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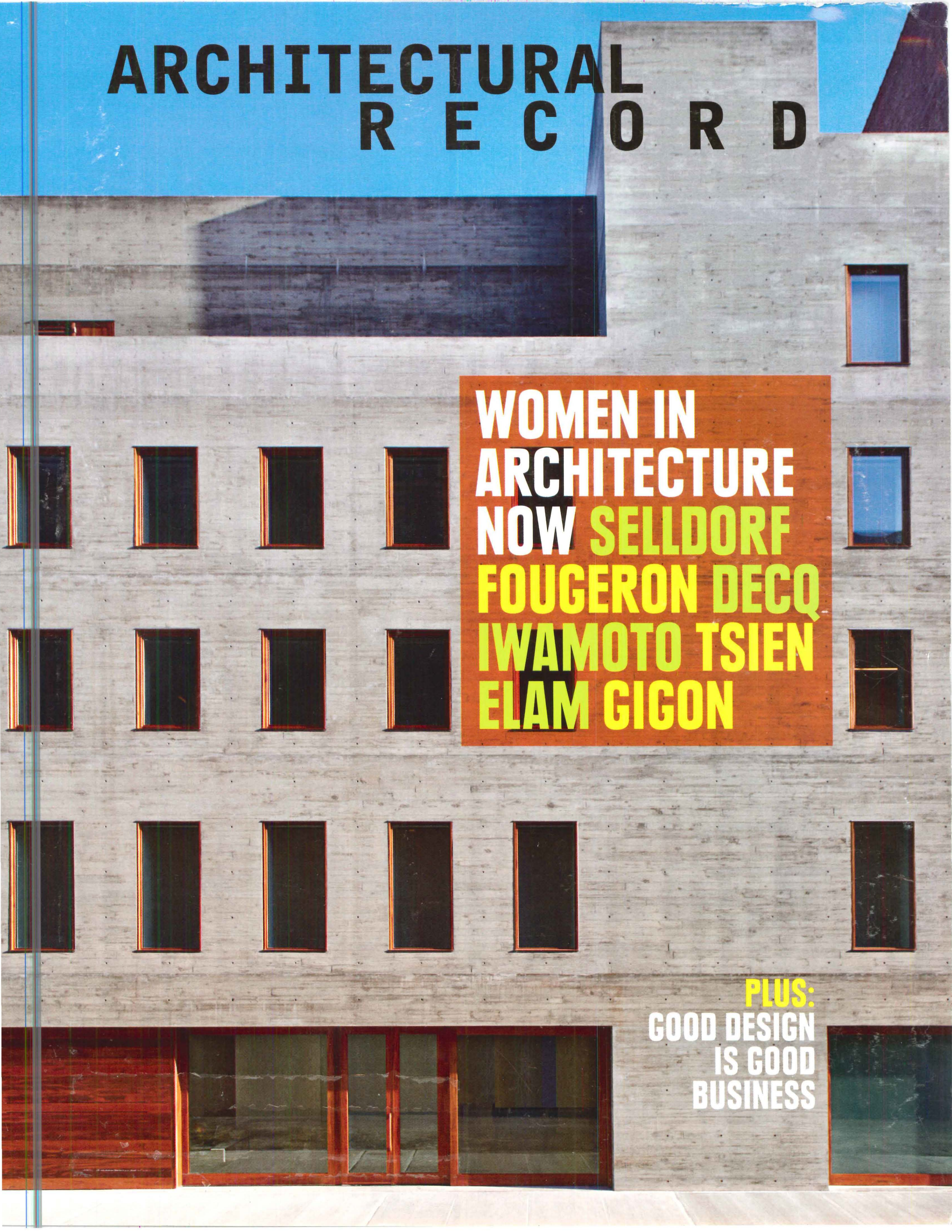

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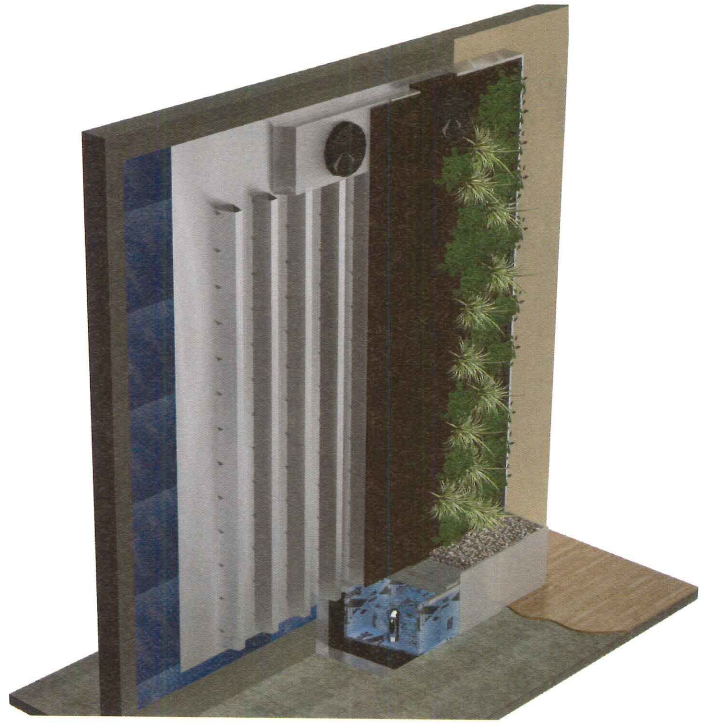

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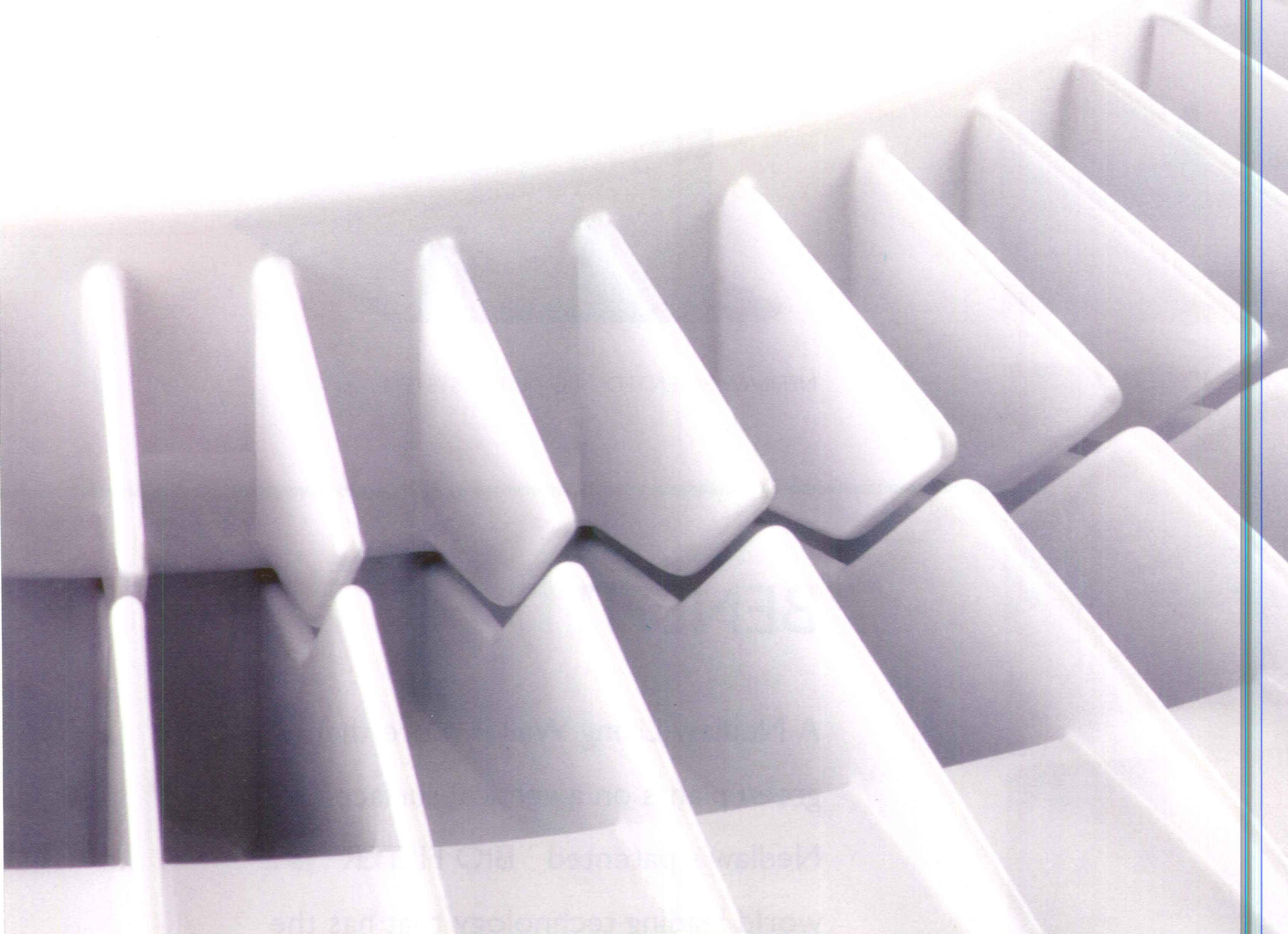

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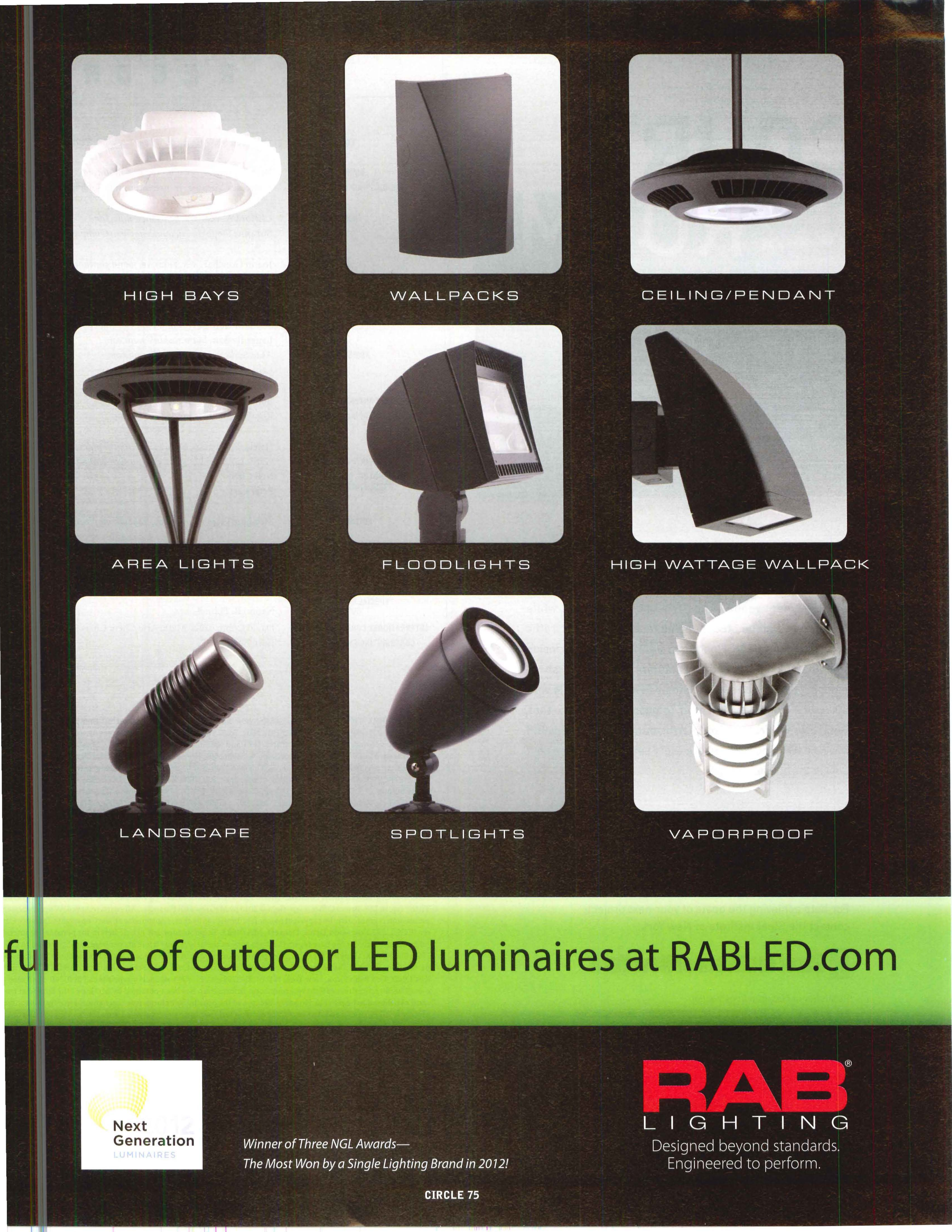
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ARCHITECTURAL RECORD: (ISSN 0003-858X) June 2013. Vol. 201, No. 6. Published monthly by McGraw Hil Financial, 1221 Avenue of the Americas, New York, NY 10020. **FOUNDER:** James H. McGraw (1860-1948) Periodicals postage paid at New York, NY, and additional mailing offices. Canada Post Internationa Publications Mail Product Sales Agreement No. 40012501. E-mail: arhcustserv@cdsfulfillment.com. Registere for GST as McGraw Hill Financial. GST No. R123075673. **POSTMASTER:** *Please send address changes t* ARCHITECTURAL RECORD, Fulfillment Manager, P.O. Box 5732, Harlan, IA 51593. **SUBSCRIPTION:** Rate are as follows: U.S. and Possessions $70.30; Canada and Mexico $79 (payment in U.S. currency, GST included) outside North America $199 (air freight delivery). Single copy price $9.95; for foreign $11. Subscriber Services 877/876-8093 (U.S. only); 515/237-3681 (outside the U.S.); fax: 712/755-7423. **SUBMISSIONS:** Every effort will b made to return material submitted for possible publication (if accompanied by stamped, self-addressed enve lope), but the editors and the corporation will not be responsible for loss or damage. **SUBSCRIPTION LIST USAGE** Advertisers may use our list to mail information to readers. To be excluded from such mailings, send a request t ARCHITECTURAL RECORD, Mailing List Manager, P.O. Box 555, Hightstown, NJ 08520. **OFFICERS OF MC GRAW HILL FINANCIAL, INC.:** Harold W. McGraw III, Chairman, *President and Chief Executive Officer*; Kennet M. Vittor, *Executive Vice President and General Counsel*; Robert J. Bahash, *Executive Vice President and Chi Financial Officer*; Elizabeth O'Melia, *Senior Vice President, Treasury Operations.*

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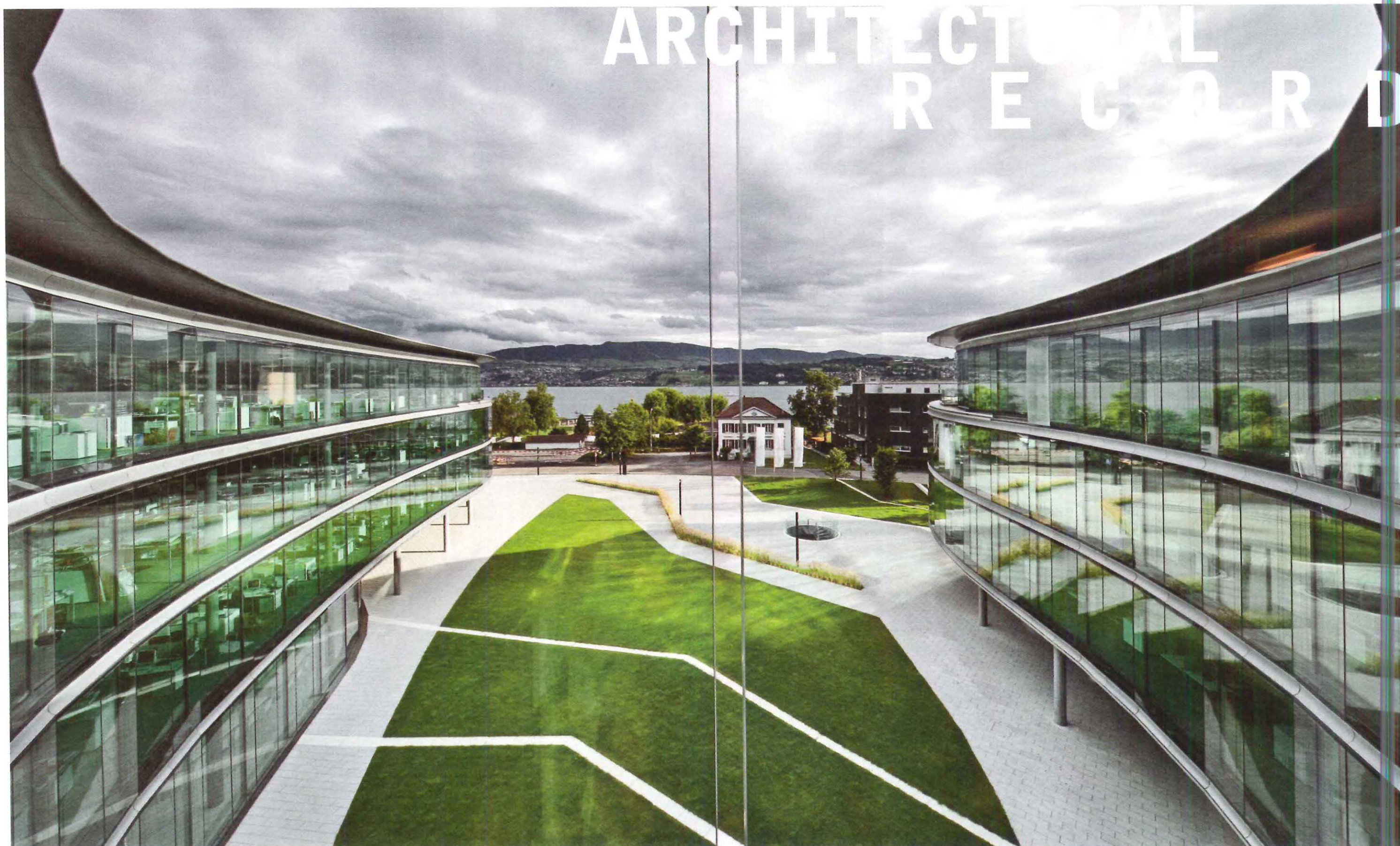

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WOMEN IN ARCHITECTURE NOW

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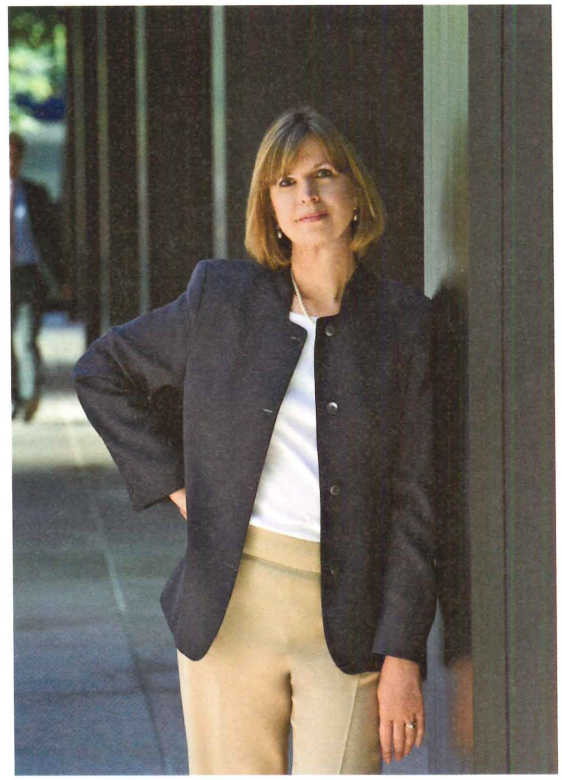


FOR SEVERAL months now, we've been reaching out to architects to talk about the status of women in the profession. Even before the *Architects' Journal* published its scathing survey of how women in architecture are treated in the U.K.—and well before two students at Harvard's Graduate School of Design launched their petition to pressure the Pritzker Prize committee to recognize architect and planner Denise Scott Brown, who was excluded from the 1991 award bestowed on her partner, Robert Venturi—we had begun to report on the inequities that persist in the field. What was striking was that many women didn't want to talk on the record about their concerns. They just want their work acknowledged—and please, they said, we're "architects," not "women architects."

