wall behind the altar subtly define the shape of a cross.

Directly above the altar, nine oak posts, like those on the facade, hang below a skylight, with LEDs embedded at their ends, marking this ritual spot. Concealed luminaires emphasize flattened, vaultlike recesses in the ceiling, creating the impression that the room is more expansive than its 25-foot height. Beams running between these recesses—as if they were Gothic ribs—are sheathed in plaster. Along perimeter walls, daylight spills down from glazed slots above to illuminate the nave. The ceiling appears to float above the space.

On a midweek afternoon, the church was surprisingly busy. Workers entered and stood in prayer; two musicians practiced on the organ, filling the space with sonorous chords; and, outside, residents crossed the plaza. Inside, intense sunshine, sometimes obscured by passing clouds, bounced off the articulated ceiling, casting elongated shadows on the side walls of the nave and then receding slowly, replaced by more diffuse illumination. The effect was mesmerizing and calming, and it was difficult to leave.

The St. Paulus Church provides parishioners in this isolated town with a refined venue for exploring their souls. "I can pray in a forest," says Father Ginter, "but being in a beautiful church helps me return to myself and find peace." ■

credits

ARCHITECT: Klumpp + Klumpp Architekten – Hans Klumpp, Julia Klumpp, design principals; Armin Traubenek, Thilo Sprenger, Boris Peter, Julia Nele Winkler, project team

ENGINEERS: Professor Faltlhauser Ingenieure (structural); Nürk und Partner (m/p); Neher Butz (electrical)

CONSTRUCTION SUPERVISION: Roland Göppel

CLIENT: Catholic community of Frommern

SIZE: 5,900 square feet

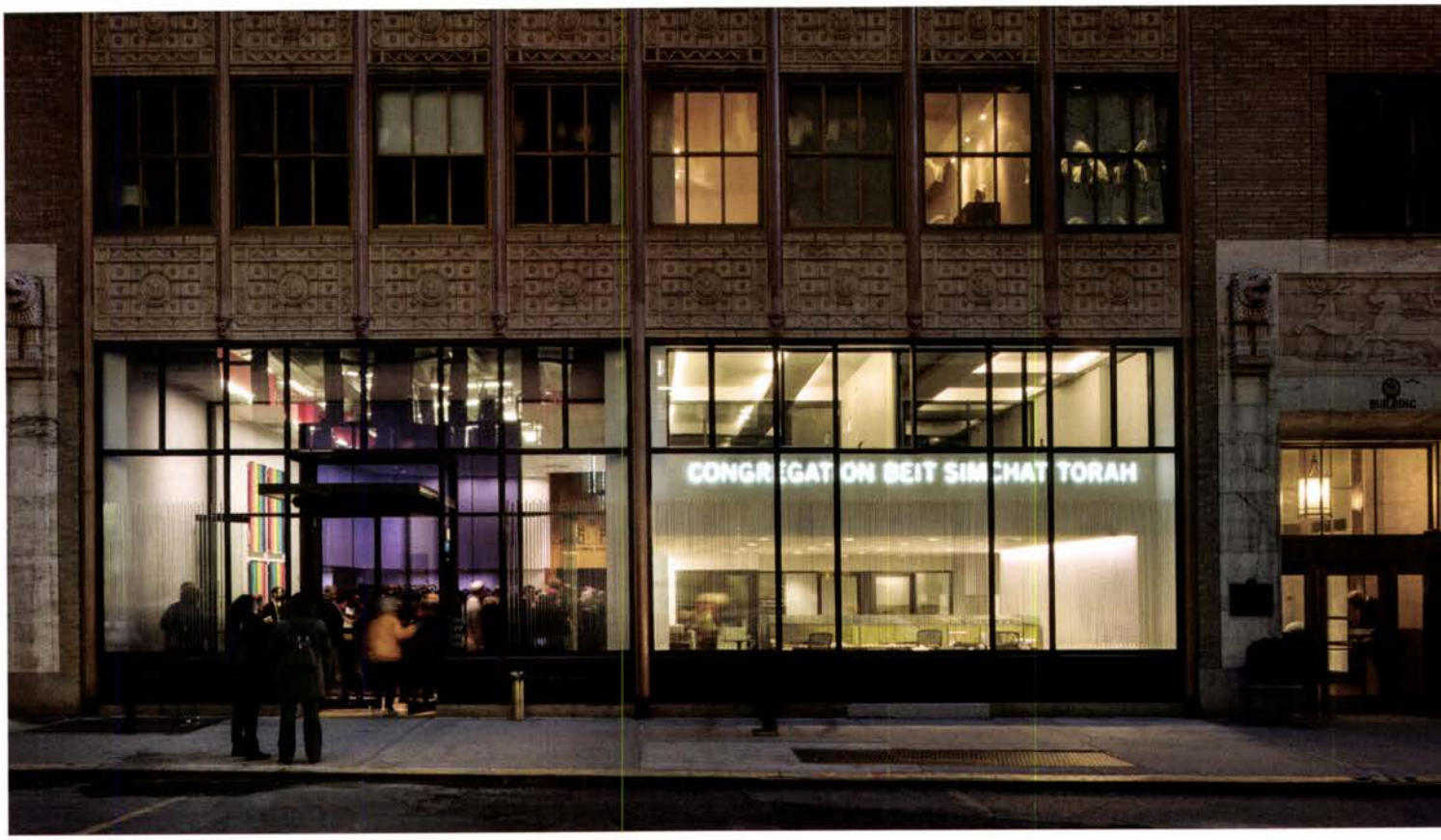
COST: $3.6 million

COMPLETION DATE: October 2015

SOURCES

MASONRY AND CEILINGS: Kaupp GmbH

GLAZING: Lacker AG (glass, skylights, insulated panels)



Congregation Beit Simchat Torah | New York | Architecture Research Office

A PLACE TO CALL HOME

After more than four decades, a congregation finally gets a synagogue tailored to its needs

BY JOANN GONCHAR, AIA

PHOTOGRAPHY BY ELIZABETH FELICELLA

Sharon Kleinbaum, senior rabbi of New York's Congregation Beit Simchat Torah (CBST), jokes that the space her organization had occupied for most of its 43-year history was like a 1970s lesbian bar: in order to find the synagogue's windowless quarters, buried deep within the venerable Westbeth artists' housing complex in Greenwich Village, you had to follow very specific directions. Once inside, "you couldn't see the outside world, and the outside world couldn't see you," she says.

But now CBST, the world's largest synagogue for lesbian, gay, bisexual, and transgender Jews, with about 600 member households, has a new home—one that, much like the LGBT community itself in recent years, has increased visibility. Early last month, CBST moved to a space designed by Architecture Research Office (ARO) on West 30th Street in the city's rapidly shrinking garment district. It sits at the base of a 1929 Cass Gilbert loft building that has a beautifully restored terra-cotta and brick exterior. The synagogue, which occupies the ground floor and basement of the 18-story landmarked structure (now a condo building), announces itself from behind a 50-foot-long glass storefront adorned with gold-leaf pinstripes. Behind this, a pane of lavender glass—the facade's only overt reference to the congregation's LGBT identity—bears the Hebrew words "it's good to give thanks to the one above."

For CBST, this street presence (with the security advantage of a police station next door) was a key asset of the former fur and handba shop, purchased by the organization in 2011. The space had many other desirable qualities, including an 18-foot-tall ground floor with a mezzanine. The configuration would allow ARO to design a sanctuary with a gallery and provide enough seating for 299 people—about twic the number who had been regularly attending Friday-night Shabbat services at a church in the Chelsea neighborhood (the congregation had long ago outgrown its Westbeth sanctuary). The space also had 13-foot-6-inch-high ceilings in the basement, making it well suited for a chapel, classrooms, and a community room. Still, with approxi-

URBAN REFUGE
Unlike its former location, CBST's new home sits at the base of an 18-story landmarked building, behind a 50-foot-long storefront (opposite). A pane of lavender glass, visible from the street, divides the entry vestibule and the tall, welcoming lobby (below). The main sanctuary (left) features a skylight above the *bimah* that helps show off the pleats in a new canted wall of GFRC.

mately 21,000 gross square feet, the new location did not quite match CBST's programmatic ambitions. "It had everything we wanted except an extra 5,000 square feet," says Aari Ludvigsen, vice president of the synagogue's board and its capital project coordinator.

These spatial constraints, along with a tight construction budget of $8.8 million, meant that all the project's elements would need to do double duty. For example, the lobby, which takes advantage of the ground floor's height, can host receptions and encourages schmoozing before and after services. A generous stair leading to the lower level can serve as an informal seating area for the community room. And the chapel, which is large enough for a small wedding, is also the congregation's library.

But, despite these constraints, the design team's most notable triumph is the project's welcoming feel and quiet drama. This is especially evident in the main sanctuary, which the clients envisioned as a refuge, explains Stephen Cassell, an ARO principal. Cassell and his team produced the desired atmosphere by placing the *bimah* (the elevated platform where the Torah is read) along the south, rear wall of building, rather than orienting the room to the east, toward Jerusalem, as is traditional. By doing so, they were able to create a shallow space where no seat is more than 35 feet from the pulpit. This intimacy is enhanced by subtly curved walls and a rich materials palette that includes midnight blue wallpaper and plum-colored cushions for the custom curved oak benches. Designed and fabricated in England, the seating can be stacked and rolled away so that the room can be used for dinners, including Passover seders, or other events.

ARO's biggest move in the sanctuary was to demolish the existing exterior masonry wall and replace it with a new one that has vertical ribs in glass-fiber reinforced concrete (GFRC). The wall kicks out about 10 degrees at the top, permitting the insertion of a 46-foot-long skylight, without contributing to floor area. Direct sunlight, which

will occasionally find its way between the surrounding densely packed buildings and through the skylight, along with indirect sunlight and inconspicuously placed electric illumination, show off the wall's sculptural surface, giving it the appearance of pleated fabric. The new wall, and its angle, texture, and mass (achieved with 10 inches of structural concrete and 4 inches of GFRC), also help distribute sound throughout the room, even into the upper gallery.

As with any renovation project, ARO had to work with the existing building's steel and concrete frame, even though this meant columns

JOYFUL NOISE The new pleated wall's angle, texture, and mass help distribute the sounds of the services (above) throughout the sanctuary, even to the upper gallery. The ark (left) has multiple layers of enclosure, including a textile of metallic threads and plant fibers woven in Colombia, and a pair of sliding doors made of twisted oak staves. The oak elements are also employed in the basement chapel (opposite) on th walls and ceiling surrounding its ark.

in a few awkward locations. But the architects have made the most of these occurrences, engaging the structure in meaningful ways. They transformed one column that rises from the *bimah* at the front of the sanctuary into a *ner tamid*—a lamp that is never extinguished, feature in every synagogue. CBST's eternal light is minimal and modern, mad by carving a torch-shaped void from the column. It is applied with gol leaf and illuminated with an LED array that is programmed to flicker every now and then like a flame.

The *ner tamid* is one of several traditional elements found at CBST that have been reimagined to merge craft, fabrication, and contempo rary technology. Another is the ark that emerges from the sanctuary' pleated wall and holds the congregation's Torahs. The scrolls are pro- tected by three layers, the innermost being a wine-hued fabric curtai laser-cut with a floral motif derived from a frieze on a 14th-century synagogue in Toledo, Spain. This is a deliberate nod to Sephardim, wh are a minority among American Jews, and it is intended as a symbol o the congregation's diversity.

At CBST, even mundane elements communicate a commitment to inclusiveness. The main bathroom, labeled as a "shared restroom," has seven private stalls with floor-to-ceiling partitions and a commo sink area. In order to legally build in this configuration, CBST applie for, and was granted, a variance from the buildings department. In a letter that accompanied the application, Kleinbaum explained that the synagogue hoped to "build *shalom bayit*, a peaceful, safe, and incl sive home for all who come through our doors." The architects have accomplished this through myriad carefully considered details that touch almost every aspect of the project. At the same time, they have given their clients a space of their own with the visibility, and the dignity, they deserve. ■

credits

ARCHITECT: Architecture Research Office – Stephen Cassell, partner in charge; Megumi Tamanaha, project director; Jane Lea, project manager; Zachary Stevens, project designer; Drew Powers, Yannik Neufang, Nora Yoo, Kai Pedersen, Ethan Feuer, Danielle Brown, Vikki Benefiel, Adam Stehura, Michael Haddy, project team

CONSULTANTS: Silman (structural); Altieri Sebor Weber (m/e/p); Tillotson Design Associates (lighting); Threshold Acoustics (acoustics); Reginald Hough Associates (concrete)

GENERAL CONTRACTOR: Eurostruct

CLIENT: Congregation Beit Simchat Torah

SIZE: 21,000 square feet

COMPLETION DATE: April 2016

SOURCES

CURTAIN WALL: Kawneer

SKYLIGHT: Lynbrook Glass & Architectural Metals

ACOUSTICAL CEILINGS: Armstrong, Hunter Douglas, Tectum

ARK AND MILLWORK: City Joinery

ARK TEXTILES: Hechizoo, Erik Bruce, Creative Baumann

PEWS: Luke Hughes

WALL COVERINGS: Knoll, Stingray

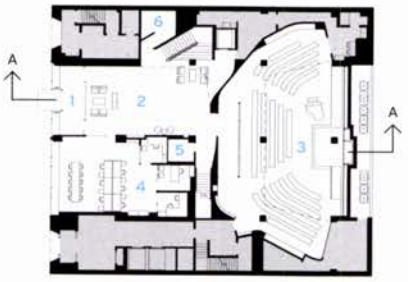
PAINTS AND STAINS: Benjamin Moore

LED MEMORIAL WALL AND ETERNAL FLAME: Studio 1Thousand

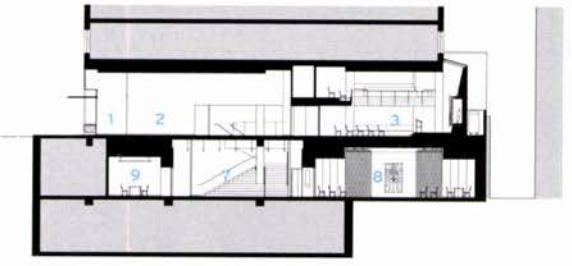
LIGHTING CONTROLS: Lutron

BASEMENT-LEVEL PLAN

0 20 FT.
6 M.



GROUND-FLOOR PLAN

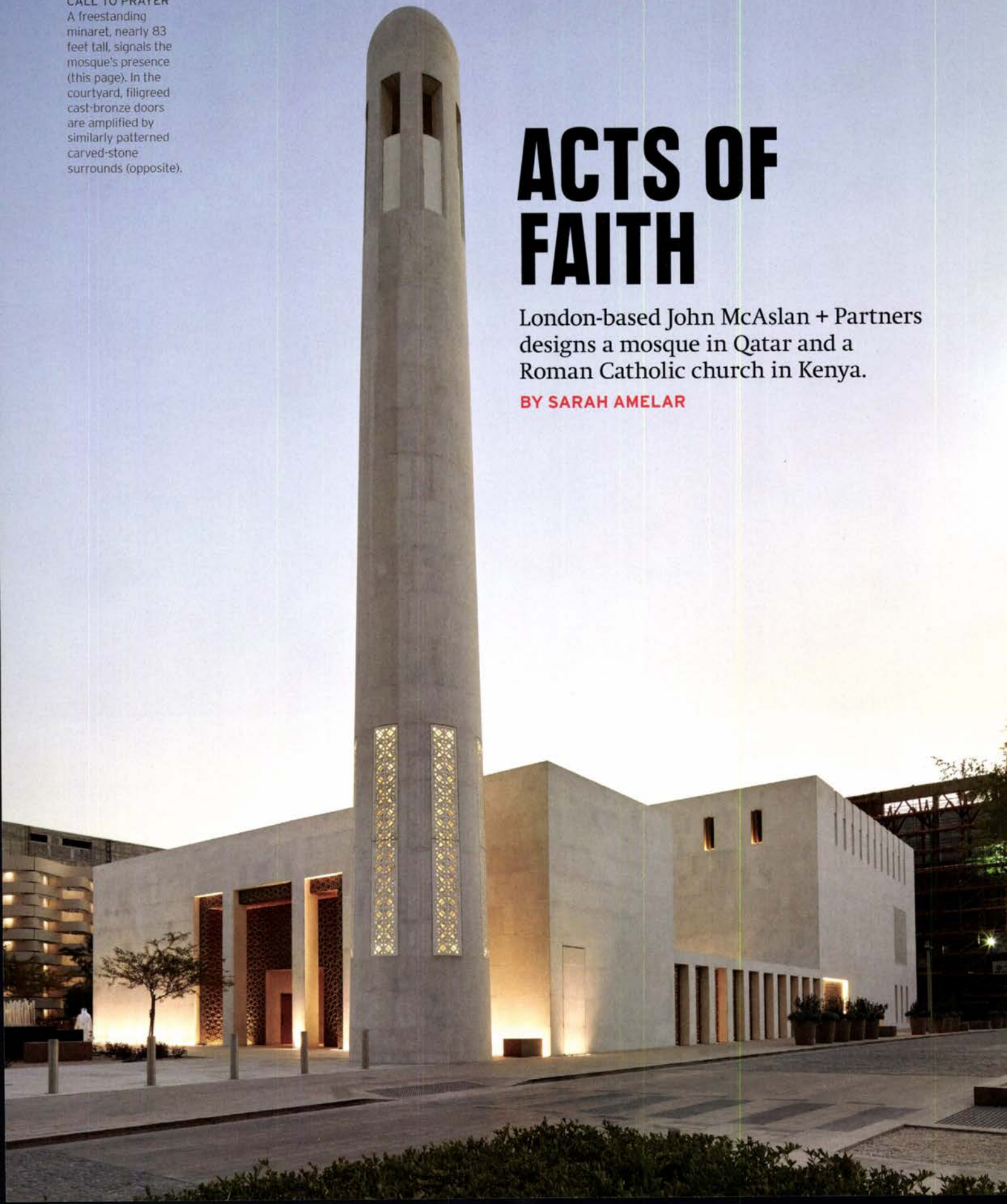


SECTION A - A

0 20 FT.
6 M.

1 ENTRY
2 LOBBY
3 SANCTUARY
4 ADMINISTRATION
5 RESTROOM
6 COAT ROOM
7 COMMUNITY ROOM
8 CHAPEL
9 CLASSROOM
10 KITCHEN

CALL TO PRAYER
A freestanding minaret, nearly 83 feet tall, signals the mosque's presence (this page). In the courtyard, filigreed cast-bronze doors are amplified by similarly patterned carved-stone surrounds (opposite).



ACTS OF FAITH

London-based John McAslan + Partners designs a mosque in Qatar and a Roman Catholic church in Kenya.

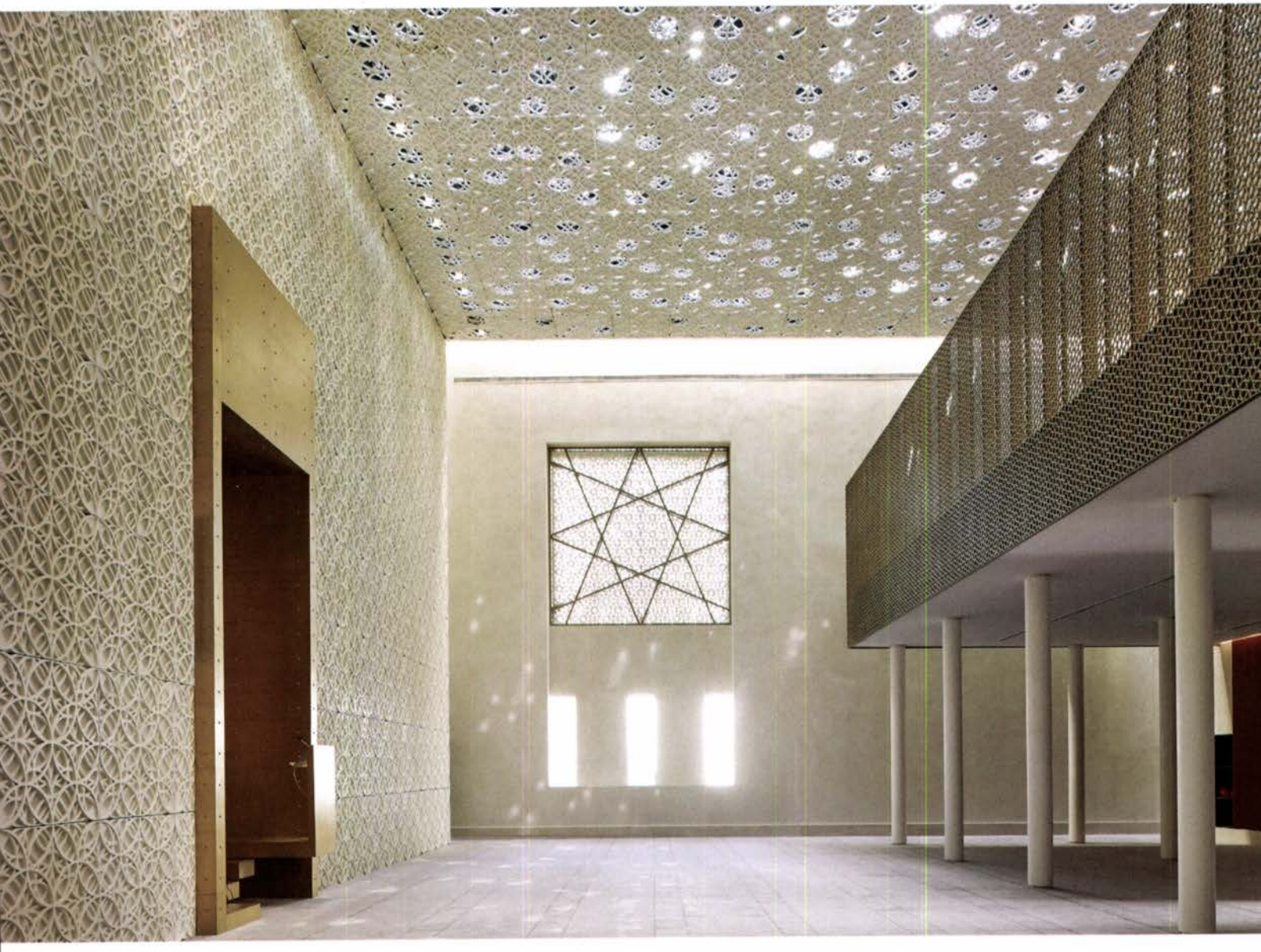
BY SARAH AMELAR

At two very different houses of worship—the Jumaa Mosque, in urban Qatar, and the Sacred Heart Cathedral, in rural Kenya—there's a moment of revelation at the threshold of sacred space. That critical transition from the outside world "can be awe-inspiring," says architect John McAslan, whose London-based firm, John McAslan + Partners (JM+P), recently completed both projects. "Yet it's not about ostentation, but about something far more humble and profound."

At Jumaa, the journey inward—physically and spiritually—proceeds from traffic-filled streets in the labyrinthine historic core of Doha, the Qatari capital, an area currently undergoing extensive regeneration (including JM+A's renovation of historic houses around the Jumaa site). Signaling the sacred building's presence is a freestanding minaret, nearly 83 feet tall and unadorned except for a ring of carved screens near its base. Clad in the same pale, luminous Omani limestone as the minaret is the mosque itself, ornamented solely with recessed, geometrically patterned, cast-bronze entryway panels: a discreet glint suggesting the inner realm. Otherwise, all that punctuates the 50,000-square-foot structure's simple massing—two rectangular volumes joined by a courtyard—are a few essential openings and the shadow-casting rhythms of rect-

FLOOR PLAN

1 PORTAL
2 MINARET
3 ABLUTIONS AREA
4 COURTYARD
5 PRAYER HALL
6 QIBLA WALL



angular columns and roof-edge castellation. Yet this quiet, balanced composition has a powerful, serene presence.

The route for worshipers follows an axial sequence largely prescribed by Islamic ritual. Here, each successive space, leading from ablution and shoe-removal areas to the prayer hall, seems calmer and more contemplative than the last. As is typical of mosques, male-female segregation was required, with separate entrances. At Jumaa, men cross a courtyard, centered on a reflecting pool, before reaching the sanctuary portal.

Accentuating this threshold's significance are geometrically filigreed cast-bronze doors, 23½ feet tall, amplified by similarly patterned carved-stone surrounds. The 16,200-square-foot prayer hall is nearly cubic, precisely echoing the courtyard's proportions. Within the inner sanctum, this outwardly austere stone box glows, its boundaries simultaneously defined and dematerialized by daylight filtering through the ceiling's delicate wood veil. The carpeting is printed with a pattern of rows indicating individual prayer mats. Directly ahead is the hallowed and intricately carved Qibla wall, oriented toward Mecca, with the imam, the worship leader, near its center. (The women's mezzanine, screened yet included in the larger space more than at most mosques, overlooks the prayer hall and the imam.) CNC-fabrication of layered ornamental surfaces—for the Qibla wall, ceiling screen, minaret, and portals—taps into local 21st-century practices, combining modern technology with ancient craft.

Creating a "specifically Qatari mosque—not a generic or even just a Gulf one—was important," says project director Fanos Panayides. Here, traditions of sparse exterior decoration and pure form dovetailed with JA+P's clean-lined modernism. "Qatari mosques," Panayides adds, "have changed little over time, retaining a simplicity that most closely represents the Prophet Muhammad's own [courtyard] house."

Ritual—and the specific context of culture and place—also had architectural implications for Kericho's Sacred Heart Cathedral, a church as rooted in Kenya's Great Rift Valley as the Jumaa Mosque is in historic Doha. About 155 miles northwest of Nairobi, Kericho is a hilly tea-growing area, where a large, vibrant Roman Catholic population had made the most of a dilapidated church-hut. Then, a miracle happened: a family from abroad anonymously gave the community a reported $3 million to build a cathedral there.

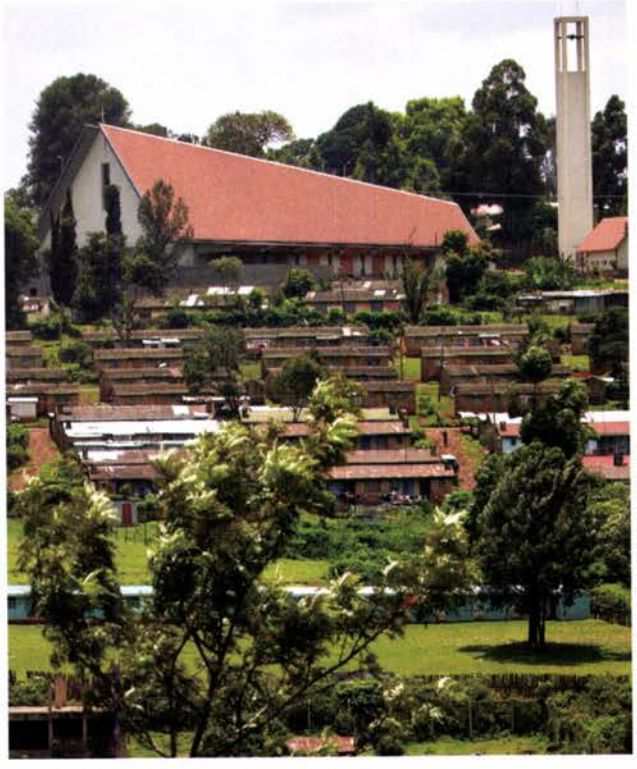
Completed in late 2015, the lofty hillside cathedral is a landmark from afar, with its separate bell tower and huge, uptilted gable roof. Seen closer in, its locally made clay roof tiles reveal patterns echoing

SACRED SPACES
Both the sacred Qibla wall and the skylit "veil" overhead integrate layers of CNC-cut wood panels. Females occupy the screened mezzanine (left). Leading from the courtyard into the prayer hall are two layers of doors: a grand, perforated bronze pair, followed by a set of solid, but similarly patterned, inner ones (right).

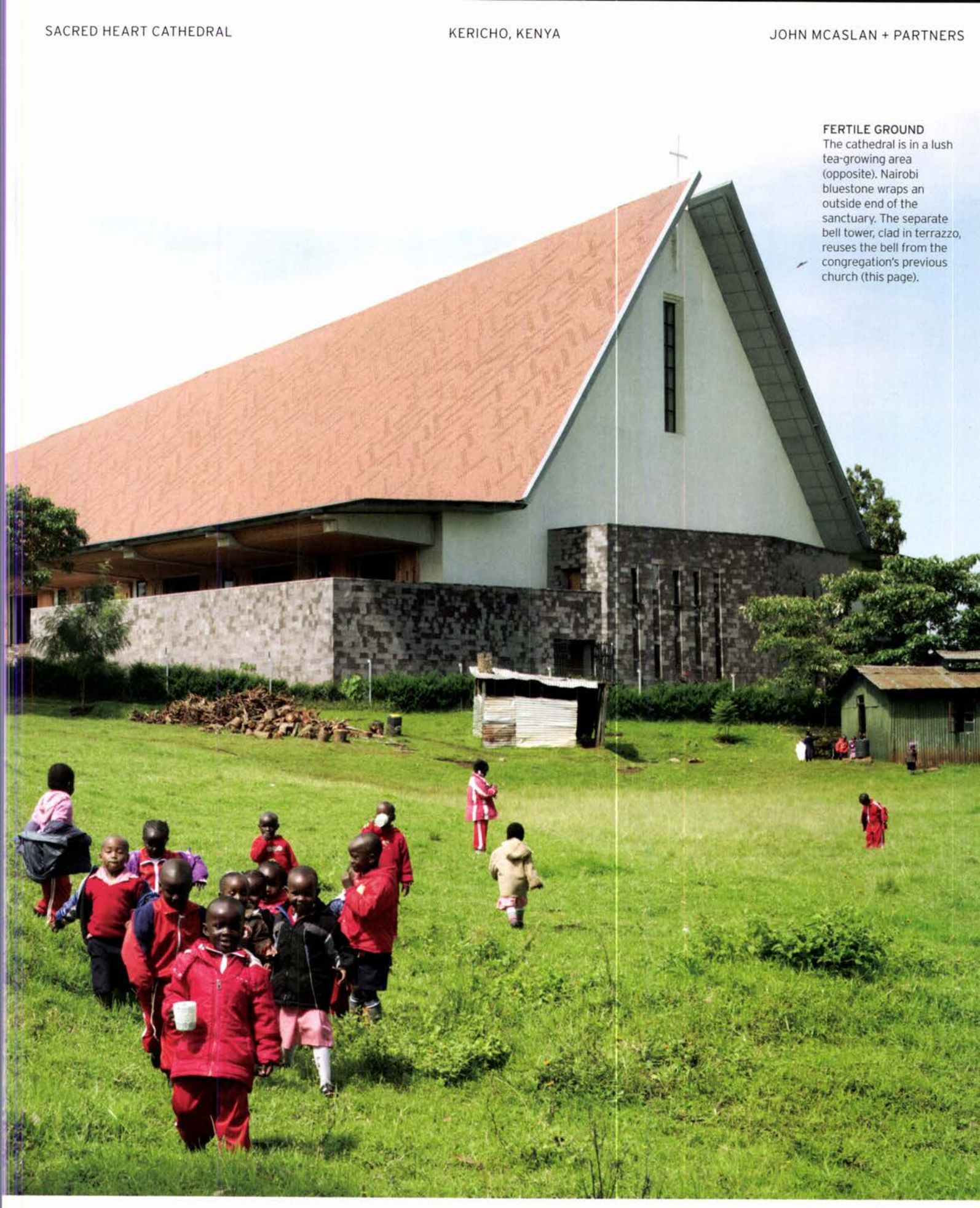
nearby fields, and it becomes clear how the building is embedded in, almost stitched into, this lush landscape. Tiered terraces extend outward under deep eaves that bend from the pitched roof like a fedora's brim. Exterior grandeur comes from the 45,000-square-foot building's scale and expressive riff on a familiar form, rather than ornamental flourishes. This humility reflects not only frugality in budgeting—though low construction costs made it possible "to do a lot here with a little," as project leader Peter McLaughlin says—but also the desire to harmonize with the surrounding structures built with a modesty of means.

Inside, an unpretentious majesty reveals itself with a crescendo more unabashedly exuberant than the mosque's culminating thresholds. "Bishop [Emmanuel] Okombo wanted the cathedral to embrace the community with open arms—with the intimacy of a family at a dinner table," recalls McAslan. "He envisioned a strong visual and physical connection between congregants and the altar." So, in plan and section, the sanctuary expands toward the altar, splaying in width and ascending in height, as its succession of concrete arches—an exposed structural skeleton analogous to Gothic vaults—telescopes down the nave. The pews, accommodating 1,000 seated, are radial. Running the length of the central aisle, a skylight filters rays through rustic cypress screens (recalling—yet distinct from—the mosque's overhead radiance).

With operable louvers, the cathedral's skylight refreshes its vast, non-air-conditioned interior with a natural stack effect. Double side-aisle doors in each structural bay also open the sanctuary to cross breezes, views, birdsong, and overflow crowds. (Similarly, in the mosque's protected courtyard, Qatari limestone paving extends the prayer-rug rows outside.) And to accommodate Kericho's "extraordinarily colorful, flamboyant, and joyful celebration of the Mass," as McLaughlin describes it, the architects created "wide aisles



PHOTOGRAPHY: © EDMUND SUMNER



FERTILE GROUND
The cathedral is in a lush tea-growing area (opposite). Nairobi bluestone wraps an outside end of the sanctuary. The separate bell tower, clad in terrazzo, reuses the bell from the congregation's previous church (this page).

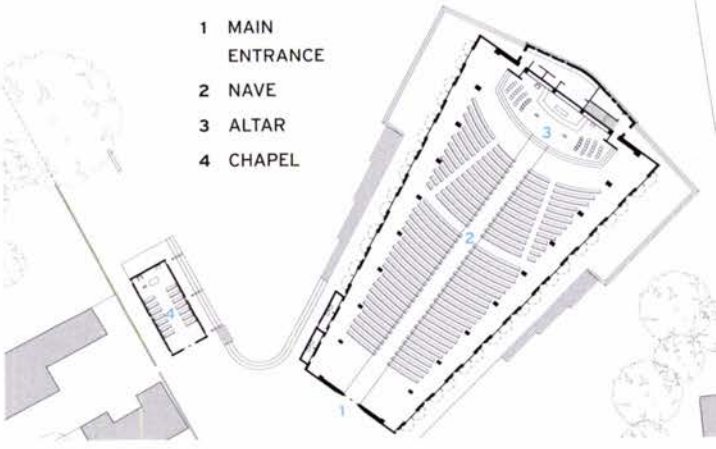
ALLELUIA Congregants spill from the side-aisle portals after services. Overflow turnout can be accommodated for Mass on the terraces (above). The altar's wood crucifix is made from a podocarpus tree that was felled to clear the site for the cathedral (opposite).

and ample space for even the choir to dance."

As at Jumaa, the design also drew on such place-specific influences and resources as regional materials and construction methods and traditionally sustainable measures (as with airflow). The cypress for the ceiling was harvested from the nearby Finlays tea plantation, which also runs a timber business. "And concrete is one of the things they do best here," says McLaughlin, "but we pushed them farther than they'd ever taken it."

The cathedral is, however, intentionally lower in tone than typical churches in the area. "We chose to accommodate ornamental flamboyance more through artwork than architecture," explains McLaughlin. (An example is the long exterior-wall mosaic by regional Rastafarian artists, portraying the creation narrative with fragments of construction-waste stone.)

Before building the Jumaa Mosque and Kericho cathedral, JM+P's only prior "sacred architecture" had been the renovation of a Quaker meetinghouse in Britain. But beyond their disparate contexts and circumstances, these sacred spaces share essential aspects, says McAlsan (whose firm is now designing Western Europe's largest mosque). "It's the aspiration to have nothing be superfluous. Everything is there for a purpose: authentic, practical, legible, and symbolic. It's a sense of solidity and permanence with, at the same time, fleeting qualities of light and space." Perhaps within that paradox of what is both substantial and ethereal, we experience the intangible, the ineffable, and the sublime. ■



GROUND-FLOOR PLAN

credits

ARCHITECT: John McAslan + Partners

EXECUTIVE ARCHITECT: Triad Architects (Sacred Heart Cathedral)

ENGINEERS: Arup, Eng Plan, EAMS (Sacred Heart Cathedral)

SOURCES

JUMAA MOSQUE

GLAZING: Saint-Gobain

HARDWARE: Giesse

INTERIOR AMBIENT LIGHTING: Zumtobel

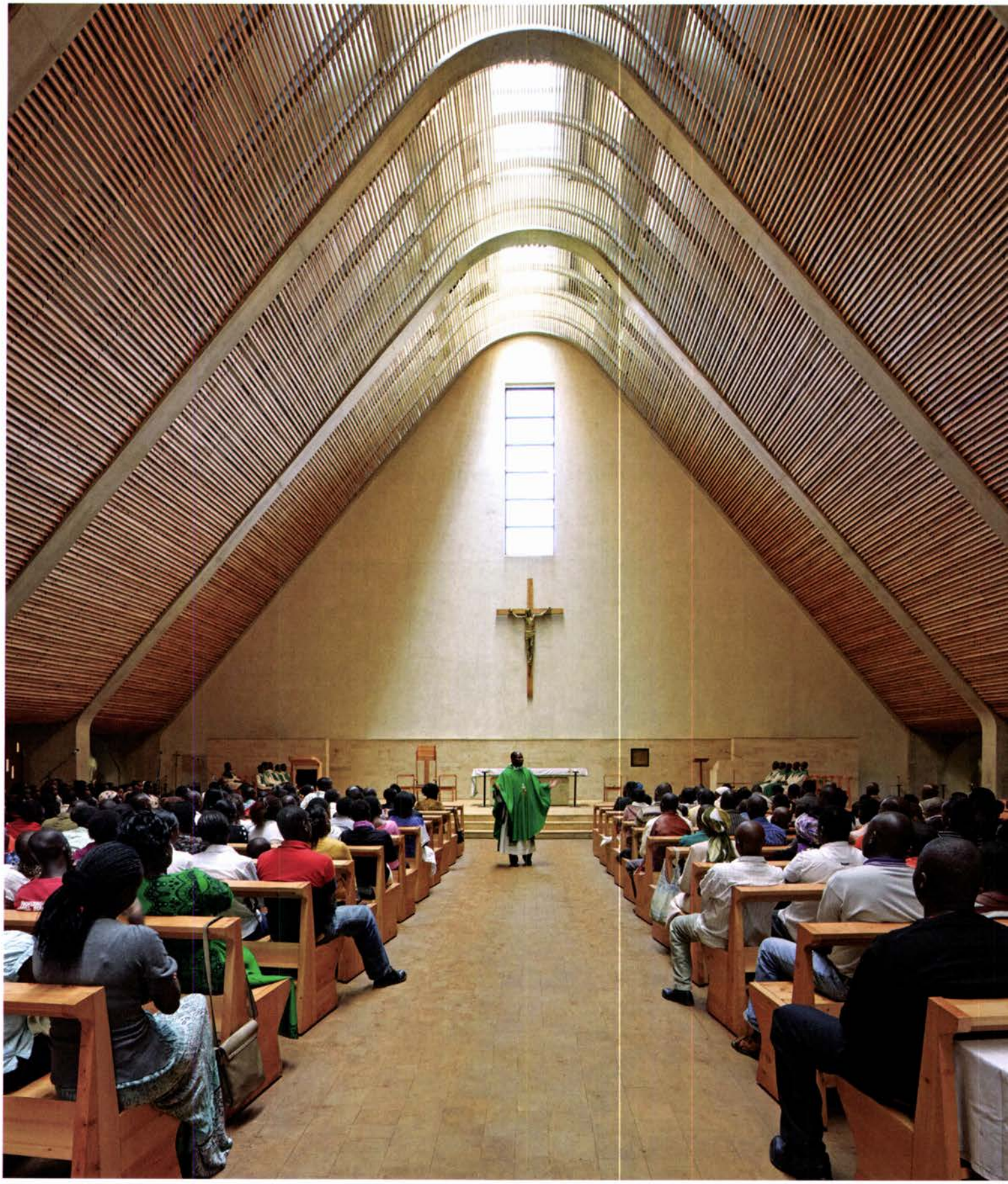
EXTERIOR LIGHTING: iGuzzini

SACRED HEART CATHEDRAL

ROOF TILES: Kenya Clayworks

STAINED GLASS AND ARTWORKS: John Clark

WOOD DOORS AND PEWS: Studio Propolis




Genie S-125

Baha'i Temple of South America | Santiago, Chile | Hariri Pontarini Architects

SUN WORSHIPER

A building with a complex skin blooms in the foothills of the Andes thanks to a multinational, multidisciplinary team.