That's an entirely understandable position. But as Gloria Steinem put it, "Whoever has power takes over the noun—and the norm—while the less powerful get an adjective." There are architects—who are overwhelmingly white men—and there are women architects, at least in the minds of many.

In her bestseller, *Lean In: Women, Work, and the Will to Lead,* Sheryl Sandberg, the COO of Facebook, talks about this. It's hard to overestimate the book's impact in restarting a national conversation about women's equality—even if many of us can't believe we're still having this conversation in 2013.

But in architecture, as in other professions, it's essential to keep talking. Here's why: though women now make up over 40 percent of the architecture students in the U.S., they account for only 23 percent of those working in architecture. Only 17 percent of partners and principals of firms are women. Worst of all, in the 35–44 age group, the sweet spot of career building, women architects leave the profession in droves. The critic Sarah Williams Goldhagen explores these facts in a sobering and provocative essay in this issue (page 157).

The good news is that there's a growing contingent of women designers whose architecture is having a profound impact on the built environment. We've been pleased to publish projects by many of them in the past, and in this issue we feature work by Annabelle Selldorf, Billie Tsien, Anne Fougeron, Lisa Iwamoto, and Merrill Elam, among others (page 167). But take note: almost all the high-profile women practicing today either run their own offices or are in partnerships, often with their spouse. The bigger firms, of more than 50 people—where 37 percent of those in architecture work, and where there are billions of dollars worth of construction projects to design—have very few women in leadership roles.

When we asked women what was one thing they would most like to change in the profession, every one—without exception—said the inadequate pay scale. Male architects would likely agree, even if they tend to make more money than their female counterparts.

And men as well as women would benefit from changes in the culture of architecture—not just in the nature of the workplace but in how work is perceived and credited. The publicity around the Scott Brown controversy has put a new focus on the Pritzker Prize and its perpetuation of the idea of the solo genius as author of a work of architecture. This view of how architecture is made is—with a few exceptions—largely outmoded in a world of complex technology and construction. It's also out of sync with the practice of many designers, who favor a research-based, collaborative approach, working across disciplines.

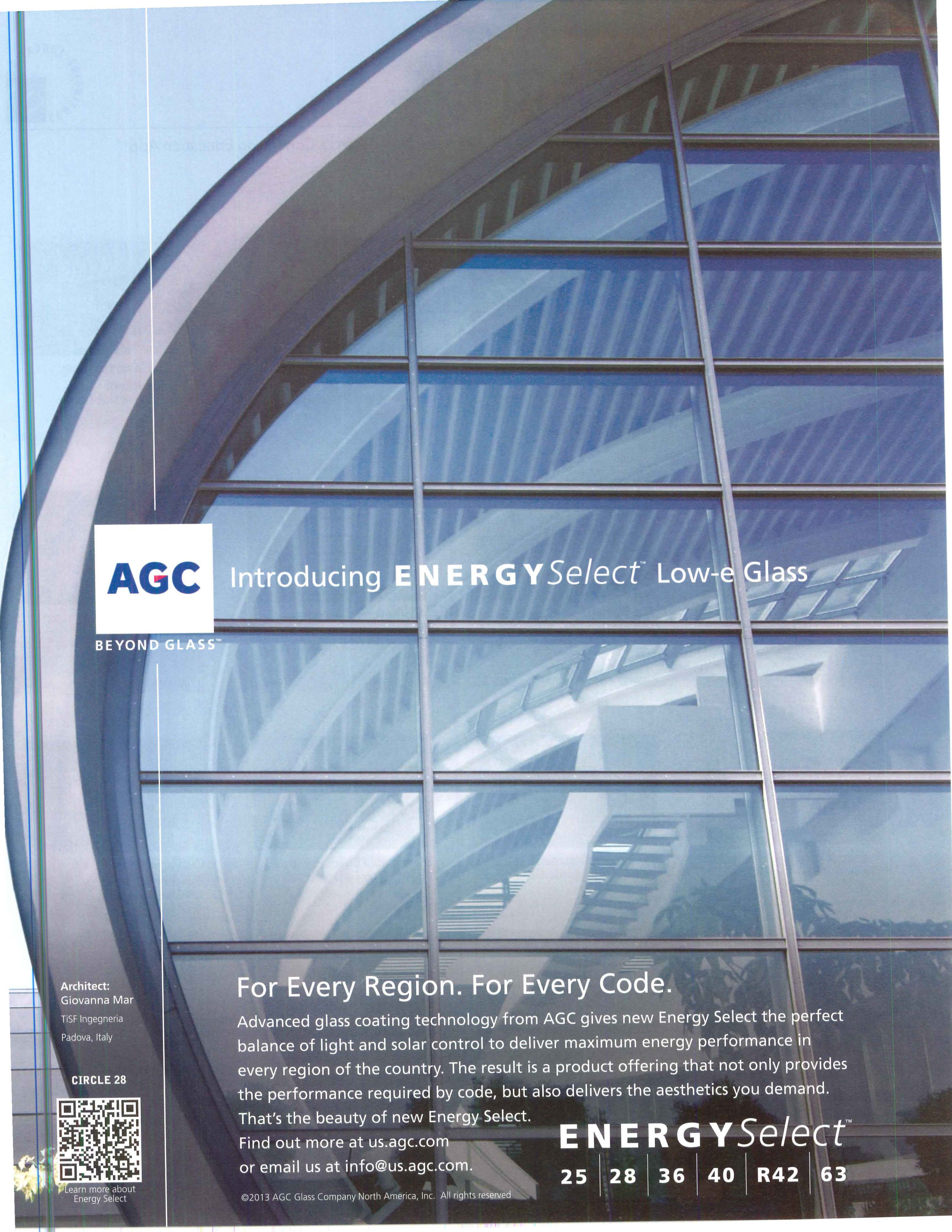
And the emergence of new values in architecture—sustainability; a concern for cities and the public realm; and the application of design thinking to solve a range of human problems—only reinforces the notion of teams, not soloists, who pool knowledge and share credit.

Architecture is a political and social act. As architects engage increasingly in some of the most serious issues of our day, the field requires practitioners who reflect the needs and wishes of people across a wide economic and cultural spectrum. Deborah Berke, the first winner of the Berkeley-Rupp Prize, awarded for helping the advancement of women in architecture, puts it this way: "All aspects of our diverse society and culture are underrepresented in architecture. It's shortsighted and does a disservice to make the issue solely about women."

Let's push the leaders of architecture today to open more doors to the talents of women and others who are underrepresented. And then we can all stop talking about it. ■

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief



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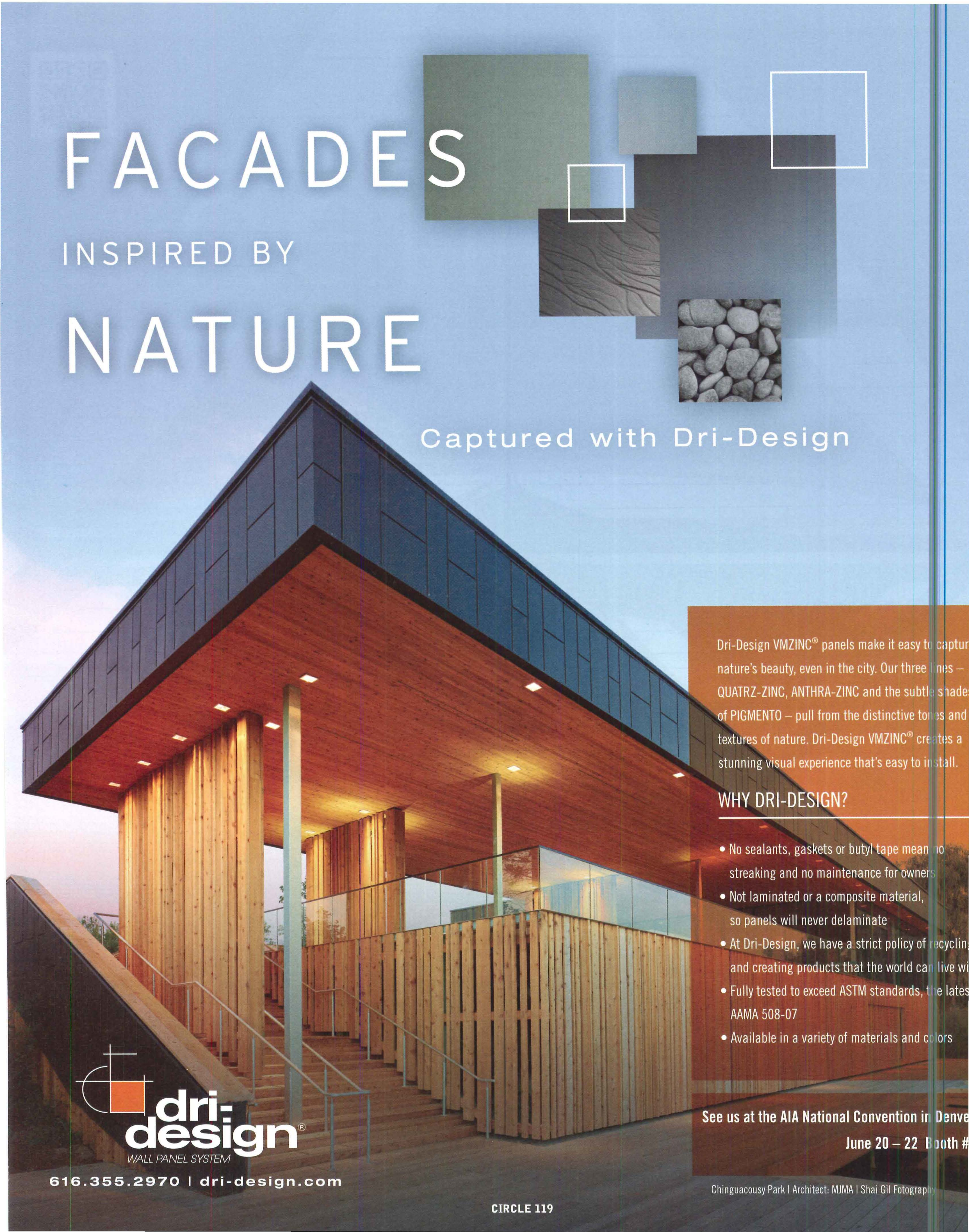
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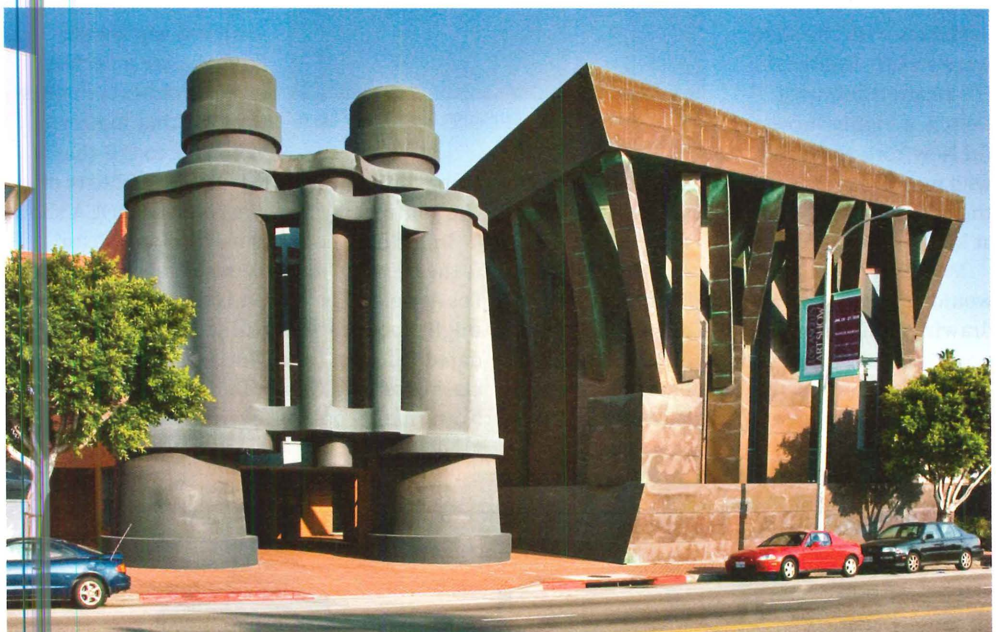
perspective

Midtown and MoMA could both use more variety, serendipity and soul. The former folk art museum building, having all those things, isn't an obstacle to progress but an opportunity.

—Critic Michael Kimmelman *in "Defending a Scrap of Soul Against MoMA,"* New York Times, *May 12, 2013*

The Controversy Over L.A.'s 'Sculpturalism' Show

BY CHRISTOPHER HAWTHORNE



This image of Frank Gehry's Binoculars Building (the binoculars were designed by Claes Oldenburg and Coosje van Bruggen) in L.A.'s Venice neighborhood is included in the catalogue for a troubled MOCA exhibition.

JUST WHEN you thought things couldn't get any more tumultuous at Los Angeles's Museum of Contemporary Art (MOCA), which has been buffeted by a string of financial and personnel crises in recent years, a new brouhaha has surfaced. And this time it concerns architecture—to be precise, a significant controversy surrounding a planned MOCA exhibition called *A New Sculpturalism: Contemporary Architecture from Southern California.*

The show is a major component of *Pacific Standard Time Presents: Modern Architecture in L.A.* (see page 59), a series of exhibitions running through the summer in venues across Southern California, organized and largely funded by the Getty Trust. MOCA's contribution was put together by a guest curator, Christopher Mount, as a survey of architecture in Los Angeles over the past 25 years.

Its central figures were to be Frank Gehry and, to a slightly lesser extent, Thom Mayne and Eric Owen Moss. Its main story line was to be the complex influence they and other members of the "L.A. school" have had on more than two dozen younger architects, including Michael Maltzan, Barbara Bestor, Hagy Belzberg, Benjamin Ball and Gaston Nogues, Patrick Tighe, and Lorcan O'Herlihy. Mount settled on the notion of "sculpturalism"—bold and experimentally minded form-making, essentially—as a way to trace that influence from the late 1980s to the present day.

In May, just a few weeks before the show's planned June 2 opening, Gehry told the museum that he no longer intended to participate, and the show faced possible cancellation. He was unhappy with the direction Mount was taking with the show, saying it lacked scholarly heft and might trivialize or caricature his work. Gehry told me that despite pleas

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Optical Illusions in King's Cross

The King's Cross redevelopment project in central London will include the largest new street in the city since 1904 and the largest public square since Trafalgar in 1845. The 67-acre project incorporates new housing, infrastructure, and office buildings with existing stock.

It is across a handful of these old structures—including the Granary Building (home to Central Saint Martins College of Arts and Design)—that Paris-based artist Felice Varini has "painted" large, metallic geometric stripes. On view through October 18, the jagged bolts took 30 days to complete. Assistants worked at night to trace the projected shapes with grease pencils. Then aluminum and vinyl forms were cut to fit the stenciled outlines and adhered to the buildings. ■

Across the Buildings, Varini's installation, spans Granary Square north of Regent's Canal. From a certain vantage point, all the shapes connect to form unified lines.

from Mount, MOCA director Jeffrey Deitch, and top officials at the Getty, he will not have his work in the show.

Mount, who worked for many years as a curator at New York's Museum of Modern Art and was briefly executive director of the small Pasadena Museum of California Art, suddenly faced the challenge of rethinking *A New Sculpturalism* without its protagonist and star attraction. Gehry wouldn't be entirely absent; the MOCA show was planned for the museum's Geffen Contemporary wing, a hulking former warehouse in L.A.'s Little Tokyo district that he had converted into gallery space in the 1980s.

Gehry's unhappiness was far from the only problem. Several other architects featured in the exhibition also had growing doubts about Mount's curatorial approach. The main concern, according to several architects I've spoken with, seemed to be that he was merely assembling a tremendously wide range of recent work rather than shaping it into a coherent whole.

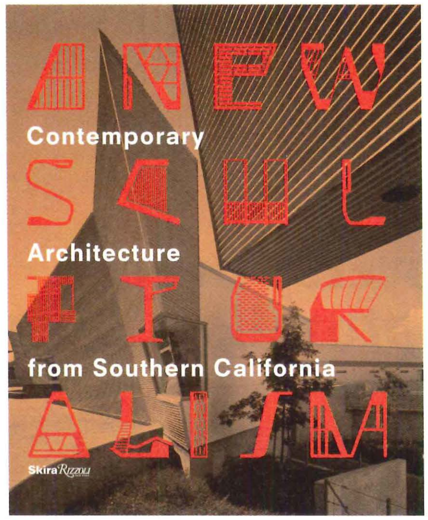
On top of that, the show began to be hit by worries that it would slip into the red, though it was awarded a grant of $450,000 by the Getty. After Gehry's withdrawal, according to several sources, Deitch ordered preparation of the exhibition halted, though the catalogue had already been published. Some of the architects hired to design freestanding pavilions for the show reported that they had not been paid or even reimbursed for the cost of materials and other expenses.

For his part, Mount maintained that the problems with the show were strictly financial. His relationship with Deitch, a highly successful New York art dealer who moved to Los Angeles in 2010 to take over the position as director of MOCA, is strained at best.

MOCA ultimately confirmed that the show would go ahead (though likely without Gehry's drawings and models). Gehry did agree, however, "to support the show as best I can," he told RECORD, and said he would participate in a symposium or other program during the run of the exhibition, now opening June 16. That's where things stood in mid-May as this article went to press.

After all the flap, one thing seems clear: Los Angeles and its cultural institutions are still struggling to make sense of the past two or three decades, a period in which a few of the city's leading architects have achieved worldwide fame. So are a number of the architects in question, for that matter. Who gets to tell that story, and how it is told, are at the heart of the controversy surrounding the MOCA show.

In the end, I'm not sure "sculpturalism" is the best way to frame recent architecture in Los Angeles. The danger is that the approach might produce an awfully narrow and outdated focus on form. But a show about the clashes among Gehry, Deitch, and Mount? Now, that I would be excited to see. ■

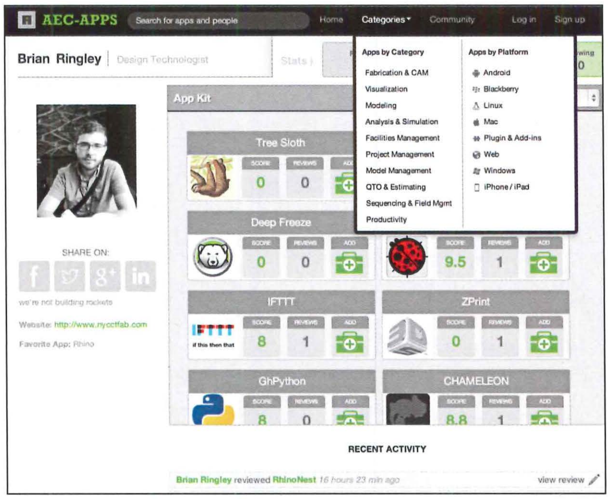


The catalogue for the exhibition has already been completed and published.