BY DEBORAH SNOONIAN GLENN

In 2003, the Toronto firm Hariri Pontarini Architects won a competition for the Baha'i Temple of South America in Santiago, Chile, with a nine-sided design featuring petal-like elements that twist and rise to a central oculus. Thirteen years later, the project is nearly complete—and its innovative cast-glass skin is a victory for the architects, engineers, fabricators, and contractors who sweated every detail to make sure it could withstand the rigors of its mountainside location.

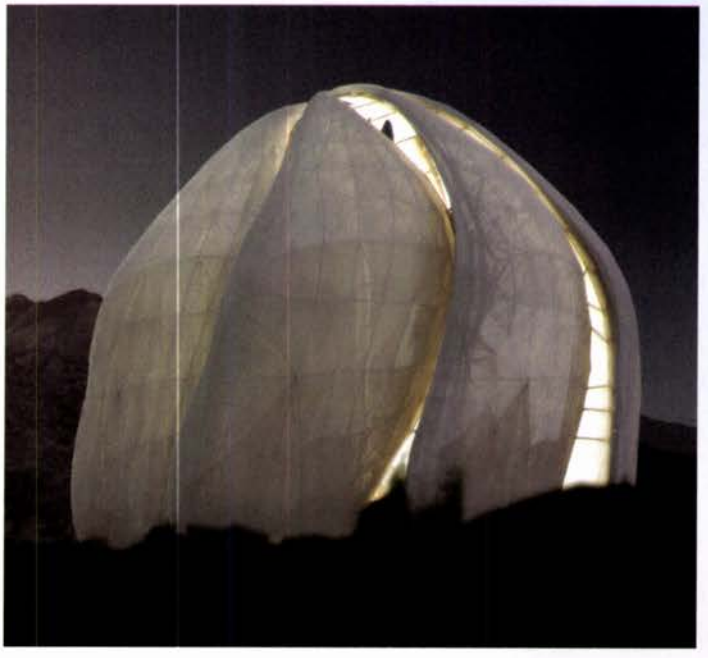
With its light-bathed interior, the temple embodies the Baha'i principle of light as a unifying element. "It's designed to last 400 years, and, in keeping with the faith's history and philosophy, we looked for an ancient, durable material that would filter light from outside or within," says Doron Meinhard, project manager and associate in charge. Principal Siamak Hariri's original scheme was clad on the interior and exterior in alabaster, a stone that's translucent when cut thin enough.

But aesthetic and maintenance concerns precluded that choice. The building sits in the foothills of the Andes, where harsh sun, summer temperatures that can soar past 100 degrees Fahrenheit, and daily temperature swings as wide as 64 degrees are the norm. Alabaster loses its translucency above 104 degrees, and it's somewhat soft, so it can be damaged by air pollution or water, says Meinhard. The architects, along with engineering firm Simpson Gumpertz & Heger (SGH), began to consider glass cladding instead, and settled on marble panels for the interior.

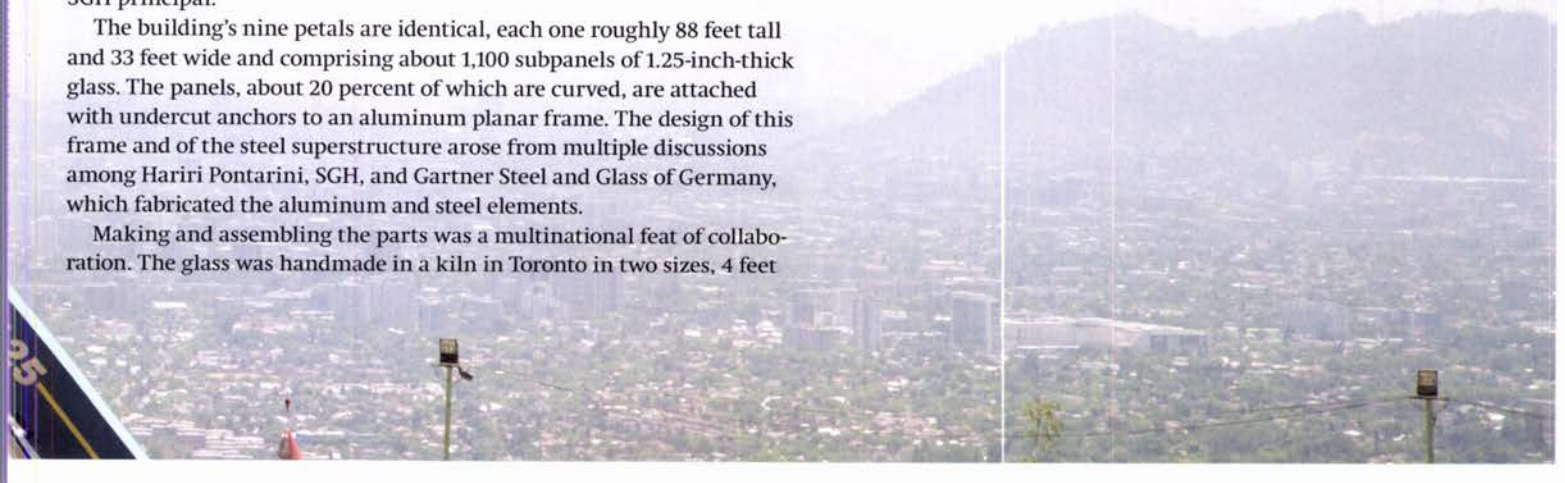
After many rounds of testing for strength, seismic performance, and thermal stresses, patterned cast glass was chosen for its light-filtering qualities and durability over laminated or annealed glass. The architects worked with glass artist Jeff Goodman on the one-of-a-kind formulation. They opted for borosilicate glass instead of soda-lime glass, because the latter cracked during thermal stress testing, making it unsuitable for a locale with such extreme temperature variations, says James Parker, SGH principal.

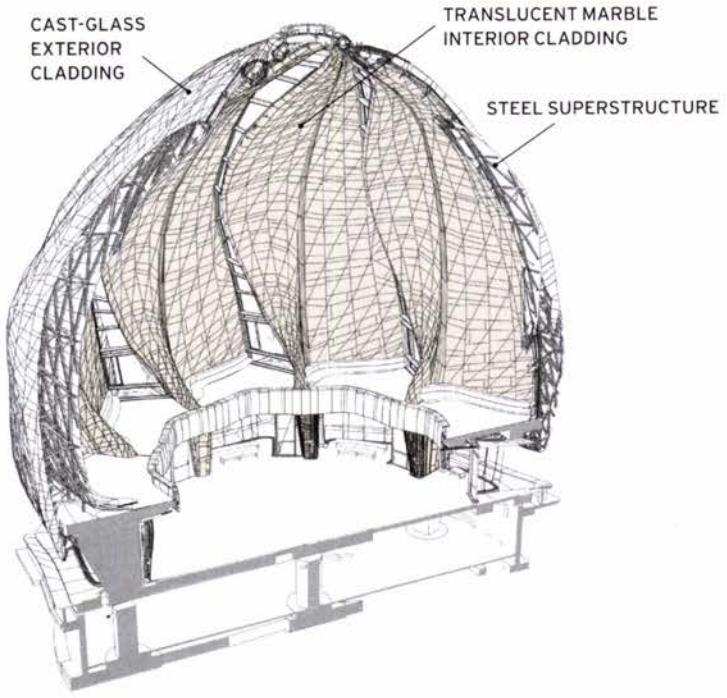
The building's nine petals are identical, each one roughly 88 feet tall and 33 feet wide and comprising about 1,100 subpanels of 1.25-inch-thick glass. The panels, about 20 percent of which are curved, are attached with undercut anchors to an aluminum planar frame. The design of this frame and of the steel superstructure arose from multiple discussions among Hariri Pontarini, SGH, and Gartner Steel and Glass of Germany, which fabricated the aluminum and steel elements.

Making and assembling the parts was a multinational feat of collaboration. The glass was handmade in a kiln in Toronto in two sizes, 4 feet



MOUNTAIN FLOWER The Baha'i Temple of South America, nearing completion in Santiago, Chile, will be enclosed by nine petal-like elements that rise almost 90 feet to a central oculus (rendering, above). The skin comprises cast-glass panels (opposite) on the outside and marble on the inside.





SECTIONAL DIAGRAM

by 6 feet and 4 feet by 5 feet. The glass pieces that would become flat panels were shipped to Germany so that Gartner could cut them via water jet to the needed shapes and dimensions. In contrast, the curved panels were cut and shaped entirely in Toronto before arriving in Germany. These pieces were also cut with a water jet, to the "flattened" shapes, determined with the help of the project's 3-D model. Gartner made 150 unique polystyrene positives in Germany and shipped them to Canada, where the glassmakers sprayed them with shotcrete so that they could withstand the kiln's heat. Each of these elements was placed in the kiln, and the corresponding pre-cut glass panel was slumped over it to acquire its finished shape.

In its facility in Bavaria, Gartner anchored all the panels—both flat and curved—to the aluminum frame, adding a structural silicone sealant where the glass meets the frame for extra durability and waterproofing. Assemblies that make up each of the facade's petals were packed in more than 100 containers and sent to Chile, where, at last, they were assembled and affixed to the superstructure.

Though the architects altered their original vision for the temple's cladding, they believe they've met its intent. "Through technological innovations we were able to make cast glass, an ancient material in itself, into something as durable and low-maintenance as stone," says Meinhard. "And it turns the entire temple into a skylight." ■

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

credits

ARCHITECT: Hariri Pontarini Architects – Siamak Hariri, partner in charge; Doron Meinhard, project manager; Justin Ford, job captain

CONSULTANTS: Simpson Gumpertz & Heger, Halcrow Yolles, EXP, Patricio Bertholet M. (structural); Simpson Gumpertz & Heger (cladding); MMM Group, Videla & Asociados, The OPS Group (m/e/p)

CLIENT: National Spiritual Assembly of the Baha'is of Chile, National Spiritual Assembly of the Baha'is of Canada

SIZE: 26,000 square feet

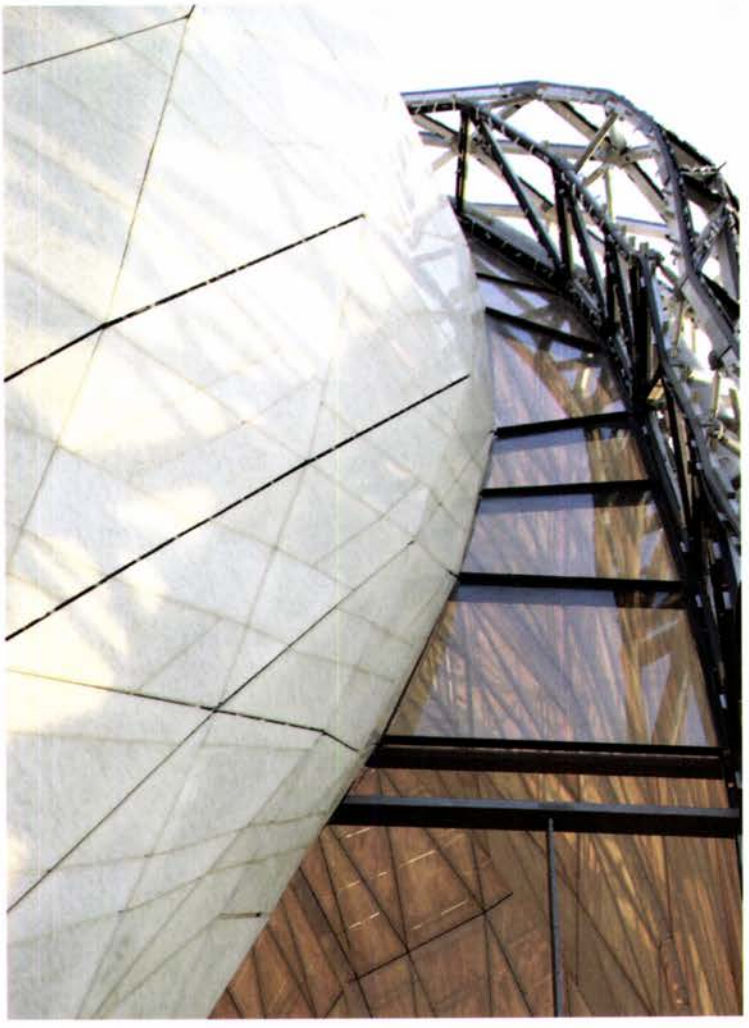
COST: withheld

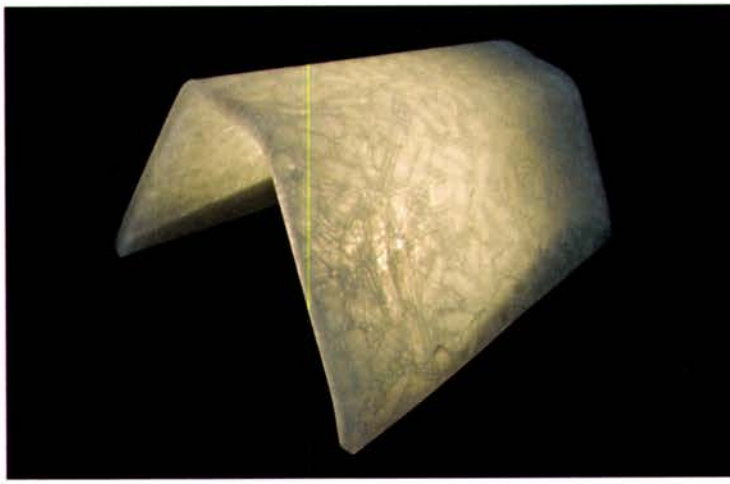
COMPLETION DATE: under construction

SOURCES

SUPERSTRUCTURE AND CLADDING: Gartner Steel and Glass

GLASS CASTING: Jeff Goodman Studio, CGD Glass





LIGHT CATCHER About 20 percent of the temple's exterior cladding pieces are curved (above). These were made by slumping flat glass over shotcrete-covered polystyrene shapes in a kiln. Together with the marble on the interior, the translucent glass will filter sunlight (left).

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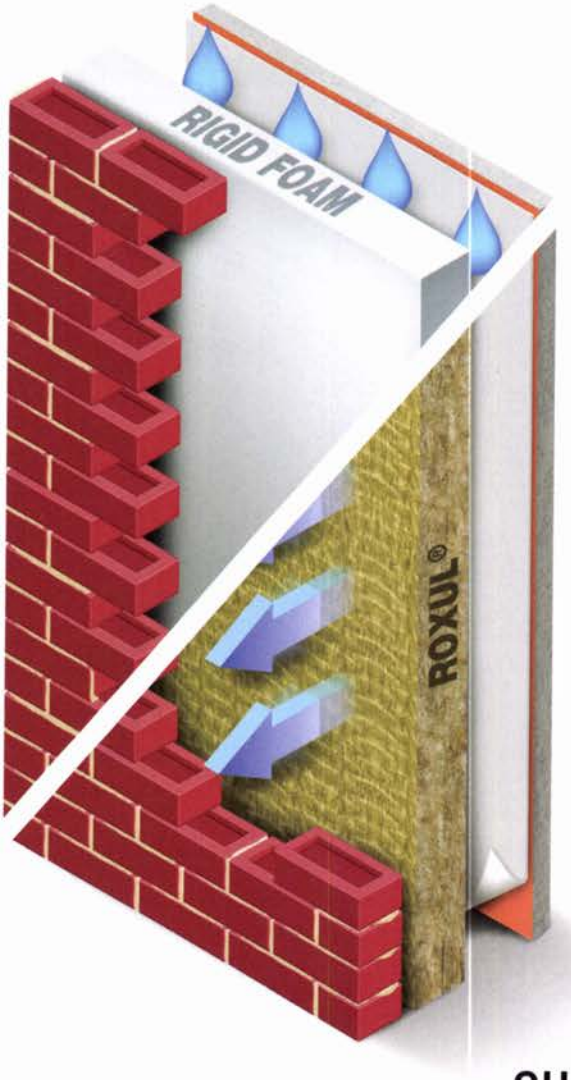

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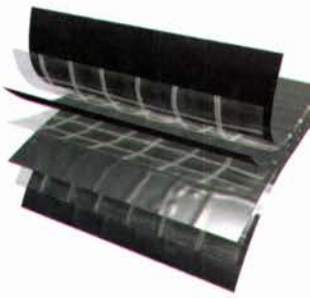

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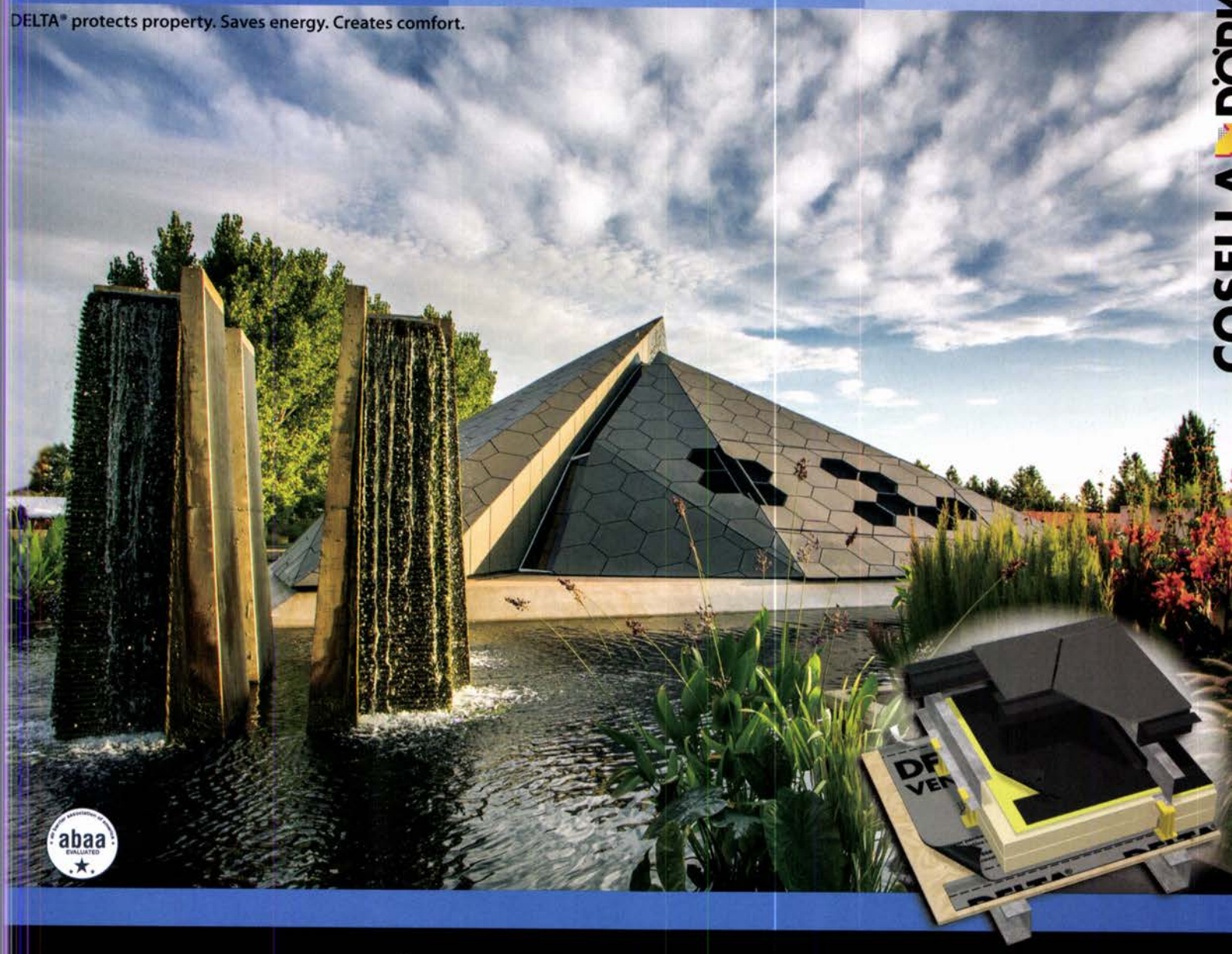

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CIRCLE 206

ZIP System® Sheathing and Tape Transforms Multifamily Apartment Project

Missouri architect 'would never recommend going back to housewrap'

Mike Reardon was attending a lunch-and-learn program for builders and architects in 2014 when the presenter began using "innovative" and "integrated" in the same sentence to describe an alternative to housewrap. It was a lightbulb moment for the Missouri architect and a turning point in how he would approach weather-resistant barriers for his firm's multifamily projects.

"Housewrap issues are a constant challenge on job sites," said Reardon, project manager for M.W. Weber Architects, an architectural design firm that specializes in multifamily, commercial and retail projects. "Housewrap is hard to install and can make dry-in difficult. This is not what you want on a job site.

"In addition," he continued, "I was adding square footage to my own home at the time and was using housewrap. I was experiencing firsthand just how difficult it can be, in terms of usability and making a project airtight."

ZIP System® sheathing and tape is an innovative structural roof and wall system with an integrated water- and air-resistant barrier that streamlines the weatherization process, while providing a continuous air barrier to reduce air leakage. Following the lunch-and-learn presentation on ZIP System sheathing and tape, Reardon was convinced the system could prevent the infiltration of air and water better than housewrap.

"I knew right away I wanted ZIP System sheathing and tape for our firm's projects, and it didn't take much to convince people to switch," he said. "The contractor for our next apartment project was initially sold on housewrap, but once we demonstrated how ZIP System sheathing and tape installs quicker, he was convinced."

Bramblett Hills Apartments is a luxury apartment complex in O'Fallon, Missouri west of St. Louis. The project includes 218,000 square feet of ZIP System panels in 204 apartments in 17 three-story buildings, 87 garages and a clubhouse.

"ZIP System sheathing and tape transformed the Bramblett job site with a two-step installation process – install the panels and tape the seams," said Eric Gowin, president of Contegra

Construction, the general contracting firm. "Taping became a one-man job, and that's not possible with housewrap. We have an aggressive construction schedule – completing a new building every 30 days – and this schedule would not be possible without using products designed to perform."

Reardon said another benefit to using a structural sheathing system with built-in moisture protection is that it can be put in place regardless of the time of year. It's a promise the manufacturer, Huber Engineered Woods LLC, backs with a 180-day exposure guarantee.[1]

"ZIP System products do not appear to be negatively affected by weather during or after installation," he said. "Once the panels are in place the structure is airtight, which is critical to preventing mold and moisture from penetrating the building. I would never recommend going back to housewrap."

Tim Breece, president of Propper Construction Services, which along with TriStar Development are the owners of the project, said faster dry-in times and more predictable construction schedules are the hallmarks of ZIP System sheathing and tape. Propper also plays a secondary role as construction managers over the development.

"ZIP System sheathing and tape is more reliable than housewrap," Breece said. "The system's water-resistant capabilities and its ability to hold up under extreme weather conditions are especially important to us.

"The continuous air barrier also is a plus, as well as fewer man hours needed to install the system," he added. "The seam tape is an obvious plus too, especially given how unpredictable Mother Nature can be in the Midwest."

Bramblett Hills is scheduled for completion in August 2016, and Breece is already looking ahead to his next project using ZIP System sheathing and tape. Propper Construction has more than 450 multifamily units under construction in the St. Louis area.

"ZIP System sheathing and tape has been a great problem-solver for us," Breece said. "It is almost foolproof to install and its ease of installation keeps our projects moving forward with no callbacks. It would be an understatement to say we are bullish about using the system in other multifamily projects." Learn more at www.ZIPSystem.com/architectural19.

[1] Limitations and restrictions apply. See ZIPSystem.com for details.

Beyond the Prototype

Architects and designers take additive manufacturing to a new level.

By Joann Gonchar, AIA

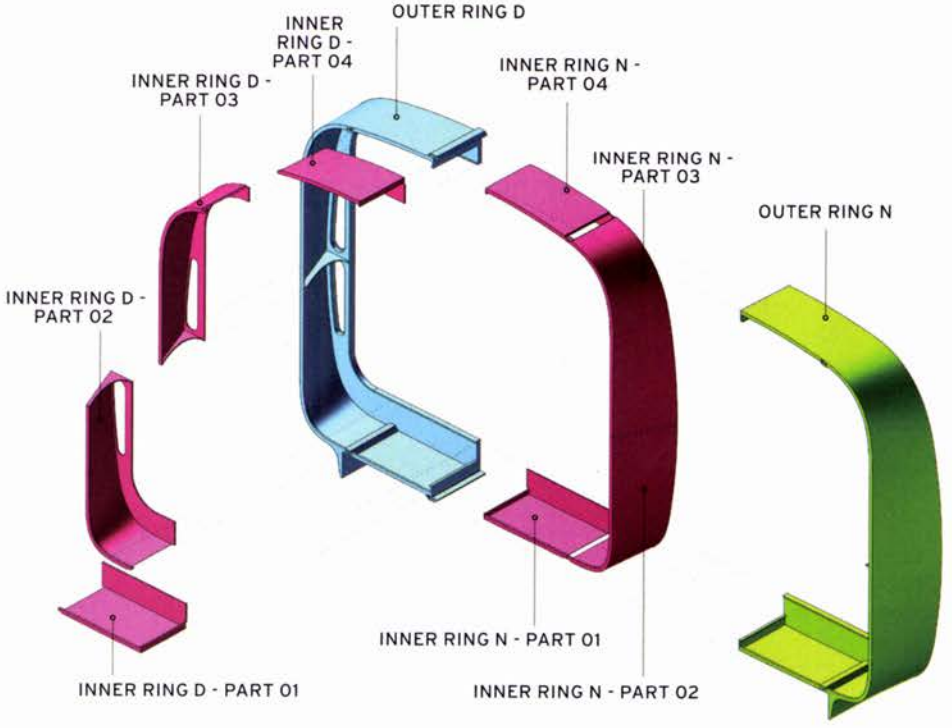
GUTENBERG'S INTRODUCTION of movable type six centuries ago was a true revolution. The development forever altered the way information was received and disseminated, democratizing knowledge. Printing's recent move beyond two dimensions could be similarly transformative. Since 3-D printers were first developed in the 1980s, the technology has made inroads into the aerospace and auto industries and medicine, and it has been embraced by DIYers and tinkerers everywhere.

In architecture, as everyone knows, 3-D printing is now regularly used to make study models and as a rapid prototyping tool, but not to create full-scale functional components or habitable spaces—yet. This situation seems to be on the cusp of changing, however, as architects, engineers, and others explore the process as an alternative to conventional fabrication and construction.

Also known as additive manufacturing, 3-printing is actually a term for several different production techniques that can transfor various materials—plastics, metals, ceramics concrete, and more—into three-dimensional objects of almost any shape or geometry. The forms are produced from a 3-D model or oth digital data source by sequentially depositing layers of material one on top of the other an fusing them. It contrasts with other machining methods, such as stamping, cutting, or grinding, which create shapes by *removal* of unwanted material.

One firm that has been investigating the potential of 3-D printing is Skidmore, Owings & Merrill (SOM). It recently complet ed the Additive Manufacturing and

GIMME SHELTER
SOM and Oak Ridge National Laboratory have developed a small 3-D-printed building (opposite) dubbed "AMIE" for "additive manufacturing and integrated energy." The structure, assembled from multiple C-shaped channels (below and left) of carbon-fiber-reinforced ABS plastic, includes photovoltaics on its roof that work in tandem with a generator housed in an accompanying 3-D-printed vehicle.



AMIE PRINTED COMPONENTS

Integrated Energy (AMIE) demonstration project—a small building the firm designed in collaboration with Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, and the College of Architecture and Design at the University of Tennessee, among other industry partners. The 450-square-foot carbon-fiber-reinforced ABS plastic structure, which was first exhibited on ORNL's campus in September, has the ability to operate off the grid: its roof includes thin-film photovoltaics that work in tandem with a natural gas–fired generator housed in an accompanying 3-D-printed vehicle.

Arguably, AMIE's most sustainable feature is not its source of power but its tight integration of enclosure and structure, which translates into an extremely efficient use of materials. The shelter consists of a series of C-shaped printed channels 12½ feet tall, 6 feet wide, and 2 feet deep—the latter dimension determined by the capabilities of the chosen printer. Although the machine could produce large objects, it did not have the ability to create so-called "support material"—a printed element, eventually to be removed, that keeps complex shapes from slumping over or drooping during fabrication, explains Brian Lee, a partner in SOM's Chicago office.

Once assembled, and other non-printed elements, such as insulation and air and moisture barriers, are included, the pieces create a highly thermally efficient volume with rounded corners and curved surfaces where the floor, wall, and roof are continuous. The form—a direct outcome of the fabrication method—gives the building stability and the capability to resist wind loads. Curiously, the printed material has a grain similar to wood and is therefore stronger in one direction than the other. So to prevent cracking in the weaker direction, the one perpendicular to the grain, the structure includes post-tensioning tendons that run along the full length of the shelter. "It looks the way it does because we wanted to take full advantage of the additive manufacturing process and the material's properties," says Lee.

Another firm that has also been studying how 3-D printing can be deployed to optimize material use and structure is Arup. The engi-

PROCESS OF ELIMINATION Arup used additive manufacturing and computational tools to optimize a node for a tensegrity structure. The iterative process created a node (at right, both images) that was 75 percent lighter than and half as tall as the original, conventionally fabricated one (at left, both pictures).

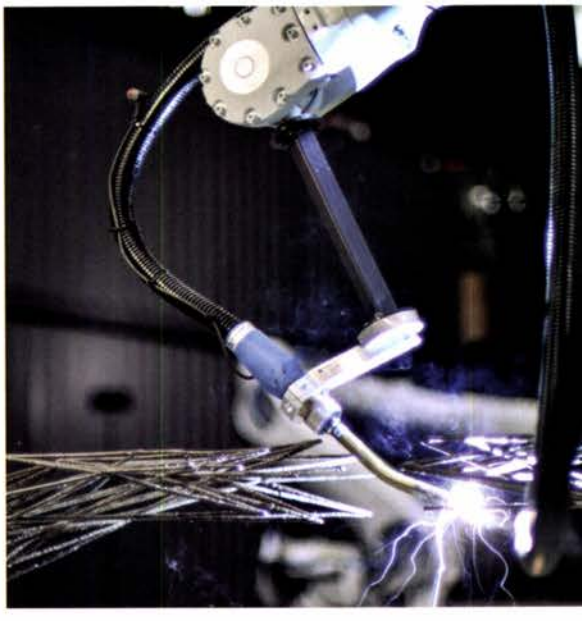
neering firm's research grew out of a 2008 commission for street lighting in the Hague, the Netherlands, that involved several irregularly shaped tensegrity structures (structures made of isolated struts in compression inside a continuous net of cables in tension). Although the scheme was not realized, it became the basis for Arup's ongoing investigation of additive manufacturing.

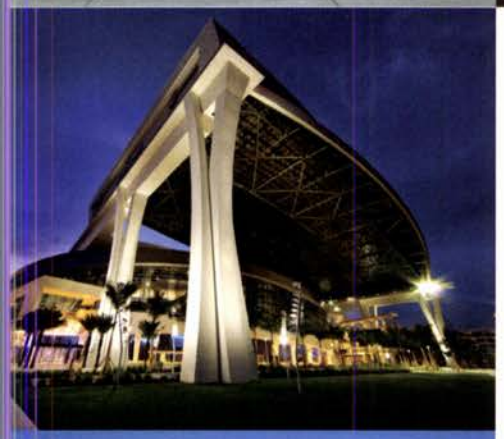
Arup's study focused on the nodes—the elements that would connect the struts and cables. It would make perfect sense to produce them with 3-D printing since, of the approximately 1,600 steel connector pieces in the series of lighting structures, very few would be identical, says Salomé Galjaard, a senior designer in Arup's Amsterdam office. Fabricating them conventionally by machining steel plates of different sizes and shapes, and welding them to steel tubes "would have been a production nightmare," she says. But "the printer does not 'care' whether it builds up the same product each time or one that is slightly different," she says.

The Arup engineers combined 3-D printing with computational tools for structural analysis and parametric modeling. This helped them identify material that could be omitted from the nodes, creating elements with organic shapes that make them look a bit like chunks of Swiss cheese. More importantly for the structural engineers, the process significantly reduced the weight of the nodes, which meant that the forces on the rest of the system's components, including the cables and struts, were reduced, allowing them to also become smaller and lighter. Further analysis permitted Arup to make the nodes lighter still.

Arup's final application of this iterative optimization process produced a node that was 75 percent lighter and half as tall as th original, conventionally fabricated node. Tl lighting structures as a whole were 50 percent lighter. The results have broad implications, including the possible elimin tion of reinforcement of the buildings from which the lighting elements were to have

WELDED WEB MX3D is building a 3-D-printed pedestrian bridge for an Amsterdam canal (rendering below). The fabrication technique developed by the 3-D printing startup resembles drawing in space with molten metal (right).





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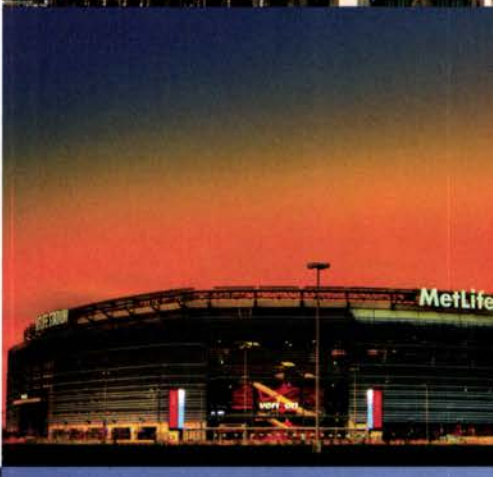

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SKIRTING AROUND A facade designed by DUS for a temporary building in Amsterdam (left and bottom) includes a skirtlike shading device and triangular elements with integrated benches. These are printed fro a bioplastic that can be shredded and reprinted once the facade has been dismantled.

been hung. The benefits of additive manufacturing can have "a snowball effect," says Galjaard.

Advocates for additive manufacturing in architecture say that there is more than one way that 3-D printing can help the industry make more efficient use of materials. DUS, a Dutch firm best known for its ongoing 3-D Print Canal House project (ARCHITECTURAL RECORD, April 2015, page 33), recently created a facade for the temporary building in Amsterdam where the Presidency of the Council of the European Union, an EU leadership body, is now meeting. The facade consists of multiple 16-foot-wide and 16-foot-tall triangular pieces with integrated benches shaded by tentlike awnings. The triangular elements, which all have slightly different faceted surfaces, are printed from a bioplastic that can be shredded and reprinted once the presidency's stay in Amsterdam is over in June. Hedwig Heinsman, a DUS foun er and partner, makes the point that the recyclability of the printing matrix is not th only resource-conserving aspect of the tech nology. By its very nature, 3-D printing produces less waste than conventional construction. "By connecting design directly to manufacturing, the process is made much more efficient," she says.

For the team behind another Amsterdam based 3-D printing endeavor, efficiency is a secondary concern. To Tim Geurtjens, chief technology officer of MX3D—developer of a robotic 3-D printing technology—the main attraction of additive manufacturing is its ability to produce complex shapes with intri cate detail. "We can restore the decoration that has gone out of architecture," he says.

MX3D is working on a 3-D-printed pedestrian bridge that will a span a 28-foot-wide canal in Amsterdam's red-light district. Designed by Joris Laarman (a product desig er who has long been experimenting with 3-D technology at different scales), the bridg is being fabricated in an Amsterdam ship yard and is to be installed on-site in the summer of 2017. It will be made of a still-to be-determined alloy, using an additive technique that involves the robots and MIG (metal inert gas) welding. The process, whic resembles drawing in midair with molten metal, is well suited for production of Laarman's lacy, cobweb-like span. "We can put the material exactly where we need it," explains Geurtjens.

Despite all the touted benefits, 3-D printing enthusiasts do not predict that the technology will entirely replace conventiona construction anytime soon. Creating a com pletely 3-D-printed, move-in-ready building, for instance, would require a machine that could print a wide array of materials needed for construction simultaneously or one that could print these materials in multiple pass es. This technology is at least a decade off, according to Todd Desmarais, a director in the Chicago office of Gensler. The firm has designed a 2,600-square-foot 3-D-printed office building nearing completion in Duba The client is a group of investors that in cludes the Chinese 3-D printer manufacture

The Dubai office project, which is part of an effort to create a prototype for 3-D-printe structures that would be suitable for low-ris

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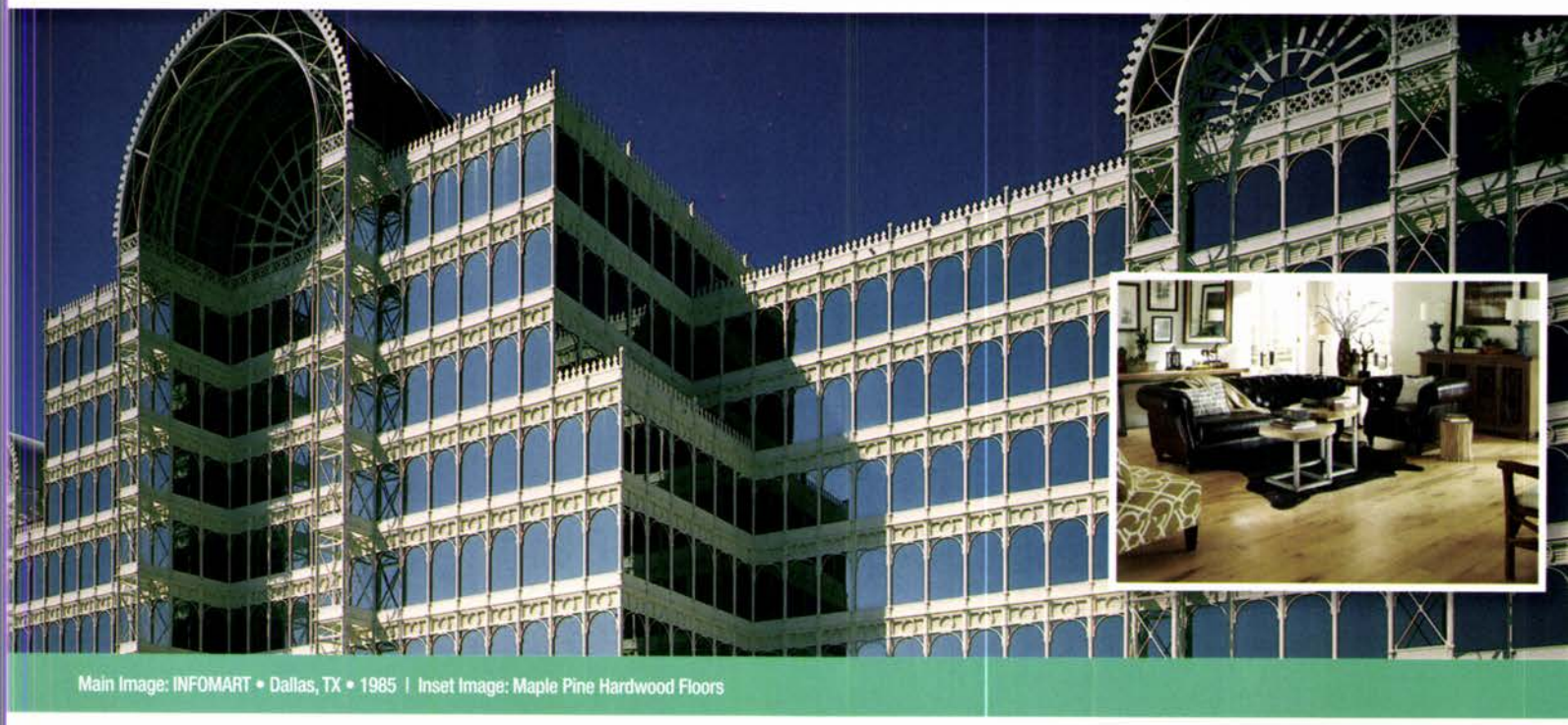

Main Image: INFOMART • Dallas, TX • 1985 | Inset Image: Maple Pine Hardwood Floors

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CIRCLE 208

HOME OFFICE Gensler's 3-D printed office, now nearing completion in Dubai (shown in an early rendering), consists of multiple modules surrounding a courtyard. It is part of an effort to create prototypes of 3-D-printed structures suitable for commercial and residential use.

residential or commercial use, consists of multiple shoebox-shaped modules surrounding a courtyard. The modules have an inner enclosure of a cement-based material and an outer shell of fiberglass. Both were printed in Shanghai in C-shaped sections and then shipped to Dubai for assembly on-site. There, other elements were also installed in a process that resembles traditional construction, including glazing, casework, and mechanical, electrical, and plumbing equipment.

The impediments to creating a building made entirely with additive manufacturing are not only technical, says Rob Bolin, a senior partner at Syska Hennessy, the Dubai office project's mechanical engineer. He points out that any printed element for the distribution of air, water, or power—such as ductwork, piping, or conduits—would need to comply with established standards. "The hurdles are in part regulatory," he says.