SOM and CASE Launch New App

BY MICHAEL LEIGHTON BEAMAN AND JOANN GONCHAR, AIA

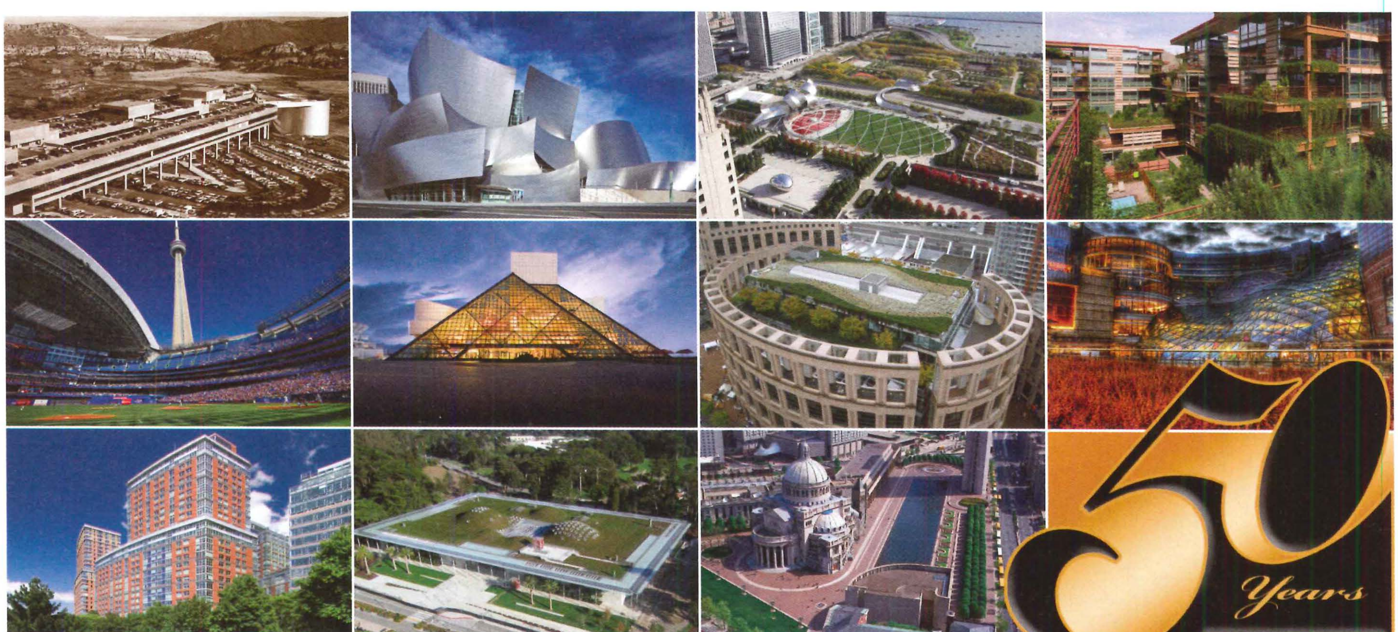
SKIDMORE, OWINGS & Merrill (SOM), in partnership with CASE, a New York City–based building information modeling (BIM) consulting firm, recently launched AEC-Apps.com, a software-focused networking website. It combines the structure of social-media sites like Instagram, Facebook, and Twitter with a user-generated database of software applications used in the architecture, engineering, and construction (AEC) industries. As David Fano, a founding partner of CASE, explains, visitors can browse the more than 1,000 applications available, or join and contribute reviews, create a network of software applications, follow other members' profiles, receive software-update notifications, and share their own scripts and applications. Each application page provides basic information including cost, related software and plug-ins, mini-reviews, and links to the developers' websites. Visitors can also look at the software collections from other members through an "app kits" window.



A screenshot of design-technology instructor Brian Ringley's profile on AEC-Apps.com. He creates application collections for his students.

To date, AEC-Apps.com has over 1,000 members from fields such as design education, practice, management, and software development. Brian Ringley, a design-technology instructor at the New York City College of Technology, creates application collections for his students to reference. Ringley, who has himself contributed 17 reviews, also visits the site to explore new applications through the "similar apps" feature.

The site, which went live on April 15 after four months of testing, is free to use and join. It currently serves primarily as a database of design applications and member collections. However, according to Nicholas Holt, technical director of SOM's New York office, AEC-Apps.com plans to expand its capabilities, allowing members to post workflow scenarios. Workflow, which Holt refers to as "recipes," is the process of translating data between applications to achieve a specific effect or product. Holt says this feature could influence the development of future applications, providing insight to both programmers and vendors into how designers, engineers, and contractors work with various data types and applications. "The site will speak to vendors and let them know which tools we need," says Fano. "We won't need to limit ourselves to the tools that are currently out there." ■



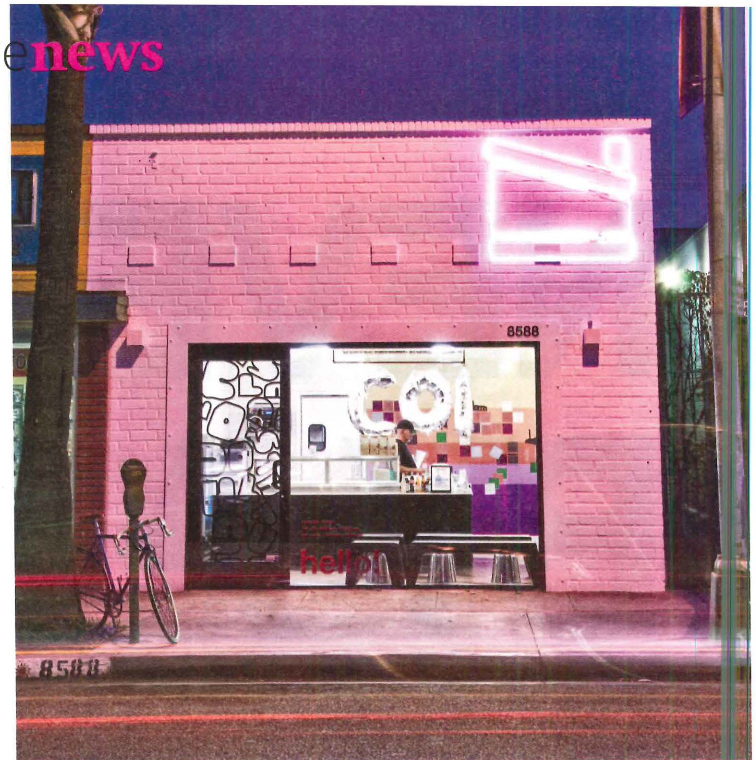
[NEWSMAKERS]

Design, Bitches

BY CARREN JAO

WHAT BEGAN as architects Catherine Johnson and Rebecca Rudolph's provocative response to the question "What is architecture?," posed by the American Institute of Architects Los Angeles chapter as part of a 2010 competition, became the ethos of the duo's collaboration: "It is design, bitches" was their answer. The SCI-Arc graduates met while working at Bestor Architecture; they established their Los Angeles practice in 2010. The pair's projects unabashedly integrate a spectrum of influences, from pop culture to fine art.

For Superba Snack Bar in Venice, California, completed in 2012, Johnson and Rudolph crossed a Parisian café with the kind of stoner-chic aesthetic seen in the 1982 movie *Fast Times at Ridgemont High*. They are currently at work on a second Superba. RECORD spoke to the architects about their projects and the philosophy that fuels their work.



In 2012, Rudolph and Johnson (from left) produced *Masters of Architecture* at L.A.'s Architecture + Design Museum, working with photographer Meiko Takechi Arquillos. They set up a photo booth that paid homage to, and poked fun at, iconic portraits of Charles and Ray Eames (left), I.M. Pei, Le Corbusier, and others. Above, the duo's permanent home for the Coolhaus ice-cream truck in Culver City.

You kept Design, Bitches as your official business name. Why is that?

Rudolph: It's sort of an alter ego. Design, Bitches is this entity that allows us to do things that as individuals we might not have the courage to do. It also allows us to be very candid with what we really think.

Johnson: The name is rooted in some of our underlying philosophies. When we wrote that architecture is "design, bitches," it made the profession seem more approachable and accessible to a larger audience.

Design, Bitches is unusual in that you are two women working together. What is important to you both?

J: This idea of a more transparent collaboration. The whole architecture with a capital A is usually focused on just one person. It's a Frank Gehry or Rem Koolhaas. We think that architecture has always been about collaboration. None of those buildings could be built or designed by one person. Working with other talented people actually creates a better end product. Why would we not want to access them and their talent and give them credit?

R: The hope is that someday there will be more people working at Design, Bitches.

How do you approach your "four wheels to four walls" projects, where you translate L.A. food trucks into brick-and-mortar shops?

J: We have this high-low inspiration. It can be very philosophical, or it could be a Beyoncé costume. At the Coolhaus shop [for an ice-cream truck with architecture-inspired flavors; Design, Bitches conceived the permanent outpost in Culver City, completed in 2011], the floating mirror balloons could reference Andy Warhol, or we just found these cool balloons and wanted to make them into signage.

R: We'll try to gather inspiration relating to the project and then pair it to create an unusual juxtaposition. The inspiration doesn't come out of nowhere–it's related to the atmosphere the client wants to create and the food they're serving.

Design, Bitches has also created branding and conceptual products for clients. How does that square with your thoughts of architecture?

R: We see architecture as not just the building or structure; it's the environment that you're creating, that people are interacting with. It could be the cup that you pick up just as much as the space itself. Straight up, it's fun to work on a variety of things.

J: Architecture can be slow-moving. It's kind of nice to have these other little bits on a faster track to keep things lively.

What projects are you working on now?

R: We're working on a bigger Superba, which will be a 4,000-square-foot multifunctional space. This one is inspired by art studios in Venice from the '80s, and also the auto-body garage that occupies the site now. We're trying to keep the large garage door on one side and have moving blankets be the fabric for the banquettes. Then on one side we'll have cedar decking and marbled tables, for a more refined look at night. We're also working on a house surrounded by the Angeles National Forest. We've been invited to participate in the Santa Barbara Contemporary Arts Forum in 2014, on an exhibition about architects doing a variety of things besides designing buildings.

Given your penchant for small insertions, what if someone asked you to design a monument?

R: [*Laughs*] We would probably subvert it a little bit.

J: Even if we were on that route, I think I would always have a love of the little slices because they're some of my favorite places in all the cities I've been to. They're the most memorable places for me.

R: We would want the design to allow for the negative space and for the unplanned to happen. ■

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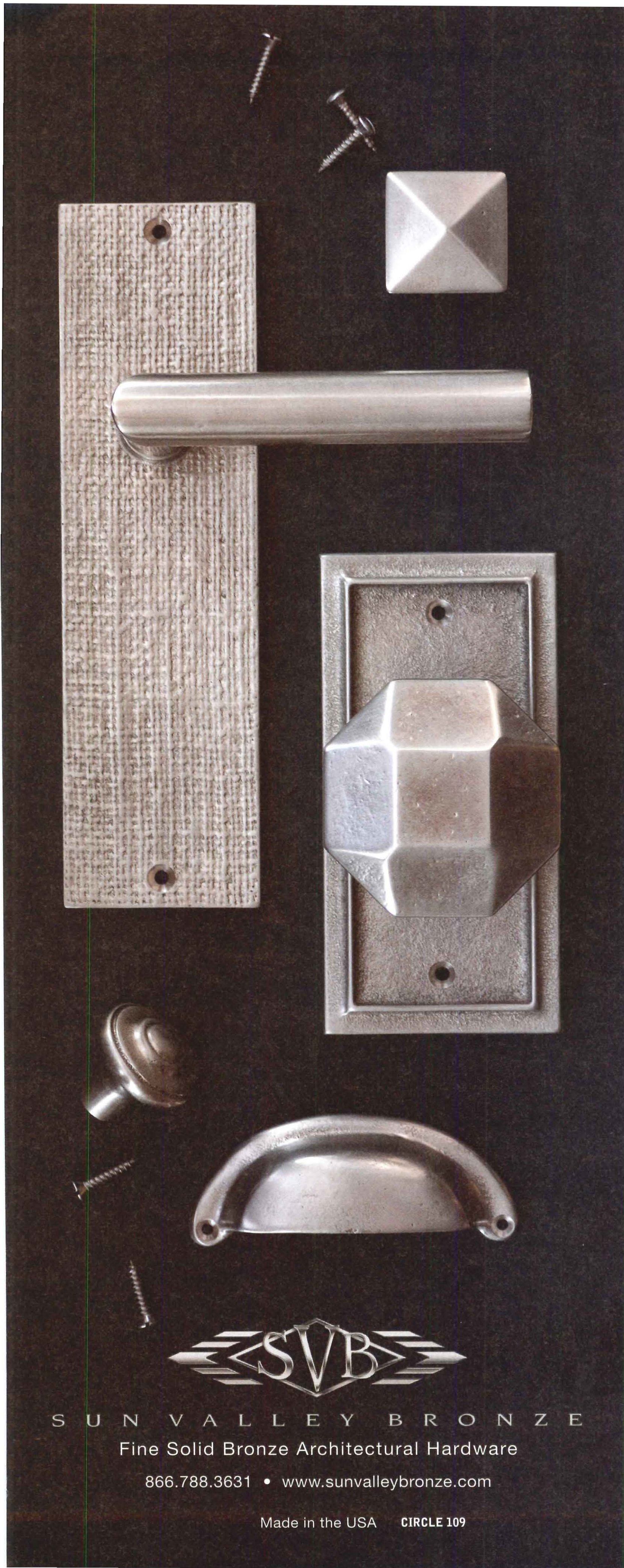


[COMMENTARY]

Glazing Over New York

BY FRED A. BERNSTEIN

NEW YORK City is reaching a tipping point, architecturally. The city has the chance to go the way of London and Paris, where carefully chosen bits of contemporary architecture enliven an urban fabric that remains largely intact, or the way of Shanghai and Dubai, where relentless repetition of glass facades leads to a numbing sameness.

Several recent developments suggest that New York, for all its attention to the built environment—and 12 years of a design-savvy mayoral administration—is choosing the latter approach, permitting continuous walls of glass to erase the city's history and leave its citizens with little to reflect on but reflections.

The place to see this happening most vividly is Astor Place, in Greenwich Village, where a new building by Fumihiko Maki is nearing completion. Maki, also the architect of Tower Four at the World Trade Center, is known for the taut elegance of his glass skins, and at Astor

Daniel Burnham's Wanamaker's building reflected in the facade of Fumihiko Maki's 51 Astor Plac

Place he has delivered just that—the freestanding building is completely covered in dark glass, causing this response from one designer whose opinion I asked: "Is that a building? I thought it was a pavilion for a Plexiglas convention." Almost entirely lacking in detail, the building offers nothing of human scale, and in a part of the city where humanity is at its most resplendent. For most of the building's perimeter, the grayish glass continues right down to the ground.

Combined with several other recent developments, it may be the last straw for Astor Place and the adjoining Cooper Square. Flanking Astor Place are a couple of 19th-century landmarks, including the Second Empire–style bank building at Seventh Street and Third Avenue, which is largely intact after more than 150 years, and Cooper Union's Foundation Building, a muscular brownstone edifice that hasn't changed substantially since Lincoln spoke in its Great Hall in 1860. And then there's the handsome Wanamaker's department-store building by Daniel Burnham (1903–07), a palazzo so self-assured that even Kmart signs can't undermine it. With so much of the past firmly established, the area could handle a little contemporary architecture—even welcome it, as the city's history continues to unfold. Indeed,

when the Sculpture for Living, a condo tower designed by Gwathmey Siegel & Associates, opened in 2005, it may have been widely ridiculed, but it wasn't sufficient to destroy the specialness of Astor Place. Neither was the arrival of the Cooper Square Hotel, an overly busy milky-glass tower by Carlos Zapata. The next big arrival, the classroom building at 41 Cooper Square by Pritzker Prize winner Thom Mayne, is so powerful, architecturally, it actually enhanced the sense of place—something contemporary architecture, like any architecture at its best, can do.

But then came two disasters. First was the demolition in 2011 of a modest brick house at 35 Cooper Square, which served as a kind of buffer between the Zapata and Mayne buildings. Built in 1825 by a descendant of Peter Stuyvesant, with Federal-style detailing, it had an importance, in tying the neighborhood to its past, far out of proportion to its size. It will soon be replaced by a nine-story dormitory building.

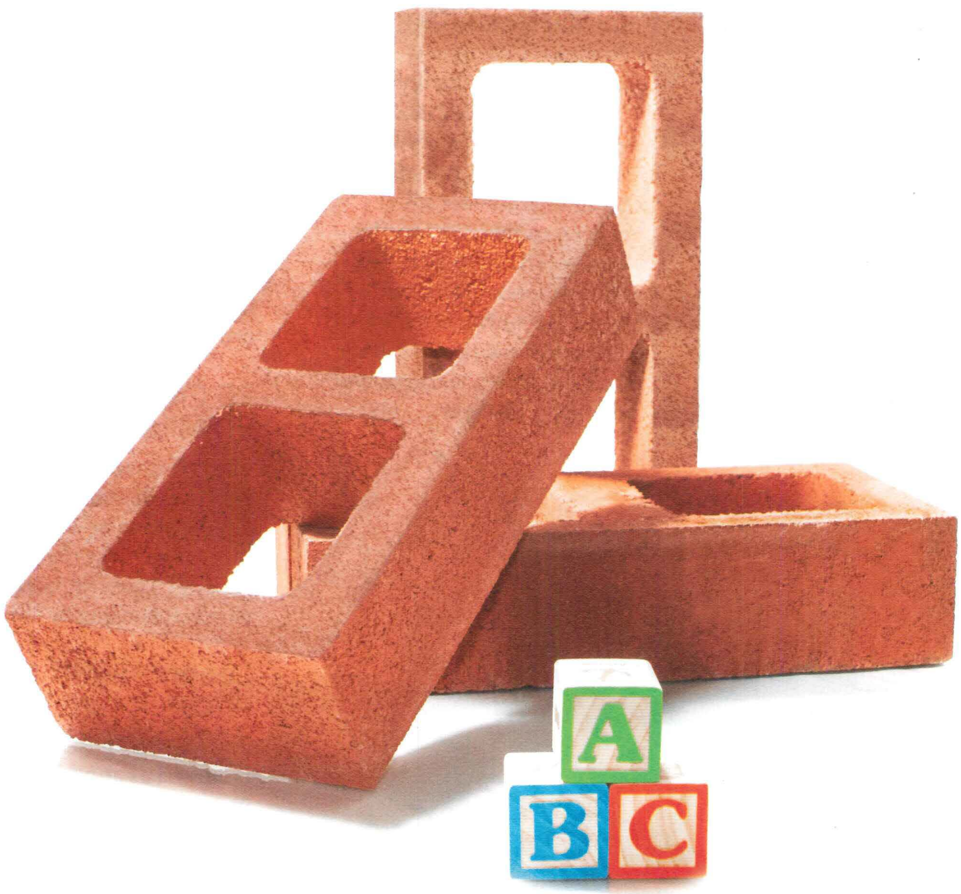
Next came the Maki building, on Cooper Union land leased to a private developer, Edward Minskoff. (The school, facing financial difficulties, announced in April that, for the first time in more than 100 years, it will begin charging undergraduate tuition.) No one laments the loss of the beige-brick building Minskoff tore down, yet beige brick was a more thoughtful choice for the location than Maki's Mylar-like facade. Perhaps the interiors of the new 51 Astor Place will be spectacular, but most New Yorkers will never get inside. What they'll see outside is something that seems almost to mock the history of the area by reflecting the earlier buildings without adding anything to the mix. People come to cities for variety and stimulation; asking them to love a blank glass box is like asking a pet lover to adopt a shiny Jeff Koons dog.