But even if 3-D printing technology is not yet advanced enough to create an entire building from additive manufacturing in one go, additive manufacturing can still provide the answer to a variety of pressing problems. SOM's Lee says that buildings like AMIE could serve as emergency shelter, especially as different printing matrices are developed and tested, and their cost comes down. He raises the possibility that, if there were access to a printer, disaster housing could be printed on-site, from locally sourced material.

Most devotees of the technology do predict that additive manufacturing will infiltrate design and construction practices for buildings—but gradually and selectively. "The conventional process will be more efficient and cheaper for most buildings," says MX3D's Geurtjens. However, 3-D printing will make sense where customization is important or for elements with an extra level of complexity. He points to facades in particular.

Arup's Galjaard agrees that, for the time being at least, use of additive manufacturing will not be widespread. But she expects that we will see the technology used in projects where weight is especially critical—in the components of long-span, operable roofs over stadiums, for instance. She points out, not surprisingly, that to take full advantage of the benefits of additive manufacturing, designers need to "zoom out" and look beyond the individual 3-D-printed element, studying the implications for the whole project. This, she says, "will lead to better design solutions in the long run." ■

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Learning Objectives

1 Define the terms "3-D printing" and "additive manufacturing."

2 Describe how architects and engineers are using 3-D printing to create habitable spaces and full-scale functional components.

3 Discuss some of the technology's current limitations.

4 Describe some of the most appropriate applications in architecture for 3-D printing.

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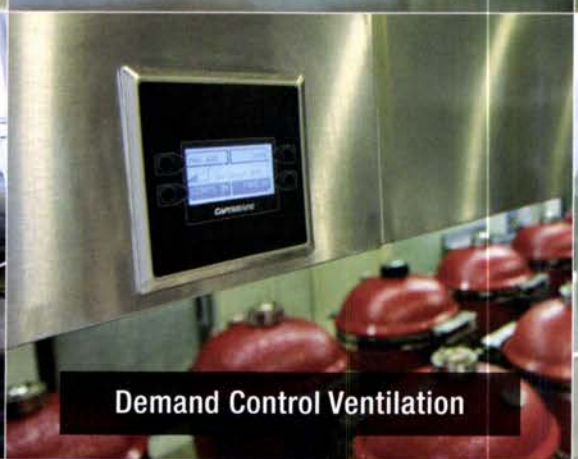

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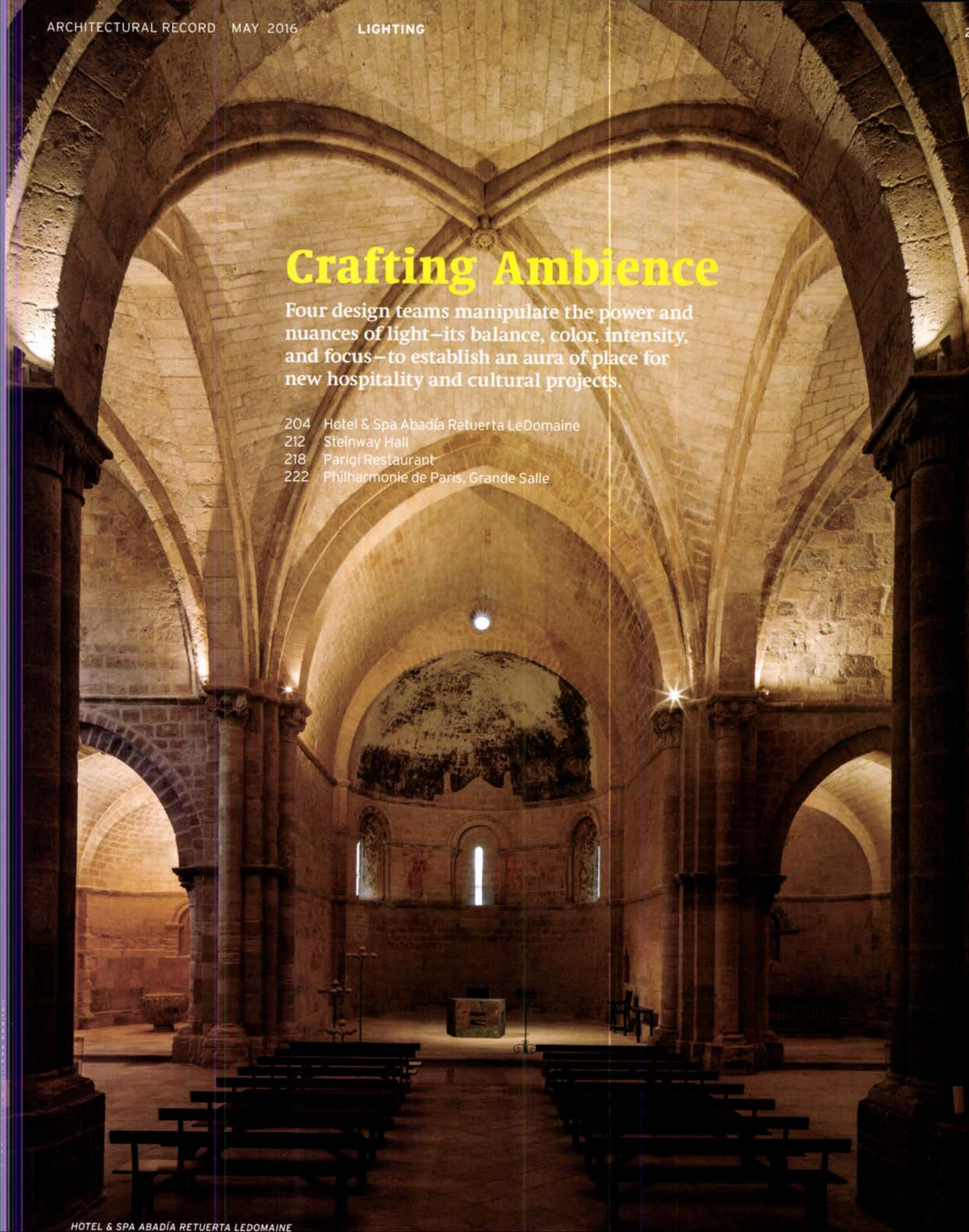

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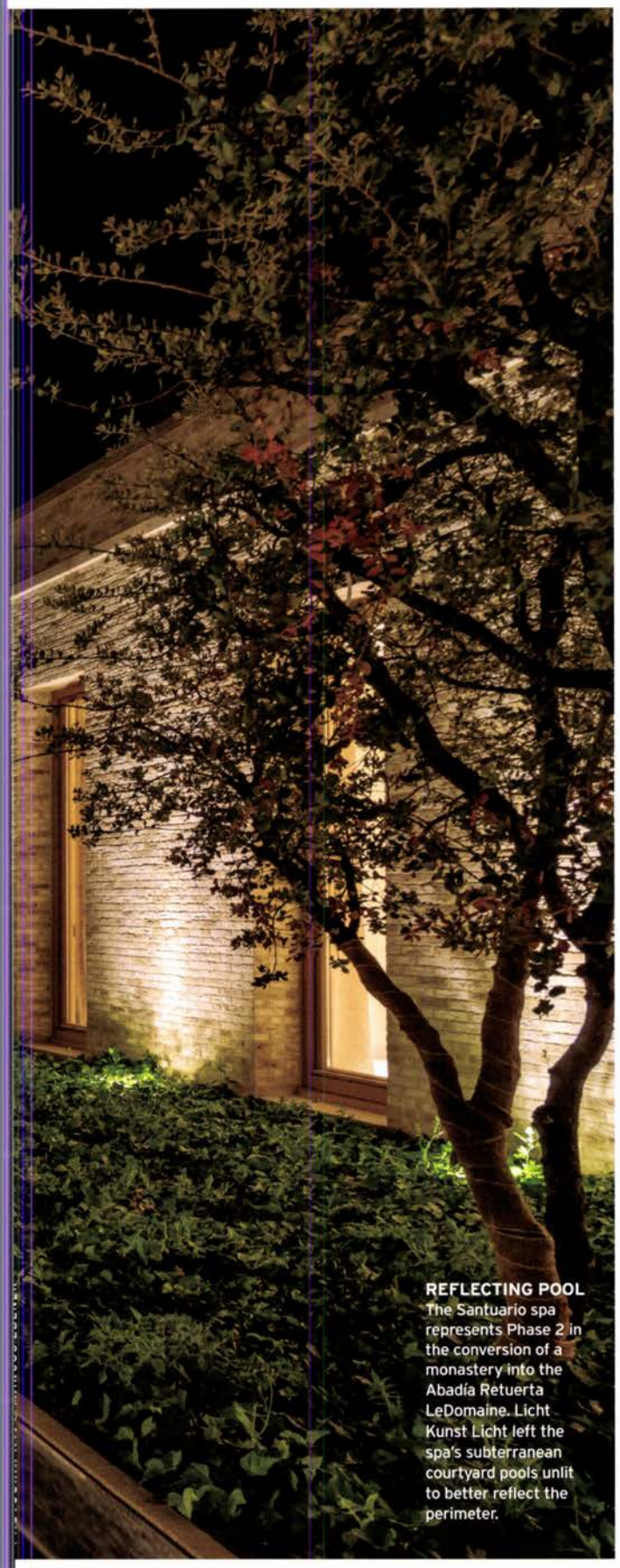


REFLECTING POOL The Santuario spa represents Phase 2 in the conversion of a monastery into the Abadía Retuerta LeDomaine. Licht Kunst Licht left the spa's subterranean courtyard pools unlit to better reflect the perimeter.

Hotel & Spa Abadía Retuerta LeDomaine

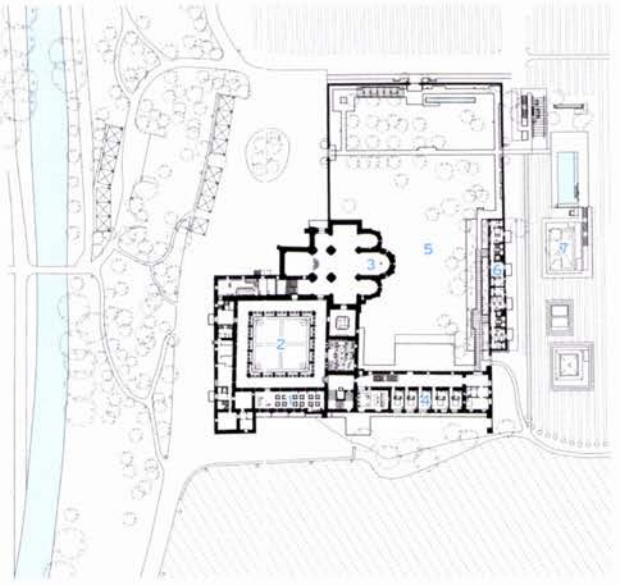
Marco Serra/Diener & Diener
Licht Kunst Licht

By David Sokol

FROM THE founding of their namesake monastery in 1145, the clerics of Santa María de Retuerta pursued Roman Catholic values of work, peace, and hospitality. Although monks have not occupied this corner of Spain's Sardon del Duero area since 1931, contemporary visitors to their former abbey subscribe to the same principles, but in the reverse order. Abadía Retuerta LeDomaine today nourishes the collective spirit as a five-star hotel where staffers outnumber guests three to one. The hospitality destination's spa lends additional tranquility to the idyllic vineyard setting. And for those who insist on productivity, the reimagined landmark includes meeting rooms for as many as 150 people.

The Santa María de Retuerta estate encompasses 1,730 acres; the chemical company Sandoz purchased the property in 1988 for its agricultural division, bottling a first vintage of wine there in 1996—the year the owner merged into Novartis. Six years later, the Swiss pharmaceutical giant decided to rehabilitate the abandoned Baroque-Romanesque structure on the site, and one of the company's longtime architect collaborators, Marco Serra, started work in earnest in 2006. Serra invited the German lighting design firm Licht Kunst Licht (LKL) to take part in the conversion, which integrated 22 guest rooms, two restaurants, a bar, lounge, winery, and administration facilities into the archetypal Benedictine-style layout.

In addition to its spatial configuration, the abbey's weighty masonry structure features tiny apertures common to the building type, says LKL director Martina Weiss, who adds, "The lighting was key to transforming the cool atmosphere into a place where people feel comfortable." Weiss also notes



SITE PLAN

1 REFECTORY RESTAURANT
2 CLOISTER COURTYARD
3 CHURCH
4 GUEST ROOMS
5 COURTYARD
6 STABLE GUESTROOMS
7 SPA

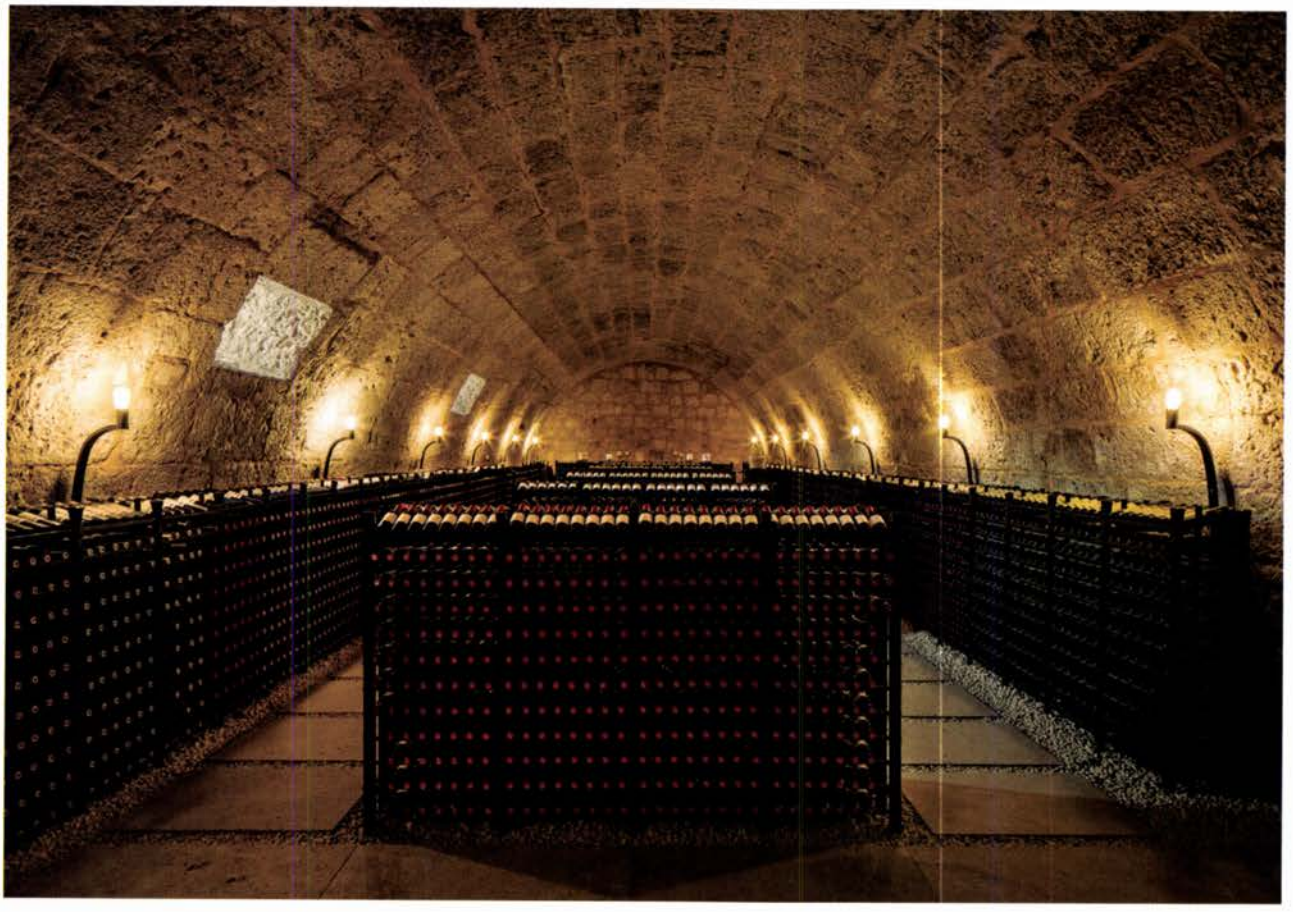
that historical protections limited th illumination strategy: "You can't rec any luminaries into the structure; e element has to be applied."

LKL conceived custom fixtures made of thick sheets of folded bro that would strike the right balanc gravitas and delicacy. As Weiss pu "We needed a luminaire strong enough to stand out on its own an still look pure and simple, like the monastery." The bronze not only complements the abbey's massive limestone walls visually, but also represents the ancient craft tradit with which they were made.

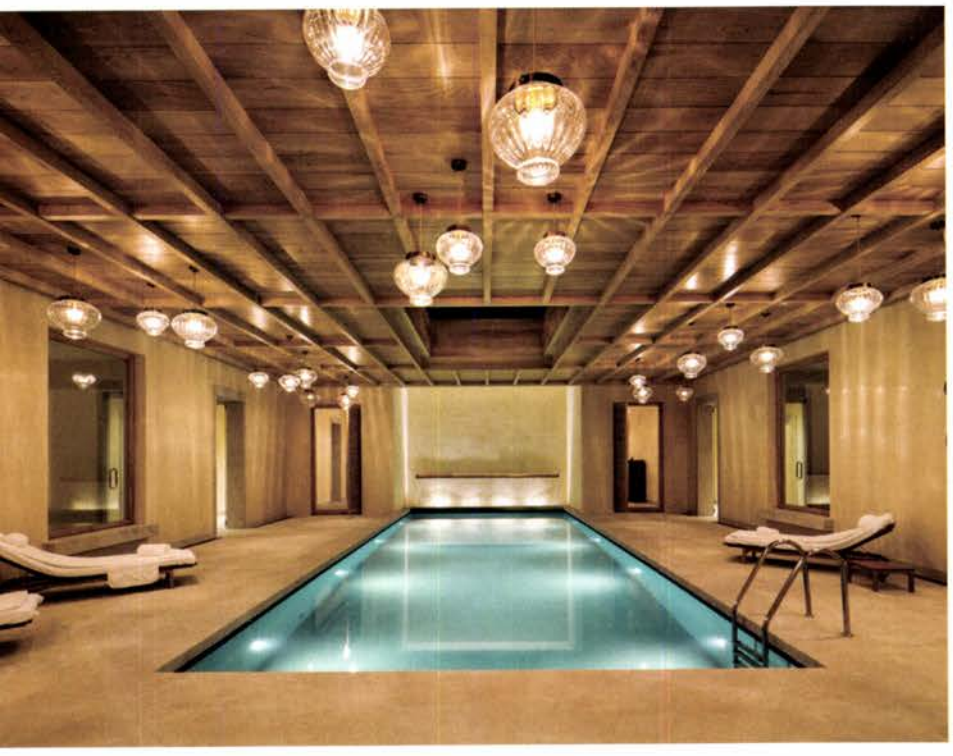
The design team sourced the ribl like floor and table lamps, spheroid pendant, and minimalist sconces fr a producer of bronze high-mast ligh in Bavaria. Although this manufact had not created smaller-scale fixtur before, it undertook the commissio with time-honored artisanship. The craftsmen abraded outward-facing bronze surfaces by hand to give the an even weightier, more dimension appearance, burnishing the interior faces to a warm gold finish. Pleased with the meticulous attention to de LKL employed the company to fabri the hotel's exterior components, wh include illuminated bollards, light poles, and pendants.

Positioning components demand less precise methodology. "The plan may have had specific lighting poin but we would arrive on-site to find t the crews couldn't draw power, so w had to respond by changing the pla ment and rhythm of the luminaires Weiss says. In particular, the sconce and floor lamp–illuminated corrido overlooking the abbey's courtyards required trial runs. LKL also went o site to finesse the outdoor lighting, ensure that the low-intensity 2,500-Kelvin (K) metal-halide lamps not interfere with the night sky.

Off-the-shelf products also contrib uted to the metamorphosis of the as 12th-century structures into a warm inviting destination. LKL aimed disc surface-mounted spotlights on a fres of the Last Supper in the refectory an on the groin vaults of the abbey's church, which now serve as a Miche starred restaurant and event venue, respectively. Uplighting tucked in a highlights the ornate oval dome abo the main visitor stair.



GLOWING REFERENCE
The hotel encompasses the former abbey and stables. LKL grazed the compound's exterior walls without light spillage using metal-halide lamps (above); in the wine cellar (left), custom bronze luminaires evoke candles once mounted to the walls; LKL-designed bronze floor lamps provide most of lighting in the groin-vaulted refectory (opposite), now a restaurant.



SHINING DETAILS Folded-bronze sconces illuminate limestone-clad corridors (above, right); a guest room (below) features custom fixtures; LEDs housed in mold-blown glass volumes dot the ceiling of the spa's indoor pool (above).

The hotel Abadía Retuerta LeDomaine opened in 2012 to widespread acclaim and solid bookings; its instant success compelled management to crystallize plans for growth—this time overseen by trusted Novartis collaborator Diener & Diener Architekten. The architects reallocated former stables for eight additional guest rooms and constructed the Santuario spa entirely underground.

Staying on for the additional project, LKL differentiated the new spa by designing a mold-blown glass LED-illuminated pendant, producing it in multiples and suspending it from the ceiling of the indoor pool and reception room in clusters. "You don't have to pretend it's old," Weiss says of the whimsical installation, adding that executing this scheme in an opaque material could have made the subterranean space feel smothering. In a show of continuity, the glass volumes are accented in bronze, and the converted stables are filled with the original custom luminaires.

Phase 2 allowed LKL to revisit the initial 2012 project by replacing the halogen lamps in its custom sconces and desk lamps with 2,500 to 2,700K LEDs. Plans are in the works to similarly retrofit all remaining interior fixtures throughout the property. Glowing with 21st-century design and technology, this medieval retreat is now prepared to share its hospitality and peaceful surroundings with visitors for years to come. ■

credits

ARCHITECT: Marco Serra Architekt (hotel); Diener & Diener Architekten (spa)

LIGHTING DESIGNER: Licht Kunst Licht – Andreas Schulz, principal; Martina Weiss, project leader

CONSULTANTS: Marlene Doerrie (interior design, hotel); Michele Rondelli (interior design, spa); August Künzel (landscape architect)

SIZE: 330,000 square feet

COST: withheld

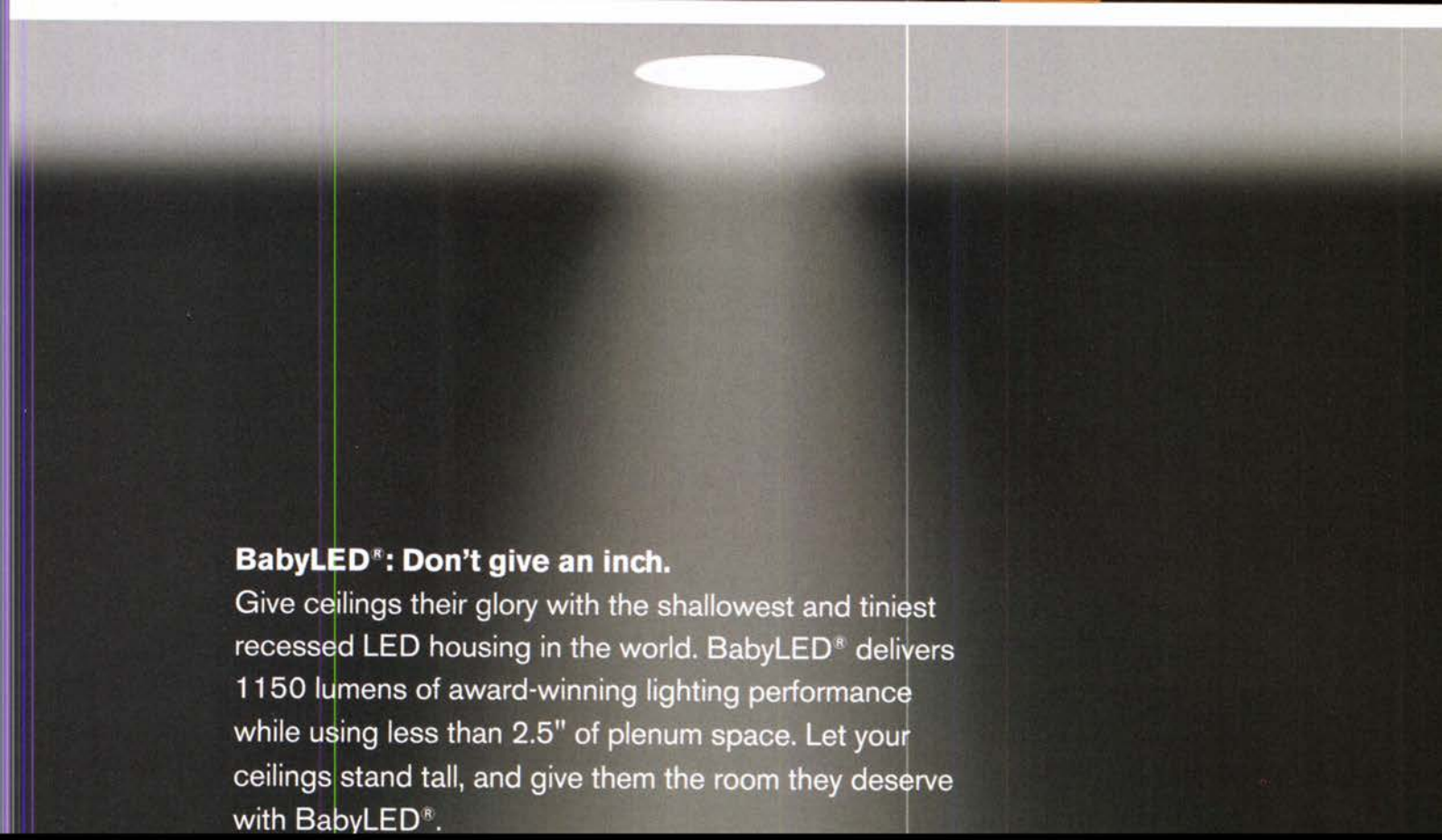
COMPLETION DATE: July 2015

SOURCES

CUSTOM BRONZE FIXTURES: Bergmeister Leuchten

INTERIOR LIGHTING: GE (cove); Flos (downlights); Wibre (pool); Santa & Cole (table lamps)

EXTERIOR LIGHTING: Bega, Hoffmeister, Vibia



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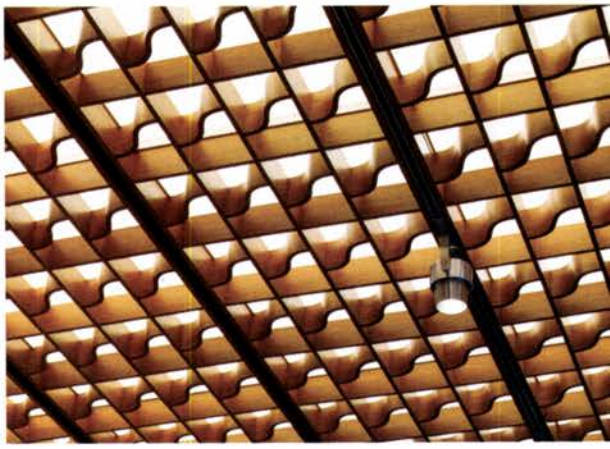
Steinway Hall

Selldorf Architects
Tillotson Design Associates

By Linda C. Lentz



THE RENOWNED piano manufacturer Steinway & Sons recently moved its flagship, Steinway Hall, from the Beaux-Arts New York City landmark it called home for 90 years to a modern Midtown skyscraper. The upshot is a project that will illuminate its brand for 21st-century clientele.

Established in the 1850s, Steinway built a musical legacy in New York with production facilities (now in Queens) and three successive showrooms in Manhattan. Named Steinway Hall, these retail galleries have always offered more than just pianos for sale. The first (circa 1866) housed a 2,000-seat auditorium where the New York Philharmonic played for 25 years. Next, the existing 1925 West 57th Street structure, designed for the company by Warren & Wetmore (RECORD, September 1925, page 201), embraced visitors within its Neoclassical domed reception area, salon-like showrooms/studios, and small concert hall. Like a club-house, it hosted artists, from Vladimir Horowitz to Billy Joel, who came to concertize, practice, and select pianos f performances around town.

Such a clubby ambience was intimidating to some, says Stephen Milliken, Steinway senior director of global publi relations. "It was so segmented, people would walk into th rotunda and didn't explore deeper into the space because

THIRD MOVEMENT An expansive, backlit ceiling, bisected by elegant track lighting, is softened by a custom teak grid modeled on a piano's curve (opposite, top and bottom); a specially commisioned light installation by Spencer Finch hangs above the central stair.

they didn't realize they could." Under the design direction of architect Annabelle Selldorf, the new Steinway Hall is welcoming and contemporary. Yet the architect was careful to integrate established elements of the company's rich craftsmanship and history, such as an end-grain oak floor like that found in both the factory and 1925 interior, used for its ability to withstand weight.

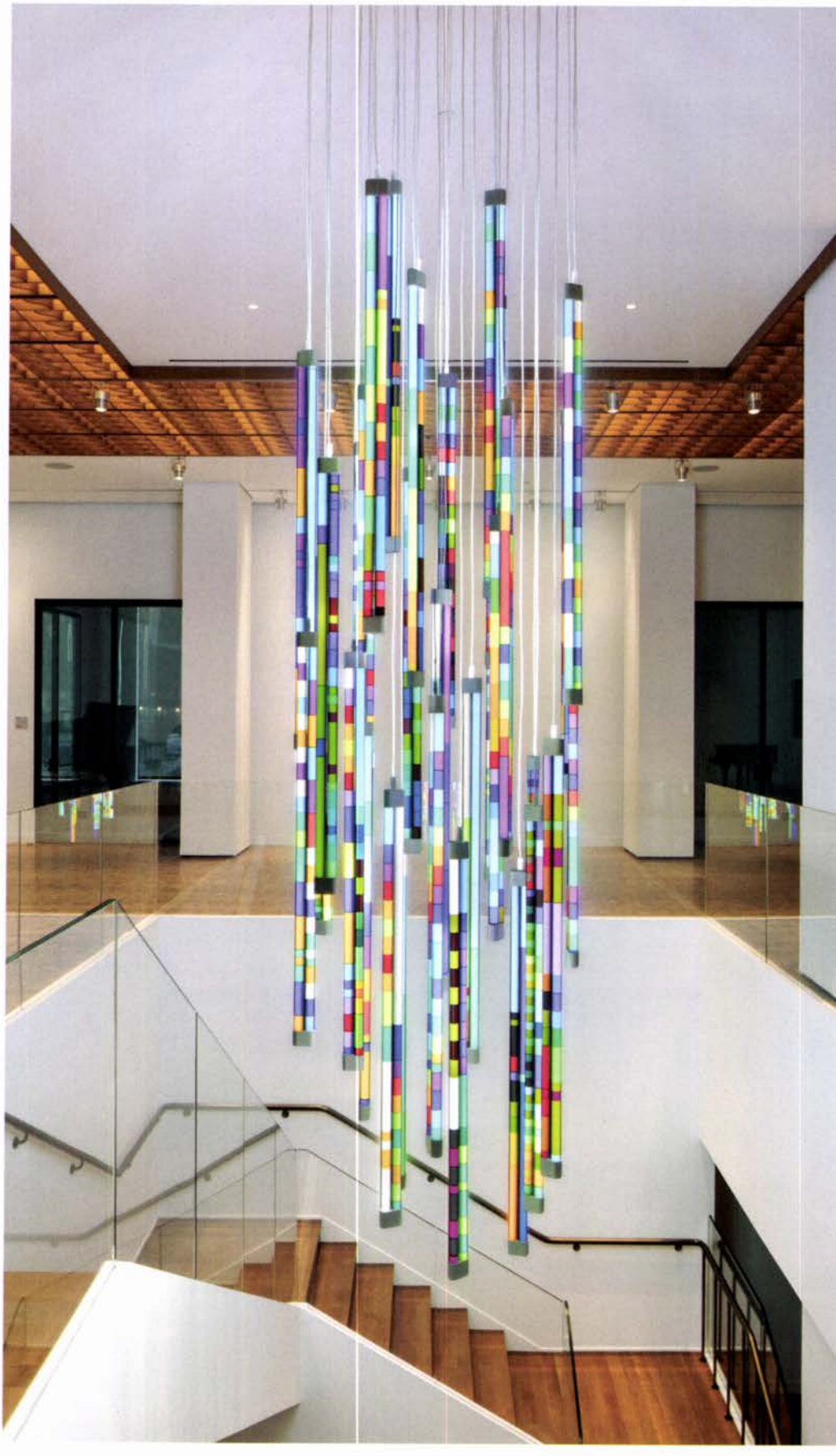
The spacious venue occupies the ground floor and basement of a 19,000-square-foot, single-story extension of an office tower on the Avenue of the Americas. The upper volume, the main selling floor, has 14-foot-high ceilings and ample glazing. It is so clear and informed by daylight, says Selldorf, it feels like a public space.

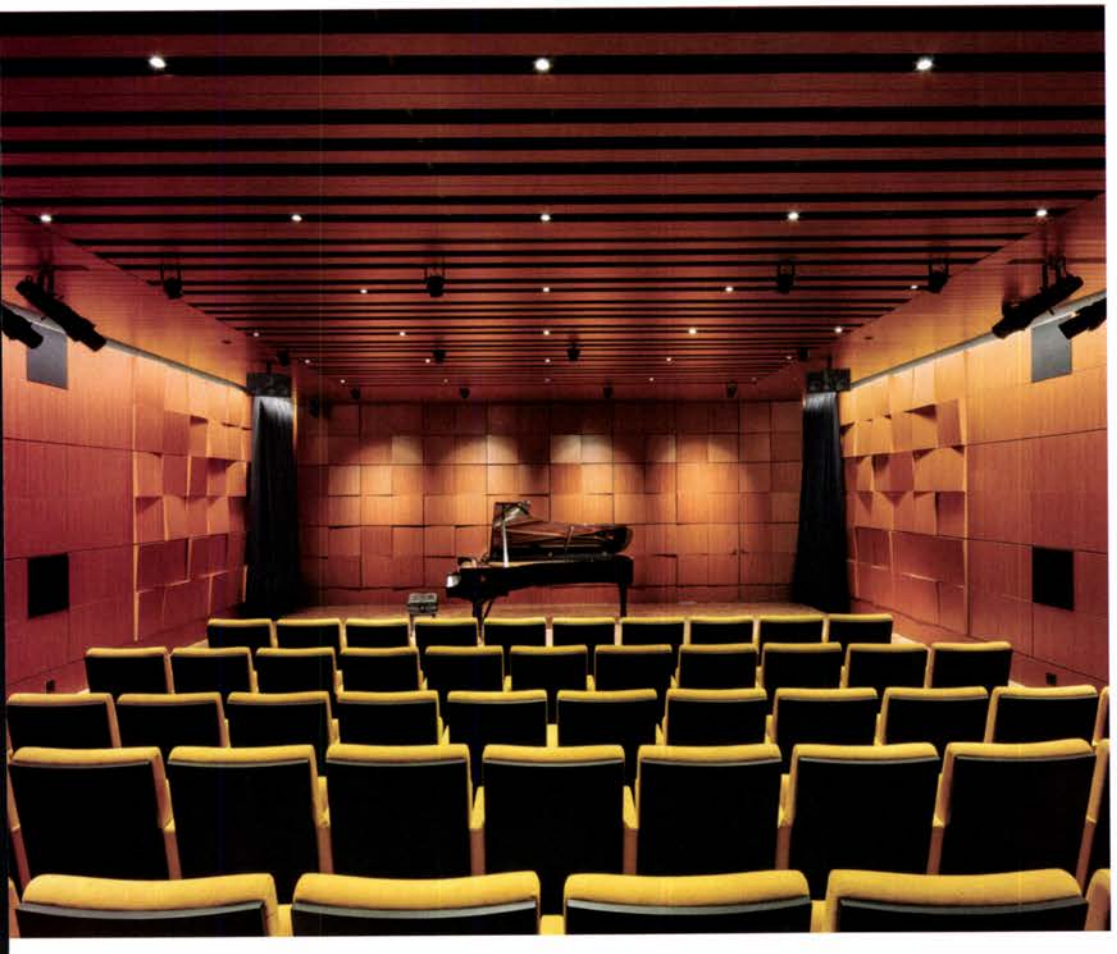
Wanting to capture this sense of light and openness but also control it, the architect installed white window shades that prevent glare without blocking views. Then she worked with lighting designer Suzan Tillotson to develop an intimate scheme that in addition fulfills Steinway's technical requirements. Together they created a luminous ceiling, backlit with 3,000K LED tapes. Covered by a custom teak grid that echoes the warmth of the wood floor, this acoustically reflective surface washes the room in a diffuse, even light. For sparkle, Tillotson added a flexible track system at regular intervals to highlight the curves and features of the pianos. Mindful of power consumption, maintenance, and cost, she substituted high-quality LED AR111 retrofit lamps for halogen in the track heads.

Amid the subtle luminescence, a vibrant light installation by artist Spencer Finch directs visitors toward a central stair leading to the lower level. Entitled *Newton's Theory of Color and Music (The Goldberg Variations)*, it is based on Bach's famous work and explores the intersection of music, color, and emotion through light.

While the showroom continues below, borrowing light that spills down the generous stairwell, the subterranean quarters are largely reserved for a state-of-the-art recording studio and 69-seat recital hall, as well as the surprising new professional haunt for sampling instruments—visible through a glass wall—dubbed the Concert & Artists Selection Room.

"I wanted the atmosphere to change where the concert pianos are," says Selldorf. So she distinguished this special space with a bril-





LIGHT MOTIFS The Concert & Artists Selection Room (above) has an eye-popping yellow floor and disc-shaped luminaires suspended from an exposed black ceiling. Acoustic requirements determined the specification and placement of the lighting in the teak-lined recital room (below).

liant yellow floor (the color of a concealed faux suede used to articulate the hammers in the piano). To get the height necessary for optimum acoustics, she exposed the ceiling, painting it black to disguise acoustical materials and mechanicals, and distributed a dramatic array of custom lighting "discs" across its expanse. Inspired by fixtures in Marcel Breuer's Whitney and Richard Rogers's Madrid-Barajas and London Heathrow airports, Selldorf teamed with Tillotson to craft this metal luminaire comprising LED tape circling the perimeter with a stretch PVC diffuser.

Acoustics were a driving factor throughou the project, but nowhere more than in the teak-lined recital hall. Because it will be used for critical listening and recording, the Tillotson team located LED drivers outside th room to minimize background noise and positioned fixtures to prevent potential vibra tions. As an extra precaution, the lighting designers and Arup acoustician Nathan Blum paired various LED retrofits and fixtures to determine compatibility prior to specification. The resulting scheme uses a mix of halogen and LED lamping and is integrated into the audio/video controls to facilitate management of individual zones, or composed lighting scenes.

Like a jewel box, the rejuvenated Steinway Hall glows from within its prominent new location, displaying its finely tuned merchandise to passersby and reverberating with a musical heritage that spans more than a century. Says Milliken, "We can't abandon that."

credits

ARCHITECT: Selldorf Architects – Annabelle Selldorf, principal; Julie Hausch-Fen; partner in charge; Myriel Mechling, project manager

LIGHTING DESIGN: Tillotson Design Associates – Suzan Tillotson, principal

ENGINEERS: Severud (structural); AltieriSeborWieber (m/e/p)

CONSULTANTS: Spencer Finch (light installation); Aru (acoustics)

CLIENT: Steinway & Sons

SIZE: 19,000 square feet

COST: withheld

COMPLETION DATE: April 2016

SOURCES

FLOORS: Kaswell (end-grain oak); Fusion Floors (seamless yellow)

LIGHTING: Litelab (track); Soraa (LED replacement lamps); Newmat (custom discs); ETC (spotlights); B-K Lighting (pendants); Electrix (cove); Prescolite, USAI (downlights)

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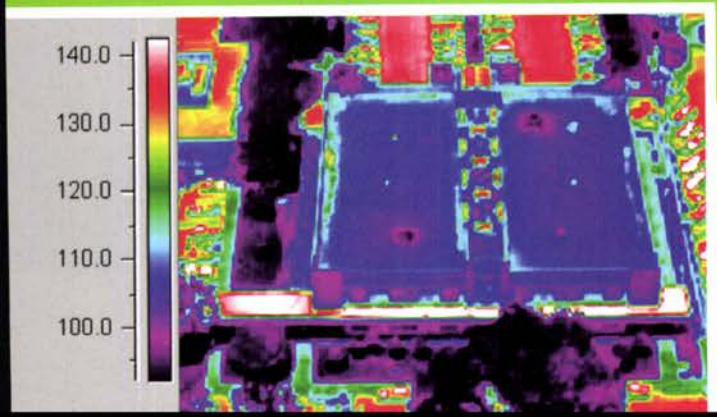

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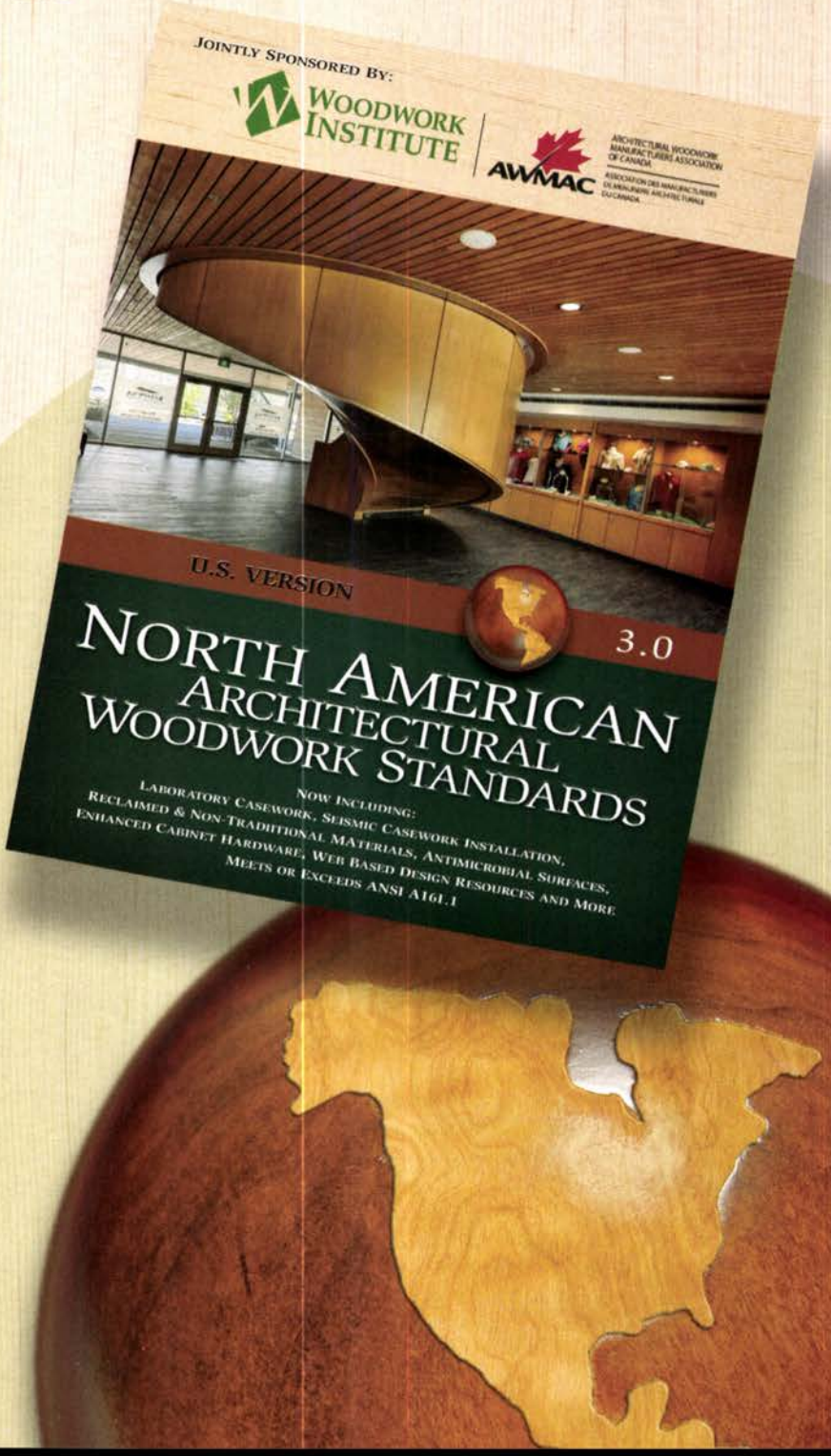

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CIRCLE 205

Parigi Restaurant

St. Louis

Mitchell Wall Architecture and Design

By Josephine Minutillo

NAMED AFTER the Italian word for Paris, Parigi was designed to look as if it were an Italian restaurant in the heart of the French capital. Located instead at the ground level of a luxury apartment building in Clayton, a tony suburb of St. Louis, the newly opened eatery fuses Italian design inspiration, and leading Italian design brands, with a traditional bistro feel.

Lighting played a large role in achieving that effect. The restaurant's main space is divided into three zones—the general seating area, private dining, and the bar—with a different lighting scheme corresponding to each. The main dining room, which includes booths at the center and smal tables along the expansive storefront windows, features rows of bare LED A-lamps—a nod to Adolf Loos—suspended from brass lampholders along the ceiling. "Exposed bulbs were very commonplace in bistros at the turn of the last century," explains architect Susan Bower, who led the design team at locally based firm Mitchell Wall. "They also work here to provide spherical illumination and bounce light up to show off the ceiling posters."

A mash-up of images of Italian and French art, food, fashion, and cinema designed by architect Stephen Leet, these PVC panels are affixed to the ceiling due to the limited wall space. Those cross bands of artwork, though, also serve to ti the two linear seating areas together. Embedded in the salmon-colored partition walls that separate them are verti-

cal architectural fixtures, whose LED light sources emit a soft glow around the lampshade and beneath the base toward the floor.

On the low wall by the booths, upholstered in a bright orange that was a popular color for Ferraris in the 1960s, is a line of large table lamps. Finished in copper, they offer diffused light while mingling with James Beard Award–nominated chef and owner Ben Poremba's collection of copper pots and espresso makers.

Brass-colored panels in tandem with cleverly concealed LED accent ropes are responsible for the golden hue around the bar. Rotating sconces with long cantilevering arms satisfy Poremba's wish for the bar to be a flexible space.

A large window on the kitchen, visible from the main dining room and bar, is framed by heat lamps that both keep food warm and act as subtle ornament. "Light and heat emanate from the kitchen," says Bower. "We wanted that to be the brightest spot."

On the opposite end of the restaurant, and exuding a very different kind of illumination, is the private dining room. Painted turquoise, with walls left bare to allow for presentations during business lunches and dinners, the central focus is a beautifully tiered Ingo Maurer chandelier. Called *Lacrime del Pescatore*, Italian for "tears of the fisherman," its nylon nets are dripping with 385 crystals. A single 3,050K halogen spot, mounted separately on an adjacent wall, projects onto the luminous drops.

"Installing that piece was like installing an artwork," recalls Todd Lannom, consultant and supplier for the project, who also provided lighting for three of Poremba's earlier restaurants in a grittier part of downtown St. Louis. "Each crystal had to be added individually, and the

LIGHT MEAL
At the bar, LED rope lights allow the brushed-aluminum panels, which are anodized with a brass finish, to glow (opposite). Bare bulbs dot the ceiling while copper-finished Foscarini table lamps line the top of the booths (above).

CRYSTAL CLEAR In the private dining room, a chandelier of layered nylon nets drips with crystals (above). Vertical fixtures are embedded in walls and mounted several inches above the floor (below).

placement of the nets adjusted with the incremental weight. It's amazing though how light fills that volume with just one bulb."

"Given the context of the restaurant in a suburban high-rise, we really wanted that space to sparkle and evoke the clinking of glasses," says Bower. "The defraction of light into a rainbow of colors makes you feel as if you've entered a very special place." ■

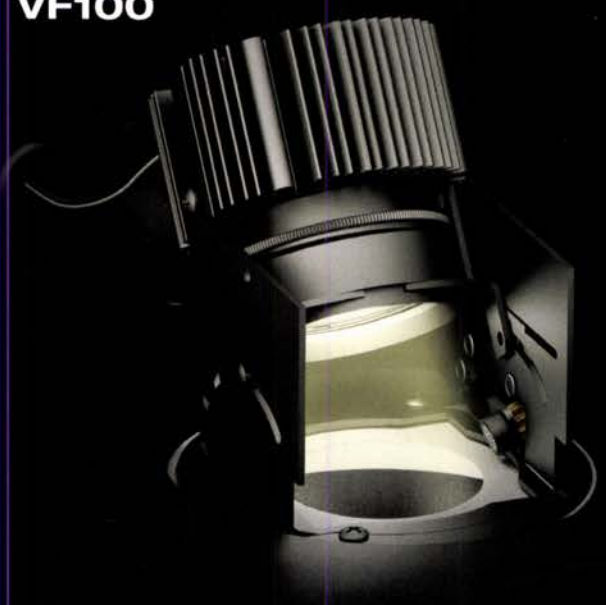
credits

ARCHITECT: Mitchell Wall Architecture and Design
CONSULTANT: Ford Hotel Supply
GENERAL CONTRACTOR: J.E. Foster Building Company
CLIENT: Bengelina Hospitality Group
SIZE: 4,000 square feet
COST: withheld
COMPLETION DATE: February 2016

SOURCES

INTERIOR AMBIENT LIGHTING: Flos, Foscarini, Ingo Maurer, Jesco Lighting Group
DOWNLIGHTS: Janmar
LIGHTING CONTROLS: Vantage
SOLID SURFACING: Corian
FURNISHINGS: TON, Moroso, Grand Rapids Chair Company, American Hospitality (booths)
PAINT: Sherwin Williams
TILE: Daltile, Expanko

VF100



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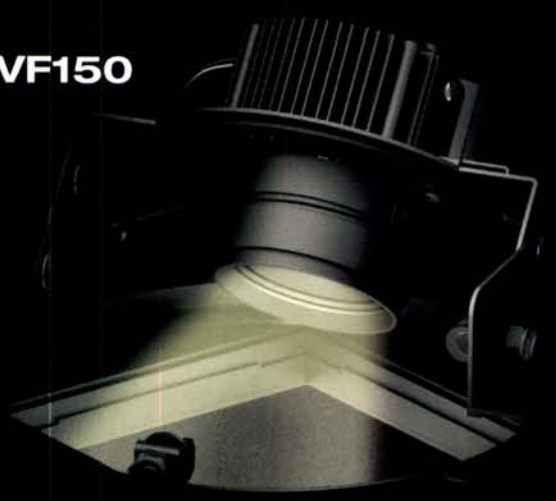

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CIRCLE 157

Philharmonie de Paris, Grande Salle

Ateliers Jean Nouvel
L'Observatoire International

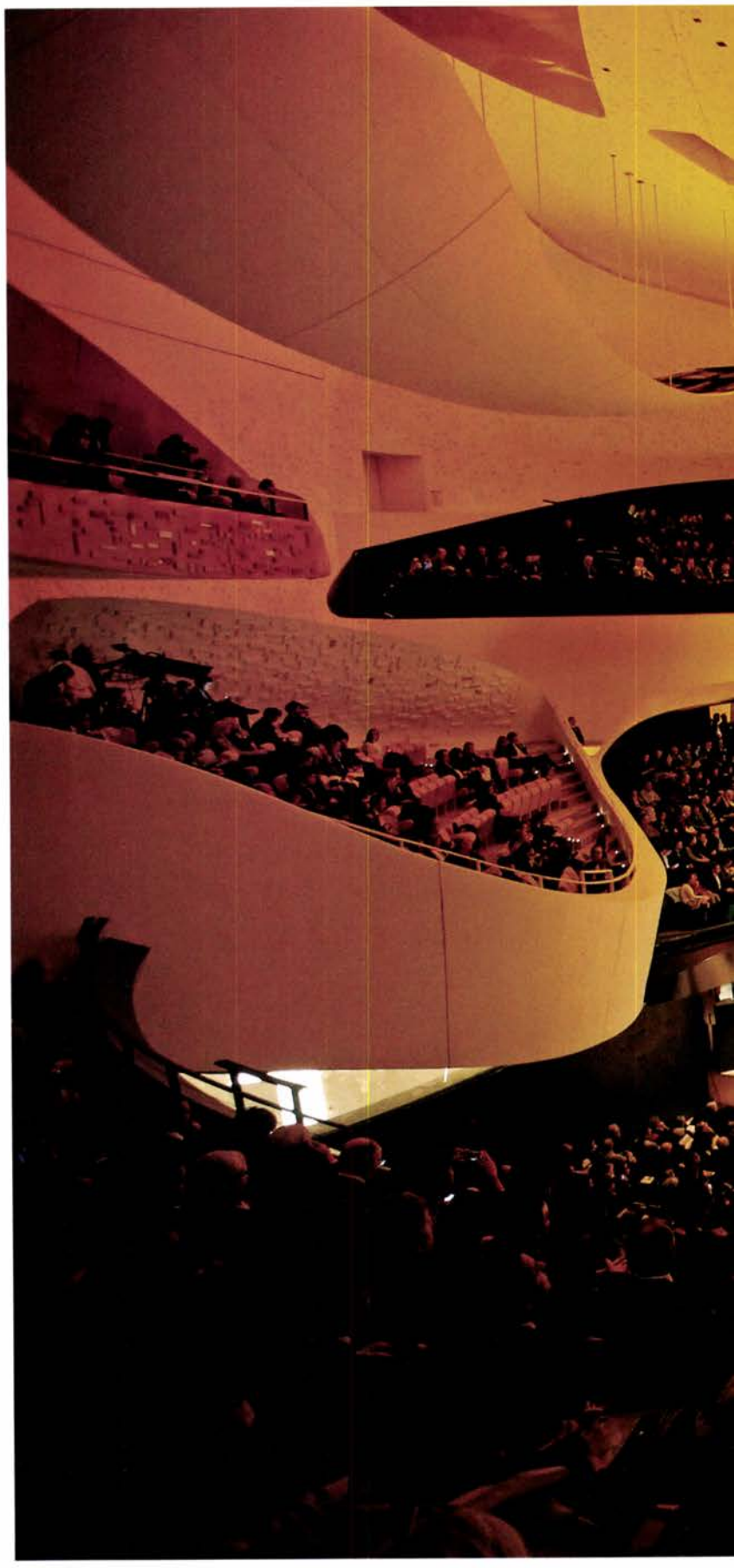
By Laura Raskin

WHEN LIGHTING designer Hervé Descottes began work on Jean Nouvel's concert hall, the Philharmonie de Paris, the project was well under construction, and the architect even had another designer's lighting scheme in hand.

"Jean Nouvel was very uncomfortable with [the other scheme]," says Descottes, whose firm, L'Observatoire International, is based in New York. "He didn't think it would work." Descottes, who collaborated with Nouvel on projects in Asia as well as his Guthrie Theater in Minneapolis, explains that the previous plan anchored the lighting to the ground and resulted in hot spots in mock-ups. Nouvel's brief to Descottes was to create instead a feeling of complete levitation. "The challenge was like jumping into quicksand to try to save a friend," says Descottes, laughing. "At the end, he was happy with it."

That seems plausible, even though Nouvel famously distanced himself from the shimmering stainless-steel hall on the east side of the Parc de la Villette after numerous construction delays and allegations of cost overruns led to the hall's opening uncompleted in January 2015. Nouvel didn't attend the gala celebration and released a statement defending Ateliers Jean Nouvel, stating, in part: "Today, the Philharmonie de Paris opens. Too early. The building is not finished. There were no acoustic tests of the concert hall. The schedule did not allow the architectural and technical requirements to be respected. This despite all the warnings, which I have been giving since 2013."

Nevertheless, the Philharmonie opened to rave reviews of its acoustics, orchestrated by Marshall Day, and of its 2,400-seat Grande Salle, with sinuous balconies and vineyard style tiers. Descottes matched the soft, round architecture—"there isn't a single sharp corner"—with lighting that he described as perfectly uniform and diffuse. The custom LED luminaires, completely hidden in the architecture, go from a bright white to a lush amber, changing according to the event or dimming sequentially



RARE FLOCK The jagged forms of Jean Nouvel's Philharmonie de Paris are clad in polished stainless steel, mottled metal, and interlocking bird-shaped tiles (above). Though it opened in an uncompleted state, the concert hall (right) received kudos for its acoustics and viewing experience.

MOOD SWINGS LED luminaires that go from bright white to glowing amber are hidden in acoustic "clouds" that hover above the stage and seating areas (above). In the circulation spaces, lighting designer Hervé Descottes created geometric podiums that project light onto the walls and ceilings (below).

from the sides of the hall to the square central stage, "like a flower starting to open," says Descottes. The stage lights above the musicians are crystalline in their clarity, by contrast.

The designer created shoebox-like containers—about a foot long by 8 inches wide—to contain 90 LEDs each (the hall has 641 fixtures in total). He then tucked most of these boxes behind the two levels of balconies and on top of the architect's floating "clouds," organically shaped acoustic panels that hang above the stage and seating. With the help of glass reflectors inside the boxes, the light bounces off the ceiling. The textured surface of some of the balcony fascia and wall panels helped hide any imperfections, says Descottes.

In the glowing yellow circulation space that surrounds the hall, Descottes designed angled, rectangular boxes, on top of which he placed LEDs that project light onto the walls and ceilings. The sculptural podiums don't reveal the light source and, as in the concert hall, create an almost shadowless glow. "It was a little like a dance, because we had to work with what was existing," says Descottes. He adds that projects in which the fixtures are hidden are becoming the norm for L'Observatoire, especially in Europe. Rather than designing decorative elements, Descottes is focused, as he was at the Philharmonie, on allowing the architecture to sing. ■

credits

ARCHITECT: Ateliers Jean Nouvel – Jean Nouvel, principal; David Letellier, Gregory Bismuth, project leaders

LIGHTING DESIGN: L'Observatoire International – Hervé Descottes, principal

ASSOCIATE ARCHITECTS: Metra+Associes

ENGINEERS: Iosis International, Aedis (structural); Marshall Day (acoustical)

CLIENT: La Philharmonie de Paris

SIZE: 1.1 million cubic feet (concert hall); 75,000 square feet (surrounding corridor)

COST: withheld

COMPLETION DATE: January 2015

SOURCES

LIGHTING: Secante (custom fixtures); LEDON (LEDs)

CONTROLS: Novelty Group

Radiant Infrared Heating Technology


The Breakers,
Palm Beach, FL


EW Solaira ICR Series
r recess applications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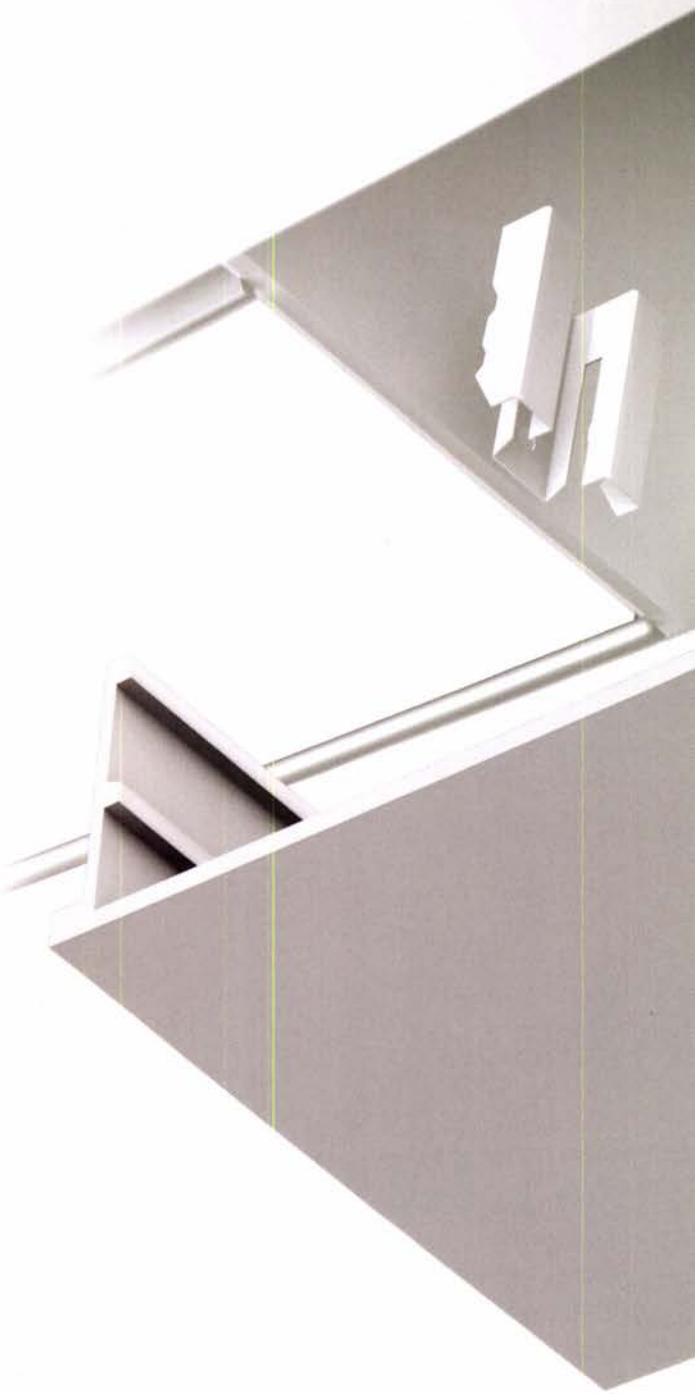

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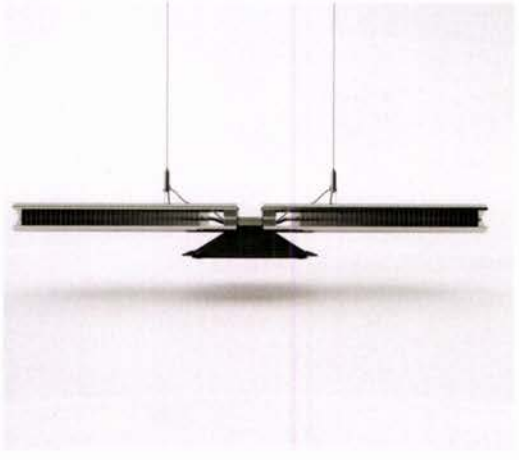
products lighting

SOME SMART LAMPS HAVE BRAINS AND BEAUTY.
BY JULIE TARASKA



Inside Out

Sonneman sonnemanawayoflight.com

Sonneman's first collection of outdoor fixtures comprises 35 studies in geometry, each offered in a trio of finishes. (Tides sconce in textured gray, shown; other options include textured bronze and white.) Illuminated with 10W to 20W LED arrays, these uplights, downlights, and precision spots in square, round, and rectilinear shapes are ADA-compliant—and may be used indoors too.

CIRCLE 110

W163 Lampyre

Wästberg wastberg.com

Made of two pieces of opaline glass, this dimmable lamp—which designer Inga Sempé named with the French word for glowworm—emits light from the top of its conic shade to the bottom of its cylindrical base. Illumination levels range from very bright to a mere halo. Available in a 13" x 10" bedside and 20" x 15" table size fitted with, respectively, E14 and E27 sockets.

CIRCLE 111

SensAble Technology and ST Connect

Lunera Lighting lunera.com

This smart-lighting platform starts with new, sensor-filled versions of Lunera's plug-and-play retrofit LED lamp engines. These SensAble Technology lamps may be used alone—responding individually to motion, heat, and light—or linked via a ZigBee network. An optional control app, ST Connect, uploads the lamps' data to a Cloud account, where it is analyzed for cost and energy savings.

CIRCLE 112

Cu-Beam

Dyson dyson.com

Dyson's entry into architectural lighting features a heat-pipe cooling technology that prolongs an LED's life; it also allows the fixture to provide an even, intense light using half the amount of energy usually required. A custom-engineered PMMA lens focuses the illumination, with adjustable trim blades offering framing and glare control. Available in downlight (pictured) and uplight versions.

CIRCLE 113

Nightsight

Zumtobel zumtobel.com

Created for urban environments, this modular family of plug-and-play outdoor LED fixtures uses two types of luminaires to illuminate surfaces and set target accents. The adjustable lights can be mounted on masts, walls, floors, or ceilings to brighten pathways and architectural details. Offered in two color temperatures and five light-projection types.

CIRCLE 114

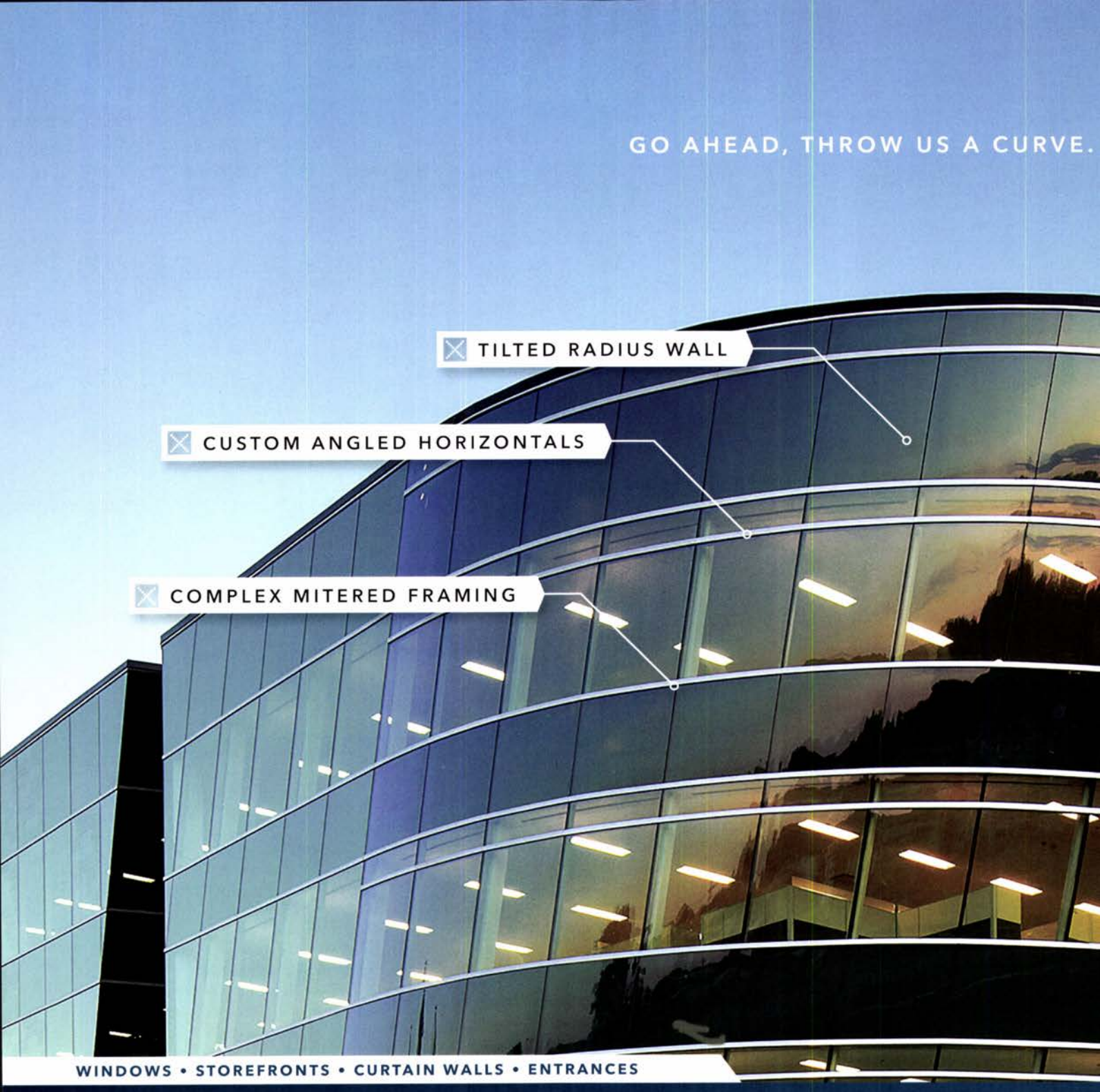
Infra-Structure

Flos Architectural flos.com

Still in the concept stage, Vincent van Duysen's sculptural, Bauhaus-inspired Infra-Structure plays with rhythm and sequence, offering specifiers their own custom mix of pendants, luminaires, and spotlights magnetically connected around a 24V track. The surface-mounted system may be installed in a single line or with multiple linked tracks.

CIRCLE 115

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



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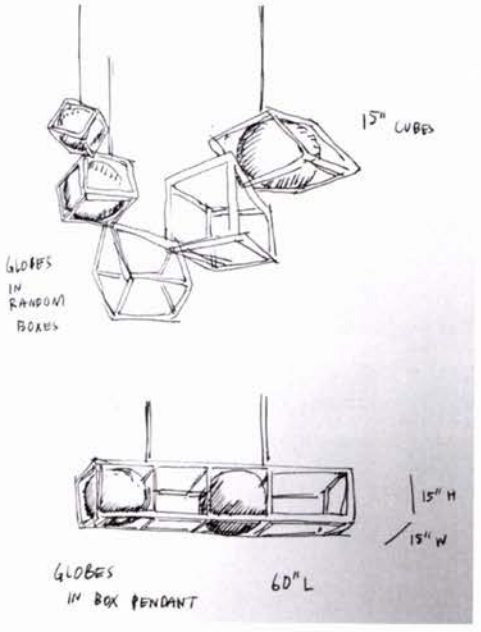

The Rockwell Group with Rich Brilliant Willing collection includes the Phase sconce (left), as well as the pendant/chandelier Witt (far left and above), which can be hung in various geometries. Twist, a lighted steel stool/side table with a wooden top, is one of the three entries in the Rockwell for Gaia & Gino line.

Joining Forces

Rockwell Group collaborates on two contract lighting lines.

By Julie Taraska

LIGHTING IS core to Rockwell Group's DNA, with the interplay of illumination and shadow central to the firm's interiors, architecture, and stage sets. Ten years ago, the team translated that expertise into a lighting collection for 54-year-old Italian manufacturer Leucos. But times and technology have changed. "Relatively young companies know how to create beautiful, high-quality fixtures," says Rockwell Group founder David Rockwell, "and LEDs have significantly improved." The firm took both considerations into account for two new commercial lighting collections, each created with an unexpected partner.

Comprising a pair of ADA-compatible sconces and four variants of a chandelier/pendant, the David Rockwell with Rich Brilliant Willing (RBW) collection pairs the firm with the upstart New York manufacturer that designs and produces fixtures in its Brooklyn workshop. RBW had approached Rockwell Group with the idea of collaborating on lighting products "that would be closer to real-life use . . . something an architect would specify," says RBW cofounder Theo Richardson. Rising to the challenge, the Rockwell team designed a "modular, metal-and-glass kit of parts that could be assembled in different geometries," explains Rockwell Group principal and studio leader Barry Richards. The fixtures will debut at ICFF and be available through RBW's website and showrooms.

Rockwell Group's line for the Istanbul-based tabletop brand Gaia & Gino came about in a similarly serendipitous manner. "I was chatting with David [Rockwell] about what was missing in the hospitality market," says founder Gaye Cevikel, "and he answered, 'I cannot find nice table lamps.' So I said, 'OK. Would you design some for us?'"

Fast-forward four years to last month's Salone del Mobile, where Gaia & Gino unveiled the results: two curved-steel lamps and a lighted side table/stool. Each handcrafted piece will be available this autumn exclusively through Casa International.

Customized versions of both product lines will be included in future Rockwell projects, says Rockwell's Richards. But don't expect the firm to set up a storefront anytime soon. "We'll showcase and promote the pieces," Richards explains. "But we're designers, not sellers." ■

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Image courtesy of Armstrong Commercial Ceiling Solutions

Understanding Code-Compliant Integrated Ceiling Solutions

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The 21st Century Classroom: Flooring for Learning

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Code-Compliance Conflicts in the Exterior Wall Assembly

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Advancing the Daylighting Discussion

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Photo courtesy of CornellCookson

Closing the Gaps: Rolling Doors That Meet Mandatory ASHRAE 90.1 Standards

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Too Transparent?

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Photo courtesy of Kitchens To Go built by Carlin/Sprung Instant Structures Inc.

Interim Executive Dining Facility Bridges Construction Gap at Business School

Sponsored by Sprung Instant Structures Inc. and Kitchens To Go built by Carlin

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Artisanry, Architecture, and North American Glass Tile

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Photo courtesy of Lamboo Technologies

Sustainable Envelopes with Structural Engineered Bamboo

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Folding Glass Doors Are an Asset for Commercial Spaces

Sponsored by LaCantina Doors

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Sustainable Stone From Cradle to Gate

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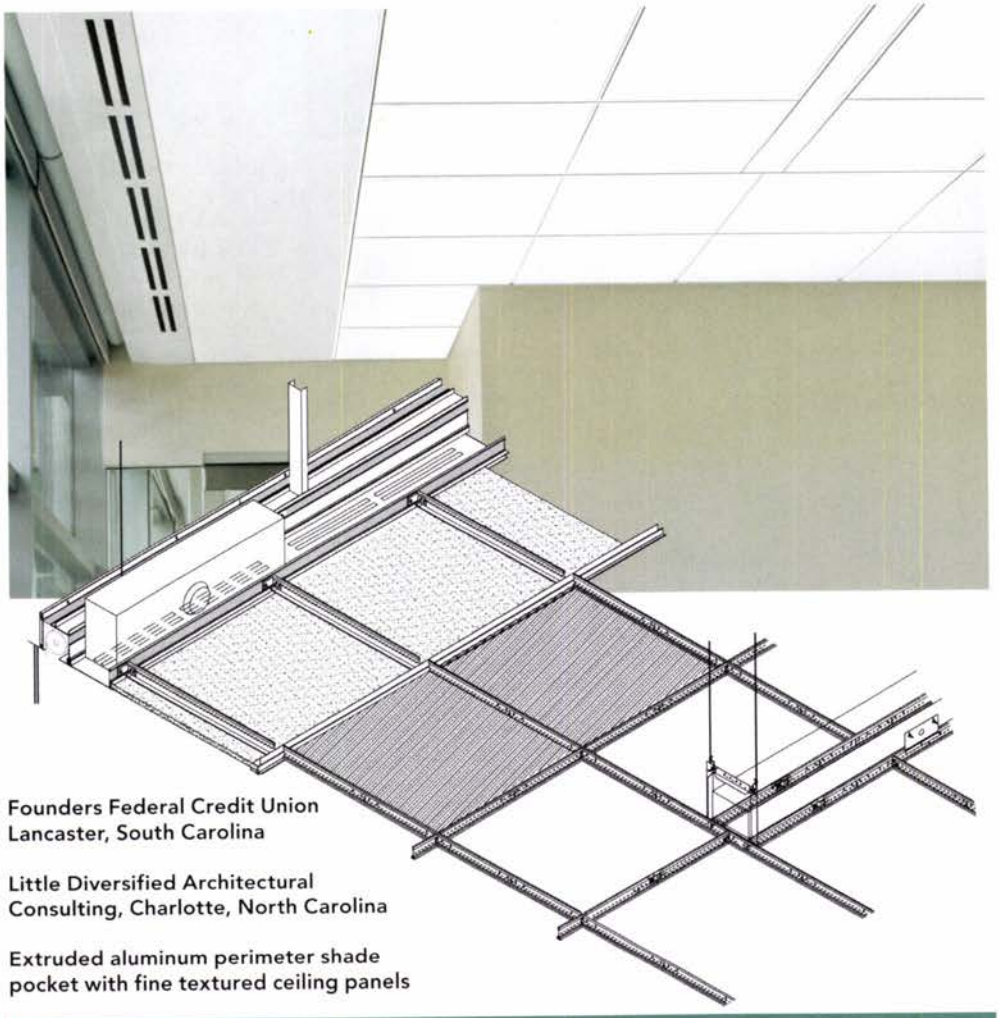
CONTINUING EDUCATION

Understanding Code-Compliant Integrated Ceiling Solutions

Using modern ceiling installation systems to meet design intent, IBC code requirements, and construction schedules

Sponsored by Armstrong Commercial Ceiling Solutions | *By Amanda Voss, MPP*



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Extruded aluminum perimeter shade pocket with fine textured ceiling panels

INTEGRATED CEILING SOLUTIONS BELL HELICOPTER, FORT WORTH, TEXAS

The Design Need:
The client desired a clean, consistent visual across the building, including transitions from the perimeter windows to the interior suspended acoustical ceilings. Much of the design intent was not achievable using conventional framing techniques. Intensive coordination of services above the suspended ceiling, including HVAC, mechanicals, fire suppression, and lighting, dictated a structurally sound system that trades could work in and around easily.

The Solution:
Pre-engineered ceiling systems were utilized to guarantee the contractor could build within the design vision and intent and keep the project ahead of schedule and on budget, while meeting LEED Silver certification requirements.

All images courtesy of Armstrong Commercial Ceiling Solutions

New solutions are available that make building high-performance, aesthetically pleasing, integrated ceilings faster and easier than ever before. Traditional ceiling construction methods are less and less compatible with current design trends, expedited construction schedules, and sustainability practices. You are challenged with designing spaces that that meet your clients' design intent and IBC and ASTM requirements, while contractors are pushed to meet accelerated construction schedules. By collaborating early with your ceiling partner, you can ensure best practices are followed for your project to meet design intent.

Pre-Engineered Ceiling Construction

Pre-engineered ceiling components were used in the Bell Helicopter headquarters construction to reduce coordination between trades, labor costs,

CONTINUING EDUCATION

1 AIA LU/HSW

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

1. Discuss new installation systems that navigate the challenges of designing ceilings from one end of a building to another.
2. Explain the design and construction benefits of pre-engineered integrated ceiling systems versus traditional ceiling design and construction practices.
3. Describe the environmental and occupant comfort benefits of pre-engineered systems versus traditional systems.
4. Apply new construction practice knowledge to make informed product specification choices.
5. Implement new construction methods to design ceilings that can be easily constructed.

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AIA COURSE #K1605K

NOAA Offices,
Tuscaloosa, Alabama

Gould Evans Architects, New Orleans, Louisiana

Drywall grid and extruded aluminum perimeter trim with fine textured ceiling panels

PRE-ENGINEERED TRIMS AND TRANSITIONS NOAA NATIONAL WATER CENTER, TUCALOOSA, ALABAMA

The Design Need:
The architect for the NOAA National Water Center wanted to feature a "river" that twists and turns its way through the center of the facility's ceiling. It was formed by creating a separation between the suspended drywall ceiling and its acoustical ceiling. Light coves around the perimeter of both ceilings function as the "riverbanks". Original plans called for the coves to be built of drywall. However, acoustical contractor Keith Yeager believed this would be extremely time consuming and difficult. "Studs and drywall would take forever," he says, "because of the need to frame it, hang it, tape it, and sand it. Considering the extremely curved nature of the coves, it also would have been almost impossible not to have cracks or flat spots in the drywall, especially since the radius changed every few feet."

The Solution:
To solve the problem, Yeager designed coves using extruded aluminum perimeter trim, all of which had to be custom made because of the complexity of the curves. Three different sized coves—18 inch, 12 inch, and 6 inch—were required. All consisted of multiple components. The most complex was the 18-inch cove, which required five elements. In total, 400 feet of 18-inch coves were installed, 480 feet of 12-inch coves, and 250 feet of 6-inch coves. To make the job easier and faster, each section of cove was given a letter and each of its components, a number. The ceiling manufacturer then packaged each section and its pieces in a separate crate."When you have to attach so many custom-made components to each other, it helped to have all the pieces in the same package," Yeager explains. Once installation began, job superintendent Tim Thomas notes construction of the coves using the pre-engineered trims and transitions was accomplished in half the time as drywall. "We probably saved two months in the construction schedule" he says. "And, there are no cracks or flat spots. Considering the curves and lengths of the spans, this would not have been possible with traditional drywall."

and to speed the construction schedule. The ceiling components met the same codes and standards as traditionally built, on-site systems and reflected the identical design intent and specifications of the most sophisticated site-built systems using the same architect-specified materials. Thirty to 50 percent faster to build and install compared to traditionally constructed ceilings, they generate less waste, provide consistent quality throughout the building, and meet tighter construction schedules.

Pre-engineered components and related details can be included in specifications to ensure consistent installed visuals throughout a project. Pre-engineered ceiling systems are often already tested and approved for use in Seismic DEF building areas, backed by the required certifications available from the manufacturer. If you are specifying for a LEED project, components can contribute to credits.

In addition to traditional ceiling systems, examples of pre-engineered ceiling system solutions include: drywall suspension systems for ceilings and soffits, light coves, shade pockets, transitions, and acoustical clouds and canopies.

DESIGN DETAILS: PRE-ENGINEERED TRIMS AND TRANSITIONS

Pre-engineered trim and transition options can be used to address changes in elevation, geometry, or material type. Transitions are available that make acoustical panels to drywall, as well as geometric shifts, such as from a rectangular office to a curved hallway, fast and easy to detail and build. Pre-engineered transitions eliminate excess framing, provide consistent fit and finish, and allow for quality control, while reducing the time required detailing and specifying. These transition solutions are designed precisely to fit with a variety of ceiling panel types and suspension systems. Unique curves and shapes as well as crisp detailing are easily duplicated throughout an entire project. Pre-engineered steel and extruded aluminum transitions use significantly less framing to structure and eliminate interferences in the plenum that can reduce the construction schedule, minimizing risk and ensuring design intent. These transitions are often tested to meet the same codes as standard transitions, including seismic requirements, and are available in a wide variety of standard and custom colors.