Mirrored surfaces offer nothing but reflections, and New Yorkers deserve a bit more to look at than themselves

It is happening in other parts of Manhattan, including Broadway and 57th Street, where the recladding of the magnificent 1928 building by Shreve and Lamb now called 3 Columbus Circle was a huge loss. Meanwhile, the city is preparing to "upzone" parts of the business district around Grand Central Terminal, which would encourage glass-and-steel behemoths in place of many of the existing brick and stone office buildings. And it is pushing the development of a giant office park over Hudson Yards—which William Menking, editor of the *Architect's Newspaper*, described as "likely to be the most corporatized landscape this city has ever seen." At the same time, it is allowing NYU to fill in huge parts of Greenwich Village south of Washington Square Park with what, in current renderings, are huge glass edifices.

Of course, some of New York's best buildings are glass; the startlingly beautiful Seagram Building is at the top of nearly every list of architectural masterpieces. But even Mies van der Rohe, the progenitor of the glass-skinned building, was profoundly influenced by context. Would he ever have built Seagram the way he did if the surrounding structures had been glass towers, rather than the stolid masonry buildings that flanked it at the time? Unlikely. Phyllis Lambert, who selected Mies for Seagram and struggled to get it built to his specifications, has also worked much of her life to save the historic limestone facades of her native Montreal from the onslaught of mediocre Mies-inspired buildings. The point is that it takes both old and new, working in concert, to keep a city from becoming a suburban office park. This isn't a screed against contemporary architecture. If the trend toward placing featureless glass boxes in pedestrian-heavy spots like Astor Place continues, it is the reputation of contemporary architecture that will suffer most. ■

SOME CHOICES JUST DON'T STACK UP



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CIRCLE 129

perspective**news**

On the Boards

Jan Shrem and Maria Manetti Shrem Museum of Art, University of California, Davis
SO–IL
Davis, California

SO–IL is working with Bohlin Cywinski Jackson and contractor Whiting-Turner on the 29,000-square-foot museum, which features curved glass walls and an illuminated 50,000-square-foot steel canopy connecting interior spaces and courtyards. The $30 million building will house the university's fine-art collection and provide space for exhibitions, lectures, and studio art classes.

Glenstone Expansion
Thomas Phifer and Partners
Potomac, Maryland

Founded in 2006 by Emily Wei Rales and Mitchell Rales, Glenstone is a private collection of post–World War II art open to the public on 200 acres in Potomac, Maryland. Its first exhibition building was designed by Charles Gwathmey. Now a 150,000-square-foot expansion by Thomas Phifer and Partners is under way: a series of discrete concrete pavilions—each devoted to a single artist—set into a landscape design by Peter Walker. It is expected to be completed in 2016.

Arriyadh Metro Station
Snøhetta
Riyadh, Saudi Arabia

Now that Saudi Arabia is building its first-ever subway system, with six lines and 108 miles of track, it needs metro stations. In April, Snøhetta's design was selected for the signature downtown stop. A polished stainless steel canopy shades the limestone pedestrian plaza and acts as a periscope, reflecting daylight into the subterranean station.

noted

CityAge Conference Hosts Conversations on Global Metropolis

New York University hosts the CityAge conference June 18–19. Billing itself as a "platform for dialogue designed to amplify new ideas in business, government, and society," it features talks by KPF principal Jill Lerner and author Andrew Blum.

Library of Congress Announces Drawing Prize

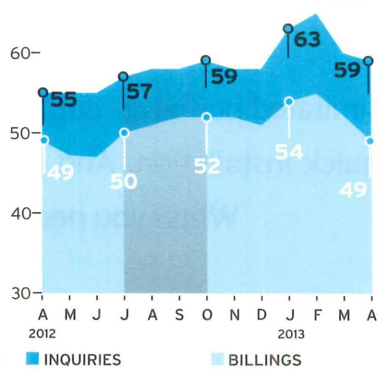
The 2011 and 2012 Leicester B. Holland prizes for the best measured drawing of a historic building go to Thad Heckman, an architectural-studies instructor at Southern Illinois University, and Laura Beth Ingle, an architectural historian in Chattanooga (see drawings on architecturalrecord.com).

20 Projects Short-Listed for $1 Million Aga Khan Award

The Aga Khan master jury announced on April 30 the short list of nominees for the 2013 prize, to be selected in September. The list includes the Museum of Handcraft Paper by Trace Architecture Office and post-tsunami housing by Shigeru Ban Architects.

Cooper-Hewitt Names Design Award Winners

Cooper-Hewitt, National Design Museum, bestowed its annual awards in May. Winners include James Wines of the architecture studio SITE; Michael Sorkin, architect and critic (and RECORD contributor); Jeanne Gang of Studio Gang Architects; landscape architect Margie Ruddick; and Aidlin Darling Design.



ABI Lowest Since July 2012

After months of increased demand for design services, the Architecture Billings Index (ABI) dipped below 50 for a score of 48.6 in April. "Project-approval delays are having an adverse effect on the industry," says AIA chief economist Kermit Baker, "but again and again we are hearing that it is extremely difficult to obtain financing to move forward on real-estate projects."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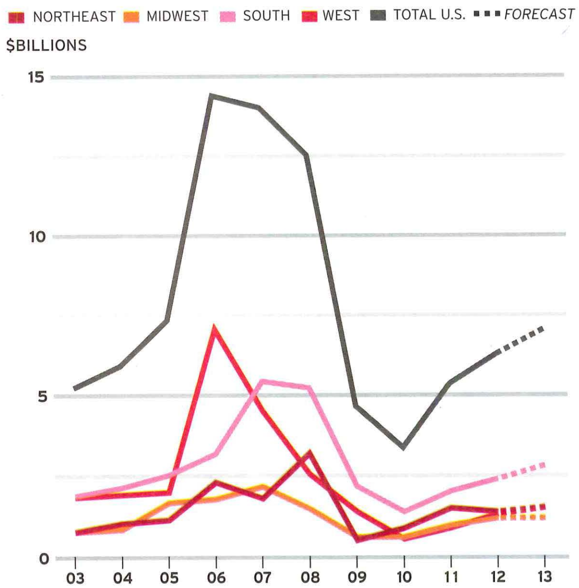
MARKET FOCUS
HOTELS

Hotel construction starts dropped precipitously during the recession. But now they are on the rebound, buoyed by consumers' increased willingness to travel, falling vacancy rates, and rising room rates.

Hotel Starts by Region

In addition to U.S. total and 2013 forecast figures



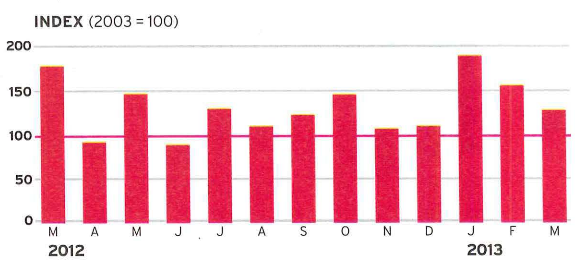
Top Metro-Area Markets

Ranked by total hotel starts 1/2012 through 3/2013

	REGION	$MILLIONS
1	NEW YORK CITY	1,106
2	ORLANDO	484
3	DENVER	370
4	CHICAGO	367
5	MIAMI	350

Downtown, Mexico City; CheremSerrano (page 238)

The Dodge Index for Hotel Construction 3/2012 – 3/2013



The index is based on seasonally adjusted data for U.S. hotel construction starts. The average dollar value of projects in 2003 serves as the index baseline.

Top 5 Design Firms

Ranked by hotel construction starts 1/2011 through 3/2013

1. **HKS**
2. **Cooper Carry**
3. **Gensler**
4. **Lindsay Pope Brayfield Clifford & Associates**
5. **Nobutaka Ashihara Architect**

Top 5 Projects

Ranked by hotel construction starts 1/2012 through 3/2013

$250 MILLION

PROJECT: Cabana Bay Beach Resort Hotel
ARCHITECT: Lindsay Pope Brayfield Clifford & Associates
LOCATION: Orlando

$189 MILLION

PROJECT: JW Marriott
ARCHITECT: HKS
LOCATION: Austin, TX

$183 MILLION

PROJECT: Westin Denver International Airport
ARCHITECT: Gensler
LOCATION: Denver

$180 MILLION

PROJECT: Four Seasons Resort Orlando at Walt Disney World
ARCHITECT: HKS
LOCATION: Lake Buena Vista, FL

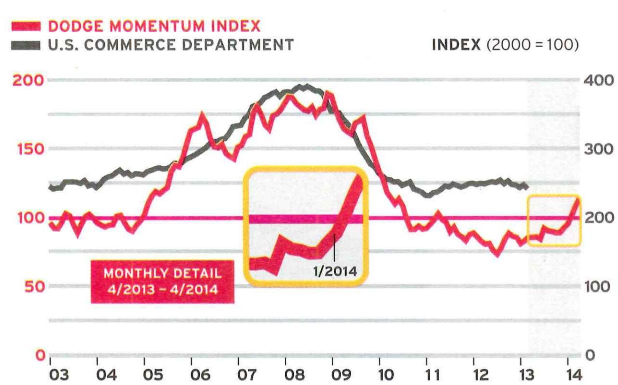
$165 MILLION

PROJECT: Ameristar Casino Resort
ARCHITECT: Bergman Walls & Associates
LOCATION: Lake Charles, LA

MOMENTUM INDEX'S RISE SHOWS STAYING POWER

After stalling last fall, the Dodge Momentum Index has been steadily rising. April's 5.2% advance—the fifth consecutive gain—brings the index to 114.4, its highest level since mid-2009.

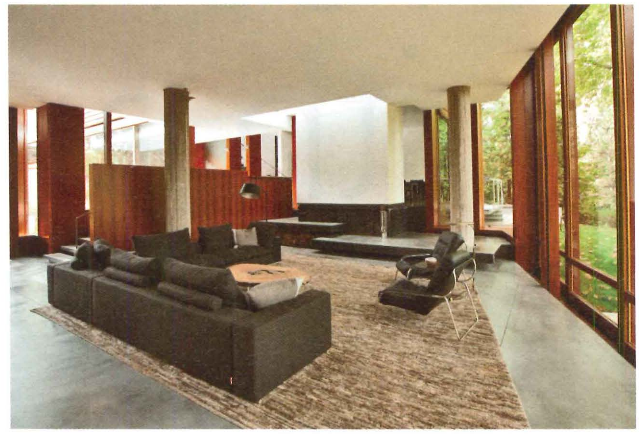
The Dodge Momentum Index is a leading indicator of construction spending. The information is derived from first-issued planning reports in McGraw Hill Construction's Dodge Reports database. The data leads the U.S. Commerce Department's nonresidential spending by a full year. In the graph to the right,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



McGraw Hill Dodge Analytics tracks projects from predesign through construction to capture hard construction costs, square footage, and other key statistical information. The top projects are ranked on the basis of hard construction costs for stand-alone hotels and the hotel portions of mixed-use developments.

perspective house of the month

SHIM-SUTCLIFFE ARCHITECTS' "HOUSE ON RAVINE EDGE" IS A SERIES OF LOW PAVILIONS THAT MAKE THE MOST OF TORONTO'S UNUSUAL TERRAIN. BY LAURA RASKIN



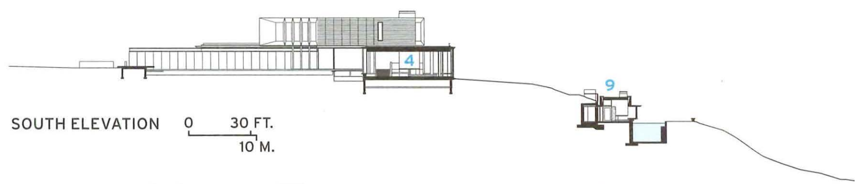
Powder-coated-aluminum panels animate a corner of the top floor and contrast with the adjacent clapboardlike weathered-steel cladding (left and inset). A freestanding mahogany partition directs visitors into the living room (above). A board-formed-concrete retaining wall and stair lead to the pool house (below).

SOMETIMES CALLED "the city within a park," Toronto is known for its ravine system—natural river valleys that create urban oases. At the edge of one of these forested pits, Toronto-based Shim-Sutcliffe Architects used an intimate understanding of the terrain to design a single-family residence of Wrightean pavilions clad in weathered steel and green, powder-coated-aluminum panels. "The house and the pool house are part of a journey from the city to this natural area," says architect Brigitte Shim.

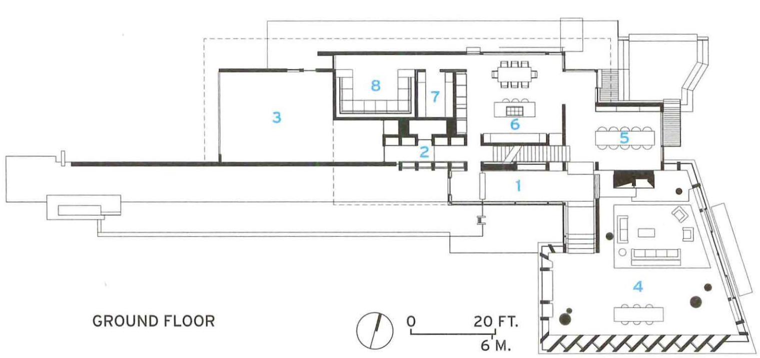
After visitors arrive in the driveway, a long weathered-steel wall to the left and narrow koi pond to the right guide them to the covered entrance canopy. The canopy is partially clad in geometric green panels that screen a bedroom window. (The material palette is one the architects like—they used it on an assisted-living facility for a congregation of nuns, which recently opened in Toronto.)

The extensively glass-walled ground floor contains a living room with mahogany fins along the south elevation that offer privacy while maintaining a view. Here, a poured-in-place-concrete floor and columns contrast with the delicate custom stainless steel uplights.

Outside, the site slopes down to a pool house with a weathered-steel green roof that floats above a wood deck and fireplace, creating an outdoor room. "Even though it's a new house, it feels like it's been there a really long time," says Shim. ■



SOUTH ELEVATION 0 30 FT. 10 M.



GROUND FLOOR 0 20 FT. 6 M.

1 ENTRY HALL
2 GARAGE ENTRY
3 GARAGE
4 LIVING ROOM
5 DINING ROOM
6 KITCHEN
7 PANTRY
8 FAMILY ROOM
9 POOL HOUSE

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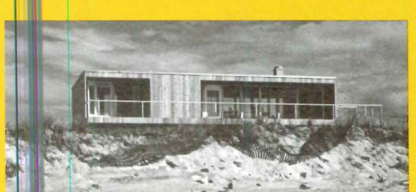

The answer to the May issue's *Guess the Architect* is **RICHARD MEIER,** who completed the Lambert House on Fire Island, New York, in 1962. For more details, including the winner, go to archrecord.com.

By entering, you have a chance to win a video camera.
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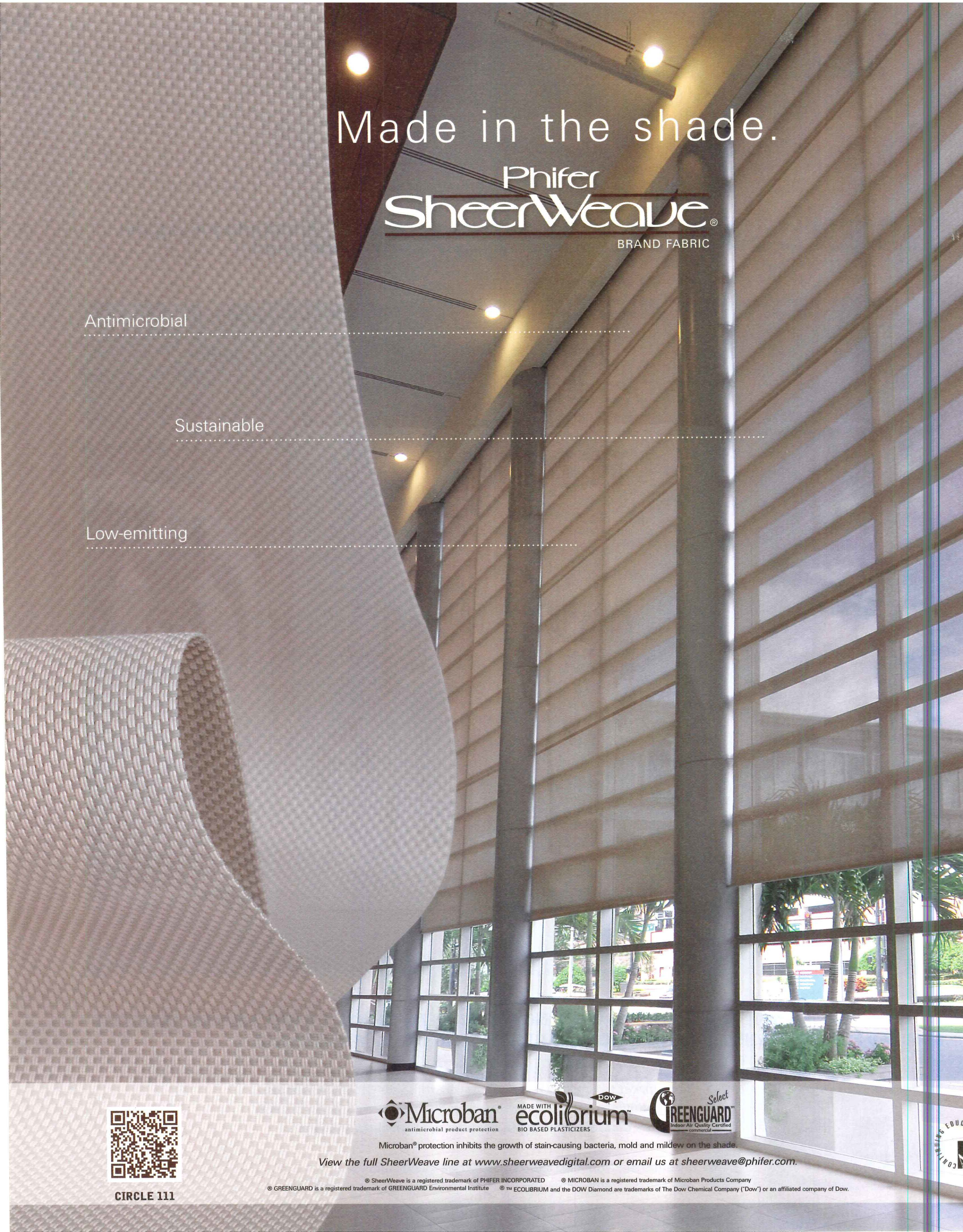
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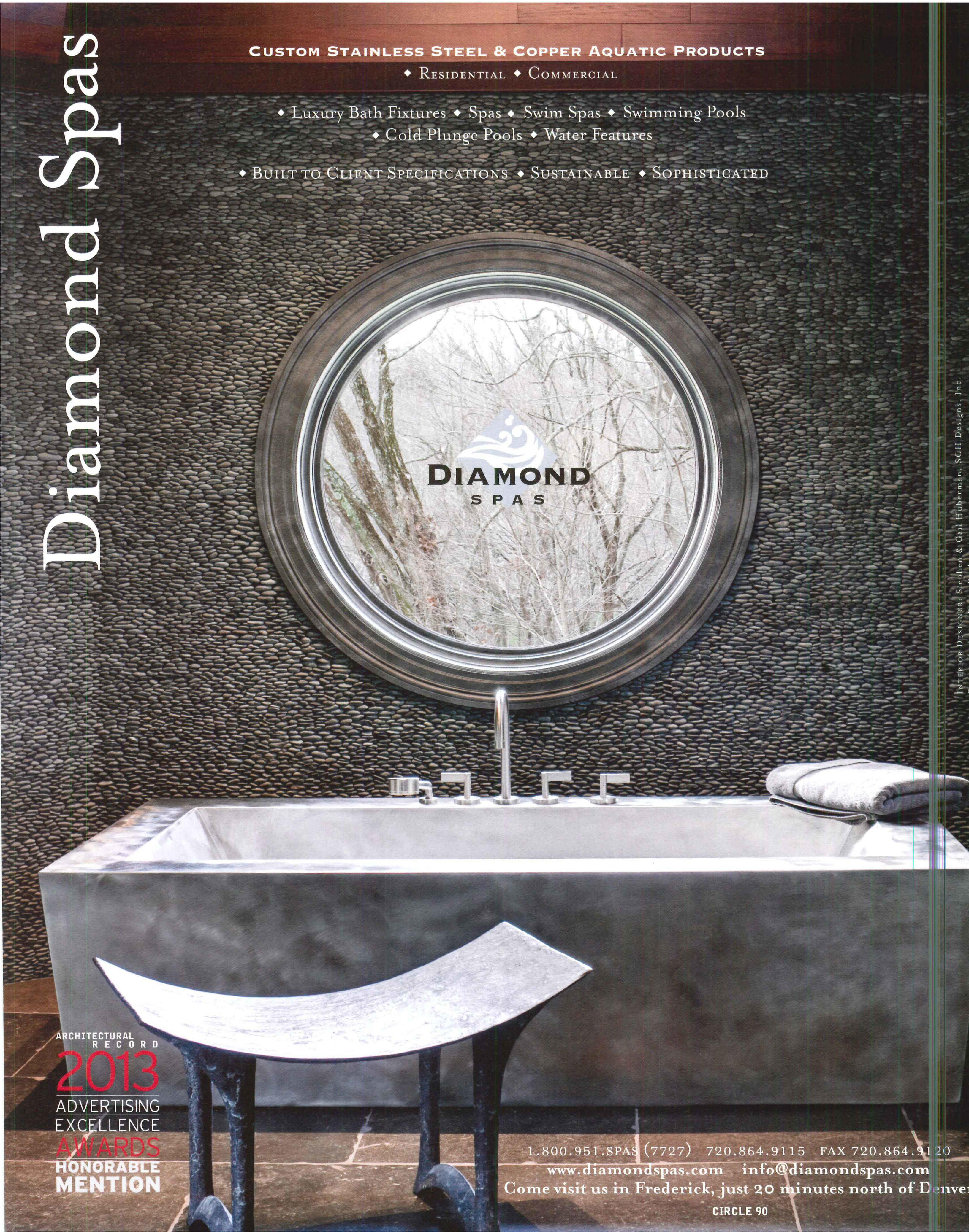
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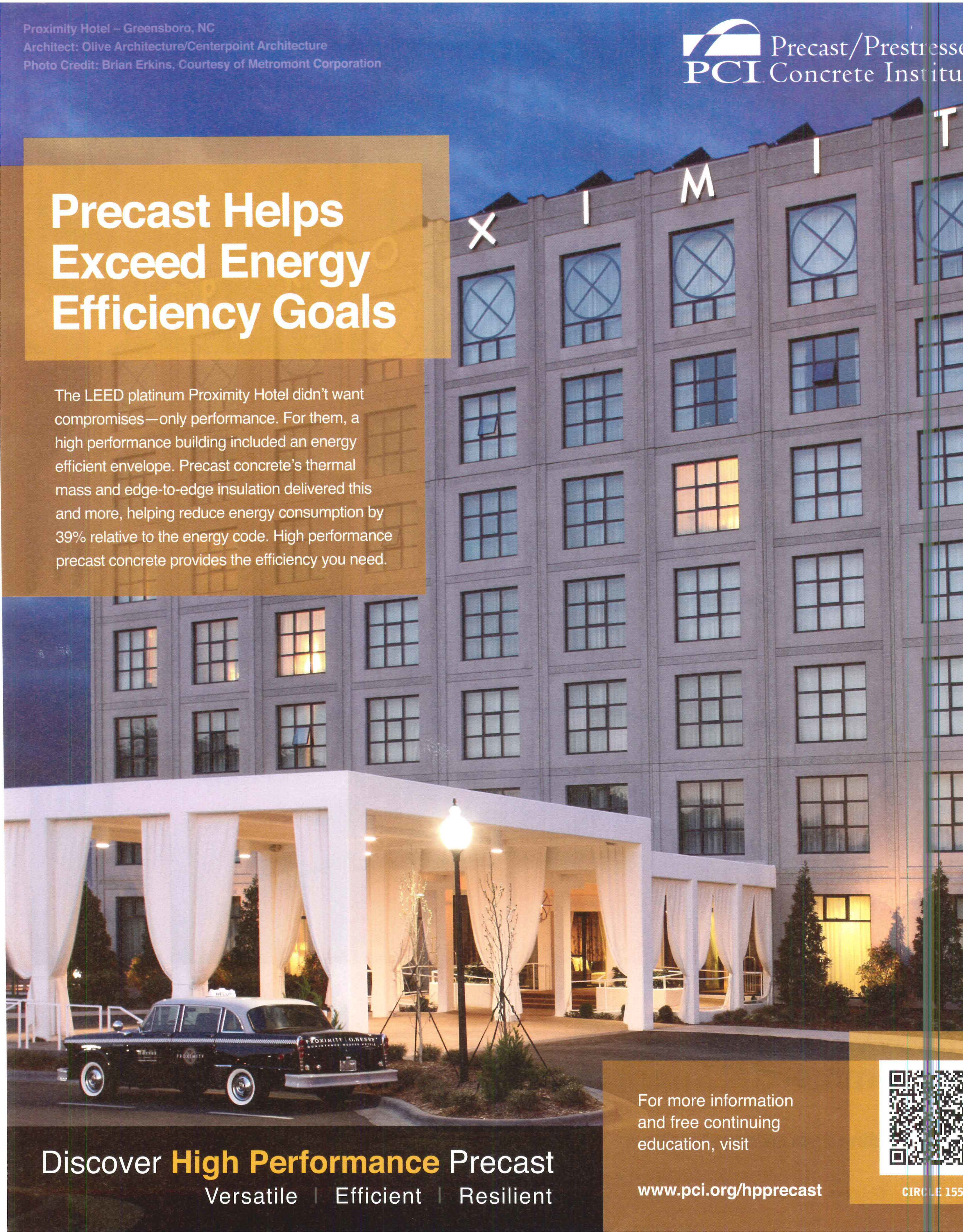

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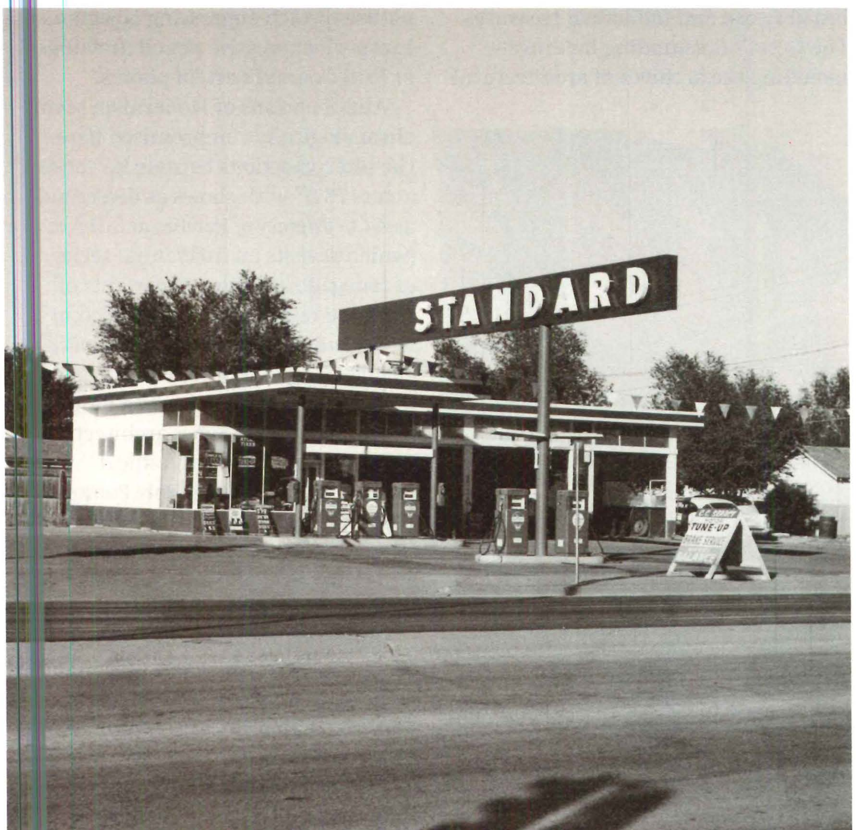
L.A.'s Future in the Rearview Mirror

The Getty wrangles a herd of exhibitions on postwar architecture and design.

BY SARAH AMELAR



IN A KEYNOTE address at the University of Southern California in 1940, Frank Lloyd Wright dismissed the built environment of Los Angeles as amounting to little more than a "dish of tripe." But even without the notable houses he'd built there himself, the city's unfolding architectural saga was already more complex and, in some respects, more appealing than a dollop of offal. And over the next half-century, L.A.'s rapid evolution would produce enough fare—both loathsome and savory—to merit *Pacific Standard Time Presents: Modern Architecture in L.A.*, a Getty-sponsored collaboration with exhibitions and events at 17 venues across the region this spring and summer.

In 2011 and 2012, *Pacific Standard Time: Art in L.A. 1945–1980* engaged 60 cultural institutions to explore the emergence of the city's art scene in the decades after World War II (RECORD, November 2011, page 36). Naturally, design played a role. But in the second act, architecture is now the focus. With it comes the perpetual conundrum of how to create vital and meaningful exhibitions about buildings, urban conditions, and works far too large or impractical to display in galleries. The responses to this familiar dilemma are as varied as the shows, their subject matter, and their venues.

Like *PST*, with its panoramic though spotty overview of art, *PSTP* is (by design) a loose potpourri of exhibitions and events. Without imposing a unifying approach, the Getty has embraced cultural institutions of vastly different scales, missions, personalities, and holdings—for installations ranging from single-architect retrospectives (featuring, for example, A. Quincy Jones at UCLA's Hammer Museum) to grand surveys, such as *Overdrive: L.A. Constructs the Future, 1940–1990*, at the Getty Center and *A New Sculpturalism: Contemporary Architecture from Southern California* at the Museum of Contemporary Art, a show that faces possible cancellation (see page 31). The mix also includes an exhibition of Ed Ruscha's depictions of Standard gas stations (at the Getty) and others that are themed or entirely unconventional. For example, in *As He Remembered It*, at the Los Angeles County Museum of Art (LACMA), artist Stephen Prina re-creates, in hot pink, the built-ins from two now-demolished R.M. Schindler houses. Quirky and conceptual, this spatial disconnect questions the site-specificity of Los Angeles Modernism.

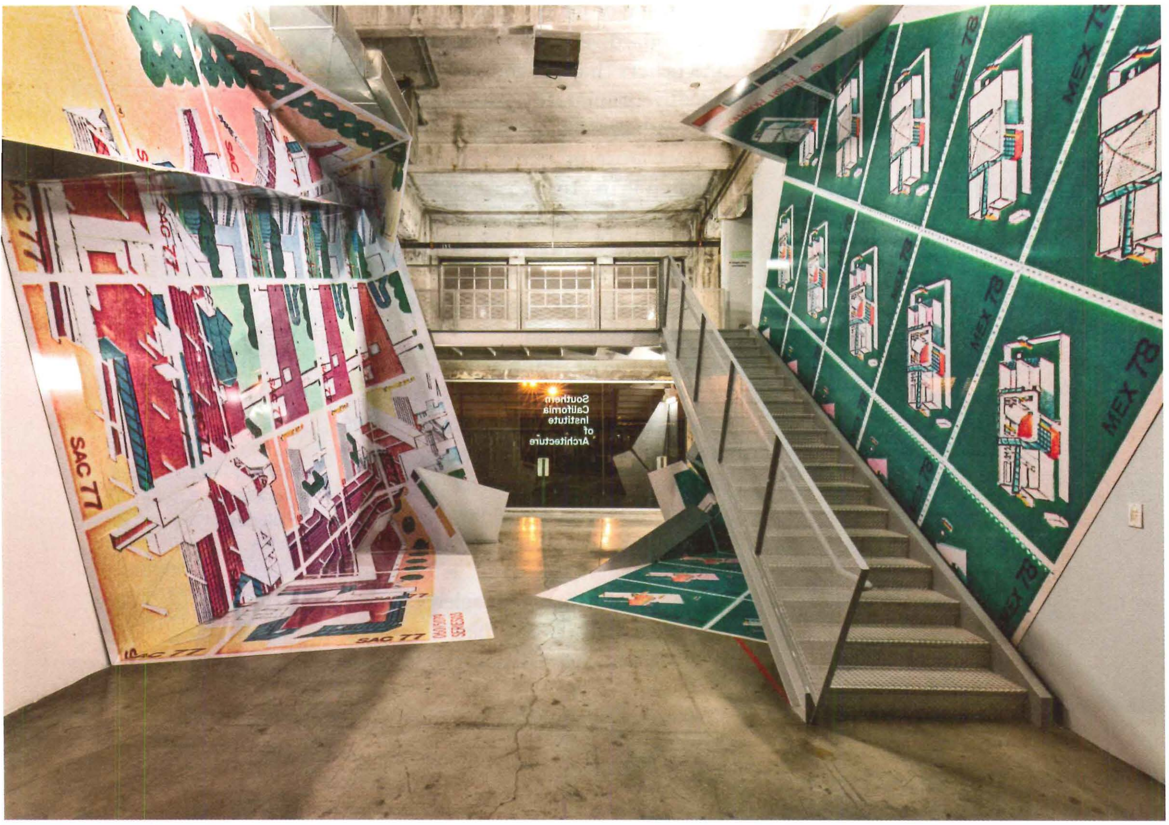
But *Overdrive*, implicitly the framework for all the other shows, is perhaps not unconventional enough. With 400-plus objects compartmentalized into a series of didactic categories, it's like reading an essay where you can practically see the stiff, underlying outline, with its Roman numerals, letters, and enumerated lists. The labeled categories—"Car Culture"; "Urban Networks" (dealing with infrastructure); "Engines

At the Getty, a show of work by Ed Ruscha includes a 1962 photo (left); another exhibition, *Overdrive*, looks at categories such as "Car Culture" and "Engines of Innovation" (below).

The show at SCI-Arc reproduces mock stamps created by Morphosis in 1979 (below); the one at Cal Poly Pomona looks at the postwar house in Southern California (bottom).

of Innovation" (local "industries" like oil, aerospace, higher education, and entertainment); "Community Magnets" (a catch-all for museums, sports stadiums, religious centers, and Disneyland); and "Residential Fabric"—are far-reaching but encapsulate almost every cliché about this sprawling city. And the time frame of 1940 to 1990 seems questionable, if not arbitrary; Southern California's brand of architectural Modernism emerged decades earlier, in the work of Irving Gill, Schindler, Richard Neutra, and others, and had run its course long before 1990.

Even with these significant shortcomings, the show's strength lies in its broad sweep and individual treasures. The Getty's outstanding holdings—including the archives of architectural photographer Julius Shulman and architects John Lautner, Ray Kappe, and Pierre Koenig—are well represented, as are many less expected sources, like transportation-agency holdings. So it's worth looking past the exhibition's tedious and often unimaginative nature to such engrossing objects as Lautner's expressive pencil drawings or Will Connell's artful photos.



And if notions of Modernism seem chronologically compromised here, the interpretations become far looser across *PSTP*, with shows as divergent as *A Confederacy of Heretics* at SCI-Arc (which revisits an influential series of renegade architectural events of 1979; see review at archrecord.com/news) and *The Presence of the Past: Peter Zumthor Reconsiders LACMA*. The latter lets LACMA examine its own buildings, making a case for Swiss architect Zumthor's scheme for a radical transformation. At Cal Poly Pomona, *Technology and Environment: The Postwar House in Southern California* revisits Mid-Century Modern classics with 21st-century sustainability analysis.

One intriguing-sounding show (not yet open when this article went to press) is the MAK Center's *Everything Loose Will Land*. Exploring cross-pollination between architecture and art, it takes its title from another of Wright's barbs about the city: "Tip the world over on its side and everything loose will land in Los Angeles." A lot has landed in *PSTP*—and, despite some bits of tripe, there's much worth savoring. ■

Fifty Years Later, Still Scandalizing the Neighbors

What Le Corbusier's only realized project in North America says to us today.

BY BLAIR KAMIN

HOW FAST the radical present becomes the historical past. This new-is-old transformation has struck again at Le Corbusier's Carpenter Center for the Visual Arts at Harvard. The boldly sculpted reinforced-concrete building, the architect's only realized project in North America and one of the final commissions before his death in 1965, turned 50 on May 28, two weeks before New York's Museum of Modern Art would open its first major exhibition on the Swiss-born leader of the Modern movement. While time has proved the Carpenter Center's worth and influence, it has underscored old shortcomings and bared new ones. To mark the anniversary, Harvard displayed fresh material that revealed the genesis of this utterly unconventional five-story structure.

"Dear Corbu," the dean of Harvard's Graduate School of Design (GSD), Josep Lluís Sert, wrote on January 23, 1957, urging his former employer to visit the United States. Harvard, Sert said, "can guarantee a grand reception; and from that there are chances that other things may develop." That letter grew from a 1956 Harvard report on the visual arts and Sert's desire to have Le Corbusier, fresh off the triumphant opening of Ronchamp chapel,

The center's iconic ramp is wonderful to walk on, but a drag from below. And the landscape is merely a leftover space.

Time has done little to soften the sharp edge of the building's parachute-in urbanism or its deliberately provocative exterior.

fulfill the report's vision of an innovative, interdisciplinary arts hub. The exchange led to a building that, for better and worse, presaged the global trend of "starchitecture." With its slender pilotis, angled brises-soleil, and a diagonal pedestrian ramp that cleaved the structure and cracked open views onto flanking art studios and a wood shop, the Carpenter Center was unmistakably Le Corbusier's. And that remains its strength and its weakness.

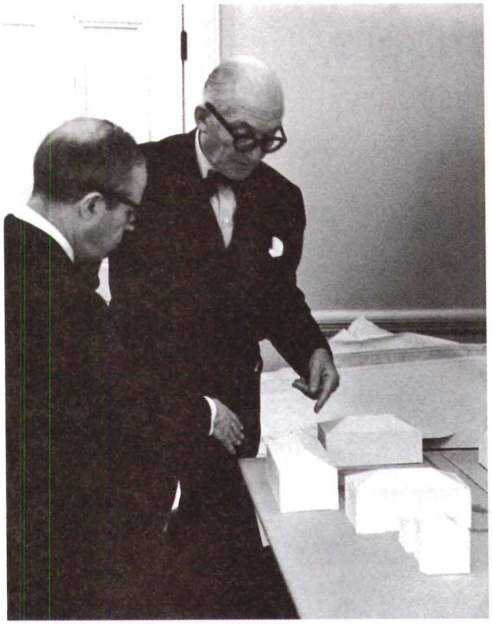
"It has been said that Le Corbusier's buildings violate the street, and this one violates the street and scandalizes the neighborhood," *New York Times* critic Ada Louise Huxtable wrote on May 28, 1963, the day of the building's dedication. "At the same time, the new building manages to make everything around it look stolid and stale."