Design Details: Integrated Shade Pockets for Acoustical and Drywall Ceilings

Traditionally, ceilings (either acoustical or drywall), shade pockets, and shades require coordination between multiple trades, potentially leading to lengthier construction schedules and poor fit and finish. Pre-engineered extruded

PRE-ENGINEERED SHADE POCKETS EPCORE TOWER, EDMONTON, ALBERTA, CANADA

The Design Need:
The project architect was looking for a clean, integrated installation between the acoustical ceiling system and the shade pockets that surrounded the interior perimeter of the 28-story glass office building that overlooked downtown Edmonton.

The Solution:
Nearly 21,000 lineal feet of integrated shade pockets were installed. The pre-engineered system features an extruded aluminum pocket that bridges the transition between the interior of a building's perimeter and the ceiling plane. The pocket also accommodates a T-bar connection clip and splice plate to provide a mechanical lock to an acoustical or drywall grid system with no visible fasteners. Claude Bachand, co-owner of Alpine Drywall, explained that his firm presented mockups of various perimeter treatments to the architects, and the pre-engineered pocket solution was selected. He also explains that this is the first time his firm has installed the system. The reason: significant time and labor savings. Bachand says the crews normally would have used traditional drywall transition methods, including framing, boarding, taping, mudding, sanding, and painting. However, the perimeter system is far less labor intensive because it replaces all of those steps. "We found that by eliminating all those steps, the shade pocket system was four times faster than a traditional drywall pocket," Bachand states. "We were able to install it in a quarter of the time. Once in place, the system requires no finishing, which makes a big difference." The pocket can be installed in one of two ways, either directly to a wall or free floating. "The building has a curtain wall system so we couldn't attach it to the exterior wall," explains Alpine Co-Owner Grant Laplante. "It had to be floating." Describing this reaction to the perimeter system, Laplante states that the architect, owner, and crew were all impressed with the look of the pocket. "They liked it because installation was so much easier and so much cleaner."

Epcore Tower
Edmonton, Alberta, Canada

Kasian Architecture Interior Design and Planning LTD
Toronto, Ontario, Canada

aluminum pocket and shade options provide seamless integration between a variety of acoustical and drywall ceiling types, making specification simpler and installation faster and easier, while eliminating additional trade coordination and reducing ceiling construction schedules by 50 percent or more. Pre-engineered shade pocket options also allow consistent quality control at the building perimeter, reducing time required to detail and specify. They can also be customized in depth and dimension to work with almost any popular shade option you might choose.

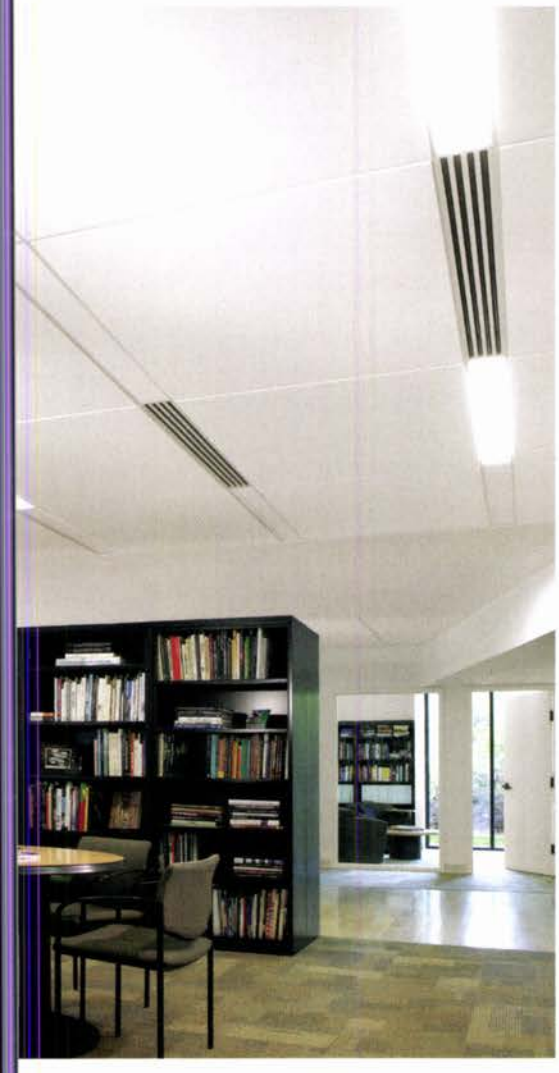
Continues at ce.architecturalrecord.com

Amanda Voss, MPP, *is an author, editor, and policy analyst. Writing for multiple publications, she also serves as the managing editor for* Energy Design Update.

MONOLITHIC CEILING DESIGN
GREENWAY GROUP, ATLANTA, GEORGIA

The Design Need:
Create an office space that provides a functional working environment, while removing the clutter in the ceiling plane. Greenway Group, an Atlanta-based consulting company that advises some of the country's preeminent architectural and design firms, desired a ceiling that matched the contemporary look and feel of its new office space and eliminated traditional lighting integration issues, such as tall fixture housings and ceiling height specification difficulties.

The Solution:
A ceiling system was installed that integrated and organized narrow light fixtures, air diffusers, and sprinkler heads into a compact linear zone that visually coordinated with large-scale, fine-textured ceiling panels. The system eliminated the need for cluttered penetrations in the acoustical ceiling panels, making fixtures more streamlined as well as easier to service and maintain. This provides a very clean, custom look that coordinates with the space, even though it used standard components and installation methods.



Greenway Group, Atlanta, Georgia

DAG Architects, Destin, Florida

Ceiling system with compact linear zones for light fixtures and diffusers

The premium rubber flooring product selected for the new Thornwilde Elementary School in Hebron, Kentucky, has essentially become a standard for all Boone County Kentucky School District's new construction and renovation projects, based on experience with the flooring's performance, durability and low maintenance in schools throughout the district since the early 2000s.

All images courtesy of nora systems, In

The 21st Century Classroom: Flooring for Learning

How premium rubber flooring supports exceptional learning environments

Sponsored by nora systems, Inc. | *By Layne Evans*

"Look at your learning space with 21st century eyes. Does it work for what we know about learning now or what we knew about learning in the past?" —The Third Teacher

Design innovation in educational facilities at all levels is undergoing a revolution. The multi-author book, *The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning*, summarizes many of the most important emerging concepts about the impact of the physical environment on teaching and learning.[i] Evidence-based design—making design decisions based on research about how aspects of the physical environment directly influence human performance and well-being—has transformed health-care architecture, measurably improving outcomes for patients, families, and staff. Now, the same principles are being applied to the design of spaces for learning. A growing body of research and many impressive examples around the country show an exciting range of new products and ideas for learning environments that give students what they will need to succeed as global citizens in a complex, technological world.

The materials selected for these new spaces are key to the success of the most innovative designs but also to ensuring the most fundamental needs—healthy air, good light, clear sound, physical safety, and comfort. Even the best decisions about curriculum, assessment, teaching methods, and other important issues can be instantly undermined in the classroom by inferior materials; for example, if students can't hear or teachers have to repeat themselves, if the air quality is unhealthy, or if the floors are hard and unsafe.

On the flip side, physical environments with properly selected materials, effective light, and forward-thinking design have been shown to improve student performance and teacher success on a wide range of measures from test scores to absenteeism to reduction in headaches and asthma.

As with other materials in educational settings, flooring has to perform in new ways. Rubber as a flooring material has many inherent advantages, but there are significant dif-

CONTINUING EDUCATION

1.5 AIA LU/HSW

1.5 GBCI CE HOURS

0.1 IDCEC CEU

Learning Objectives

After reading this article, you should be able to:

1. Discuss the importance of the physical learning environment as the "third teacher" in today's state-of-the-art classrooms.
2. Evaluate flooring in educational settings as an outcome driver for both students and teachers.
3. Examine the role of premium rubber flooring as a component in achieving educational goals.
4. Specify flooring with characteristics that enhance teaching and learning, with a focus on: safety, indoor air quality, acoustics, comfort, effective operational optimization and maintenance, and a durable, sustainable life cycle.

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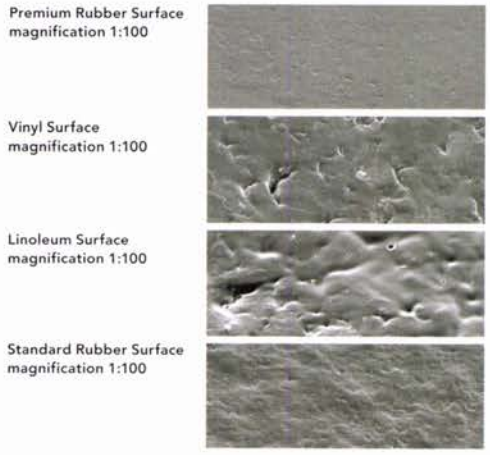
GBCI COURSE #0920007948
IDCEC COURSE #CC-105297-1000

Figure 1: Surface Density of Resilient Flooring



The advantages of high surface density include improvements in safety, acoustics, resistance to dirt and microorganisms, and ease of maintenance.

ferences even among rubber flooring products (see Figure 1). Premium rubber flooring differs in quality of ingredients, manufacturing, surface density, and performance characteristics that allow it to respond to new demands. The most functional rubber flooring products can stand up to collaborative floor plans and moveable furniture, foster communication by reducing unwanted and confusing sound, and provide the comfort and safety that aids concentration and reduces distraction. They help maintain healthy air quality and can be thoroughly cleaned without harmful chemicals, eliminating the fumes, labor, and disruption of stripping, waxing, and recoating.

The large majority of schools are not built to optimize learning, health, and comfort, but to achieve minimum performance at the lowest cost. Many older classrooms are actually working against basic health and safety. Whether for brand new spaces or badly needed renovations, decisions about flooring will have a direct impact on the success of students and teachers for many years to come.

This course will illustrate how premium rubber flooring supports some of the most important new concepts in the creation of exceptional learning environments. Although most of the emphasis is on teachers and kids in K-12, the information is just as important and relevant to students of every age, from the littlest learners in daycare and pre-K spaces, to higher-education facilities and technical and career spaces for lifetime learning.

AGE OF COLLABORATION: DON'T STAY IN YOUR SEATS

The exact list of core concepts in today's best thinking about education differ, depending on the focus of the list maker—sometimes there are three "Cs," sometimes five or more. But three are on almost every list: collaboration, communication, creativity. The days of every student sitting quietly in his or her chair for hours at a time, desks lined up in front of a teacher who is the only one speaking, are gone, or at least educators are trying hard to show how counter-productive that scenario can be.

Beyond learning a set body of knowledge, students today are preparing for a future that will require teamwork on small scales and global scales, quick learning, and the ability to do many different jobs in a lifetime, most of which probably do not exist yet. An "agile classroom" is a learning space that can be reconfigured on a dime to engage different kinds of learners and to enable teachers to become guides, marshalling resources for groups of kids who are learning to think on their own and find the information they need. Students move their furniture easily to make small, project-based groups or find space to study alone undisturbed. Different learning styles are accommodated and encouraged. Communication skills are learned in one-to-one exchanges with teachers and other students, and through forms of media that we all use now and ones that we are just now inventing. Creativity thrives where technology connects the classroom to people, places, and networks all over the world, along with problems to solve and the capabilities to do it.

The physical environment has to be up to the challenge of these new ideas. In a classroom of the "old" model—which unfortunately still exists in most schools—the rich, active, agile learning environment described above, with its moving kids and moving furniture, would lead to a noisy, clattering, chaotic atmosphere. Floors would be scratched and stained at the very least, and often slippery with hard, unforgiving surfaces.

To provide a safe and effective foundation for a good learning environment, the flooring must perform well in several key areas discussed in the following sections: physical safety, healthy air quality, good acoustic performance, visual and ergonomic comfort, and the practical realities of today's educational buildings requiring low maintenance, durability, and sustainability.

SAFETY IN NEW CONFIGURATIONS

The best new designs in learning environments emphasize movement. Research discussed in *The Third Teacher* continues to confirm a deep connection between movement, learning and brain development. When students are allowed to move around more, the ability to concentrate actually improves. In one example, ergonomic chairs that could swivel, rock, and otherwise respond to adjustment resulted in better test scores. Even "fidgeting" is more productive for learning than sitting for long periods in rigid furniture.

In a space where teachers and students are often in motion, the slip-resistant surface of rubber flooring reduces the likelihood of falls. Its ability to absorb energy can help prevent or reduce injuries when falls inevitably occur. Rubber floors are not only safer to move on, they are safer to fall on. Added traction is particularly important in areas where large numbers of people are moving

Exceptional learning environments emphasize movement and collaboration. In early grades especially, students need a comfortable, safe, healthy, and easy-to-clean floor.

quickly most of the day, such as hallways, stairwells, cafeterias, and gymnasiums.

Slip resistance can be increased by texture in the surface, but at some point there are trade-offs with cleanability, and maximum traction isn't desirable in places where people need to be able to walk easily or move equipment. An optimum level of slip resistance for the use of the space is required. When people have confidence that the flooring is not slippery, the stress of walking and standing is reduced.

But slip resistance in flooring is complex to evaluate. Slips are often caused by the floor's surface, as opposed to trips caused by factors like changes of level, damage, or obstacles. The pattern and transitions in flooring surfaces have an effect on perception. The flooring material's firmness directly affects the posture and balance of people walking or standing on it.

Some of the key environmental factors that relate to slip resistance include the friction between the floor and the shoe, the presence of micro-roughness in the material, the hardness of the floor, and the finish of the floor, including applications for sealing during installation and later for varnishing, sealing, or polishing.

Premium rubber flooring does not require coating or polishing, so the surface does not have the type of gloss that can cause slipperiness (and create a visual perception of slipperiness, which in itself can be a hazard). Products are also available in a range of thicknesses and textures to provide precise balances of energy absorption, adequate cushioning, and firmness.

Coefficient of friction (COF) represents the resistance an object encounters in moving over another—in this case, a foot over the floor. High COFs indicate greater friction and less slip potential. For example, ice, which has a COF of 0.2, is more slippery than swept concrete, which has a COF of 0.9.

COF is often considered the only relevant component of slip resistance, but it is complicated to measure effectively and consistently. Although OSHA has no mandatory standard for COF, it has published guidelines in the past that recommend a COF greater than 0.5 as a reasonable level, while noting that there are many applications where greater slip resistance is needed. This is also the minimum value of the commonly used James Test (so named because it uses a slip-resistance machine developed by Sidney James at Underwriters Laboratories; it is also the basis for ASTM Standard D2047: Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine). But not every floor is subjected to this test. In fact, there is currently no single slip-resistance test method applied consistently to both coated and non-coated resilient flooring.

CASE STUDY: PARADIGM SHIFT

Eanes Independent School District (ISD)
Austin, Texas

Eanes Independent School District (ISD) recently completed three projects, including the gymnasium at Valley View Elementary, corridors at Hill Country Middle School, and the cafeteria at Eanes Elementary. The district wanted a long-range, standardized flooring solution to use in all its classrooms, hallways, cafeterias, and gyms to eliminate problems experienced with its old flooring. A premium rubber flooring product was selected to replace existing VCT and carpet tile.

"It's a paradigm shift for the district. It's always been about VCT or carpet tile," says Bob Cervi, director of facilities, maintenance, and operations. "We're finding where we can use this particular rubber flooring, and we're doing it. It's a long-range solution. It's not a fix; it's a solution."

The new flooring was chosen to meet specific criteria of reduced maintenance, a long product lifespan so that it would not need replacement for decades, quieter classrooms and hallways, and hygienic properties. But its performance has shown additional benefits as well.

For example, days of work have been freed up for maintenance staff who no longer need to strip and wax floors. Explaining the benefits to the district, Cervi says, "It takes two custodians four days to strip and wax a cafeteria. Since the rubber flooring is waxless, that means we just gained two custodians and eight days of work to do something else. The other kicker: that's four days we are not running the HVAC during the summer when there's no one in the building, just to make sure the wax cures out. Anytime we can gain man-hours and reduce energy consumption, we've saved a job as a district."

Cervi continues, "Additionally, we no longer have a slip, trip, or fall issue because someone always does [fall] on that slick stripper. So we can reduce our workers' comp concerns."

In addition to saving time and money on maintenance, Eanes ISD has also found improved indoor air quality. "The PE teacher was having indoor air quality issues in the gymnasium, which was carpeted. Spills would happen and would sit for hours. You can only steam clean so many times. We no longer have that issue with the rubber flooring," says Cervi.

Students are also able to better focus, as unwanted noise is attenuated. Cervi reports, "The principal at Hill Country Middle School couldn't believe how much quieter the halls were."

Being a former teacher himself, Cervi explains, "I understand both sides of the desk, so I see the direct correlation of how what we do on the maintenance side affects the educational process." When it comes to enhancing staff and student experience, Cervi says, "I'm a big fan of the new floor's compaction rating that reduces leg fatigue at the end of the day for teachers."

"What I also like is that there is now 10,000 square feet of flooring that we're not stripping and waxing."

Eanes ISD is now planning to install the same premium rubber flooring product in six more classrooms, with additional renovation projects in the works for next summer.

McMaster University, Hamilton, Ontario, Canada, initially tested a premium rubber flooring product in one of the school's busiest buildings. "There is a stairwell right by the road that receives most of the foot traffic into the building. The landings were previously VCT and didn't stand up," says Craig MacDonald, director, maintenance and facility services. "We replaced it completely with rubber stair treads and rubber tiles on the landings. Thousands of students walk up and down those staircases every day—and they still look fantastic." From there, the university so far has used the product in the student health services area, laboratory renovations, elevators, and its three largest libraries, one of which is shown here.

As a result, two rules of thumb are useful when evaluating slip-resistance test results. First, check to see if the test was conducted by an independent company, which helps ensure accurate results. Second, flooring should be tested with its intended use in mind. For example, if the flooring requires five coats of polish, then it should be tested after five coats of polish have been applied. If the manufacturer states that no coating is required, then the floor should be tested without a coating. Some premium rubber flooring products achieve high slip-resistance ratings even immediately after cleaning, which ensures safe use of the space without delay.

The option considered most useful for comparing the COF of resilient flooring is to test using a modified version of ASTM D2047, without polish (unless the flooring requires it) and using a sensor made of dry neolite (the material of most of today's shoe soles). This test method is currently being developed by the ASTM F06 committee. Most resilient flooring manufacturers already use this method and publish the values. The flooring manufacturer should provide testing reports, including the test method and the machine and sensors used, and if possible, testing information on pre-aged samples of the product to indicate long-term performance.

ASTM F-1344

ASTM developed the F-1344 Standard Specification for Rubber Floor Tiles in 1991, which replaced the old Federal Specification #SS-T-312b. These standards provide dimensional and performance criteria for product acceptability.

- Permits a thickness tolerance of +.015"/-.005" for pattern tile and +/-.005" for smooth tile
- Permits a hardness rating not less than 85 when tested in accordance with ASTM D-2240 Durometer (hardness)
- Provides performance requirements in the areas of static load limit, resistance to short-term chemical resistance, resistance to heat, and abrasion resistance

AS BASIC AS AIR

"Make janitors guardians of the indoor environment. Choose cleaning products, materials, and technology wisely, and teach maintenance staff best practices." —The Third Teacher

It may seem extreme to question the very air that students and teachers are breathing, but unfortunately the problems in many of today's classrooms do start there. Among the disturbing facts noted in *The Third Teacher*: asthma is the most common chronic disorder in childhood—currently affecting 16.2 million children under the age of 18. Asthma is the leading cause of absenteeism, responsible for more than 20 million missed school days in the United States per year. The air is unfit to breathe in an estimated 15,000 American schools.

Physical products and materials in the classroom, including flooring, have a direct impact on indoor air quality in two important ways: first in their basic composition, and then in their maintenance profile throughout their product life.

First, many materials emit large quantities of volatile organic compounds (VOCs), a hazard not only to occupants of the space but also to the environment at large. The VOC emissions of an interior floor product are related to the material's composition. Creating products that perform well but contain low or no VOCs is a challenging engineering and chemical problem that flooring manufacturers have worked to solve, with varying success.

Some materials are inherently less hazardous than others because they contain fewer synthetics, chemicals, and petroleum. Premium rubber flooring is composed of ingredients including natural rubber, a sustainable resource, and does not include previously used materials, such as tires or chemicals like plasticizers.

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***Layne Evans** is a writer specializing in architecture, construction, the building industry, energy, and the environment. She has created more than 50 print and multimedia continuing education courses.*

Exterior wall assemblies must be designed to meet code-required structural support, continuous insulation, moisture management, and fire resistance performance criteria, but available solutions often interfere with one another.

Photo courtesy of Laminators Incorporate

Code-Compliance Conflicts in the Exterior Wall Assembly

Specify aluminum composite material wall systems that satisfy conflicting code requirements and achieve performance goals

Sponsored by Laminators Incorporated | *By Jeanette Fitzgerald Pitts*

The exterior wall portion of the building enclosure is a multifunctional part of the built environment. It keeps the majority of exterior environmental loads from getting in, it keeps the majority of building-generated heat from getting out, it is the aesthetic facade, it supports the facade structurally, it manages moisture flow through the exterior wall, and it controls the spread of fire throughout the building envelope; just to name a few of the performance requirements. While building enclosures range from elaborate and cutting edge to basic and cost conscious, every building enclosure must be code compliant.

Surprisingly, a code-compliant building enclosure is difficult to design, in large part, because there are conflicts within the building codes that make the path to compliance unclear. This article separates the potential code conflicts into four types:

1. Structural Requirements and Moisture Management
2. Structural Requirements and Energy Code/Continuous Insulation
3. Structural Requirements, Moisture Management, and Energy Code/ Continuous Insulation
4. Structural Requirements, Moisture Management, Energy Code/Continuous Insulation, and Fire Requirements

While there is no magic bullet, this article will identify potential solutions for these four important conflicts and discuss the advantages and disadvantages of each. Pragmatic application of best practices can help a designer avoid

CONTINUING EDUCATION

1 AIA LU/HSW

GBCI CMP 1 GBCI CE HOUR

Learning Objectives

After reading this article, you should be able to:

1. Identify the basic elements of an exterior wall system.
2. Discuss code-compliant options for providing the structural elements necessary to support the veneer, while simultaneously complying with water control, energy, and fire control requirements.
3. Explain why it is impossible to specify a non-proprietary NFPA 285-compliant exterior wall assembly.
4. Specify exterior wall systems that satisfy conflicting code requirements and achieve performance goals.

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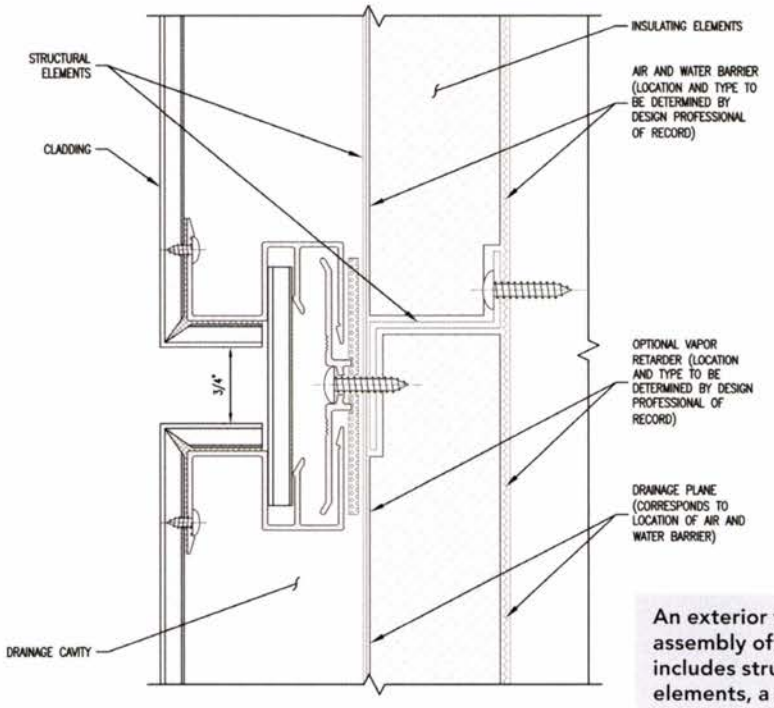
Image courtesy of Laminators Incorporated



An exterior wall assembly often includes structural elements, a drainage plane, a vapor retarder, insulating elements, and exterior cladding.

TYPICAL JOINT DETAIL
ACM CLADDING SYSTEM OVER CONTINUOUS INSULATION

the difficulties associated with these code conflicts and create a functionally compliant enclosure.

BASIC ELEMENTS OF AN EXTERIOR WALL SYSTEM

The exterior wall system is tasked with managing and controlling the movement of heat, air, and moisture into and out of the building enclosure, while providing the requisite structural support for the exterior facade. In order to accomplish this extensive list of interrelated, but diverse, design objectives, the exterior wall assembly includes a number of stand-alone components and systems that must work simultaneously and in close proximity with one another without interfering. A few of the basic components and systems commonly found in an exterior wall assembly include: structural elements, drainage plane (typically the air and water barrier), vapor retarder (optional as required), insulating elements, and exterior cladding.

Structural Elements

The structural elements inside of the exterior wall system include the structural supports that attach the veneer, or other types of exterior cladding, to the structure. Building codes require that these structural elements be designed to support the self-weight of the veneer and to withstand appropriate environmental loads, such as wind loads. Structural elements include, but are not limited to, the primary wall structure, sheathing, secondary framing system elements (e.g. cold-formed metal furring), and other structural members that are specific to certain proprietary exterior wall systems.

Drainage Plane

The drainage plane in an exterior wall assembly exists to effectively manage moisture but is regularly called upon to manage airflow as well. Most often, the drainage plane is defined with an air and water barrier, an element designed to both manage water and airflow at the same plane within the exterior wall construction.

The water barrier is designed to limit exposure of bulk rainwater and condensation to the managed portions of the exterior wall cavity, to enable the exterior wall cavity to dry, and to prevent uncontrolled water from penetrating further into the interior. The air barrier in the exterior wall assembly is intended to control the airflow between the outdoors and the interior, conditioned space. Airflow control is important because airflow carries moisture, spreads smoke, impacts indoor air quality, and influences the movement of heat, which impacts the thermal performance of the building.

Vapor Retarder

Moisture, in any form, needs to be effectively managed in the built environment. While the drainage plane is designed to control the movement of liquid water; water vapor, which refers to water in its gaseous state, is controlled by a vapor retarder. A vapor retarder impedes the flow of water vapor between the exterior assembly and interior walls. The code defines when a vapor retarder is required, and it is oftentimes incorporated into the drainage plane by using a product that can function as a water barrier, an air barrier, and a vapor retarder.

Insulating Elements

The expansion of insulation requirements in the exterior wall system is a relatively new addition to the energy code—the result of a growing demand for improved systems efficiency and increasing interest in satisfying sustainable design initiatives. Insulating elements in the exterior wall system manage the flow of heat in and out of the building. This reduces the heat lost or gained through the exterior wall and improves the overall performance of the HVAC system because less energy is required to keep the building at its preferred temperature.

Exterior Cladding

Exterior cladding refers to the protective layer or finish affixed to the exterior side of the building envelope. The exterior cladding makes an important contribution to the overall aesthetics of the building, but also provides the first layer of protection against bulk rainwater penetration.

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Jeanette Fitzgerald Pitts *has written dozens of continuing education articles for* Architectural Record *covering a wide range of building products and practices.*

Advancing the Daylighting Discussion

Explore the scientifically proven advantages of automation in daylight management

Sponsored by MechoSystems | *By Jeanette Fitzgerald Pitts*

The Washington, D.C., offices of international law firm Nixon Peabody use an automated shading system to maximize the presence of beneficial daylight in the workspace. Shades lower to manage glare and minimize solar heat gain and raise to admit soft, ambient daylight whenever possible.

Photo courtesy of MechoSystems/Eric Laignel

The daylighting industry has undergone significant changes since the 1974 oil embargo, the event most often credited with kick-starting in earnest the movement to reduce the energy consumption of the built environment. "Daylighting and daylighting controls, in particular, have had a long and complicated history," explains George Loisos, principal and owner of Loisos + Ubbelohde, Alameda, California. "Today, the performance issues prevalent in the past have more or less been resolved, and buildings are now required by codes and green building programs to incorporate daylight and daylight controls that will save electrical energy and manage glare and solar heat gain in the interior space."

The evolution of daylight management solutions from problematic to code-mandated is evidence in itself of the development that has taken place in the daylighting industry over the past few decades. Concentrated efforts from the scientific community, designers, and manufacturers have created an environment where the theoretically plausible, technologically possible, and practically prudent have been leap-frogging one another, creating instances where certain aspects of daylighting were possible before the terminology existed to discuss them or the benefits of their application had been proven.

Automated shading systems have been at the forefront of the daylighting discussion for some time. Now, these systems are scientifically proving, through experimental and post-occupancy studies, that they are a crucial component of a daylight management solution. Third-party research conducted by industry leaders has concluded that automating the shading system, instead of relying on the constant manipulation of manual shades, optimizes the position of the shade throughout the day and maximizes the amount of usable daylight allowed into a building, while mitigating glare. These automated shading systems also assist the HVAC system, while protecting occupants and the interior from solar heat gain and direct solar radiation.

This course will take a closer look at how the daylighting discussion is evolving, review the results of studies that examined the post-occupancy performance of automated shading systems in The New York Times Building, explore the impact that automation can make in terms of effective daylight management, and compare and contrast a few of the different automated daylight control solutions available today.

CONTINUING EDUCATION

1.5 AIA LU/HSW

Learning Objectives

After reading this article, you should be able to

1. Explain how automated shading systems can be used to manage glare and minimize solar heat gain, save lighting and HVAC energy, provide occupants with access to daylight and views, and satisfy green building codes and LEED rating system criteria.
2. Differentiate between the new daylighting metrics developed to measure the daylighting performance achieved by a design.
3. Quantify the impact that automated shading systems have on the overall daylighting performance and energy use of a space when compared with the daylighting performance delivered by manual shades.
4. Describe the daylighting and energy savings results realized by The New York Times Building and published in the post-occupancy study.

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AIA COURSE #K1605R

INTRODUCING AUTOMATED SHADING SYSTEMS

An automated shading system predicts, monitors, and responds to the unique, daily microclimate surrounding the building. These systems are comprised of motorized woven solar fabrics, advanced daylighting software, roof-mounted solar radiometers that monitor sky conditions in real time, exterior-mounted photometers that monitor sky brightness, and minimal interior-mounted photosensors that monitor for the presence of direct sunlight and brightness that may disrupt the visual environment. The system applies an advanced algorithm that considers the changing position of the sun in relation to the building and the changing solar angles at each window, along with the real-time climatic information detected by the sensors, to determine the optimal position of every shade throughout the day. The solar fabric is raised and lowered accordingly to prevent glare and solar heat gain from entering an interior space and allow soft, usable daylight into the interior. It is important to note that automation systems can be scalable and range from a sensor and a few motors to floors to whole buildings or an entire campus. Not all features are present on all systems, sensors have different design intent, and specifications and a commissioning strategy will vary accordingly.

Automated shading systems can be incorporated into the interior of a building, sometimes the exterior, or in an environmental wall, between panes of glass with sealed or ventilated air cavities to enable heat recovery, heat rejection, daylighting, and natural ventilation. Of the three options, automated interior shading systems offer a simpler, often lower-cost solution that can be applied to new construction as well as major renovations and tenant improvements.

These systems enable a designer to incorporate more glass and clearer glass into their designs, and provide occupants with a constant connection to the outdoors, without subjecting interiors to harsh glare and solar heat gain. When compared with some of the other available daylight control systems, shading systems are unique in their ability to deploy a woven solar shade, to block direct sunlight, and yet still provide a view to the outdoors. The woven nature of the solar shade enables people to see beyond the shade, unlike blinds or louvered solutions that provide a visual obstruction when in position.

By effectively managing solar heat gain, automated shading systems also create tremendous HVAC energy savings. The deployed solar shades reflect or absorb much of the heat energy present in direct sunlight. For the thermal energy that remains inside the building envelope, shades tend to keep that energy at the perimeter rather than letting it penetrate deeper into the interior. The reflected heat can pass back through the glazing and into the outdoors, or it can become trapped between the shade and the pane of glass. The solar fabric that absorbs the solar radiation can heat up as well. While the solar shade effectively contains much of the solar heat at the window, the return air vent located in the pocket above the window, in which the solar shade is also installed, helps to get this solar-heated air out of the building. The heat trapped at the window pane or absorbed by the fabric moves up into the pocket and is evacuated through the return air vent, never entering the interior space. In an application without pockets, the mechanical engineer can position the air return at the window wall to collect heat passing beyond the shade.

Photo courtesy of MechoSystems

Solar radiometers are mounted on the roof to continuously monitor sky conditions and enable the shading system to adjust to cloudy or clear days accordingly.

DAYLIGHTING TERMINOLOGY AND METRICS

The technology used by automated shading systems and the technology used to evaluate the effectiveness of automated shading systems have advanced dramatically since 1974. As it has become possible to achieve better daylight management in the built environment, and prove it, both quantitatively and qualitatively, the discussion around how daylight can be used in a space and the metrics that help to determine whether the incorporation of daylight in the design has been successful have also advanced.

Daylighting

Daylighting refers to the practice of purposefully bringing daylight into a building. There are a number of important objectives that can be achieved with good daylighting design, from reducing the electrical use of the lighting system to improving the mood and productivity of building occupants. However, not all daylight is equally equipped to support these goals. In certain conditions, daylight can cause glare, discomfort, and solar heat gain.

Daylight can enter a space in many forms. It can be a direct beam from the sun, diffused through a sky light, or reflected off of an exterior or interior surface. Daylighting practices attempt to use the daylight available on a project to effectively satisfy specific design goals and realize the many potential benefits of daylight inclusion, while protecting interiors from the negative effects of glare and solar heat gain.

Daylight Harvesting

Daylight harvesting, sometimes referred to as daylight integration, refers to the practice of coordinating the presence of daylight and electric light in a space so that electric light levels are reduced (and, in some instances, turned off) when sufficient daylight is available, saving energy throughout the day.

Daylighting goals at The New York Times Building included maximizing the natural light in the space, maximizing occupant connectivity with the outdoors, avoiding direct solar radiation on occupants, and maintaining a glare-free environment.

Photo courtesy of MechoSystems/PDK Commercial Photographers

The potential energy savings from daylight harvesting is substantial. The 2011 Heshong Mahone Group study titled "Office Daylighting Potential" found that daylight harvesting could reduce the energy used for electric lighting in California's existing office buildings by 17 percent. Today, estimates of the energy savings that can be realized by daylight harvesting have increased considerably, pegging the potential reduction at more than 30 percent. In the Daylighting section of the Whole Building Design Guide (www.wbdg.org), Gregg Ander, FAIA, writes "for many institutional and commercial buildings, total energy costs can be reduced by as much as one-third through the optimal integration of daylighting strategies."

Daylight Autonomy

Daylight autonomy is a more recently coined daylighting term, and it describes a daylighting objective where designers hope to do more than coordinate the presence of electric light and daylight—they want to eliminate the need for electric light altogether, for as much space as possible, for as much of the day as possible. Although relatively new, daylight autonomy goals are already filtering into green building initiatives, such as the Leadership in Energy and Environmental Design (LEED) green building rating system, and new metrics have been designed to measure the daylight autonomy that a space is able to achieve.

Daylighting Metrics

Daylighting metrics help quantify the presence of daylight in a space and aid the design community in determining whether certain daylighting goals have been reached. For example, daylight factor (DF) is one of the most traditional metrics used to measure daylight illuminance in a building. It identifies the percentage of available daylight that has been allowed into the interior at a given time by comparing the level of daylight available, as defined by the International Commission on Illumination (CIE) in the CIE standard overcast sky, at a specific time, with the amount of horizontal illuminance that occurs at a specific interior point at the same specific time.

While the use of DF predates the widespread adoption of electric lights, and it was used more recently in previous versions of the LEED green building rating system to set a target level of daylight incorporation, the metric has some major limitations. The *Recommended Practice for Daylighting Buildings (RP-5-13)*, published by the Illuminating Engineering Society (IES), identifies the consideration of only the overcast sky condition as a weakness, but also cites that the metric "does not include contributions from direct and reflected sunlight, and does not distinguish between performance due to latitude, climate type, facade orientation, or time or day or year."

Photo courtesy of MechoSystems/Bruce Damor

Daylight autonomy describes the design objectives where designers hope to eliminate the need for electric light altogether, for as much space as possible, for as much of the day as possible.

Recently, new daylighting metrics have emerged that consider the annual presence of the sun in a space instead of the amount of daylight present at one specific time. These annual metrics provide designers with a clearer picture of how daylight will interact with the building, and building occupants, over time and can be used as powerful tools in helping designers create spaces that are free from glare and solar heat gain, while realizing impressive energy savings.

Annual Sunlight Exposure (ASE)

The annual sunlight exposure (ASE) metric helps designers to identify whether their project spaces will be penetrated by enough direct and intense sunlight throughout the year to warrant a tweak in the design or a daylighting management system, such as automated solar shades. The ASE refers to the total number of hours in a year that a specific point of interest receives direct sunlight at a level that exceeds a certain value. The RP-5-13 states, "The objective of ASE is to indicate the risk of visual discomfort from direct sunlight and/or the likelihood that window blinds may be deployed or other action taken to avoid discomfort from direct beam sunlight."

As Matthew Tanteri, design principal of Tanteri + Associates, Austin, Texas, and a member of a collaborative alliance focused on daylighting and sustainability with HLB Lighting Design, Austin, Texas, explains, "The ASE metric provides a litmus test that indicates whether or not a building, as it is designed, will need some type of shading to protect the occupant from the amount and intensity of direct sunlight to which he or she will be exposed throughout the year. The test looks for the percentage of space that experiences more than 1,000 lux of daylight for more than 250 hours annually before the deployment of any operable blinds or shades. If that percentage is over 10 percent, based on the metric's supporting research, it starts to indicate that th building will need a shading system to ensure the visual comfort of the occupants."

Daylight Autonomy (DA)

The daylight autonomy (DA) metric measures th percentage of the occupied time throughout the year that a target level of illuminance is met or exceeded by daylight alone. The written notation of the DA metric includes the target illuminance. For example, if the target illuminance on the wor plane in an office space was 300 lux (30 fc), the D metric would be written as DA300. If the space is able to achieve an illuminance level of 300 lux at the work plane for 50 percent of the day, then the DA300 value for the space is 50 percent.

Spatial Daylight Autonomy (sDA)

The spatial daylight autonomy (sDA) metric extends the application of the DA metric and

provides the percent of the area in a room or building where a given daylight autonomy value is achieved. For example, if the daylight autonomy targets are 300 lux (30 fc) in a space for 50 percent of the workday, the sDA metric is written as sDA300, 50 percent and the sDA value would represent the percentage of the space in the building where daylight alone provided 300 lux (30 fc) for half of the workday. A larger sDA value indicates that more of the building can be lit, for at least part of the day, by daylight exclusively.

Where LEED once employed the daylight factor to set target levels of daylight incorporation, LEED v4 now recognizes the sDA metric and awards points based on how much of a building is able to achieve predefined daylight autonomy levels.

"The sDA metric was a breakthrough for many reasons, it's co-metric relationship with ASE probably being one of its more unique aspects," explains Tanteri. "It replaced daylight factor, which everyone knew was flawed once applied to anything other than an overcast sky condition. But sDA was developed before there was a way to calculate it. That says a lot about how fast the industry is moving. Now that we are applying these new metrics, we are learning lessons about what works and what doesn't with the new designs and new technologies they are inspiring. The industry is in a state of constant evaluation and re-evaluation."

It is important to note that not all daylighting metrics are applicable to every project. As Jim Ashmore, IES, explains, "The designer will need to consider the unique project and project goals to determine which metric or combination of metrics will provide the best snapshot of daylighting performance for that specific space."

DAYLIGHTING BENEFITS: OCCUPANT HEALTH, PRODUCTIVITY, AND EFFICIENCY

There are now many studies detailing, at length, the positive impact of daylight exposure on human health, productivity, and building efficiency.

Daylight and Health

Daylight exposure, or the lack thereof, can make a dramatic impact on the health and well-being of the human body. The daily cycle of daylight and dark is the primary source of synchronization for many important internal processes called circadian rhythms. Circadian rhythms govern sleep/wake cycles, regulate hormone release and body temperature, and affect blood pressure, mood, metabolism, reproduction, and immune response. Disrupted circadian rhythms have been associated with an increased risk for a cardiovascular event, obesity, diabetes, and neurological problems, such as depression.