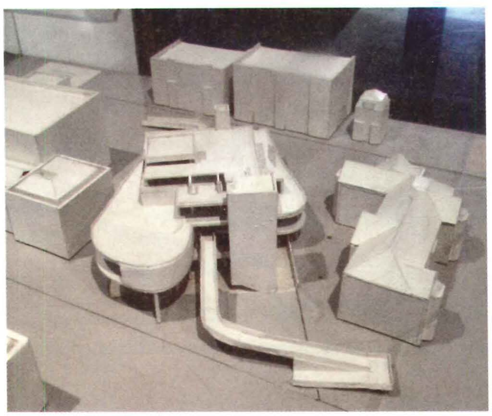
The center's problematic presence has its roots in the conflict between a tight site just outside Harvard Yard and the building's expansive program, which put painting, drawing, sculpture, exhibition space, film, and photography under a single roof. Concern over this tension surfaced early on, as we learn from a small but illuminating GSD show, *VAC BOS* (the architect's shorthand for Visual Arts Center, Boston)*: The GSD and the Making of Le Corbusier's Carpenter Center,* curated by Peter Christensen, which recently closed.

An August 31, 1960, letter from Sert warned Le Corbusier that Harvard's leaders were fretting that the building "too amply fills the site." The letter proposed a series of tweaks, among them rotating the plan to comply with local setback mandates and altering the ramp so it would not crowd the adjoining Harvard Faculty Club. Le Corbusier accepted these suggestions, though he rejected another: that he mollify traditionalists by using brick as a paving material.

The presentation drawings that accompany these records are artful relics of the pre-parametric age, rendered in light pastels that communicate with sophisticated ease such elemental Corbusian concepts as the free floor plan and facade.

Yet time has done little to soften the sharp edge of the $1.5 million building's parachute-in urbanism or a deliberately provocative exterior that thumbs its nose at its polite Georgian Revival neighbors. The center remains awkwardly wedged between the Fogg Museum of Art and the Faculty Club, exhibiting what Huxtable rightly termed an "overbusy profusion of elements" that produced "a kind of visual nervous indigestion." The grassy stretch beneath the ramp is a residual nonplace, while the subterranean courtyard, rimmed with dull gray gravel, is every bit as off-putting as it was 50 years ago—in Huxtable's cutting words, "more like a prisoner's exercise yard than an aesthetic retreat." Surface parking





Sert (left in top photo), who had worked for Le Corbusier (to his right) before becoming the head of Harvard's GSD, helped his mentor get the Carpenter job. Above, the building sits between the Fogg Museum (left in photo) and the Faculty Club (right in photo). At right, the center under construction as seen from Prescott Street.

spaces mar the building's eastern entrance, a miniature version of Le Corbusier's "towers in a park" becoming "towers in a parking lot." Only three years later, Robert Venturi's *Complexity and Contradiction in Architecture* would chart an alternative path, one far more accepting of the rich ambiguity of the modern city.

The ramp and the interior are the center's saving graces. The former electrifyingly lifts the visitor above Harvard Yard and allows views into the "deep space" of the building's studios. The art students and the process of making art are surprisingly showcased, the distinction between inside and outside winningly dissolved. The ramp, often accused of being a useless display of architectural virtuosity, should finally get more everyday traffic after the planned reopening of the Fogg Museum in fall 2014. As part of that project by Renzo Piano, the ramp's redesigned east end will lead to the Fogg's new east entrance and be extended all the way to Broadway, a major arterial street.

Most of the students and teachers I spoke with on a recent visit praised the handsomely proportioned, flexible studio spaces and the effectiveness of the brises-soleil in creating soft daylight conducive to their work. "If we didn't have all these [track] lights on, the natural light would still be amazing," said Harvard senior Nina Khosrowsalafi. The building, she added, offers a refreshing change from the typical "Harvardian" red-brick box.

Administrators contend that the building's see-through design has helped foster the original goal of interdisciplinary communication. "I think that works beautifully," said David Rodowick, the center's outgoing director.

Yet in this pampered age of creature comforts, complaints about the center's almost monastic austerity (it was finished three years after Le Corbusier's monastery at La Tourette) surface quickly. There is only one men's bathroom, and it's inconveniently located in the basement. The ramp is too steep to be wheelchair-accessible, though the rest of the building, according to Rodowick, is ADA-compliant. Students say they had to wear coats inside during one particularly fierce cold snap last winter. The original HVAC system, Rodowick acknowledges, needs to be replaced. The building's upper floors, which lack air-conditioning (Le Corbusier blamed air-conditioning for the prevalence of sinus problems in the U.S.), get so hot in summer that floors four and five are not used for classes at that time. Le Corbusier's prediction that the building would be cooled by the brises-soleil and tall, narrow operable windows did not pan out. Another unexpected outcome: the all-encompassing concrete is acoustically unsuited to art accompanied by sound.

Even so, these faults do not diminish the Carpenter Center's enduring architectural quality—its smooth, precisely honed concrete is a pleasure to see and touch, in contrast to the rip-your-skin "corduroy" concrete of Yale's Paul Rudolph Hall. Nor have the faults diminished the center's significant influence on both Harvard and American campus design. Here, for the first time, the university reached overseas for a global star and lent its imprimatur to his still-unconventional approach. That opened the door for a wide range of monumental essays in concrete, including the powerful, now beaten-down Boston City Hall of 1968 and the GSD's urbanistically responsive Gund Hall, which followed a year later.

If, as Huxtable concluded, the Carpenter Center is not Le Corbusier's best work, it is nonetheless the best chance Americans have to see that work firsthand—and to learn afresh from both its triumphs and ongoing troubles. ■

Contributing editor Blair Kamin is the Chicago Tribune*'s architecture critic and was a 2013 Nieman Fellow at Harvard.*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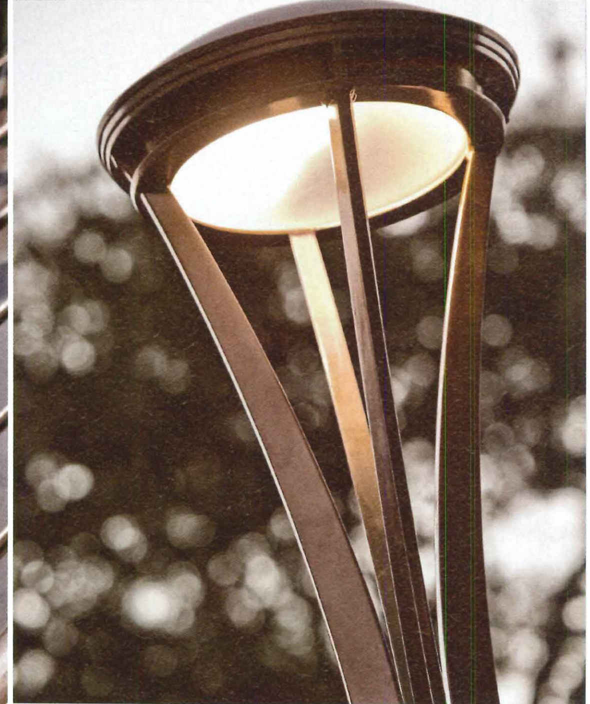


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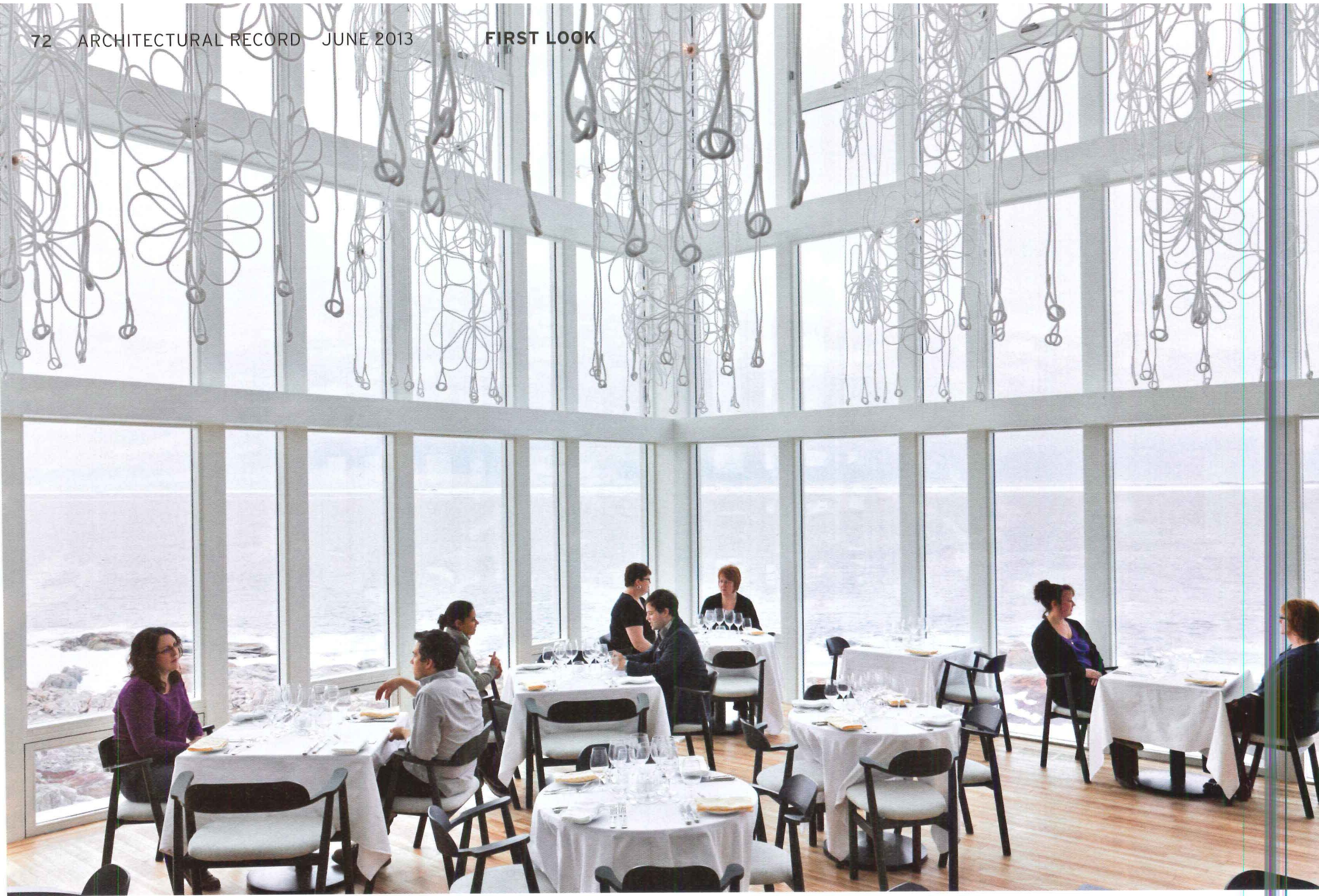
TREADING LIGHTLY
Like many local houses, the Fogo Island Inn sits on piles ("shores," in local parlance) to reduce its impact on the land (left). Zita Cobb, who started Shorefast, worked in high tech, then returned home to Fogo. A four-story block with guest rooms intersects a two-story wing with a dining room, library, bar, and art gallery (above).

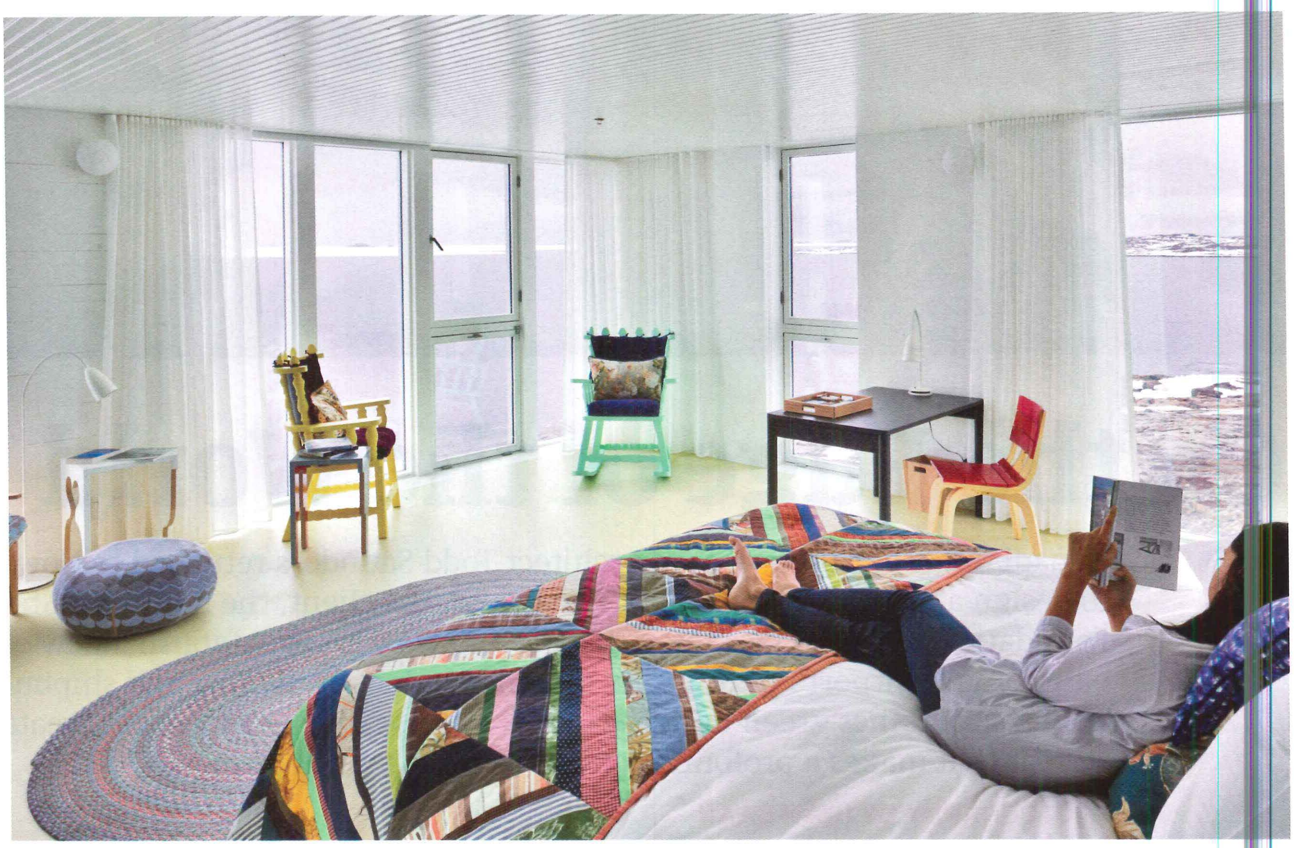
On the Edge of the World

Canadian-born, Norway-based architect Todd Saunders returned to Newfoundland to design a 29-room inn on tiny Fogo Island. His client, the nonprofit Shorefast Foundation, employs local craftspeople and workers to establish a new economic base for an "outport" community once dependent on fishing and shipbuilding. The inn combines green-design strategies and vernacular forms to create a dramatic retreat that makes a profound connection to a rugged place.

PHOTOGRAPHY BY IWAN BAAN



WATER VIEWS
Triple-glazed, argon-filled windows and heavy insulation keep the dining room (above) and other interior spaces comfortable in the 40,000-square-foot inn. The steel-frame, concrete-slab structure (opposite) is heated by wood-burning boilers, taking advantage of a local resource. Solar panels on the roof of the inn and an adjacent services building supplement energy from the grid. Designers from North America and Europe worked with Fogo craftspeople to create furnishings for the guest rooms (right) and other interiors. "Strange and familiar" is a common local expression, says Saunders. "And we tried to capture that here."



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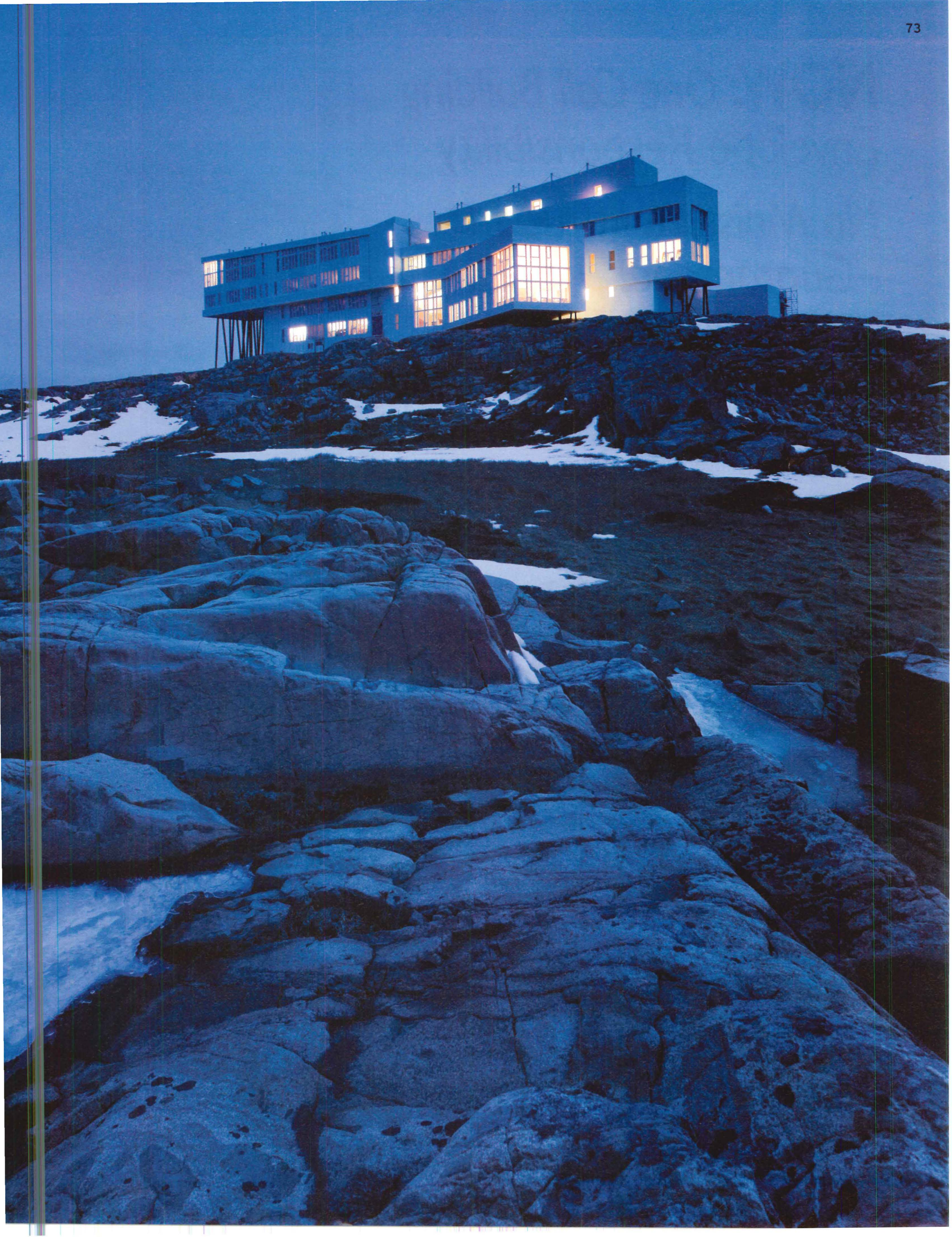

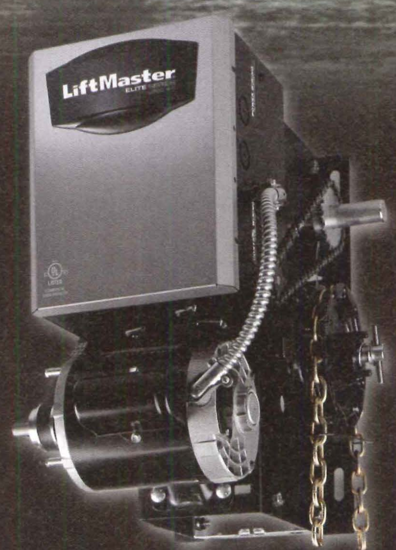
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The Maestro's New House

After a decade of hotly contested design and construction, conductor Valery Gergiev's opera house thrills audiences amid ongoing discord.

BY JUSTIN DAVIDSON **PHOTOGRAPHY BY TIM GRIFFITH**

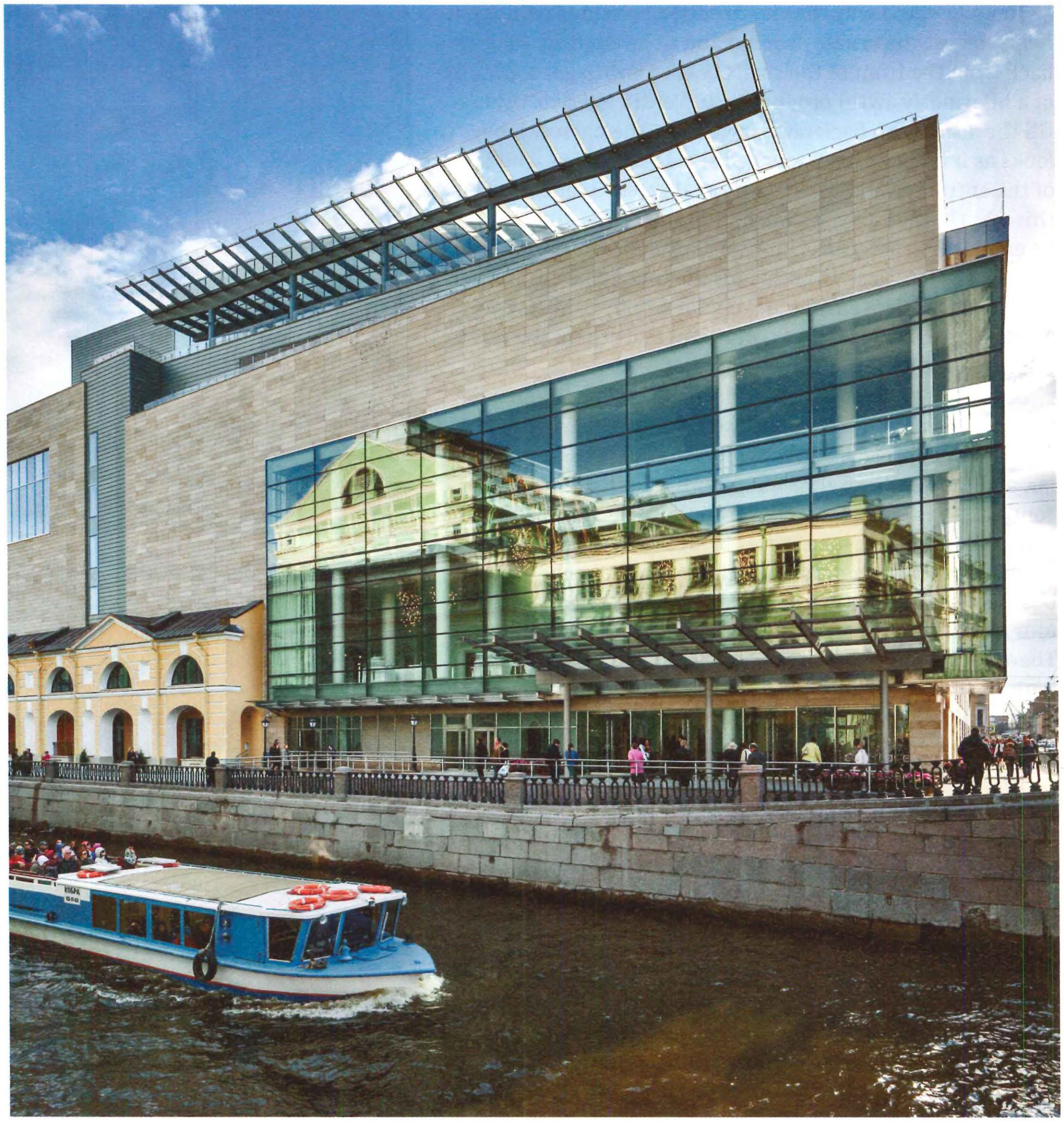
Mariinsky II
St. Petersburg, Russia
Diamond Schmitt Architects

ALMOST ANY route through St. Petersburg leads among florid palazzos, their pastel plumage reflected in quiet canals. Founded almost exactly 300 years ago, the city's core is pretty much complete, so it's surprising that one new architectural extravaganza, the 2,000-seat Mariinsky II opera house by Toronto-based Diamond Schmitt Architects, should be so ostentatiously neutral (RECORD, April 2013, page 21). On first encounter you notice only its stolid bulk, that great gray hunk of limestone lurking behind the mint-colored old Mariinsky. At dusk, the eye flits to the relic of a lemon-yellow Neoclassical facade affixed to one flank, then takes in the building's glowing glass hat, and continues through the glass curtain wall to the spectacle inside. There Swarovski crystals drip from the ceiling. A suspended steel staircase ribbons through the atrium like an orange peel. Between acts, patrons bask in the flattering glow from the luminescent wall of polished onyx that wraps the auditorium. The gloss is nice, but this is Russia, and that's kid stuff in the bling department.

This intrusion of soft-core modernism in the heart of the imperial city is troubling, and not just because new buildings here are too rare to waste. Everything about the opera house's architecture is tentative—even the attempt to be self-effacing—yet it's been assigned a formidable role. Russian president Vladimir Putin, whose government footed the $700 million bill, was the first to appear on the stage, neatly tying together the futures of the Mariinsky and Russian opera with that of the nation itself. St. Petersburg has hitched its global brand to culture. Opera and ballet are not elite pleasures but a wellspring of the city's identity. Valery Gergiev, the company's artistic and general director since 1996, is a celebrity of billboard stature, and the new house is the product of his dream.

"How do you like the new Mariinsky?" locals ask with wrinkled noses. "More comfortable but less spirit, no?"

Yes.



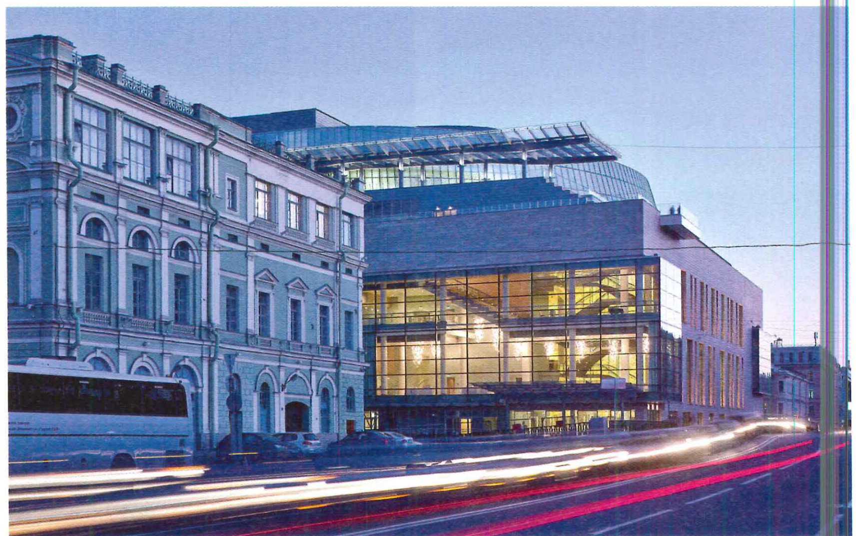
ACT II Set within a punctuated facade of Jura limestone, a backlit onyx wall provides a luminous backdrop for the lobby's 108-foot glass staircase (opposite). Glimpses of the past appear on the glazing around the entrance of the Mariinsky II as it reflects its 19th-century Rococo predecessor across the Kryukov Canal and a reconstructed fragment of the city's historic Lithuanian market along the adjacent limestone (above). A rooftop terrace and amphitheater for small-scale summer performances offer spectacular city views (left).

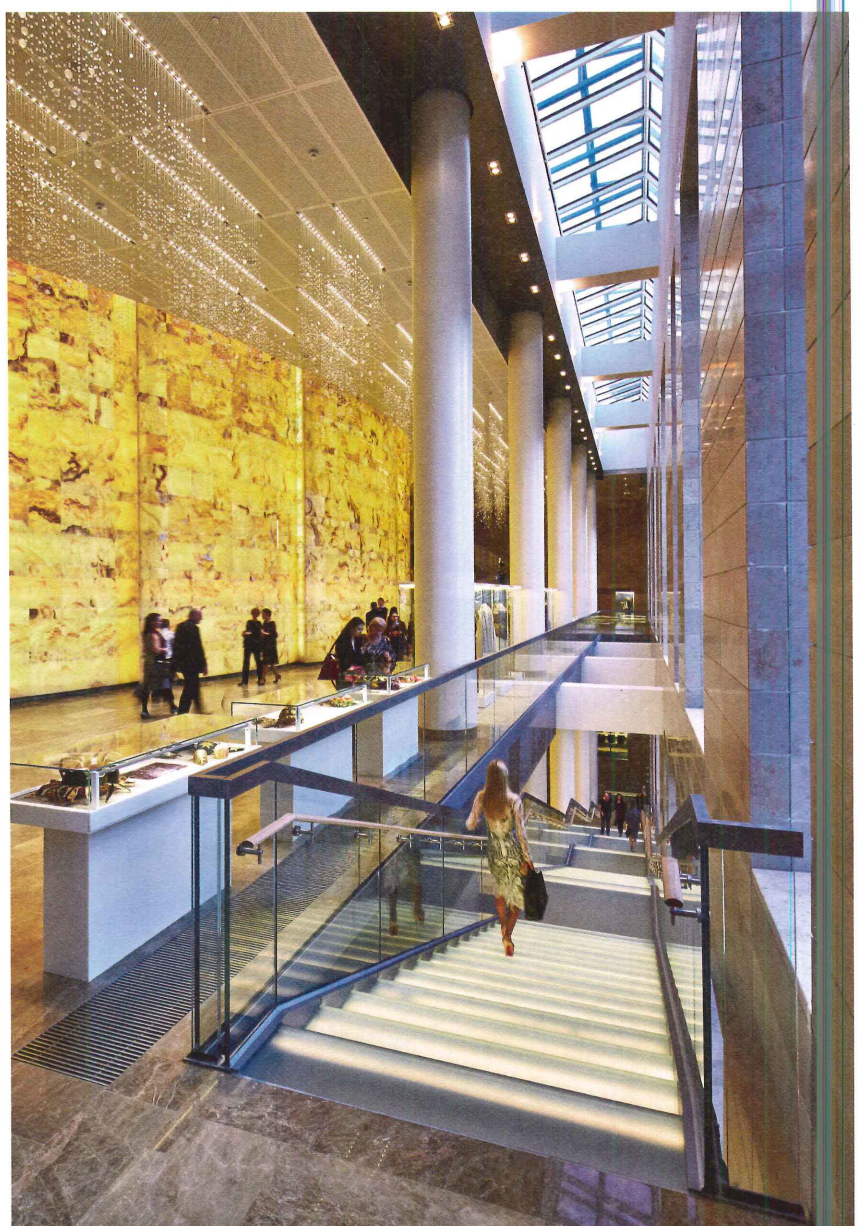
To understand why the city needed a second Mariinsky, it helps to visit the ornate original and sit sweltering, 10 rows back from the front of the czar's box, trying to get a glimpse of a hilariously awful production of Verdi's *Nabucco.* Ushers fill the aisles with back-ravaging chairs, the narrow lobby looks as if it hasn't been touched since Soviet days, and most of the entrances are blocked by metal gates. Opened in 1860, this was the aristocracy's warm lair, where the elite could be entertained at leisure. In *Anna Karenina,* Count Vronsky attends the Mariinsky and spends his time twisting around to scan the audience from his regular front-row seat. The czar's box contained only a handful of seats then; the rest of the space was for dining, napping, and cards.

Under Gergiev, the Mariinsky company—once named for the Soviet general Kirov—has fostered a more serious and egalitarian approach. Performances are ceaseless and popular, and Gergiev himself is ubiquitous on virtually every continent. If there were a concert hall at the South Pole, he would show up. Just hours after bringing the curtain down on the three-day opening festival, he and the orchestra boarded a private train for Moscow, the first leg of an annual tour of sprawling hinterland cities and small Siberian towns. There's something touching about these missionaries of high culture leaving their shiny new home and going off to pack whatever rundown auditorium they find, sometimes giving three concerts in a single day.

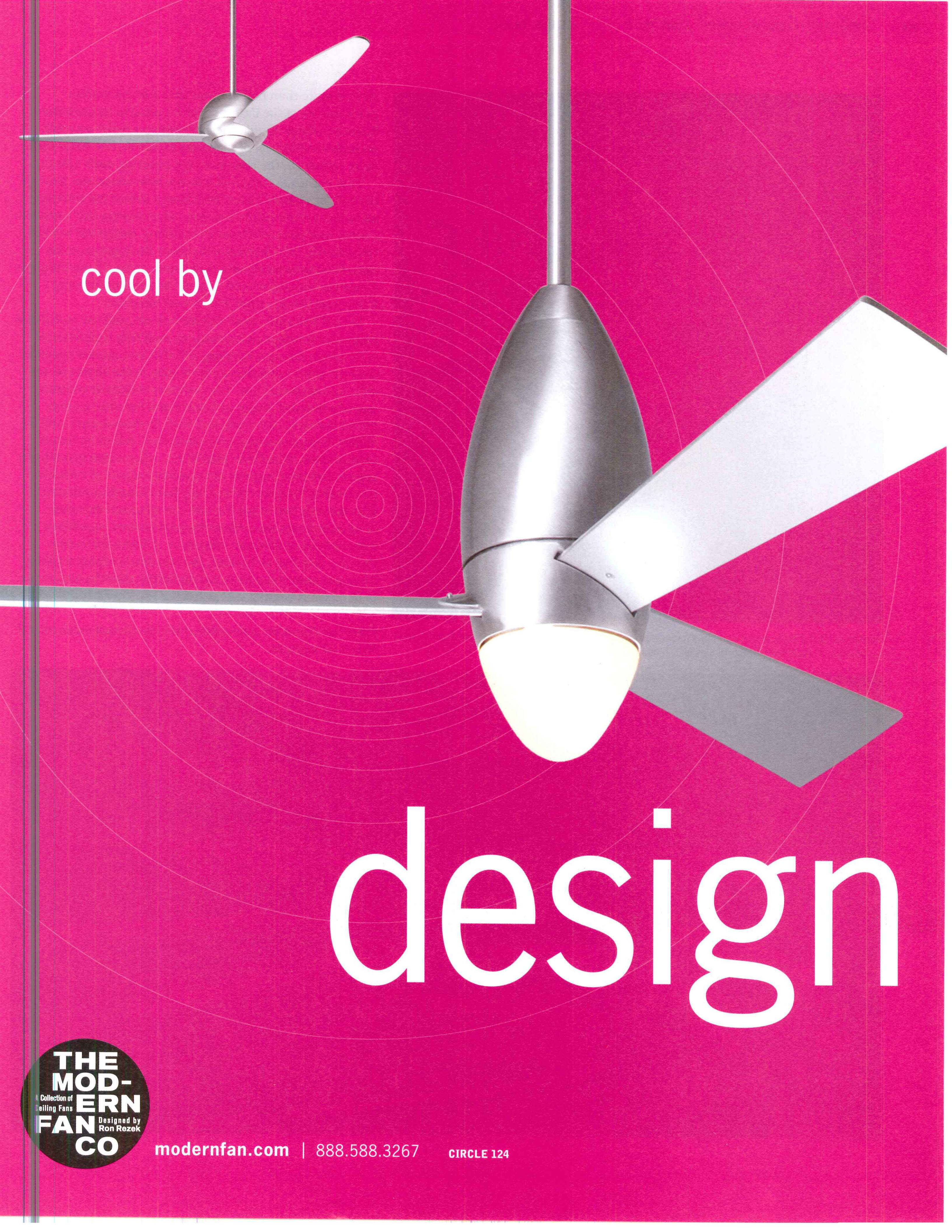
Mariinsky II embodies the ambition to perform more works more often, for more people—which is why Gergiev insists that what matters is not how it looks but how it sounds and what it can do. It's certainly impressively equipped. Six separate stages—one at the proscenium, one in the rear, and four in the wings—roll into various configurations like tiles in a numbers puzzle, making it possible to switch sets, or even operas, in minutes. These platforms can be raised by a giant hydraulic lift or isolated by soundproof partitions, so that an orchestra can record a symphony while an opera performance is taking place a few feet away. With its gently swooping balconies and paneling of blond-beech slats, the auditorium has all the quirkiness of a Scandinavian convention center, but its sightlines are superb and the sound is clear and light. At intermission, audiences have plenty of space to mingle, including a rooftop terrace with views onto a skyline flecked with golden spires. Perhaps most important to Russian habits is the ample cloakroom. (Try entering any restaurant, museum, or concert hall in St. Petersburg with an outer garment slung over your arm, and you will be firmly commanded to check it.)