Daylight and Productivity

Daylit spaces foster an environment where people are more productive or simply do better. A ground-breaking 2003 study, "Windows and Offices: A Study of Office Worker Performance and the Indoor Environment," also by the Heschong Mahone Group, explored the impact of daylight on a California call center and found 7 to 12 percent faster call processing and a 16 percent improvement in cognitive tests for those with a primary view through a window. Workers with a view spent 15 percent more time on their primary tasks than their peers without a view who spent 15 percent more time talking on the phone or with others. In healthcare environments, patients with access to daylight have demonstrated reduced post-operative recovery times, reduced use of pain medication, and improved outcomes. In educational settings, the incorporation of daylight has been linked with increased learning capacity. A 1999 study, "Daylighting in Schools," conducted by Heschong Mahone Group, found that students in classrooms illuminated by daylight achieved higher test scores and learned faster than students in settings that had little or no daylight.

Daylight and Building Efficiency

As a natural energy source of light and heat, daylight can also offer significant gains to the built environment in terms of improved efficiency, if the building is able to effectively harness the available energy. Effectively incorporating daylight into commercial buildings can reduce electricity use for lighting by 40 to 50 percent or more. Reducing the amount of time that the lights are on also reduces the heat that is generated by the lighting system, reducing the total load on the HVAC system and creating savings. Depending upon the geographic location of the building, daylight can also be used as a passive warming source, offering another benefit to the HVAC system.

CODE-MANDATED DAYLIGHTING AND DAYLIGHT HARVESTING

Effectively using daylight to enhance the interior environment for the health and productivity of building occupants and to reduce the energy use of the building is not just a good idea anymore—it is now required by code in many places throughout the United States.

LEED

For years, the U.S. Green Building Council (USGBC) LEED green building rating system has included credits focused on the inclusion of daylight and views in sustainable design. Although LEED is a voluntary green building program, many state and local governments are adopting LEED requirements into their building codes, making green building mandatory.

Compliance with LEED building practices has been a requisite for federal buildings for quite some time. In fact, the General Services Administration (GSA) now requires that the new construction and substantial renovation of any federally owned facilities meet or exceed standards for LEED Gold certification, an increase from the LEED Silver certification that was previously mandated.

It should be noted that the GSA recently recognized the Green Globes 2010 program from the Green Building Initiative as an acceptable third-party certification system that can be used to verify the construction or renovation of high-performance federal buildings.

Written with the intent to "connect building occupants with the outdoors, reinforce circadian rhythms, and reduce the use of electrical lighting by introducing daylight into the space," the Daylight credit in LEED v4 offers up to three points for achieving a certain level of daylight illumination (between 300 and 3,000 lux) throughout a percentage of the regularly occupied areas and requires that the design provide either manual or automatic glare-control devices in those regularly occupied areas, as well.

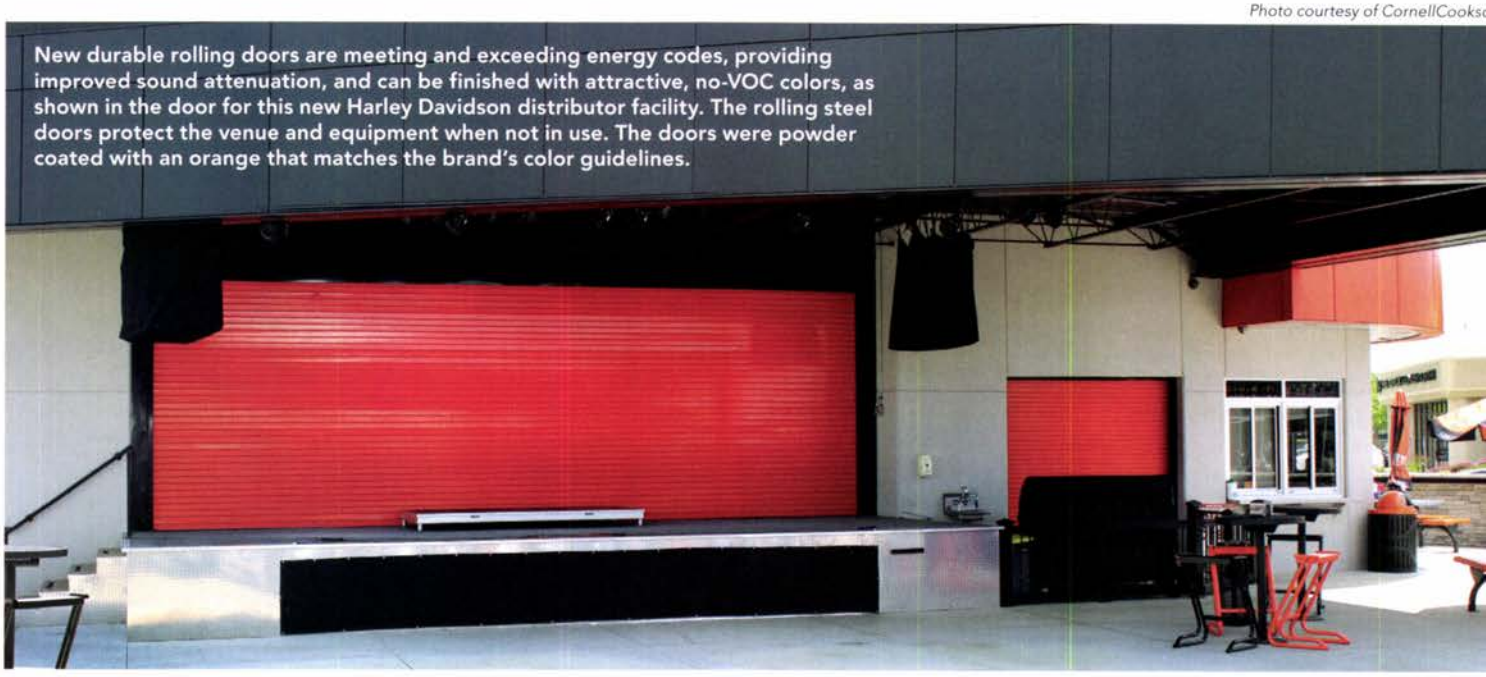
Continues at ce.architecturalrecord.com

Jeanette Fitzgerald Pitts *has written dozens of continuing education articles for* Architectural Record *covering a wide range of building products and practices.*

Photo courtesy of MechoSystems/Carlos Rivera

Effectively using daylight to enhance the interior environment is now required by code in many places throughout the United States.

Photo courtesy of CornellCookso



New durable rolling doors are meeting and exceeding energy codes, providing improved sound attenuation, and can be finished with attractive, no-VOC colors, as shown in the door for this new Harley Davidson distributor facility. The rolling steel doors protect the venue and equipment when not in use. The doors were powder coated with an orange that matches the brand's color guidelines.

Closing the Gaps: Rolling Doors That Meet Mandatory ASHRAE 90.1 Standards

The importance of specifying rolling doors that meet new air infiltration standards

Sponsored by CornellCookson | *By Celeste Allen Novak, FAIA, LEED AP BD+C*

Design professionals are increasingly demanding products that meet and exceed code requirements. They are designing to meet new high-performance criteria and using energy models to meet net-zero energy use. In the near future, it is highly likely that a well-designed building will be expected to meet the goals of net-zero energy usage.

A greater industry focus on improved energy performance standards has led to changes in regulations, codes, green building rating systems, and building products. Code authorities have recognized that reducing air infiltration is crucial when improving the energy performance of exterior rolling doors. Air infiltration is defined as the unintended or accidental flow of air through a building envelope via cracks in the building envelope—particularly in and around door and window openings. Controlling air infiltration is an important strategy for design professionals focusing on the reduction of energy use and is a crucial part of achieving a building with net-zero energy usage.

Exterior rolling door manufacturers are one of many industry leaders who have developed high-performance products to meet these new stringent performance goals. Advances in exterior rolling door construction enable new rolling doors to exceed current air infiltration codes by as much as 73 percent. Enhancements to the aesthetics of rolling door products can support a wide range of design intentions, while also achieving mandatory code compliance.

There are many benefits to selecting rolling exterior doors, but traditionally aesthetics were not at the top of that list. This is changing, as manufacturers are now able to powder coat custom images onto doors, either to help the door stand out or even blend into a larger design aesthetic. While sectional doors are more energy efficient than rolling doors, there are many situations where rolling products are the best—and sometimes only—option for a closure product. They work particularly well in low-headroom situations, as rolling doors are stored in a compact coil at the head of the opening. Fortunately, recent advances in rolling doors are significantly improving their energy efficiency. They are selected as space savers and are used in many applications where security, reliability, and durability are paramount. Now, the demand for sustainable

CONTINUING EDUCATION

1 AIA LU/HSW

1 GBCI CE HOUR

Learning Objectives

After reading this article, you should be able to:

1. Discuss air infiltration requirements of ASHRAE 90.1, International Energy Conservation Code (IECC), and California's Title 24, and the impact on net-zero, energy-efficient, and sustainable buildings.
2. Identify the mandatory requirements for rolling doors to meet new air infiltration standards.
3. List the variety of credits that code-compliant, high-performance rolling doors can contribute to when meeting green building rating systems, such as LEED.
4. Specify exterior rolling doors that meet ASHRAE criteria for project climate zones.

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

AIA COURSE #K1605H
GBCI COURSE #0920007992

Photos courtesy of CornellCookson

Designers can meet LEED Materials and Resources credits for indoor air quality by selecting doors with non-emitting, no-VOC finishes, as used in the graphics at the McKee corporate office showroom.

Insulated rolling steel doors provide building security and prevent heat loss, especially with extreme outside temperatures.

products has driven the rolling door industry to improve energy efficiency. Design professionals are now choosing energy-efficient overhead doors for both high-end and industrial buildings. These doors contribute to the use of nonrenewable resources wisely, providing economic and environmental savings.

Even after the past 20 years of focused initiatives by thousands of professionals working on sustainable design projects, the statistics are bleak. The U.S. Energy Information Office reports that "In 2014, 41 percent of total U.S. energy consumption was consumed in residential and commercial buildings, or about 40 quadrillion British thermal units."[1] Green building rating systems, such as the USGBC LEED v4 and the International Living Future Institute Living Building Challenge, are continuing to set the bar high, as designers are beginning to develop projects with net-zero, or almost net-zero, energy consumption. "The 2030 Challenge" requires all new buildings, developments, and major renovations to be carbon neutral by 2030. These initiatives are at the forefront of major changes in how buildings are designed and constructed.

In 2015, at the 21st Conference of the Parties (COP21) of the U.N. Framework Convention on Climate Change (UNFCC), nearly 200 countries, including the United States, signed a historic agreement to keep global average temperature rise low. This agreement set a long-term commitment to keep the global average increase to well below 2 degrees Celsius above preindustrial levels and to pursue efforts to limit the temperature increase to 1.5 degrees Celsius. To meet this target, the world must reach zero fossil fuel CO_2 emissions in the urban built environment by about 2050 and zero total global greenhouse gas emissions by 2060 to 2080.[2]

At the same time, numerous organizations, including those that set building codes and standards, are developing tighter regulations that apply to the energy efficiency of building products. The latest best practices and standards for meeting new air infiltration standards of The International Energy Conservation Code (IECC) 2015, 2015 International Green Construction Code (IgCC), California Title 24-2013 Building Energy Efficiency Standards, and the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 90.1-2013 are important energy-saving mandates. Many design professionals do not realize the latest code requirements identify stringent, nonnegotiable standards for acceptable air leakage. Contrary to popular opinion, these are not optional standards to be "greener." The new regulations are mandatory, and a trade-off path to approval is not available. Even more importantly, products must have third-party certification to substantiate compliance.

CODE COMPLIANCE

Energy codes are adapted at the state, county, or city level. At the federal level, there are codes and standards that must be met to comply with federal funds available throughout the American Recovery and Reinvestment Act (ARRA) of 2009. Different federal agencies, like the GSA as well as several branches of the armed services, require that buildings are designed to meet strict environmental targets.

Continues at ce.architecturalrecord.com

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Photo courtesy of Connie Zhou Photography/Gensle

Described as the greenest high-rise in the country, Pittsburgh's Tower at PNC Plaza successfully merges an expansive glass facade with highly energy-efficient technologies.

Too Transparent?

Responding to new energy goals with facade design

Sponsored by the Ornamental Metal Institute of New York

While the beautiful aesthetic created by large expanses of facade glazing is not disappearing any time soon, increasingly stringent energy codes are pushing architects to seriously reconsider just how much glass they can afford.

"The dominant drivers, at least with large commercial and luxury residential buildings, continue to be aesthetic," confirms Mic Patterson, LEED AP BD+C, vice president of strategic development for the Advanced Technology Studio of Enclos in Los Angeles, California. "Building developers want floor-to-ceiling glass because of market demand, despite the negative effect on thermal, solar, and acoustical performance."

However, an initiative called the Architecture 2030 challenge is pushing all new buildings, developments, and major renovations to be carbon-neutral by the year 2030, and the Energy Independence and Security Act of 2007 is directing projects built after 2025 toward a zero-net-energy goal. While these targets are still a few years away, they are beginning to shape the all-glass facade.

Furthermore, ASHRAE Standard 90.1 and California's Title-24 are already making an impact now, guiding nonresidential buildings to limit window area to 40 percent or less of the total wall area, while requiring high-performance glazing that balances thermal performance with high visual light transmittance for daylighting, according to Erik Ring, P.E., LEED Fellow, principal of LPA Inc. in Irvine, California.

"Currently there is a 'perfect storm' forming, as energy codes, environmental mandates, and economic drivers are all coming together," states Udi Paret, general manager building solutions, Solaria Corporation, San Francisco, California. "From international agreements, such as the COP21 (Conference of Parties) Sustainable Innovation Forum, to federal incentives, such as the extension of the higher solar investment tax credit bracket, all the way to municipal level

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Learning Objectives

After reading this article, you should be able to:

1. Explain why energy codes are leading architects to rethink the use of all-glass facades.
2. Identify design features that warrant consideration in response to new energy codes and occupant demands for improved comfort.
3. Discuss how high-performance glazing, shading, dynamic glass, fabric membranes, double-skin facades, and building-integrated photovoltaics are helping to support expansive glass facades.
4. Assess, through case studies, successful applications of these technologies in achieving energy savings and increased user choice and comfort.

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AIA COURSE #K1605D

code requirements, such as last year's update to Title 24 for at least 1 percent renewable energy generation in new construction, there's a myriad of drivers making developers and building owners realize that innovative designs in glass facades are necessary to maintain competitive edge and the value of their properties."

So, in order to overcome the modeled energy penalty associated with the poor-performing, all-glass envelope, designers are more seriously evaluating technologies such as high-performance, insulated low-e glazings, electrochromic and photochromic glass, solar shading, double-wall facades, and, to some extent, building-integrated photovoltaics (BIPV).

That said, it's important to point out that the codes that more directly address window-to-wall ratios only do so from a prescriptive-design approach, still leaving room for designers to well exceed the recommended 40 percent ratio, as long as they can ratchet down energy consumption in other ways, i.e. a performance-based approach to meeting code.

"The newer, stricter codes are certainly making a drive toward a more energy-efficient building. As a result, it pushes us as architects to rethink the traditional 'glass box.' This inherently encourages the use of less glass in the facades and a greater use of high-performance glazing and high-performance mechanical systems, but doesn't mandate anything," explains Laura P. Beene, AIA, LEED AP BD+C, project designer/project manager for Earl Swensson Associates (ESa) in Nashville, Tennessee.

While Omar Renteria, AIA, NCARB, LEED AP BD+C, senior project director for EYP Architecture & Engineering in New York, acknowledges that more frequent code publishing cycles are driving improvements in overall best practices, they still don't support the high-performance baselines that today's envelopes require. Instead, "they take into consideration average metrics that are very broad and are more geared to baselines as static points in time from an environmental perspective, and therefore don't always address the trend toward more unpredictable and rapidly changing environments to which envelopes must adapt to in order to truly meet sustainability goals."

In other words, buildings can't be viewed as isolated elements within the built environment, he says, and more effective results will need to come from designers performing more extensive analysis and energy modeling to achieve high-performance metric targets.

For example, while glass is certainly needed for daylighting and views, for other envelope areas—such as at interstitial spaces that don't have transparent or translucent requirements—Renteria says that too much emphasis is placed on glass when a different and potentially more sustainable material would be better suited to achieve a more efficient response. "In short, designers could be more responsible from a sustainable point of view to use glass where it is needed, but look for other material solutions where it is not."

THE NEED FOR GLASS

To the extent that the building codes are pushing higher energy standards, there is still a strong desire amongst owners, architects, and users for large amounts of natural light inside their buildings.

"Many architects and owners do still seek highly glazed building designs," states Ring. "Fully glazed buildings can provide striking exterior elevations and dramatic first impressions on the interior."

"Glass is critical and fundamental in the design of any building," agrees Beene. "Glass shapes our spaces, can act as a defining design element, the natural light it creates shapes our moods, and the view provides a connection to the outside world beyond. These needs don't go away just because we need to be more energy efficient, but it does challenge us as designers to question the amount of glass we use and balance the desire versus the need for glass."

In terms of sorting through the technological solutions that can be employed to support a more expansive glass aesthetic, the first line of defense is usually high-performance glazing, for example, glass with a low U-factor and high solar heat gain shading coefficient, tinted and reflective glass, and triple-glazed insulated glass units.

Glass films, either laminated to the glass panes or suspended in between, have also become more available recently and significantly contribute to glass performance, adds Thomas Chinnock, AIA, an associate of Shepley Bulfinch in Phoenix, Arizona.

The Cleveland-based market research firm, The Freedonia Group, forecasts that U.S. demand for high-performance flat glass products will increase 8.2 percent annually through 2017.[1]

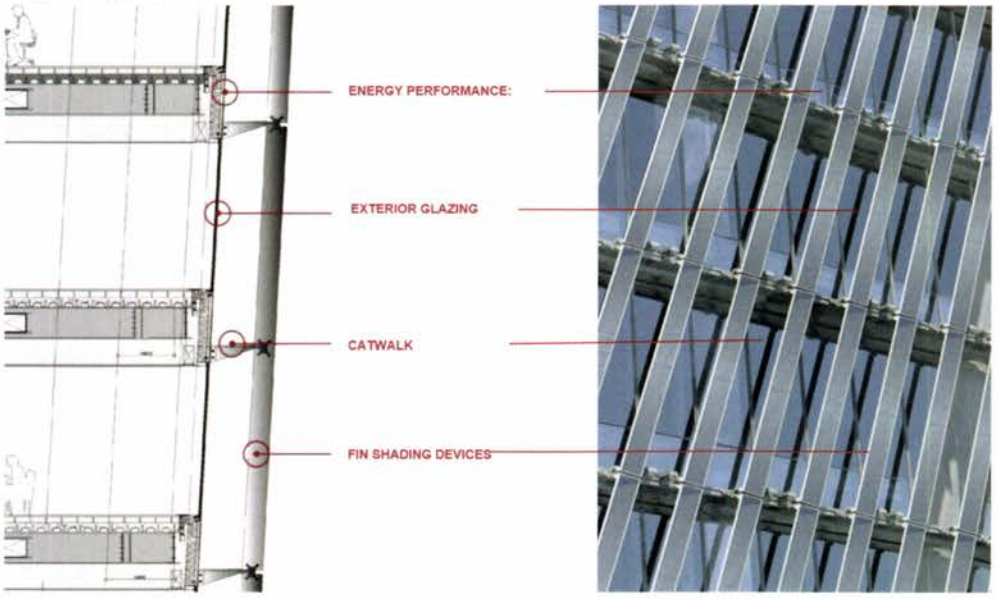
Meanwhile, the U.K-based Palmer Market Research group reports that commercial glazing posted a 29 percent rise in volume value growth from 2012 to 2014, and a further 20 percent rise in market value is anticipated out to 2019.[2]

Fortunately, high-performance glazing has advanced significantly over the past decade, and designers anticipate that new coatings and technologies will continue to emerge and advance, particularly in response to the trend toward energy efficiency. "It's one of the most economical design tools we have in our toolbox to maintain significant glass exposure but maintain compliance with the energy codes," remarks Beene.

Photo courtesy of Transsolar

At Loyola University's Marcella Neihoff School of Nursing in Chicago, Illinois, designed by Solomen Cordwell Buenz, automatically controlled solar shades on the west facade and fixed louvers on the south facade are so effective that a thermally activated slab is capable of meeting all the cooling demand in the space.

Image courtesy of HOK



At the 80-story Capital Market Authority Tower in Riyadh, Saudi Arabia, HOK specified fin-shading devices in an offset frit pattern, a triple-glazed IGU system, catwalk, and a photovoltaic array.

Capitalizing on triple-silver technology—which applies three layers of silver during the magnetron sputter coating process, thereby delivering a high level of selectivity between light transmission and solar factor—the latest generation of low-e glazings are currently capable of delivering visible light transmittance levels above 50 percent with a solar heat gain coefficient below 0.25, which is a noted improvement in performance.

That said, Patterson offers a cautionary note against specifying an IGU with a low-e coating and calling it a day. "In spite of the significant gains achieved by the glass industry over past decades, especially in the area of solar glazings, even the high-performance glazings remain markedly poor thermal insulators, and solar control remains a problem," he says.

Suggesting an alternative, Ring recommends unitized curtain wall systems with spandrel panels to present the exterior impression of a fully glazed building, while blocking much of the unnecessary thermal gains. He explains that often the best design choice is thoughtfully locating expansive glazing for the desired daylighting, views, and exterior impact, and using spandrel panels to improve thermal performance for the rest of the facade.

Meanwhile, Ring's LPA colleague Rick D'Amato, AIA, LEED AP, principal, is witnessing an increase in alternative daylighting strategies, such as controlled skylights and tubular daylighting devices. "When possible, a thoughtful examination of the internal spaces has resulted in a 'form follows function' approach to facade design, which places and sizes glazing according to optimal use."

In terms of solar shading systems, Ring says they can be highly effective in improving the thermal and daylighting performance of building envelopes, with the caveat that they must be designed correctly. The devices also require careful consideration to constructability and maintenance concerns.

Furthermore, their effectiveness is contingent upon climate, building orientation, and the location of the fenestration within the building, i.e. the number of stories and/or the depth of the floor plates. "Shading may provide significant benefit, or little to no benefit at all, depending on the design and location," says Beene.

One of many examples where shades were successfully applied is Loyola University's Marcella Neihoff School of Nursing in Chicago, Illinois, designed by Solomen Cordwell Buenz. According to Pratik Raval, associate director at Transsolar Inc. in New York, automatically controlled solar shades on the west facade and fixed louvers on the south facade help reduce solar loads to the point that a thermally activated slab can meet all of the cooling demand in the space.

Similarly, a high-profile international project—the HOK-designed Capital Market Authority Tower in Riyadh, Saudi Arabia—incorporates fin-shading devices in an offset frit pattern, along with a triple-glazed IGU system, catwalk, and a photovoltaic array at the top of the building's 80-story crown. According to Roger Soto, AIA, LEED AP, design principal for HOK's Gulf Coast region, the fins are optimized both in their plan position and sectional angle to account for the solar tracking, significantly reducing direct solar incidence from the harsh Middle Eastern sun on the conditioned enclosure.

DYNAMIC GLAZING

Growing in popularity, a compelling alternative to the challenges inherent in shading systems is dynamic glazing. In response to a low-voltage application of electricity, a pane of electrochromic glass darkens to one or more predetermined levels and then returns to its clear state once the voltage polarity reverses.

"Dynamic glass is a great option, as it allows for expansive windows, without the need for blinds and shades, because the windows tint on demand," explains Brandon Tinianov, vice president of business development for dynamic glazing manufacturer View in San Francisco. "By decreasing the heat that is associated with a typical window installation, dynamic glass decreases HVAC costs by about 20 to 25 percent, and in a new build, can influence builders to use a smaller HVAC system from the start."

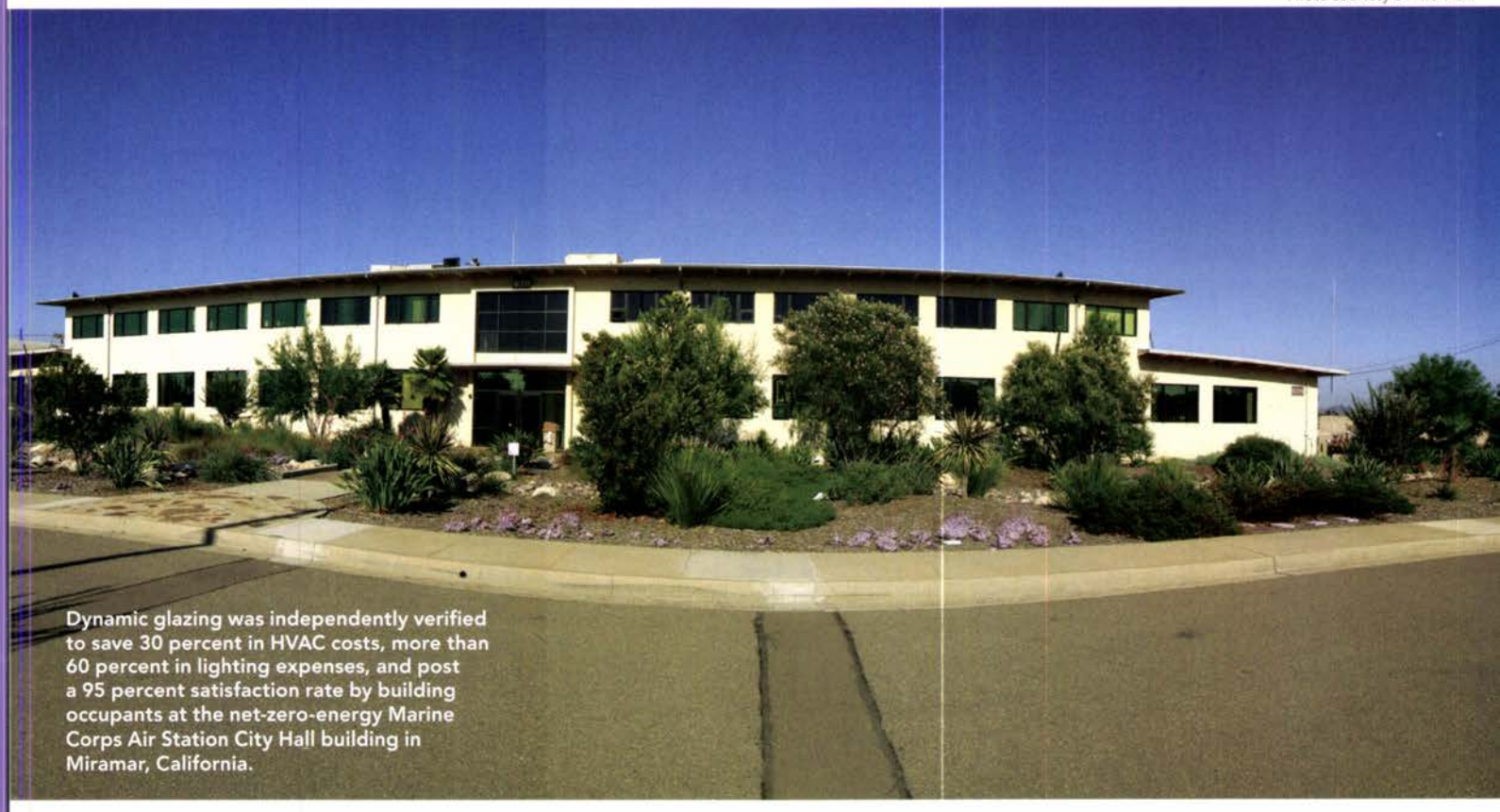
Case in point, at the net-zero-energy Marine Corps Air Station City Hall building in Miramar, California, 1,935 square feet of low-performing, clear glass was replaced with dynamic glazing and then measured and verified over a period of 12 months by the U.S. Department of Defense's Environmental Security Technology Certification Program. Posting impressive findings, the installation achieved close to 30 percent in HVAC savings, more than 60 percent in lighting savings, and a 95 percent satisfaction rate by building occupants.[3]

On another recent project, Shepley Bulfinch was tasked with finding the best way to reduce light levels for a higher education building atrium. "During the summer months, direct sun in the space made it uncomfortable for students. However, light levels were pleasant on overcast days or during the winter," says Jonathan Baron, AIA, LEED AP, Boston-based director of Shepley Bulfinch. "Shading was found to be too expensive, and baffles that might block some of the sunlight were found to be too intrusive in the existing space. Finally, tinting the glass to cut summer sun would leave the space gloomy and unpleasant on winter days."

Ultimately, electrochromic glass proved to be the best solution to this complicated problem. It blocks sunlight from directly entering the space, but still allows indirect sunglight in more favorable locations.

In terms of recent technological advances with dynamic glazing, manufacturers are incorporating sophisticated control algorithms into their systems, which take into account advanced weather inputs to better predict the sun's movement and incoming weather conditions, such as cloud cover. Fed by real-time information, the dynamic glazing automatically adjusts based upon the current lighting and solar gain levels entering the facade.

Photo courtesy of The View



Dynamic glazing was independently verified to save 30 percent in HVAC costs, more than 60 percent in lighting expenses, and post a 95 percent satisfaction rate by building occupants at the net-zero-energy Marine Corps Air Station City Hall building in Miramar, California.

Other, newer dynamic glazing options include multiple tint zones within one pane of glass and the ability to specify the product in a variety of geometric shapes, such as triangles, parallelograms, and diamonds.

While the technology is considered to be commercially viable, it is still relatively new to the market and has not yet been widely adopted.

BUILDING-INTEGRATED PHOTOVOLTAICS

While still considered a niche market, BIPV is slowly but surely making its way into more building projects, such as Frank Gehry's Novartis Building in Basel, Switzerland, where facade integrated photovoltaics generate energy, provide effective shading, and bring daylighting into the facility.

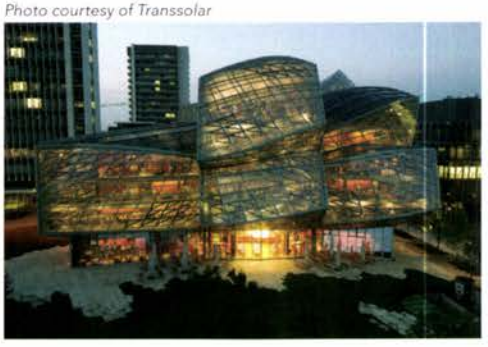
Previously hampered by unattractive aesthetics and high cost, newer automated semiconductor mechanical processing technologies—combined with highly durable, high-performing silicon cells—is making the technology more viable.

"The most innovative BIPV technology is now presented to the market as a complete, fully engineered, fabricated solution ready for seamless installation," reports Solaria's Paret.

"Whether standardized or customized, the process from design to installation across the building skin is simplified, and products are being installed at costs that are comparable to traditional, non-PV systems."

In fact, the U.S. General Services Administration's Green Proving Ground program—designed to take innovative technologies and evaluate them in real-world settings to accelerate the adoption of sustainable building technologies—recently incorporated BIPV into the program. So far, this has involved rigorous U.S. Lawrence Berkeley National Laboratory BIPV testing of energy generation, glass performance, tenant comfort, economics, and the design-build process.

Photo courtesy of Transsolar



Frank Gehry's Novartis Building in Basel, Switzerland, serves as a successful application of building-integrated photovoltaics.

The next step will be considering BIPV amongst GSA's vast real estate portfolio, starting with a commercial pilot installation at a federal building in Kansas City, where additional data will be collected and compared with non-BIPV windows in the same building, according to Paret.

"More awareness about the real benefits of BIPV is infiltrating influencers not only in architecture, building, and construction, but also across policy makers and thought leaders. Increasingly, it is accepted that BIPV solutions offer a reliable, seamless alternative to traditional glass solutions, while providing additional value in moving glazed facades toward the goal of positive net energy gains," he adds.

On the flip side, architects point out that for many buildings, vertical elevations with insufficient surface area are not a good fit for BIPV, which is why rooftops and exterior canopies are a more popular choice.

Continues at ce.architecturalrecord.com

Even After 70 Years, It Still Fits Perfectly.

Texas Quarries limestone was the first choice for St. John's School in 1946, and remains the best choice for its historically inspired campus plan.

Hiram A. Salisbury looked to England for inspiration when he designed St. John's School in 1946. He blended Cotswold stone walls and gabled roofs with Collegiate Gothic forms and details, using versatile Texas Quarries limestone. Curtis & Windham Architects has built on that legacy to create the school's Campus Center, which houses classrooms, offices, and a 10,000-square-foot dining hall for the growing elite prep school. The structure addresses modern needs–a parking garage, kitchen facilities, and technology–yet Texas Quarries limestone is the constant: quarried from the same source as seven decades before. Now, the entry court at St. John's is artfully framed by buildings united in vision though separated by several generations. Unmistakable Texas Quarries Cordova Cream–by turns boldly rugged and pristinely fluid in our craftsmen's hands–is the material for all time.

From the earth, for the earth.®

LEED-accredited engineers and full-service support

Texas Quarries

St. John's School Campus Center
Houston

architect
Curtis & Windham Architects, Houston

general contractor
W.S. Bellows Construction, Houston

masonry contractor
W.W. Bartlett, Houston

Acme Brick materials

Texas Quarries: Cordova Cream, cleft and smooth, random ashlar limestone

"Limestone from Texas Quarries was the critical path on this 16-month project. School administrators signed off on early shop tickets and drawings, even before the contract was completed. Texas Quarries dedicated a sizable team of craftsmen to the project throughout construction.

"The character of the stone was important because we had no pattern to match from the existing stone, but rather a series of rules as to how the cleft units went together. We worked with the scale of openings, eave heights, and other cues from the original building, although we had to create new forms with greater volumes. We honored the spirit of the original details, including arches that are self-supporting within a steel frame structure.

"To address the large dining hall, historical precedent was instructive, allowing us to break down one space into smaller compartments with different ambiances. We were inspired by the Hall of Christ Church at Oxford for stone details and use of color in floors and ceilings, Baker College Commons at Rice University for scale and classical proportions to make a great room, and especially the Trumbull College Dining Hall at Yale for one-story side aisles that allow clerestory windows above.

"Working with Texas Quarries was fantastic. The shop drawing process is so clear that we always know design to fabrication to building will go beautifully."

– Russell Windham, principal, and Michael Driskill, project manager, Curtis & Windham Architects, Houston

New construction seamlessly complements the original 1946 building (left).

Designing with Texas Limestone

A cost-effective natural product with high durability and many design opportunities

Sponsored by Texas Quarries – An Acme Brick Company | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

Texas limestone is used for its appearance and durability in commercial, institutional, and residential buildings, including St. John's school in Houston, Texas.

All images courtesy of Texas Quarries – An Acme Brick Compar

The tradition of using cut stone for buildings has been common since the time of the Greek and Roman Empires and used even earlier in Egypt, England, Ireland, and elsewhere. Some of those ancient buildings and monuments still exist today and are intact in part because of the stone material used but also because of the ways it was designed, handled, and crafted into the buildings. Today, the same is true. Cut stone of different types is still used in buildings that seek to convey a sense of permanence, a particular style, or a connectivity to the environment by using natural materials. Limestone in particular has been used as a material of choice for building facades for centuries. It is available in many parts of the world, is fairly easy to cut and carve, and has proven itself over time—in fact, the Great Pyramids in Egypt are constructed largely of limestone. A little closer to home, limestone from Texas has some specific characteristics and varieties that make it distinct and even unique compared to other limestone around the world. For building designs that need to rely on great aesthetics, long-term durability, and a range of design options, it is worthwhile learning more about Texas limestone.

TEXAS LIMESTONE OVERVIEW

In geological terms, limestone in general is considered a common mineral. It is made up mostly of calcium carbonate ($CaCO_3$) and forms primarily in shallow sea water from marine life, such as clams, scallops, or coral, which use calcium and bicarbonate in the water to form their protective shells. Over time, as the organisms die and the shells are left behind, they fall to the bottom and accumulate in layers, where they combine together to form what we know as the sedimentary rock called limestone. Its abundance on land around the world reveals the places where vast oceans previously existed millions of years ago. The variety of different types of limestone in different locations also speaks to the variety of conditions and marine life that likely existed in different places and at different times.

Some limestone is of a mixed makeup and is treated as a commodity. This is the type that is commonly used for gravel or stone in some places in the United States. It can also be used for industrial purposes, like the creation of Portland cement, lime fertilizer, or as an additive in products like paints, roofing, and even paper. But sometimes a vein of limestone is discovered that is rather pure and consistent

CONTINUING EDUCATION

1 AIA LU/HSW

Learning Objectives

After reading this article, you should be able to:

1. Identify the natural characteristics and beneficial design opportunities, including the variety of textures, colors, and size options, for different type of Texas limestone.
2. Investigate the manufacturing process of Texas limestone and its suitability for both interior and exterior building applications.
3. Assess the different methods of securing different types and thicknesses of limestone onto buildings using conventional means and metal frame systems.
4. Specify and describe safe and durable installation, anchoring, and sealing practices for Texas limestone on residential, commercial, and institutional building facades.

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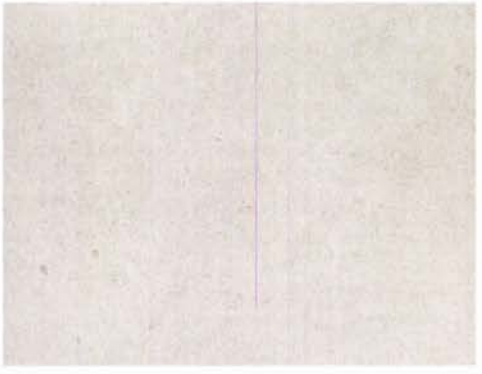
Cordova Cream

Cordova Shell

Lueders Buff



Lueders Gray

The variety of colors of Texas limestone allows for different patterns and design capabilities as shown here in Academic Building III at the University of Texas, San Antonio.

in its makeup. Pure limestone is almost totally white, but the presence of some other substances can give limestone different colors. This type is suitable for specialized purposes where appearance and durability are important, such as building facades or interior walls.

Texas limestone exhibits all of these overall properties and characteristics of limestone. What makes it a bit more unique is the ready availability of a large quantity of high-quality, pure limestone, and the range of colors and textures available. Some Texas limestone quarries, for example, have been providing high-quality material to building projects across the country and overseas since the 1920s, and there is still plenty available. The range of colors includes not only white, but creamy beiges, some light grays, and some with hues of reds and browns.

Texas limestone is typically used for interior and exterior wall surfaces. On interiors, the variety of color and texture can allow for an appropriate palette to create many different design schemes that work well with other materials. On the outside, the stone can provide the weathering surface of the building as an integral part of an overall facade or wall assembly design. Used in vertical surfaces this way, the material should hold up quite well over time as a very durable and elegant design solution. On horizontal surfaces, such as outdoor pavers, limestone can work well in low-traffic areas, but the details of installation should be reviewed with the supplier. Checking with the quarry about the suitability of a particular type of limestone to be used in a horizontal application is also advisable since different types of limestone or simply different quarries may produce stone that is better suited to horizontal applications than others.

Of course, Texas limestone, like all limestone, has a few things to keep in mind when considering its use. First, as a sedimentary rock, it is a very porous material. In order to avoid any possible degradation over time from water penetration, this can be addressed by sealing the surface of the stone or using it in locations where the porosity is not a concern. Similarly, it is a chemical mineral, and as such can react with other chemicals, including acid-based cleaners.

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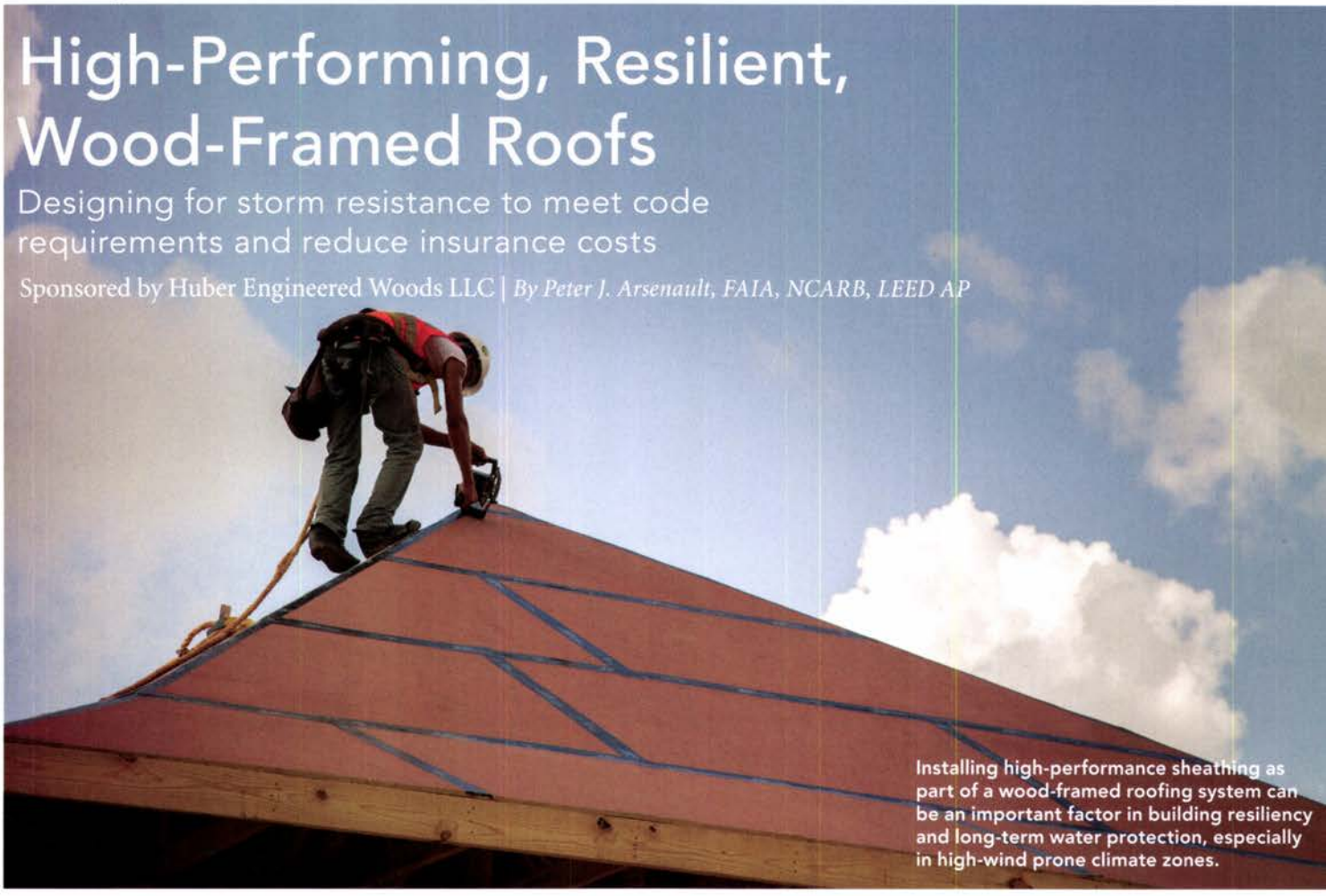
CONTINUING EDUCATION

High-Performing, Resilient, Wood-Framed Roofs

Designing for storm resistance to meet code requirements and reduce insurance costs

Sponsored by Huber Engineered Woods LLC | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*



Installing high-performance sheathing as part of a wood-framed roofing system can be an important factor in building resiliency and long-term water protection, especially in high-wind prone climate zones.

Wood-framed construction is the predominant method of building homes in the United States and has gained steady acceptance in light commercial and industrial buildings. The inherent strength of wood framing, its cost effectiveness, and energy efficiency have all been borne out over hundreds of years of use. Building code changes, environmental sustainability, and homeowner interest in higher building performance are a few factors placing new demands on this popular approach to framing. Most recently, resiliency in buildings has become a priority, particularly in areas prone to severe weather. The not-for-profit Resilient Design Institute defines resiliency as "the capacity to adapt to changing conditions and to maintain or regain functionality and vitality in the face of stress or disturbance. It is the capacity to bounce back after a disturbance or interruption." In response to these changing needs, building professionals are adopting new products and practices to strengthen wood-framed buildings, with a particular focus on roofs. This course will focus on some of the changing considerations in the design, basic construction anatomy, and best practices that can lead to high-performance, resilient, wood-framed roof construction.

DESIGN CONSIDERATIONS IN ROOF SYSTEMS

Designing high-performance roofs is a function of a complex interplay of key factors and special considerations. Understanding the basic environmental loads or stressors that a roof needs to endure in a particular project location is the first step. Then selecting the best combination of roof shape, framing technique, and materials all contribute to a design that will remain durable and last for its intended life cycle.

Environmental Loads

The list of things that a roof needs to contend with from the environment includes everything in the local weather forecast.

- **Water:** Whether in the form of liquid rain, gaseous vapor, or solid snow or hail, water is usually the first thing a roof is designed to guard against. Historically, in fact, the biggest cause of design liability claims have come from water leaking through a roof system. Roofs that don't drain properly, aren't fully sealed where needed, or don't anticipate worst-case scenarios are the usual culprits for leaks. Condensing moisture in the roof system can also be a significant problem

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Learning Objectives

After reading this article, you should be able to:

1. Identify the natural, environmental forces that wood-framed roof systems need to be designed to withstand in order to protect public safety and welfare.
2. Assess the advantages and disadvantages of different types of wood-framed roof systems and common roof slopes as part of a durable building design.
3. Compare and contrast different types of wood roof sheathing in terms of their performance capabilities.
4. Analyze the importance, as noted in building codes, of roofing underlayment as it relates to both the sheathing and the finish roofing material.

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since it can degrade wood and other building products. Of course, any area that receives a lot of snow needs to address the weight of that snow to guard against not only collapse but sagging or other movement, too. Plus, the insidious nature of water that forms from melting snow and then freezes into ice can wreak some all too well-known havoc on the roof system.

The concerns about water in any form don't manifest themselves only after the building is occupied, but during construction, too, particularly with wood framing. Dusty Bitton, owner of Pinetop Custom Homes, is located in McCall, Idaho, which has the highest average snowfall in Idaho and only a five-month building season. "At times, we are unable to complete our buildings before the heavy snowfall hits so we must depend on moisture-resistant products to prevent any issues until we can continue the building process the next spring," stated Bitton.

- **Wind:** Wind damage, too, is a common cause of roofing failures. The Federal Alliance for Safe Homes (FLASH®) reports that more than 39 million U.S. homes are at risk from winds that can exceed 110 miles per hour based on HUD and census data analysis from FLASH.[1] (Designers can visit flash.org to see if their locations are at high risk for a number of different "peril" situations.) The design load for wind uplift of a roof is a complex formula that is determined by such factors as roof structure, slope, wind speed, building height, roof areas, building terrain, building type, and building openings. Calculators exist to determine the design wind loads for the roof area's field, perimeter and corner zones, and minimum recommended design wind-resistance loads based on the specific building and climate parameters.[2] Once calculated, the force can be used to influence the materials selected for the roof so they cannot be torn from the building in strong winds. Of course, there is wind, and there is severe wind, as in tornadoes or hurricanes. Anticipating these severe conditions in locations where they are common requires extra attention to detail and diligence to help assure the roof system doesn't fail. FLASH has partnered with The American Institute of Architects (AIA) and other design organizations to create the *Resilient Design Guide for High Wind Wood Frame Construction*.[3] This detailed, 48-page publication, which is free and available to the public, describes the effects of wind on wood-frame constructed buildings. It also clearly and succinctly identifies the differences between common wood-frame construction, high-wind construction, and resilient construction.

STANDARDS AND PROGRAMS INFLUENCING DESIGN

Recognizing the importance of assuring the integrity of a roofing system, a number of organizations and agencies have developed guidelines and standards for design and construction. These include model building codes, regional and federal standards, and industry programs. In terms of codes, the International Building Code (IBC) and the International Residential Code (IRC) have established specific requirements for wood-framed roof construction to provide durable materials guidelines for the sake of public safety. These codes are either adopted directly or are the basis of most of the code requirements in the United States related to the assembly of wood-framed roofing systems. They address all of the components collectively, acting as part of a functioning system, while in some cases they prescribe certain items or materials as safeguards.

In terms of relevant standards, the Federal Emergency Management Agency (FEMA), for example, has produced a series of 37 fact sheets to provide technical guidance and recommendations aimed at improving the performance of buildings subject to flood and wind forces in coastal environments. Known as FEMA 499, these recommendations are not requirements unless the local code references the document, although they are considered good practice in coastal regions. One of these FEMA recommendations suggests taping the seams of roof sheathing panels to provide better protection against water infiltration if the roof covering ever blows off. Such infiltration during a severe storm can lead to a tremendous amount of water damage inside the home. In the experience of North Carolina custom home builder John Paul Corey of East Carolina Construction, taped panels held up very well on his projects after Hurricane Irene battered the North Carolina coast in August 2011, producing winds in excess of 80 miles per hour. "Other projects in the area had either tar paper on the roof or building wrap on the exterior, and 60 to 70 percent of their materials blew off during the storm that then had to be replaced," notes Corey.

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Peter J. Arsenault, FAIA, NCARB, LEED AP, *is an architect and green building consultant who has authored more than 120 continuing education and technical publications as part of a nationwide practice.* ***www.linkedin.com/in/pjaarch***

The roof construction of a building is a fundamental item to address under the FORTIFIED™ Home standard intended to improve resiliency and possibly reduce property insurance costs.

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Photo courtesy of Neolith by TheSize Surfaces SL

Sintered Compact Surfaces For Building Facades

A new product with high strength and durability properties

Sponsored by Neolith by TheSize Surfaces SL | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

Materials used on building facades need to withstand many things, including water, wind, sunlight, and sometimes severe weather conditions. They also need to hold up to the effects of people who may inadvertently or even intentionally cause damage. Choosing a material to use for a facade is certainly influenced by the ability to hold up over time under all of these conditions. It is also influenced by the available size and weight, not to mention the appearance, of the material. Being able to install it in a manner that is efficient and cost effective usually rounds out the criteria for selecting a building material for building facades. Not surprisingly, there are number of different materials that have been available to select from, some of which have been around a long time, and others that are relatively new. There is one new product category that will be the focus of this course, namely sintered compact surfaces, which have been born in the last decade. As it is becoming better known, it is becoming more popular in the United States and Canada thanks to its ability to provide superior long-term performance for basically the same cost as other common facade cladding products. Sintered compact surfaces today are finding their way into curtain walls, rainscreens, siding applications, and other common wall systems for both residential and commercial buildings.

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

1. Identify the characteristics and beneficial properties of sintered compact surfaces.
2. Discuss the manufacturing process of sintered compact surfaces and the suitability of the product to both interior and exterior building applications.
3. Assess the functional contributions of sintered compact surfaces as they contribute to green and sustainable building design.
4. Specify sintered compact surfaces in a variety of green and conventional buildings, and formulate appropriate selections related to specific applications.

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AIA COURSE #K1605F

To deal with that extensive space, the design team utilized acoustical ceiling clouds with ceiling fixtures and dropped pendants.

Photo courtesy of Kitchens To Go built by Carlin/Sprung Instant Structures Inc.

Interim Executive Dining Facility Bridges Construction Gap at Business School

Harvard chooses quality, speed, and sustainability with a frame-supported, architectural membrane-clad modular food service complex

Sponsored by Sprung Instant Structures Inc. and Kitchens To Go built by Carlin

Harvard Business School's Kresge Hall, which was built in the 1950s and served primarily as an executive education dining center, was slated to be torn down to make space for a replacement facility. While the B school stood to gain an important new building, a pressing question became what to do in the meantime. How could Harvard accommodate the scores of prestigious executives who came to attend its executive education program in the style to which they had become accustomed—all in a high-end solution that could be mobilized quickly, cost effectively, sustainably and, above all, not look like a temporary solution, but like a permanent facility that fit well with other buildings on campus? This course will discuss how Harvard solved this dilemma and the design team's process, challenges, and accomplishments, and go on to describe the elements of such a facility from both a structural and food service operations standpoint. Also covered will be experiences with similar interim facilities at other universities.

THE HARVARD EXPERIENCE

Harvard University has replaced its famed Kresge Hall in order to make space for the new Ruth Mulan Chu Chao Center, following a $40-million donation by the Chao family. The new center is named after Ruth Mulan Chu Chao, wife of James Si-Cheng Chao and the mother of six daughters, four of whom graduated from the Business School. The Chao Center, which broke ground in 2014, is slated to open in July 2016, and will serve as a central space for participants in the executive education program by providing classrooms, dining services, and offices.

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Learning Objectives

After reading this article, you should be able to:

1. Explain the value of a team approach to quickly mobilizing a high-end interim structure.
2. Compare the energy efficiency profile of a properly insulated architectural fabric structure to that of a pre-engineered metal building and conventional construction.
3. List the advantages of a coated architectural membrane.
4. Evaluate the cost effectiveness of a modular interim kitchen facility versus other alternatives.

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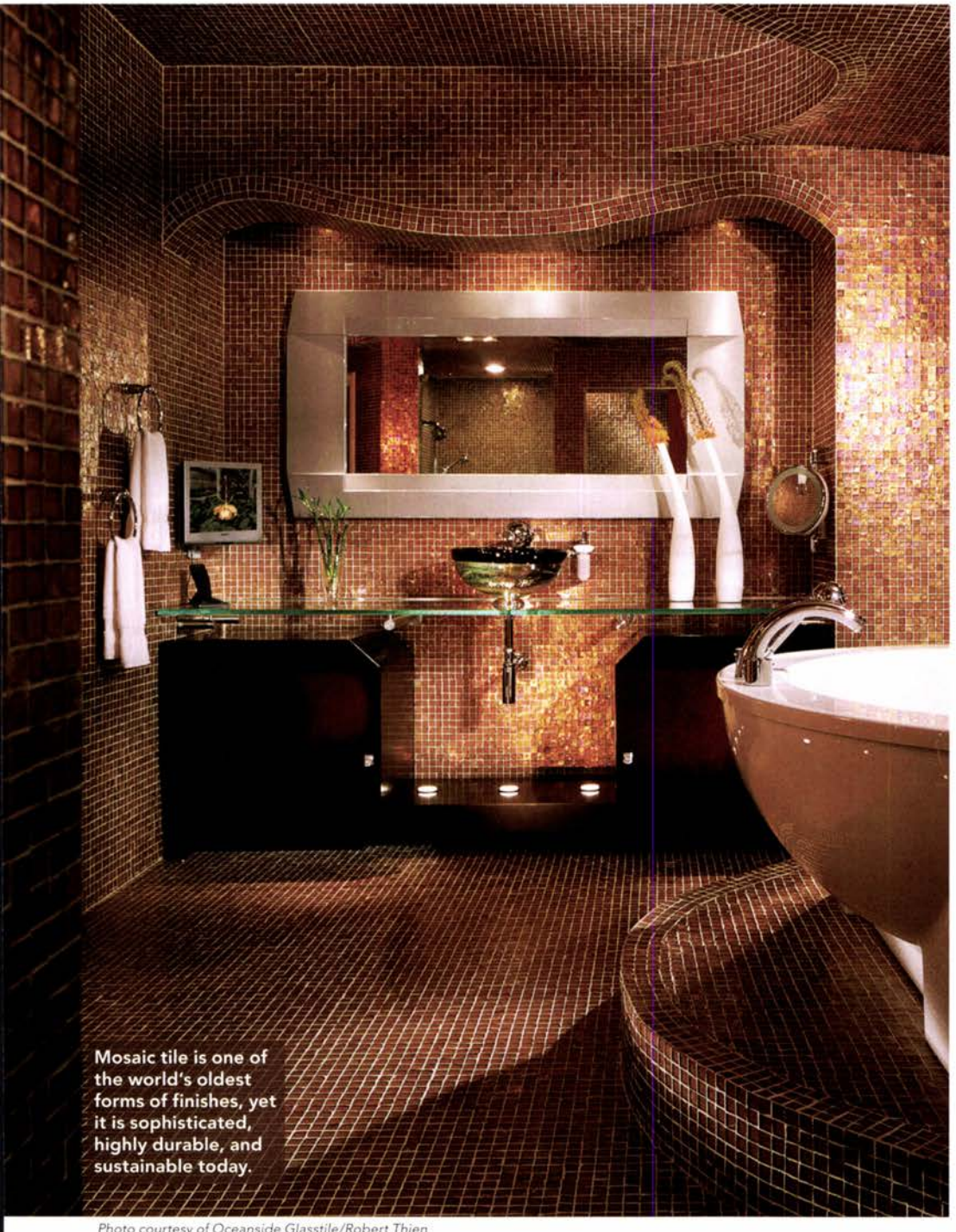
AIA COURSE #K1605G

Artisanry, Architecture, and North American Glass Tile

Understanding glass tile manufacturing and installation methods helps architects design better with more durable, sustainable mosaics and large-format tile surfaces

Sponsored by Oceanside Glasstile | *By C.C. Sullivan*



Mosaic tile is one of the world's oldest forms of finishes, yet it is sophisticated, highly durable, and sustainable today.

Photo courtesy of Oceanside Glasstile/Robert Thien

A boundless spirit of innovation, a passion for hot glass, and a new vision for the tile industry has marked the recent emergence of handcrafted glass tile manufacturing on the West Coast of the United States. The benefits of this relatively new scene extend to architectural design and interiors as well as specialty applications, such a swimming pools, water features, and sitework. For architects, the challenge today is how to best capitalize on this artisan heritage to create colorful, timeless, and highly durable designs and ensure proper, lasting installations, while also using a recycled and environmentally friendly material: old bottles and waste glass.

As with any building material, however, issues can arise in working with architectural glass tile, whether mosaic or larger-format tiles. The two most critical are the quality of the manufacturing processes as well as the suitability of application specifications and

CONTINUING EDUCATION

1 AIA LU/HSW

Learning Objectives

After reading this article, you should be able to:

1. Identify the quality standards in place for glass tile production
2. Discuss the various types of glass tile on the market and how to specify them properly.
3. Distinguish between the various installation and standards for glass tile.
4. Explore sustainability attributes of glass tile, including the use of recycled glass.
5. Describe the manufacturing methods for glass tile, glass tile installation standards, and the quality standards in place for glass tile production.

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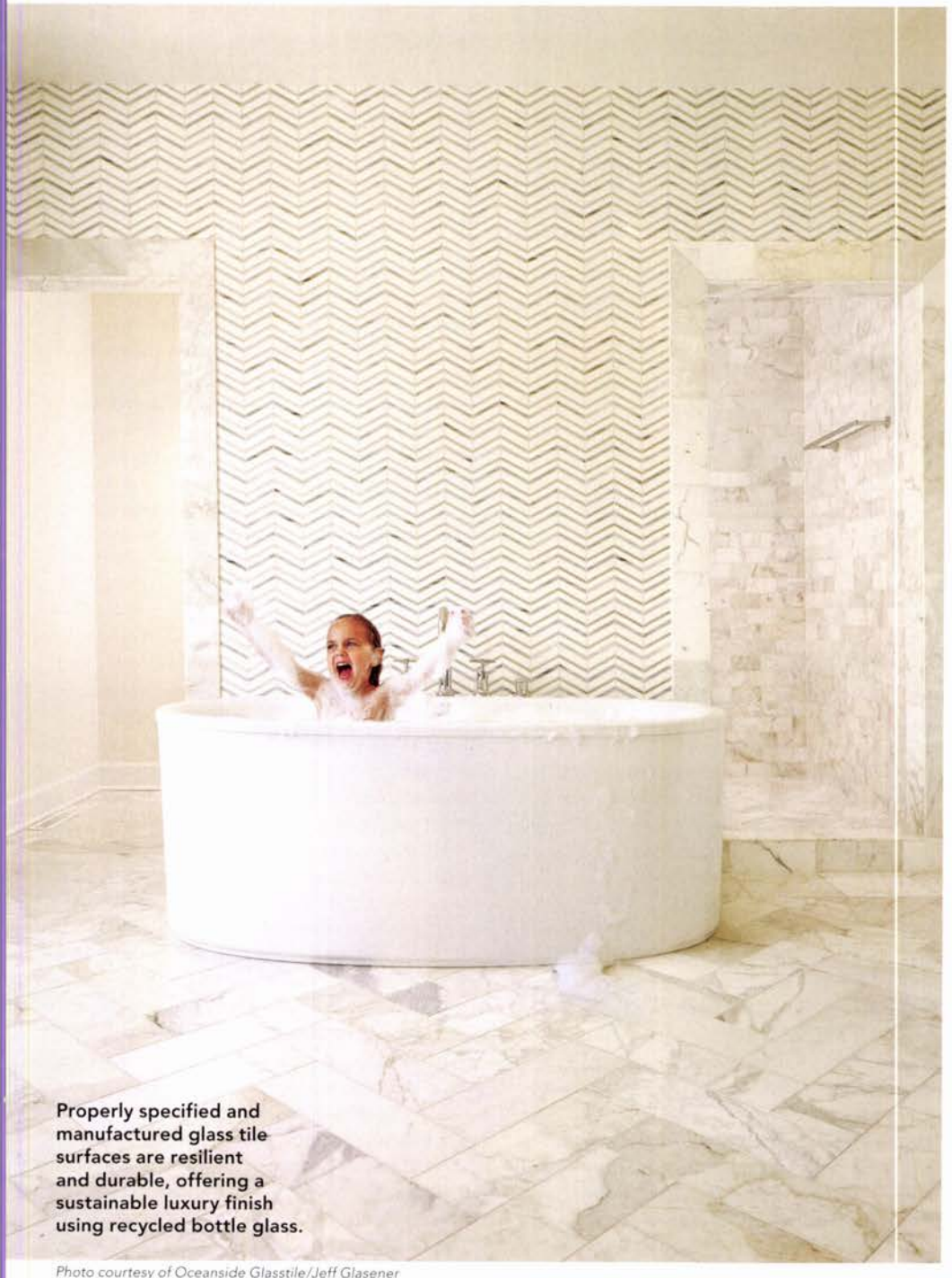
installation techniques. A wide range in quality separates the producers. In fact, the boom in glass tile products over recent years goes beyond the artisanal makers and West Coast companies. A proliferation of manufacturers worldwide and the emergence of varied production techniques have made the specifier-designer's task even more complex. "It is very important to select the correct product for the installation application," says Johnny Marckx, an executive vice president of one North American maker. "The architect's project team should be familiar with manufacturing and quality standards, tile mounting methods, and other installation techniques. It is also important to review the impact of glass tile on project sustainability."

Before arriving on the jobsite, glass tile is produced and sourced in a number of ways. Architects experienced in glass tile use typically design with awareness that not all of these products are created equal. Some brand names have invested millions of dollars into quality control standards, product testing, installation technique support, and education. Other companies may make glass tile products in ways that hold up less than adequately in common application environments.

To become reasonably expert in glass tile design and specification, it also helps to know enough about the key ingredients of glass tile, how various products are made, and even some history about glass tile. In addition to reviewing key manufacturing methods, design professionals should be familiar with glass tile testing protocols and installation standards. These provide guidance and help ensure successful buildings, landscapes, and interiors made with glass tile. The three key groups to reference are the American National Standards Institute (ANSI), ASTM International, and the Tile Council of North America (TCNA), which publishes its widely referenced *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation*.



Properly specified and manufactured glass tile surfaces are resilient and durable, offering a sustainable luxury finish using recycled bottle glass.

Photo courtesy of Oceanside Glasstile/Jeff Glasener

HISTORY AND INVENTION

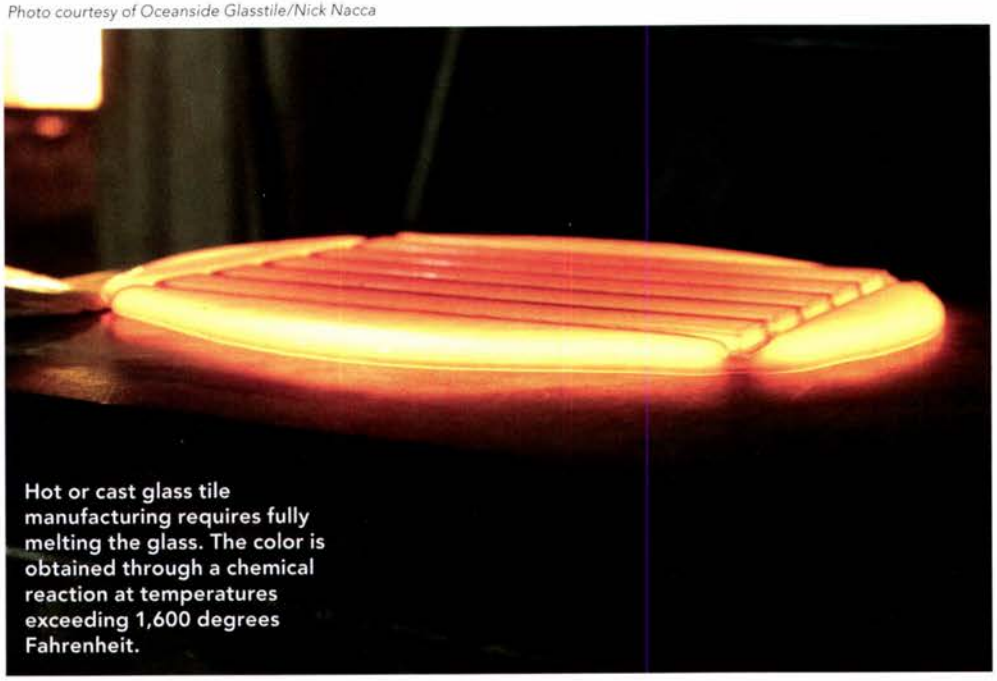
The attraction of glass tile seems self-evident to many. "The colorful, intricate patterns of mosaic and the luster of large glass surfaces offer an authentic, gratifying experience that serves human values, positive vibrations, and cultural vision," says Marckx, an expert in the industry. Glass tile surfaces are resilient and durable, offering a lasting protective finish with a good return on investment (ROI). For the green-minded owner or designer, creating a luxury finish using recycled bottle glass is an impressive double win.

It's also a longtime favorite. Glass tile is one of the oldest mediums for creating color in murals, according to William Ellis in his authoritative book, *Glass*.[1]

Although it is perceived as relatively new and part of the modern architectural lexicon, glass tile has been used in murals dating back to 2500 BCE, around the same time the Giza pyramid complex arose in what is now El Giza, Egypt. Mosaics with glass tile first appeared in the Hellenistic period, adding unlimited color possibilities, according to Frederick O. Waage: "With the development of wall mosaic, glass largely took over the functions of stone, producing tints of unsurpassed intensity and leading to a continuing search for new coloristic effects."[2]

Then and through the modern era, glass tile is generally composed of three primary ingredients: silica sand, fluxes, and metallic oxides, according to the Corning Museum of Glass. Silica, a perpetual resource and the major ingredient in glass, forms a transparent, brittle substance when properly heated and mixed with other components. (Lightning strikes have been known to fuse blobs of impure glass from beach sands.) Added to the process are fluxes—including alkalis, such as sodium carbonate (soda) and potassium carbonate

Photo courtesy of Oceanside Glasstile/Nick Nacca



Hot or cast glass tile manufacturing requires fully melting the glass. The color is obtained through a chemical reaction at temperatures exceeding 1,600 degrees Fahrenheit.

(potash)—to lower the melting temperature and help keep heating consistent throughout the process. Fluxes also help release impurities in the process. Last, manufacturers introduce metallic oxides to create color in a through-body glass tile. Different metals fire off of each other at different temperatures, which creates a byproduct of color.[3]

As with any liquefied product, the resulting molten glass material can then be molded and formed. It can be paired with natural stone and porcelain, among other materials, as it was in the earliest mosaic applications. Using various techniques, finish types can be applied today, such as non-iridescent, iridescent, and matte finishes. Three broad categories of glass tile manufacture create the range of products available for architectural and landscape uses: cold, warm, and hot.

Cold

The first manufacturing method, cold refers to low-temperature glass, which employs a sheet glass (not unlike common float glass window panels) with coatings added onto the back of the tile at temperatures lower than about 1,000 degrees Fahrenheit. The resulting sheets of backpainted windowpane glass are then cut and finished as needed. One benefit of this production method is that it allows for a broad range of colors, including Pantone Matching System (PMS) colors. However, while many colors are achievable, the cold glass tiles have limited applications. They are generally only suitable for indoor walls because the paints and coatings are not fully bonded to the glass material. For outdoor and other wet applications, the low-temperature applied paint can delaminate and chip under typical atmospheric conditions. In addition, the cold products are often mounted with a mesh, which may be visible in certain installations or when craftsmanship is poor.

Warm

The other general type of glass tile is warm. This refers to several types of manufacturing methods, and each can produce a range of unique visual and tactile effects, all produced at a range of temperatures from about 1,023 degrees Fahrenheit to 1,599 degrees Fahrenheit.

Fused

Named for the fusing of color onto float glass and the fusing together of glass panels, this method involves cutting glass into sections and shapes, followed by firing in a furnace. Color is generally added on top of or under the glass, yielding translucent tiles displaying a layer of color. The pieces are often etched or coated to add further visual interest or to improve performance, such as abrasion resistance. From large format to 1-inch mosaic, fused production offers flexibility in terms of tile size.

Smalti

An ancient glass tile technique combining silica sand with pigments for colorants under high temperatures, smalti tile is associated with classic tile mosaic artwork, including murals. From the Italian word literally translated as "enamels" but referring to a glaze or glass paste, smalti tiles offer a wide range of colors and textured surfaces in typically small formats. Typically made with soda and potash along with metals and metal oxides for color, the mixtures are fired and rolled into slabs to be cut by hand. The slabs can be several inches thick, if desired.

Photo courtesy of Oceanside Glasstile/Michael Wooda

Slumped

In a third warm process, slumping, artisans use heated glass and intentionally slow its cooling process to allow for the bending and curving of the pieces. The bending of the glass tile is often used to create trim pieces, sometimes with an appealing rolled edge. Glass tile manufacturers often offer various trim pieces made by slumping so designers can specify borders and other finishing details.

Hot

This process involves molten glass that is hand cast at about 1,600 degrees Fahrenheit and hand-sheeted and hand-cut. Unseen chemical reactions produce a wide array of colors and effects, which can be rigorously monitored for uniformity. Automated rolling and bending ma chinery may be used. Hand-casting approaches are widely appreciated by artists and architects alike, as they allow consistent tile shaping, high aesthetic quality, as well as the creation of matching trim pieces. Manufacturers note that cast glass is generally harder to produce than other types of glass tile. Consistency and vibran cy of the through-body coloring demands ac-curate formulation controls, and the heating an cooling during all processes must be continu-ously monitored. Yet, when made properly, thes glass tiles are among the most resilient. The cast products tend to be very durable, and some manufacturers recommend the tiles for higher-impact uses, such as light commercial flooring, as well as specialty environments, including outdoor and submerged water installations, suc as swimming pools and water features.

Other types of glass tile include sintered tile, produced with glass powders pressed into dies and heated. Color is added early or after cooling. The technique produces a uniform look and strong fin ish as compared to smalti tiles, which are known for their variegated surfaces. Last, many producer offer cast tiles, which are molded from glass piece yielding a layering or multihued product. Two other techniques are available: terrazzo glass, with its mix of glass and cements, as well as etched tile. Etched tiles typically have a translucent surface added for treatment by abrasion or acid-etching t achieve a given visual effect.

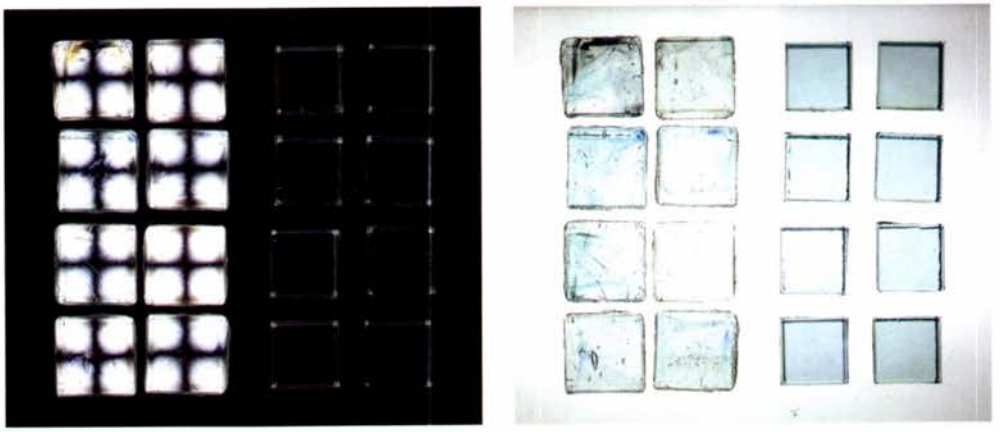
The comparison between hot and cold processes also extends to iridescent finishes. The hot process for iridescent tiles fuses the iridescence into the tile itself, rendering a more durable finish. The hot iridescent glass tiles have higher test values for scratch resistance and slip resistance, as well as unique visual characteristics. Iridescent surfaces in cold-process tiles may be easily scratched off, and the tiles may appear to have an oily finish or film.

ANNEALING MAKES TILE APPEALING

One rule of glass tile production: don't rush. "The longer the process takes to cool the glass, the stronger it is," says Jeff Nibler, an executive with the manufacturer Oceanside Glasstile. This slow cooling process, annealing, which takes place in an oven or specialized kiln known as a lehr, relieves internal stresses caused by manufacturing. Air-cooled or non-annealed tile, on the other hand, is more prone to poor quality and cracking, he adds. Annealed glass tile is suitable for many types of applications; non-annealed products are more susceptible to environmental conditions that lead to fracturing from stresses inside the glass. Examples include susceptibility to thermal shock in outdoor applications, such as in a swimming pool or fountain.

"It is impossible to tell the difference between an annealed product and a non-annealed product with the naked eye," adds Nibler. "The only way to visibly see this is through a polariscope." This device employs two polarized lenses and a light source placed behind the subject glass to determine its optic character. For translucent products, the observer can see evidence of stresses, if any exist, which appear as a rainbow of colors caused by light refracting off the stress conditions.

Photos courtesy of Oceanside Glasstile/Chipper Hatter



To distinguish between an annealed product and a non-annealed glass tile requires a trained expert using a polariscope to evaluate the tile's optic character. Defects, such as stresses, appear as a rainbow of refracted color.

Why worry about the stresses in glass tile? These could be released in any number of ways during the life of an installation, generally through breakage under pressure or thermal differential. That's why annealed products are specified for a range of applications whereas non-annealed products should be limited to interior walls with low-impact uses and occupancies.

A HAND IN THE TILE PROCESS

Walking into a tile manufacturing facility illuminates some of the time-honored techniques for making high-quality colored glass pieces. At the same time, one also sees how handcrafted processes and carefully guarded formulations work side by side with modern automation and controls technologies.

For cast glass tile, in the long-established, leading shops in the North America, Europe, and elsewhere, the process involves molten glass that is hand cast at about 1,600 degrees Fahrenheit and hand-sheeted and hand-cut. The producers build on extensive training and knowledge to undertake these handmade methods with reasonable precision and control. Unseen chemical reactions produce a wide array of colors and effects, which can be rigorously monitored for uniformity. Automated rolling and bending machinery may be used. Hand casting is important to many architects and artists. These methods help keep tile shapes and colors uniform, while also allowing for better aesthetics and matching.

Manufacturers note that cast glass is generally harder to produce than any other types of glass tile. Consistency and vibrancy of the through-body coloring demands accurate formulation controls, and the heating and cooling during all processes must be continuously monitored. Yet, when made properly, these glass tiles are among the most resilient.

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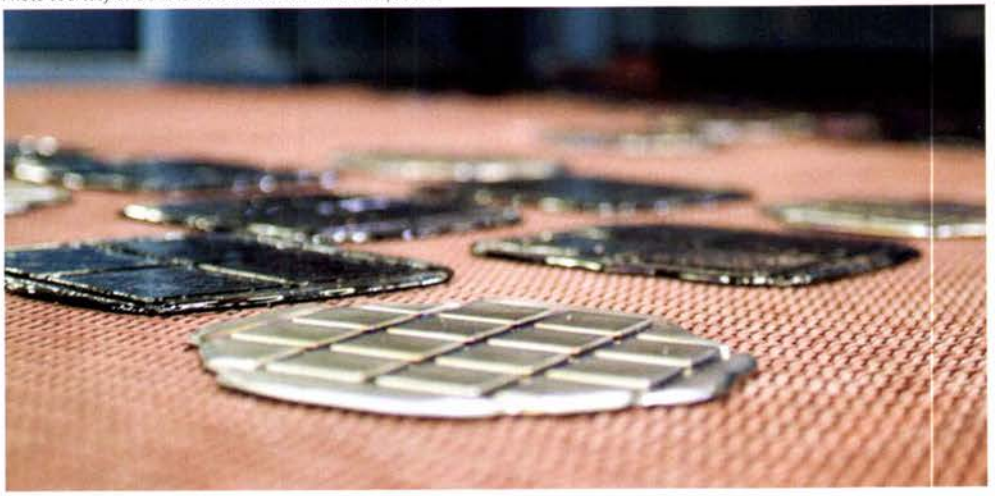
***C.C. Sullivan** leads a marketing communications agency by the same name specializing in architecture, construction, and other industries. He has produced scores of continuing education courses, articles, and technical publications globally.*
www.ccsullivan.com

Photo courtesy of Oceanside Glasstile/Katarina Shahpazova



The slow cooling process, annealing with a specialized kiln or lehr, relieves internal stresses caused by manufacturing, improves quality, and reduces cracking due to thermal stresses and underwater applications.

Modular, prefabricated components of performance-grade engineered bamboo are used for building enclosures to provide high performance, sustainability, and dimensional stability.

All photos courtesy Lamboo Technologi

Sustainable Envelopes with Structural Engineered Bamboo

Engineered bamboo products (EBPs) deliver structural solutions and renewable, bio-based solutions for high-performance building enclosures systems

Sponsored by Lamboo Technologies | *By C.C. Sullivan*

Bio-based material technology companies are developing a range of new products that improve both building sustainability and performance. In some cases, these architectural materials and systems also increase efficiencies in design and construction. One prominent example has emerged over the past decade with the introduction of dimensional, prefabricated components of performance-grade engineered bamboo. The benefits of the bamboo structural products are especially evident in the design of building envelopes and enclosures, from curtain walls to windows to rainscreens.

Employed for building structures and other architectural and original equipment manufacturer (OEM) applications, the bamboo-based panels, dimensional components, and hybrid systems offer warm, natural aesthetics. Yet engineered bamboo products (EBPs) can replace timber and engineered wood in architectural works where higher performance is desired, both in terms of sustainability and dimensional stability. Architects are finding that structural engineered bamboo serves well in contexts where metal, steel, or extruded aluminum assemblies are the norm. Hybrid solutions are also more common in recent years, a design approach pairing bamboo with steel, concrete, and other structural materials.

Part of the benefit is for increasing the use of rapidly renewable materials—bamboo-based materials—in green building construction to include structural components that are typically made with wood, plastic, metal, or concrete. With increased use of engineered

CONTINUING EDUCATION

1 AIA LU/HSW

Learning Objectives

After reading this article, you should be able to:

1. Describe engineered bamboo and LVB as high-performance, bio-based, and rapidly renewable green building materials and related building methods.
2. Discuss typical applications of structural bamboo products to building envelopes and structures that increase the use of rapidly renewable materials.
3. Identify general criteria for designing building envelope systems with engineered bamboo and LVB, including codes and standards, for greater use of rapidly renewable bamboo.
4. Explain how recent developments in structural bamboo products and LVB construction products apply to various envelope options and performance needs for high-performance green building.

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

AIA COURSE #K1605P

bamboo, building projects may qualify for several credits toward LEED certification, including:

- Materials & Resources (MR) Credit 6, Rapidly Renewable Materials
- Indoor Environmental Quality (EQ) Credit 4.4, Low-Emitting Materials
- Innovation & Design (ID) Credit 1, Environmentally Preferable Material
- Innovation & Design (ID) Credit 2, Life-Cycle Assessment/Environmental Impact
- Materials & Resources (MR) Credit 7, Forest Stewardship Council (FSC) Certification, which may be available upon request

Behind the scenes, manufacturers are discovering ways to boost the performance of engineered bamboo to achieve greater sustainability as well as improved durability, uniformity, and strength. This means that architects and end users can rely on structural engineered bamboo for longer spans, bigger loads, and more extreme conditions, according to specialists in this product area, who note that beam sizing is limited mainly by transportation capacities. Facilitating these advances are fabrication enhancements to make high-performance glulam beams and common dimensional components, as well as hybrid structural solutions and complete systems, such as large-scale fenestration. In addition, more options are available to project teams needing assistance in using bamboo, a rapidly renewable resource. For architects, today's market offers EBP consulting, shop drawings, detailed structural system analysis, engineering, custom three-part specifications, fabrication, and installation advice as needed for their projects.

For a Solar Decathlon entry by the University of Illinois at Urbana-Champaign, engineered laminated bamboo provided structural elements and a high-performance result, achieving Passive House Certification.

For the Williamson County Regional Airport terminal project in Marion, Illinois, the A/E firm RS&H has designed a domed roof structure with hybrid steel-and-bamboo cross bracing.

For these reasons, the structural engineered bamboos, EBPs, as well as laminated veneer bamboo (LVB) materials are increasingly used for building exteriors and as exposed, load-bearing members. For sustainable buildings and LEED-certified projects, engineered bamboo is used for facades, cladding, curtain walls, structural glazing, as well as a range of window and door solutions.

The use of engineered bamboo for rainscreens and structural systems is well established; what is changing is the variety and creativity of uses in recent building designs. One new project, the Williamson County Regional Airport terminal project in Marion, Illinois, designed by the national architecture and engineering firm RS&H, has a novel domed roof structure with hybrid steel-and-bamboo cross bracing for a central atrium. The structural bamboo beams will be visible in the ceiling when the terminal opens in late 2016.

Other examples include a recent entry for the U.S. Department of Energy's Solar Decathlon by the University of Illinois at Urbana-Champaign, using engineered laminated bamboo for structural elements and reclaimed barn wood cladding. Certified by the U.S. Passive House Institute, the innovative project called Gable Home uses 90 percent less energy than typical construction. Among the highlights listed by the U.S. Department of Energy was, "Laminated bamboo structure that minimizes thermal bridges," adding, "Laminated bamboo for structural elements is stronger than wood and more rapidly renewable."[1]

According to the university's assistant professor Mark Taylor, "Using laminated veneered bamboo helped our team become the first competitors in the DOE's Solar Decathlon competition to achieve Passive House Certification, both at the competition site and back in Illinois, where the house returned after competing in the 2009 event."

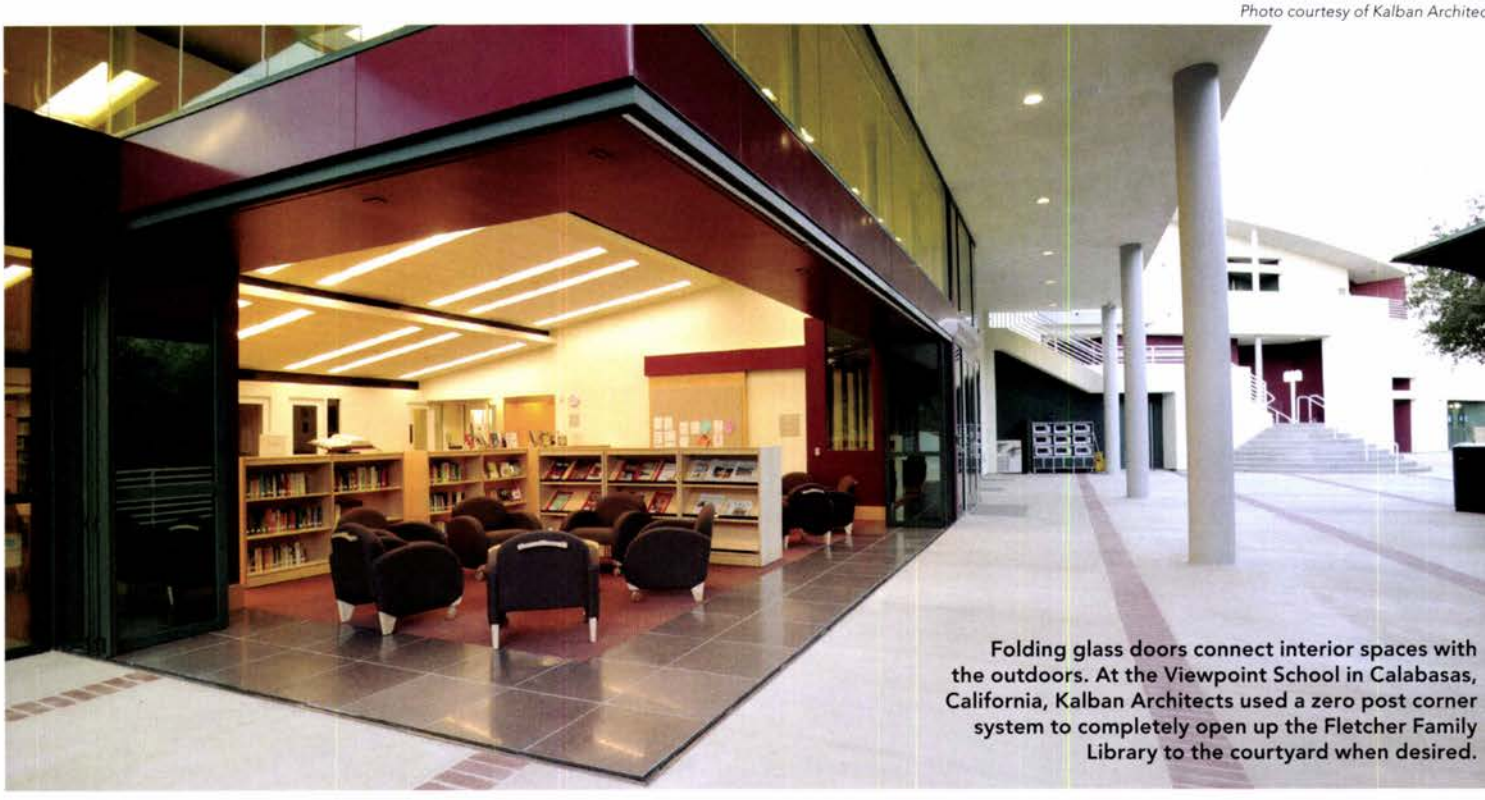
ENGINEERED BAMBOO: CONTEXT AND BACKGROUND

Considered an alternative material technology, engineered bamboo takes advantage of "a rapidly renewable material that has many applications in construction," according to Dr. Bhavna Sharma, a structural bamboo expert and lecturer at the University of Bath's Department of Architecture & Civil Engineering. "Engineered bamboo products result from processing the raw bamboo culm into a laminated composite, similar to glue-laminated timber products." This bio-based resource also resembles wood in its mechanical properties, yet it has a faster growth rate and harvest cycle, she adds.[2]

Continues at ce.architecturalrecord.com

C.C. Sullivan** is former chief editor of* Architecture *magazine and principal of C.C. Sullivan, a marketing consultancy focused on architecture, construction, and other industries. He has authored or produced more than 100 continuing education units as part of his global practice.* ***www.ccsullivan.com

Photo courtesy of Kalban Architec



Folding glass doors connect interior spaces with the outdoors. At the Viewpoint School in Calabasas, California, Kalban Architects used a zero post corner system to completely open up the Fletcher Family Library to the courtyard when desired.

Folding Glass Doors Are an Asset for Commercial Spaces

Aesthetic, high-performance options maximize space and light

Sponsored by LaCantina Doors

With some 90 percent of Americans spending most of their days indoors, one of the most salutary things an architect can do for a building is to open it up to the outdoors and natural light. Whether interior or exterior, folding glass doors represent an advantage to commercial properties in several respects: they bring richness and light to a room; they maximize space by opening a room up to the outdoors or by reconfiguring interior areas; and they increase a building's energy performance and green building quotient. Today's profiles feature maximum glass and minimal frames, enhancing these benefits, while creating a clean, crisp modern look. This course will discuss available options in glass folding doors for commercial projects, and address their performance characteristics in terms of energy efficiency, impact resistance, and sustainability. Also discussed will be ways in which glass folding doors can contribute to the health, safety, and welfare of building occupants, and new options in meeting requirements of the Americans with Disabilities Act (ADA).

COMMERCIAL APPLICATIONS

The purpose of folding glass doors is to connect the indoors and out by eliminating walls, to admit natural daylight into a building, and to reconfigure interior space for greater efficiency and flexibility. Both interior and exterior glass folding doors have long been used for these purposes to enhance a variety of commercial spaces.

Restaurant/Retail

For many restaurants and retail establishments, a folding glass door system provides a unique opportunity to maximize valuable and costly commercial space in a dramatic design element. The California-style Rockwell VT restaurant, located just outside Hollywood, needed to open its first-level bar to a courtyard that is home to a huge oak tree. A clad glass folding door system provided the necessary flexibility. With seven panels, all doors can be shut with just the daily door providing access. Alternatively, all panels can be open, giving the bar a seamless transition from inside to out and allowing bar goers room to move around. "In California, we have a

CONTINUING EDUCATION

1 AIA LU/HSW

1 GBCI CE HOUR

Learning Objectives

After reading this article, you should be able to:

1. Discuss how interior and exterior folding glass doors contribute to green building goals.
2. Name the sustainability benefits of natural daylighting and views.
3. Describe a recent ADA-compliant feature for doors in commercial projects.
4. Identify where glass doors can contribute to LEED points.

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GBCI COURSE #0090009674

Photos courtesy of LaCantina Doors

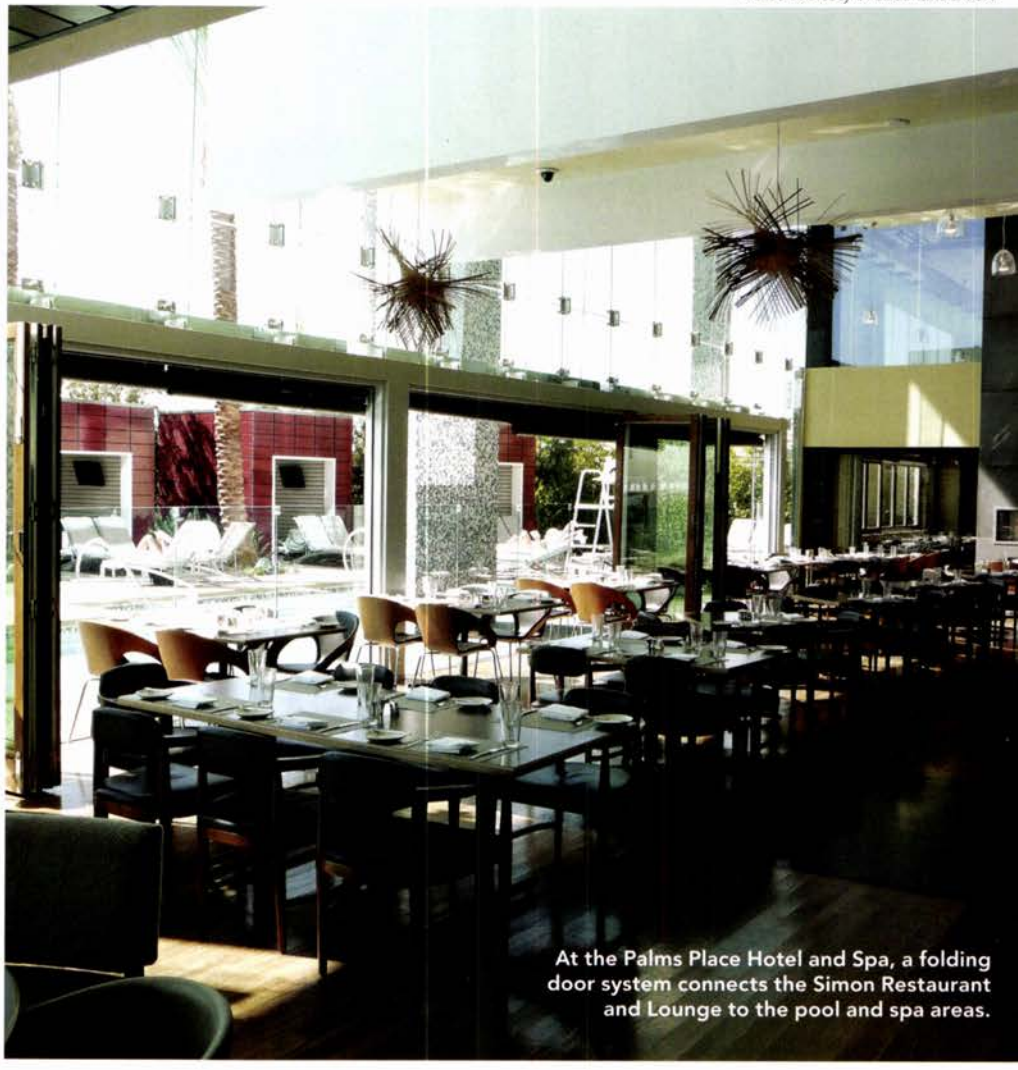
An all-aluminum folding glass door system gives Lexus dealership customers a feeling of being in a high-end home.

wonderful climate all year round, and these doors provided our customers the ability to make an indoor space immediately expand by including a patio, deck, or just the outdoors in that space through the opening of a door," says Claire Taylor of Taylor Brothers Architectural Products. "The product configuration choices, by having single operating doors as well as the ability to open up the full wall, make this a very exciting product for us and extremely popular as well."

Hotel/Resort

With destination properties competing for return guests, those with upscale features, memorable views, and expansive spaces have an advantage. For resort and hospitality properties, folding door systems can create large indoor/outdoor areas that enable users to enjoy the surroundings with unobstructed views. Guest rooms, suites and villas, outdoor cabanas, and high-rise balconies can all be outfitted with folding doors.

At one of Las Vegas' hippest and most popular resorts, the Palms Place Hotel and Spa, a folding door system was used in the Simon Restaurant and Lounge. The concept was to connect the outdoor pool and spa area to the restaurant, with a clad folding door system chosen to reflect the elegant and open feel of the lounge and restaurant.



At the Palms Place Hotel and Spa, a folding door system connects the Simon Restaurant and Lounge to the pool and spa areas.

Showrooms

Glass is an ideal backdrop to showcase products and has been incorporated in a number of showrooms, as owners seek the flexibility and upscale visual aesthetic of glass door systems to reflect their corporate culture. The Lexus dealership located in Macon, Georgia, for example, wanted to encompass its mission statement—"relentless pursuit of perfection"—in the design of its showroom. The Lexus Covenant directs and guides the dealership to "treat each customer as we would a guest in our home." David Gibson of Butler Lexus wanted his customers to feel at home from the minute they walked in the front doors to the second they drove off the lot. An all-aluminum folding door system helped achieve the goal. "The doors gave our vehicle delivery room a great feel of being in an atmosphere of a high-end home as opposed to a traditional dealership with roll-up doors," says Gibson. "The vehicle delivery home represents the end of a journey for our customers as they complete their luxury car buying experience. The end of the journey should leave a lasting impression. When the customer walks in, sees their new luxury automobile, and drives out through the opened doors, the world of driving and experiencing their new automobile opens up before them."

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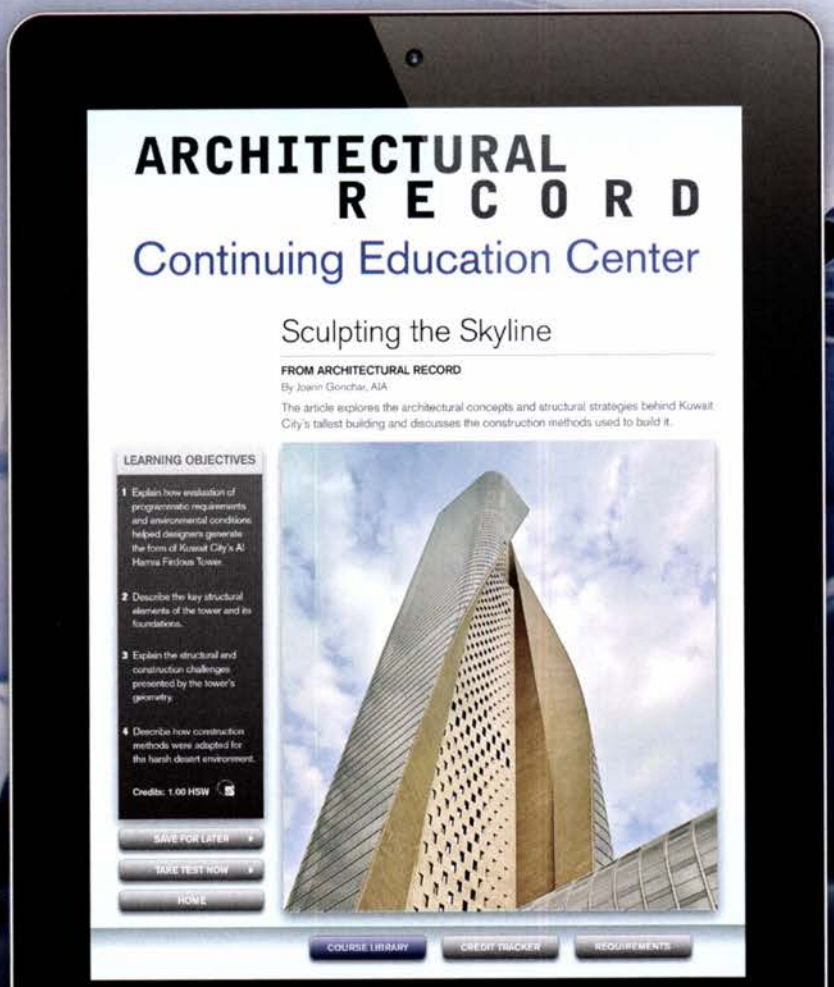

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WOOD

Sustainable Stone From Cradle to Gate

The new ANSI/NSC 373 will transform the material selection of natural stone as a sustainable choice for architects

Sponsored by MIA+BSI: The Natural Stone Institute | *By Celeste Allen Novak FAIA, LEED AP BD+C*

In the 1990s, "design thinking," a method of using synthesis to analyze complex problems, was used to generate solutions to the growing problems from climate change. Architects like William McDonough began to rephrase the questions surrounding the degradation of natural resources and pollution as a design problem. In his seminal book *From Cradle to Cradle*, he introduces what has now become a tidal wave of life-cycle analysis (LCA) environmental initiatives that document where and how materials are sourced, produced, transported, and reused. Today, architects, engineers, contractors, building owners, managers, and the public are driving a building revolution that encourages the design and construction of healthy buildings. These buildings give to rather than take from the environment from design through construction practices, including the choice of sustainable building materials.

Continues at ce.architecturalrecord.com

Celeste Allen Novak, FAIA, LEED AP BD+C, *is an architect, writer, and planning consultant in Michigan with a special focus on universal design and the design and planning for rainwater collection systems.*
www.celesteallennovakarchitect.com

Using regional production remnant materials in these stone columns contributed to the LEED Silver designation for The George A. Purefoy Municipal Center in Frisco, Texas.

Photo courtesy of Coldspring

CONTINUING EDUCATION

1 AIA LU/HSW

1 GBCI CE HOUR

1 LFA CEU

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

1. List the components of a new sustainable certification standard ANSI/NSC 373, which provides a life-cycle analysis (LCA) for dimensional stone products.
2. Define the various components of an LCA.
3. Discuss how compliance to ANSI/NSC 373's national and international requirements for environmental, ecological, human health, and social responsibility in stone quarrying and production satisfies the growing demand for sustainable product declarations.
4. Describe how the components of ANSI/NSC 373 are aligned with green building rating systems, such as LEED and the Living Building Challenge.
5. Explain how the Chain of Custody Standard (NSC COC) for natural stone products ensures the traceability of certified stone throughout the supply chain, from quarry to gate.

To receive AIA 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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GBCI COURSE #0920008009

MIA+BSI: The Natural Stone Institute serves over 1,900 members representing every aspect of the natural stone industry, offering a wide array of technical and training resources, advocacy, and networking. Learn more **at www.naturalstoneinstitute.org**. The Natural Stone Council is a collaboration of stone businesses and trade associations. Learn more at **www.naturalstonecouncil.org**.

MIA + BSI

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naturalstoneinstitute.org/resourcelibrary

New and Upcoming Exhibitions

NYCxDESIGN
New York City
May 3–17, 2016
New York's official citywide celebration of design, *NYCxDESIGN* spans all disciplines, placing emerging design practices alongside established ones. The show's program includes exhibitions, installations, trade shows, talks, launches, and open studios. Events are staged across all five boroughs of the city, in facilities from convention centers to public parks. For more information, visit nycxdesign.com.

Atmosphere for Enjoyment
New York City
May 3–September 25, 2016
In the 1960s, world-renowned sculptor and designer Harry Bertoia began exploring the potential relationship between sculpture and sound. He spent two decades crafting hundreds of "sounding sculptures" in pursuit of a simple instrument. Referred to collectively as "Sonambients," these sculptures are interactive, kinetic, and audible forms consisting of bundles of metal rods that collide and set off radiant tones when agitated by wind or touch. This exhibit at the Museum of Arts and Design will explore the Sonambients, their installation in Bertoia's stone barn, and their legacy as sound-art. For more information, visit madmuseum.org.

Manus x Machina
New York City
May 5–August 14, 2016
The Costume Institute's spring 2016 exhibition will explore how fashion designers are reconciling the handmade and the machine-made in the creation of haute couture and avant-garde ready-to-wear. With more than 150 ensembles dating from the early 20th century to the present, the exhibition will reflect on the founding of the haute couture in the 19th century, when the sewing machine was invented, and the emergence of a distinction between the hand (manus) and the machine (machina) at the onset of mass production. At the Metropolitan Museum of Art. For more information, visit metmuseum.org.

Roberto Burle Marx: Brazilian Modernist
New York City
May 6–September 18, 2016
The Brazilian artist Roberto Burle Marx (1909–94) was one of the most prominent landscape architects of the 20th century. His projects range from the remarkable mosaic pavements lining Rio de Janeiro's Copacabana Beach to the multitude of gardens that embellish Brasilia, one of several large-scale projects he executed in collaboration with architect Oscar Niemeyer. Although his landscape design is known worldwide, the artist's work in other media remains little known. This exhibition at the Jewish Museum explores the breadth of the artist's portfolio—from landscape architecture to painting, from sculpture to theater design, and from tapestries to jewelry. For more information, visit thejewishmuseum.org.

One Day in Life
Frankfurt
May 21–22, 2016
For this 24-hour concert event, commissioned by the Alte Oper Frankfurt, Daniel Libeskind forayed beyond architecture and into his musical roots. The architect selected 18 locations throughout Frankfurt, from a large concert arena to a set of subway tracks, to feature a range of prestigious artists and ensembles. This nontraditional concert experience will challenge audiences to actively make their way through the city. For more information, visit onedayinlife.org.

15th International Architecture Exhibition Reporting from the Front
Venice
May 28–November 27, 2016
This annual exhibition features success stories in which architecture has expanded the possible. Designed to appeal to a broad audience, *Reporting from the Front* explores what it is like to improve quality of life while working in marginal circumstances, and facing pressing challenges. It asks, "What does it take to be on the cutting edge and trying to conquer new fields?" For more information, visit labiennale.org.

Eye for Design
New York City
June 7–October 2, 2016
Eye for Design highlights the unique history and vision of the Museum of Arts and Design (MAD) through the catalogues the museum produced between the 1950s and 1970s. Designed by many American and international graphic artists, including Emil Antonucci, John J. Reiss, and Linda Hinrichs, these catalogues and other exhibition-related printed ephemera illuminate an underappreciated aspect of 20th-century graphic design history and showcase MAD's place in the innovative New York design community of the period. For more information, visit madmuseum.org.

Ongoing Exhibitions

workSHoP
Santa Fe, New Mexico
Through May 22, 2016
The New York–based firm SHoP has a staff of 180 people and projects completed or under way on five continents. SHoP presents an immersive look at their upcoming expansion of SITE Santa Fe, a contemporary-arts center. For more information, visit sitesantafe.org.

New York New Design
New York City
Through May 28, 2016
This exhibition in the recently renovated Center for Architecture main galleries celebrates the work of AIA New York, AIA Brooklyn, AIA Bronx, AIA Staten Island, and AIA Queens members, providing a snapshot of the work being produced in New York. With 185 projects submitted by more than 100 firms, the exhibition presents works of all scales and types, from unbuilt competition entries to large commercial projects. At The Center for Architecture. For more information, visit aiany.org.

Close-up
Los Angeles
Through May 29, 2016
An often overlooked condition of digital design technologies is the ability to design objects through continuous degrees of magnification. This exhibition at SCI-Arc proposes that technological advances have resulted in a transformation of how architectural ideas are conceived, giving new meaning to the idea of tectonics. For more information, visit sciarc.edu.

Bernard Tschumi–Architecture: Concept & Notation
Shanghai
Through June 19, 2016
This retrospective exhibition at the Power Station of Art explores Tschumi's work as a theorist, educator, and architect. At the core of Tschumi's work is a rejection of the conventions that designate architecture as the production of static forms. Architecture, he insists, cannot be dissociated from the events that take place within it; its production requires a concept-based approach. For more information, visit powerstationofart.org.

Materials Inside and Out
Chicago
Through July 3, 2016
Inspired by the working process of architect David Adjaye, this installation at the Art Institute of Chicago invites visitors of all ages to

discover how architects use building materials like wood, fabric, ceramic tiles, laminates, paint, stone, and plastics to create form and atmosphere. Visitors can arrange material samples and sketches to create a "mood board" and to consider how color, texture, and cultural context create a specific feel. For more information, visit artic.edu.

A Japanese Constellation: Toyo Ito, SANAA, and Beyond
New York City
Through July 4, 2016
This exhibition at the Museum of Modern Art focuses on the network of architects and designers that has developed around Pritzker Prize–winners Toyo Ito and SANAA, presenting recent works by internationally acclaimed designers including Kazuyo Sejima, Ryue Nishizawa, Sou Fujimoto, Akihisa Hirata, and Junya Ishigami. For more information, visit moma.org.

Tom Sachs: Tea Ceremony
Long Island City, New York
Through July 24, 2016
For this immersive exhibition, set in a tea house in the Noguchi Museum's garden, Tom Sachs has reworked the rituals and accoutrements of *chanoyu*, the traditional Japanese tea ceremony. The space is accessorized with lanterns, gates, a wash basin, a plywood airplane lavatory, a koi pond, and more. This is the first exhibition at the Noguchi Museum to present work by a single artist other than its namesake, Isamu Noguchi. For more information, visit noguchi.org.

Lectures, Conferences, and Symposia

Design for Dignity
Los Angeles
May 6, 2016
Although Los Angeles has evolved into a well-developed city, it is also experiencing a severe housing shortage. More than 44,000 people in Los Angeles County sleep without shelter. The Los Angeles chapter of the American Institute of Architects (AIA/LA) will convene a forum of leading thinkers at Inner-City Arts to develop practical steps that will combat this housing scarcity. For more information, visit aialosangeles.org.

Tadao Ando
New York City
May 11, 2016
Each year, the Architectural League's Current Work lecture series spotlights significant international figures who are shaping the future of the built environment. Tadao Ando, the founding principal of Tadao Ando Architect and Associates, is a self-educated architect who has won numerous prizes, including the 1995 Pritzker Architecture Prize and the 2002 American Institute of Architects Gold Medal. He will present his firm's work at Cooper Union. For more information, visit archleague.org.

ICFF
New York City
May 14–17, 2016
The 28th annual ICFF, North America's platform for global design, at the Jacob K. Javits Convention Center, will feature more than 750 exhibitors of furnishings, textiles, and accessories for residential and commercial interiors. This convention will offer a broad yet highly focused selection of the world's finest and most innovative avant-garde home and contract products. For more information, visit icff.com.

AIA Convention 2016
Philadelphia
May 19–21, 2016
The AIA Convention is one of the largest annual gatherings of architects and design professionals in the United States. This year's iteration will take place at the Pennsylvania Convention Center. For more information, visit convention.aia.org.

Common Boston Festival 2016
Boston
June 4–5, 2016
For its 10th anniversary, Common Boston is teaming up with the BSA Foundation to produce a reimagined and reinvigorated festival. Based in part on "open house" weekends in cities such as New York and Chicago, this year's festival will offer free access to dozens of architecturally and culturally significant spaces and places—many not otherwise open to the public. Participants will have a chance to discover and explore sacred historic sites, sky-high offices, underground entertainment venues, repurposed mansions, hidden infrastructure, unique learning spaces, private parks, and more. For more information, visit architects.org/programs-and-events/common-boston-festival.

Architectural Record Innovation Conference
San Francisco
June 8, 2016
Innovative architecture requires expanding the boundaries of the discipline by spurring creativity through design and technology. This year's conference brings together key figures who have generated a range of imaginative solutions for the built world. From architects practicing outside the discipline to principals of large firms to materials experts and graphic designers, the event's participants represent different approaches to original problem-solving in a rapidly changing world. At the Mission Bay Conference Center. For more information, visit arinnovationconference.com.

NeoCon 2016
Chicago
June 13–15, 2016
NeoCon, the largest commercial interiors show in North America, has been held at the Merchandise Mart in Chicago since 1969. The three-day event attracts nearly 50,000 design professionals and showcases more than 700 companies. For more information, visit neocon.com.

Competitions

London Internet Museum
Registration deadline: May 4, 2016
This competition asks architects and designers to submit ideas for the London Internet Museum, a space that will connect visitors to the history and future of the Internet. The chosen site is the now-closed North Woolwich Old Station Museum, housed in the original Great Eastern Railway terminal station building. For more information, visit londoninternetmuseum.beebreeders.com.
lordstanley.

What Design Can Do
Submission deadline: May 20, 2016
What can designers do to improve the reception and integration of refugees in urban areas? That's the basic question of this global challenge, a shared competition by the design platform What Design Can Do, the United Nations Refugee Agency, and IKEA Foundation. Designers, artists, and imaginative troubleshooters from all countries and disciplines are invited to take part. The five best entries will receive up to 10,000 euros each, expert advice,

and guidance in developing their concepts into feasible plans. For more information, visit whatdesigncando.com.

Place by Design
Submission deadline: May 27, 2016
SXSW Eco's Place by Design (PXD) competition celebrates innovative design work that enacts positive economic, environmental, and social change. The visionary projects showcased in Place by Design demonstrat the potential for public space to cultivate and revive localized culture and profoundly affect many aspects of society, from civic engagement to environmental adaptation to public health. For more information, visit sxsweco.com/placebydesign.

Paris Pavilion: The Art of Peace
Submission deadline: May 31, 2016
In the wake of the recent terrorist attacks in Paris, this competition invites designs for a Peace Pavilion in the city that exhibits the virtues of hope and tolerance, translated through the language of art and architecture. The pavilion should be a freestanding temporary structure that car host a variety of activities and exhibitions. For more information, visit archasm.in/briefs.

Cannabis Bank
Registration deadline: June 8, 2016
Cannabis, pot, marijuana—by all its names, it is still considered illegal in many countries around the world. However, cannabis has long been

known to have many beneficial uses, especially when it comes to medical treatment. For this reason, Bee Breeders is launching the Cannabis Bank architecture competition. Because this is a theoretical competition, the building can be located anywhere in any country. For more information, visit cannabisbank.beebreeders.com.

perFORM 2016
Submission deadline: June 17, 2016
Now in its third year, this competition challenges architecture students and interns to design a net zero energy mixed-use, multifamily building in Seattle's Rainier Beach community. Group and individual entries will be assessed for resourcefulness, replicability, beauty, and community response. For more information, visit hammerandhand.com.

Young Talent Architecture Award 2016
Entrant-specific deadlines of July 15, 2016 and August 31, 2016
The Young Talent Architecture Award (YTAA) aims to support the next generation of architects, urban planners, and landscape architects that will be responsible for transforming our environment. YTAA emerged from an interest in such students' initial work and a desire to support their talent as they enter the professional world. For more information, visit ytaaaward.com.

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(R) Regional AD

■PRODUCT SPOTLIGHTS

Advertisement

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Circle 45

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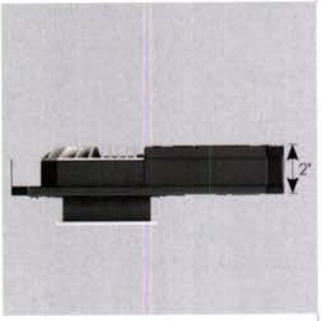

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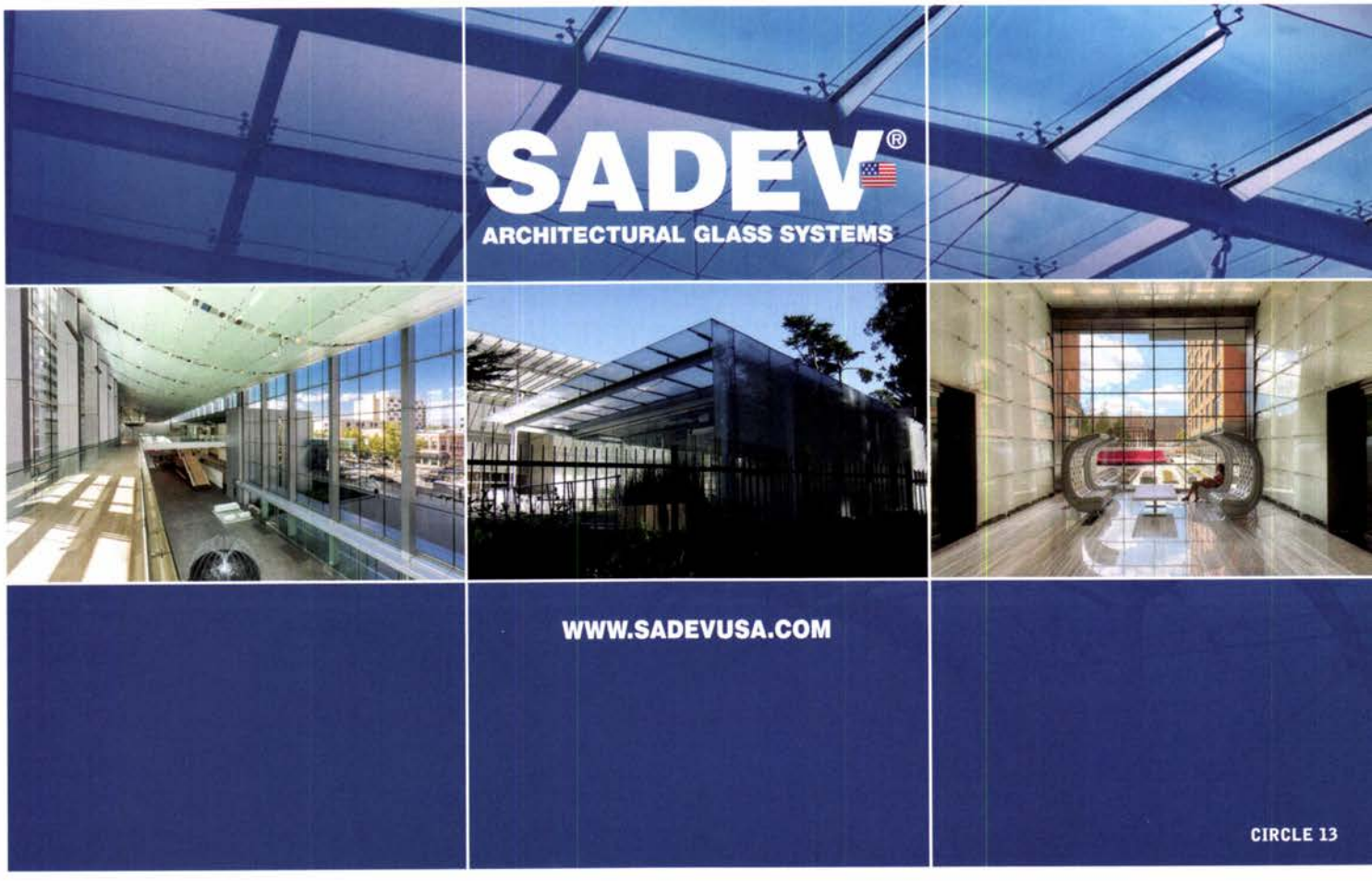
Circle 48



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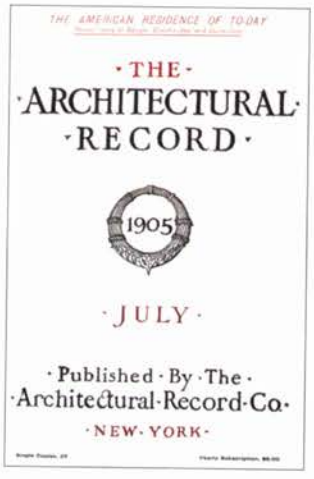
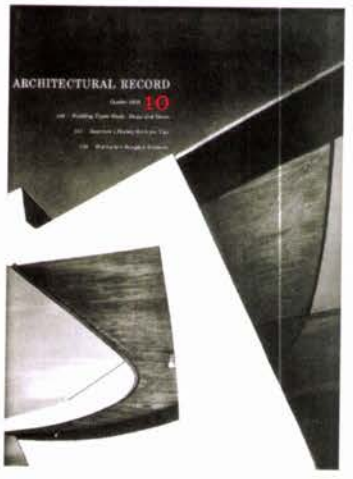
Circle 54

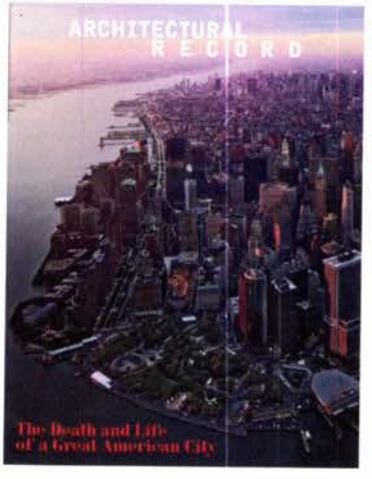
ARCHITECTURAL RECORD

125 years

We're celebrating our 125th year! Look for features celebrating this milestone in RECORD, on architecturalrecord.com and in our social media. We will honor our past while we look toward the trends in the next 125 years.





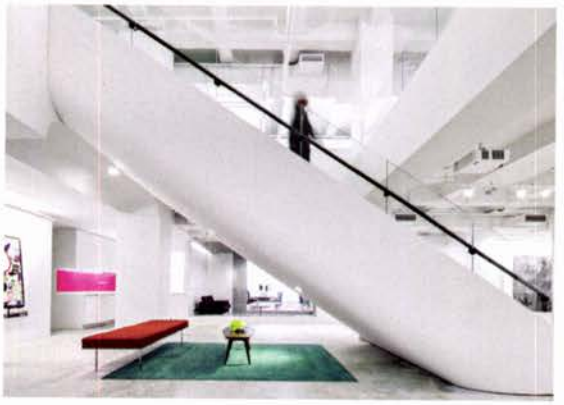


2016 CALL FOR ENTRIES Record Kitchen & Bath

The editors of ARCHITECTURAL RECORD are currently accepting submissions for the **2016 Record Kitchen & Bath** competition. Entry is open to any registered architect, as well as any designer working in collaboration with architects, who has completed an innovative residential and/or commercial kitchen or bath project in the last year. We are looking for projects that feature unexpected materials, address unique client needs, or are designed in a manner that allows these utilitarian spaces to be functional, sustainable, and beautiful. Winning projects will be featured in the October 2016 issue.

The fee is US$50 per entry. To enter, visit: kandb.architecturalrecord.com. E-mail questions to ARCallForEntries@bnpmedia.com. (Please indicate **Record Kitchen & Bath** as the subject of the e-mail.) **Submissions are due June 1, 2016.**

2016 CALL FOR ENTRIES Record Interiors



The editors of ARCHITECTURAL RECORD are currently inviting submissions for the 2016 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 October 2016 issue.

The fee is US$75 per entry. To enter, visit: recordinteriors.architecturalrecord.com. E-mail questions to ARCallForEntries@bnpmedia.com. (Please indicate **Record Interiors** as the subject of the e-mail.) **Submissions are due June 1, 2016.**

snapshot

PROJECT MARIA MAGDALENA CHAPEL
LOCATION ZOLLFELD, AUSTRIA
ARCHITECT GERHARD SACHER

SET AGAINST a dramatic backdrop of distant mountains and boundless sky, a tiny chapel in Austria's southernmost state of Carinthia magnifies the intensity and natural beauty of its location. The Maria Magdalena Chapel, designed by Graz-based Gerhard Sacher sits in the midst of a young vineyard on the gently rising plains near the foothills of the Eastern Alps. A deliberately simple material palette—glass and white self-compacting concrete, with cream and beige travertine tiles inside—allows the bucolic site to play an integral role in how visitors experience the building. "A town chapel has to exclude the outside world to attain tranquility, so the walls have only a few openings," says Sacher. "But a chapel situated in the countryside can open up and benefit from the interplay with nature." Floor-to-ceiling glazing on the building's eastern wall allows full views of the landscape beyond a large bronze cross by Czech artist Jaromir Gargulak. On the north and south sides of the building, three narrow windows slice through the bright concrete, depicting the creation story through their colorful glass panels by Carinthian artist Karl-Heinz Simonitsch. Two immense bronze doors (also by Gargulak) punctuate the clear glass of the west-facing entrance, which extends up to the top of the 25-foot-high gabled roof. "If you stroll by," says Sacher, "you will fall for the radiant-white simple form—even if you are the most convinced agnostic."
Miriam Sitz

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