Gergiev has some justification for believing it is the music that imbues a hall with spirit. In 2006, the Mariinsky carved a smallish, 1,200-seat concert space out of a burned-out warehouse. It's not a handsome place—low-ceilinged lobbies spill into disorienting hallways, and the auditorium is lined with plywood blocks—but even the most staid program attracts a young and excitable crowd. One 10 p.m. concert





PROGRAM NOTES The new building has production and rehearsal facilities for both houses, and frames the Mariinsky I with a stark simplicity (above right). Daylight filters into the lobby through skylights and windows along the building's north side (right). The onyx wall envelops the auditorium and backs onto the lobby, illuminated by rows of glittering Swarovski chandeliers.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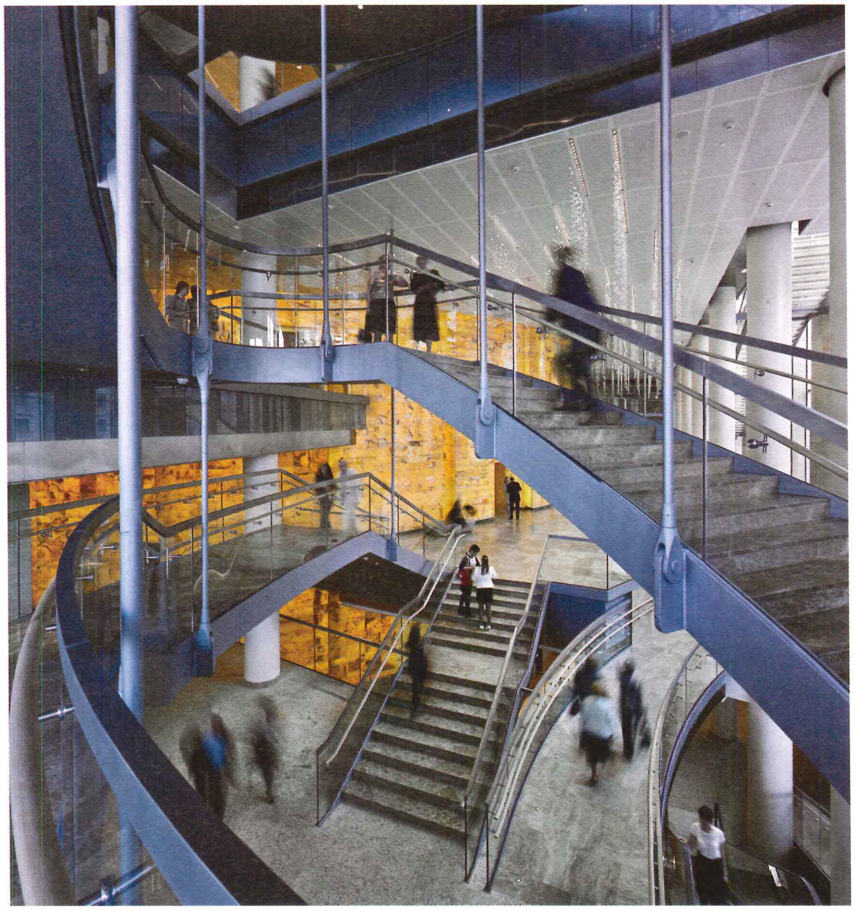


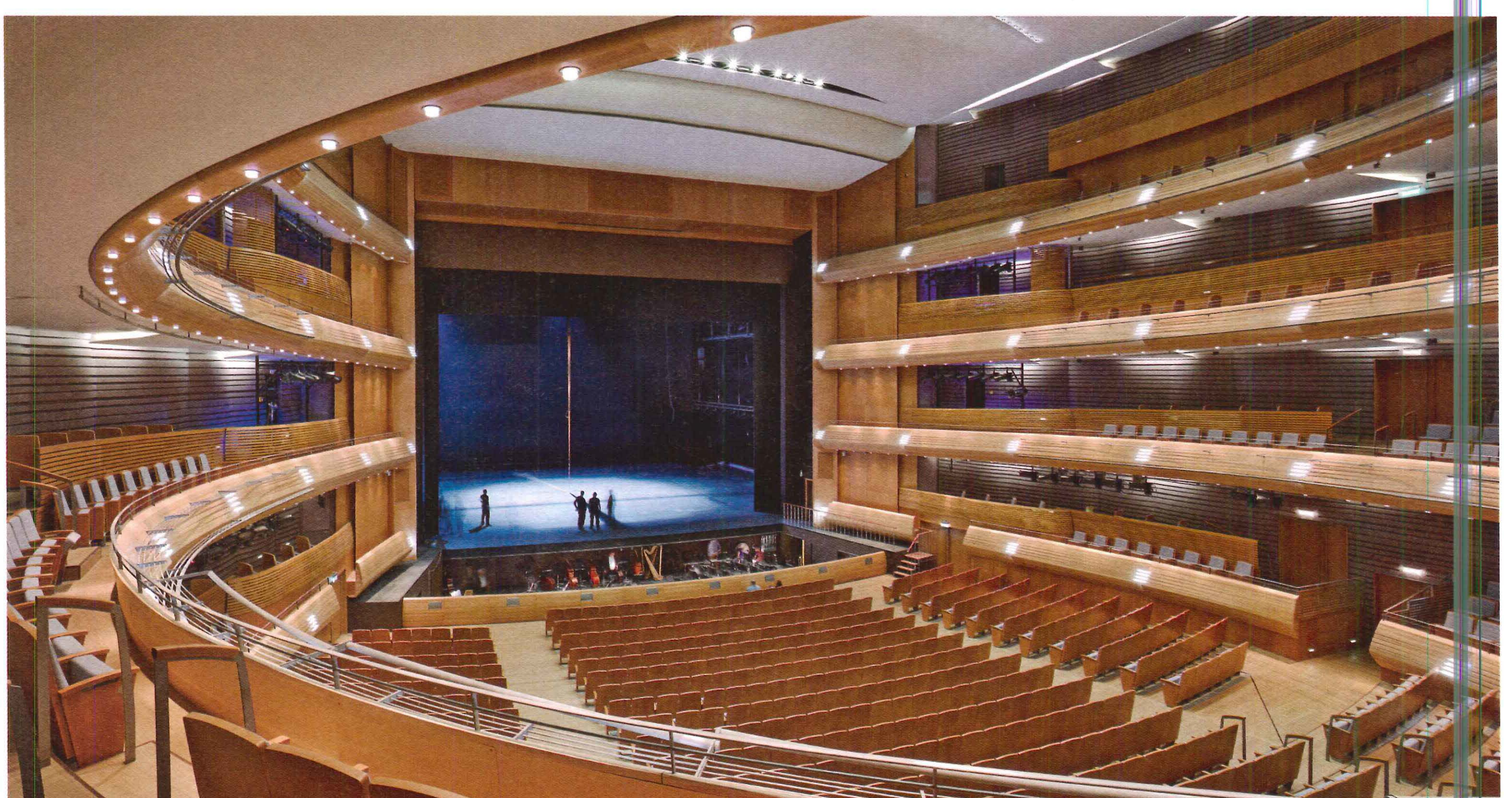
started more than half an hour late, with an ecstatic performance of the Brahms Violin Concerto by Leonidas Kavakos, whose liquid lyricism somehow fused with the orchestra's wild, seat-of-the-pants explosiveness. After three more concertos, the audience kept cheering until 1:30 a.m.

That enthusiasm carried into the new house, too. During the rollout's festive chaos, bewildered ushers led audience members astray, numbered seats were inexplicably removed, a large wall panel clattered to the floor, and toilets worked sporadically. Still, nobody who heard the soprano Anna Netrebko's desperately sensual Iolanta, or saw Diana Vishneva dance Maurice Béjart's 50-year-old but still smoldering *Bolero,* was thinking much about architecture.

Even if the kinks work themselves out, and the Mariinsky magically develops an aesthetic to match its sophisticated technology, the new building will still be a missed opportunity. An opera house has a role to play in the cityscape, too, and this one seems lost. The company originally commissioned a bravura design by Dominique Perrault, a great gilded barnacle that competed with St. Petersburg's glinting domes. Popular outrage over the design, stoked by out-of-control costs, killed that plan after construction had already begun, and the company retreated to a stance of ruthless practicality. Gergiev could surely have found an architect who not only had experience in the technical demands of opera but was also able to translate rococo sensibility into modern exuberance—someone at home with color, texture, and drama. Instead, the maestro accepted a fallacy he would never tolerate in his orchestra: that the alternative to bombast is banal good taste. ■

Justin Davidson is the architecture critic and classical-music critic of New York *magazine.*

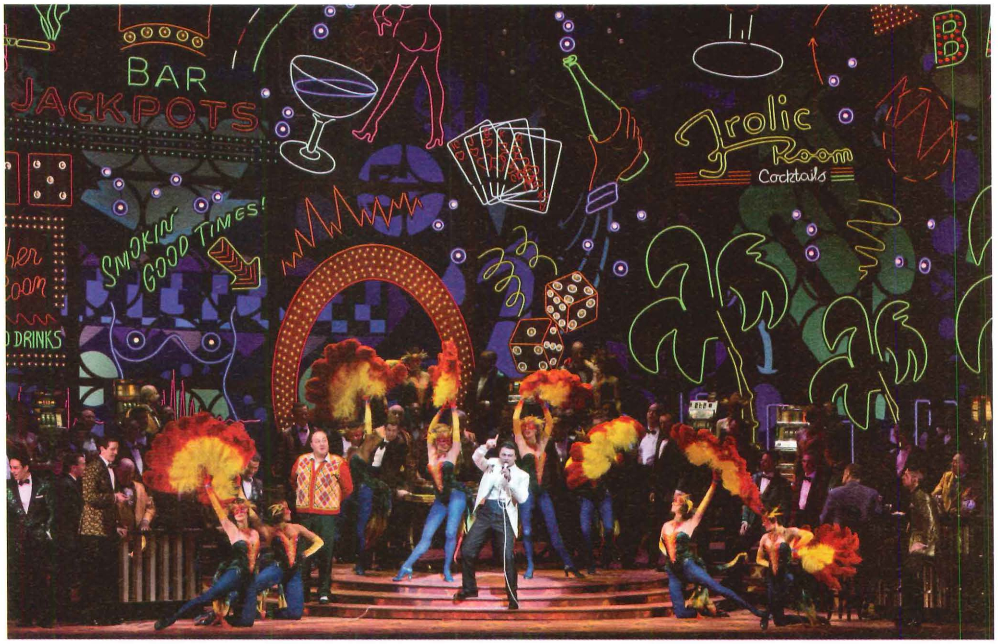
WORK HOUSE A helical stair connects upper and lower lobby levels (above). The horseshoe-shaped auditorium is wood-lined and provides excellent sightlines and acoustics (below).



High Stakes at the Opera

The Vegas backdrops for the Met's new *Rigoletto* hit home with architects.

BY SUZANNE STEPHENS



Sets by Christine Jones for the Metropolitan Opera's production of *Rigoletto* have literally learned from Las Vegas.

THE METROPOLITAN Opera's new production of Verdi's *Rigoletto* premiered this winter to rave reviews—including for its set design by Christine Jones, known for her Tony Award–winning Broadway show *American Idiot*. *Rigoletto*'s director, Michael Mayer, placed the staging of the opera in 1960s Las Vegas, rather than late Renaissance Mantua, as conceived when it was composed in 1851. Architects have responded enthusiastically to the glitzy "Rat Pack" aura of the Vegas sets at the Met—a sophisticated array of pulsating linear signage that emphasizes the three-dimensional space of the stage. George Miller, partner of Pei Cobb Freed, was overheard recently urging William Pedersen of Kohn Pedersen Fox to see it: "*Rigoletto*'s first act has a dynamic, colorful, and explosive set that instantly transports you from Lincoln Center to Las Vegas!"

In an interview excerpted below, RECORD discussed the new production (which returns in November) with Jones, who also teaches at New York University's Tisch School of the Arts.

Why did director Michael Mayer place his new *Rigoletto* in 1960s Las Vegas?

Mayer was looking for a parallel environment, one which, like Mantua in the 16th century, was licentious, decadent, and very much a man's world. The Duke became a Sinatra type with a retinue of gamblers, performers, men of questionable character, and jokers such as Don Rickles, who was one of our templates for Rigoletto, the Duke's jester.

How did you and Mayer collaborate?

I would say we have a combined vision. We have an extremely close working relationship, and we have a confidence in each other that is both exciting and stabilizing. The Met asked Mayer to create this production in an extremely short amount of time, while both of us were in the middle of other projects. But we know each other's shorthand—how to take each other's ideas and run with them, relay style. It was rewarding for all of us, including Kevin Adams [lighting designer], Steven Hoggett [choreographer], and Susan Hilferty [costume designer], to make our Met debuts together.

What sort of research did you undertake in concocting a Las Vegas of 50 years ago?

Neon, neon, and more neon...I looked at neon from every period I could find and from every discipline—from signage to installation art.

What about Robert Venturi, Denise Scott Brown, and Steven Izenour's landmark book *Learning From Las Vegas* (1972) as a source? Was that important?

Yes! Kevin suggested I look at that book—and a black-and-white blurred image near the back jumped out at me. It was a double- or triple-exposure image and made me think about seeing the Strip through a haze of alcohol and drugs, which is how most people see Vegas. As the opera's story progresses, the events, the characters, and the world itself—the neon—becomes more unraveled and chaotic. In Act I, neon is signage; in Act II, it is sculptural; in Act III, it is literally the storm and a scribble on the horizon.

What challenges did you have in creating the set of neon lights for the casino in Act I? What about moving the singers around the stage?

We used flexible plastic neon. There are so many great products available now that we were able to get the look we needed without using glass neon tubes, which would have been impossible to maintain in the Met's repertory situation.

I wanted the set to feel intimate and immediate, electrically tangible. So I made the plan as small as I could and pushed the action as far downstage as possible for the number of people in the cast. I was terrified it would be too small, but the staff at the Met assured us it would be OK. Still, I had butterflies up until all the singers were in their places!

Act II occurs in the Duke's baroque modern penthouse at the casino. What were your sources of inspiration for the flamboyant scenographic effects?

First I had the idea that Rigoletto was keeping his daughter under lock and key within the hotel. We imagined that the Duke owned the hotel, the way Sinatra had a stake in the Sands, and that he lived in the penthouse. I looked at all the hotels on the Strip and loved the architecture of the Flamingo Hotel, especially the way it echoed the brass-ringed details in the lobby of the Met opera [designed by Wallace Harrison]. The chandeliers in Act II are copies of the ones in the Met. I always try to find ways to connect the stage space to the theater, and in this instance the Met opera house, built in the mid-1960s, was especially meaningful to quote.

You placed Act III in a seedy nightclub on the periphery of Las Vegas. Here the neon lights take on an abstract design. Why?

For Sparafucile's nightclub, we looked at brothels and other seedy joints in Nevada. The idea was that as the events unravel, so does the neon—the walls become skeletal, the lights become more abstract. Emotions are at their peak, and the lighting is cued to respond to the storm. I am a huge fan of the way lights and music work together in the rock-and-roll world. With the storm and the neon, Kevin and I could make similar connections that would support the narrative. ■

View additional images at architecturalrecord.com.


FOR THE **STILE CONSCIOUS**
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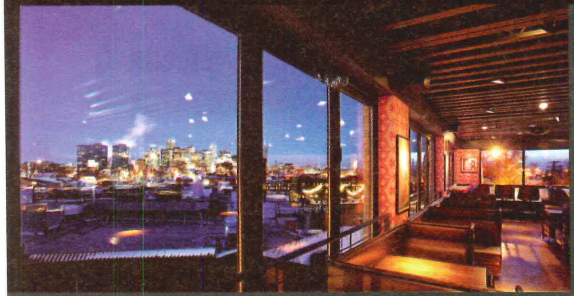


Designing the First Axis of Evil

Albert Speer: Architecture 1932–1942, *by Leon Krier. Monacelli Press, 2013, 272 pages, $75.*

Reviewed by James S. Russell

LEON KRIER would like us to look at the Nazi architecture of Albert Speer in a detached manner. But he starts painting himself into a corner on the very first page. He decries the widespread opinion that Nazi architecture is "worthless, however well-designed."

Let's stipulate that Speer, Hitler's architect and also the Third Reich's minister of armaments and war production, manipulated scale, proportion, columns, and entablatures with great facility—not to mention prodigiousness—and that the documentation of Speer's output is of interest. There are even moments I dare call sublime, but they are few. It's mostly crushingly heavy and funereal. (The intimately involved Hitler may have known things would end badly.)

Can Nazi architecture ever be deemed "well designed"? Should we ever allow ourselves to be "detached" about Nazi architecture?

Krier gushes and swoons, taking particular delight in the vast "archetypically benevolent" dome over the Great Hall that would have dominated the Berlin skyline. It is made maternally nurturing by its resemblance to a woman's breast. The ways in which he is offensive quickly add up.

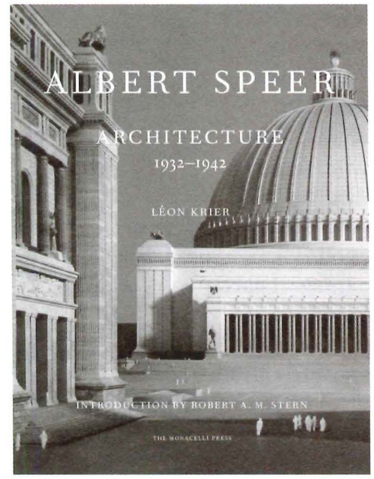
As I look at the vast north–south axis that Speer would have carved through Berlin, all I can find is architecture unique only in its gigantism. Every detail reminds people of their insignificance and the necessity of their fealty in the face of the power of the world-conquering state. (Berlin's most beautiful examples of classicism, the Museum Island and the Gendarmenmarkt, are urban pinpricks in comparison to Speer's grandiosity.)

His freeway-size boulevard might have sped bureaucrats from palatial ministry to palatial ministry, but in contrast to, say, Baron Haussmann's Paris, there is no urbanity. I can imagine Krier scandalized if even a brightly colored café awning besmirched the purity of Speer's unending pageantry of columns, pilasters, and prancing statuary utterly disconnected from the messy city it has hacked through.

Turning paranoid, Krier argues that the real enemy is Modernism. Modernists fell under the spell of industrialism, which doomed truly humanistic, craft-made classicism. And damned if Hitler didn't suffer from the same hallucination! "Industrial technology…imposed its own totalitarian rule," Krier sputters, a "dictatorship [that] would prove more fatal to the destiny of humanity as a whole than Hitler's despotism."

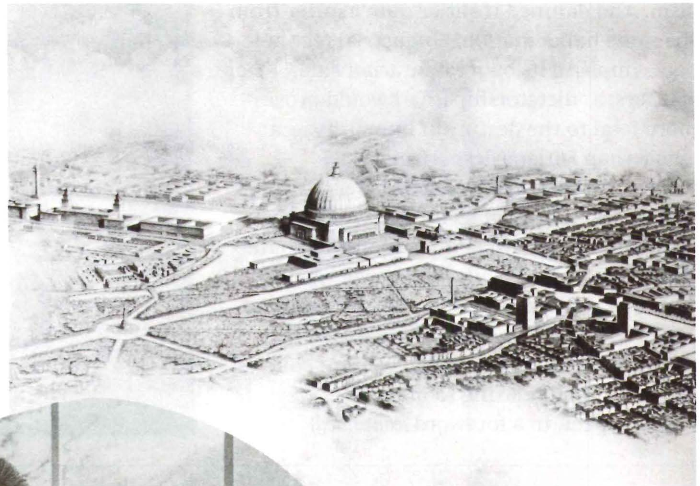
He completely ignores the Modernist intention to use industrial techniques to deliver a healthful urbanism for all, in contrast to the fetid, overcrowded slums—however quaint their street facades—that were the dominant lot of Berliners and other urban dwellers before Modernism and social-welfare policies delivered good housing to many.

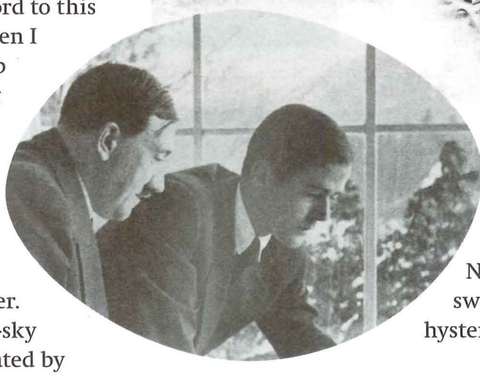
Even Speer, in a foreword *(continued)*



(continued from page 91) prepared for the book's original 1985 edition, seems less deluded than Krier. Speer, who died in 1981, wrote that Nazi architecture was not merely a symbolic backdrop, but "an integral part of the movement."

It would be easy to dismiss Krier as a gadfly. (And why did Robert A.M. Stern write a foreword to this drivel?) But then I think of Philip Johnson filing approving dispatches from the gigantic 1930s Nazi rallies designed by Speer. Under a night-sky cathedral created by upwardly aimed searchlights, heaving seas of people punched the air with Nazi salutes amid ranks of waving swastika flags–consolidating a mass-hysterical myth of unbounded power.





Hitler and Speer (left) saw Nazi architecture as an integral part of the movement. Speer planned a domed Great Hall and grand axis for Berlin (above).

James S. Russell is the architecture critic at Bloomberg News and author of The Agile City.

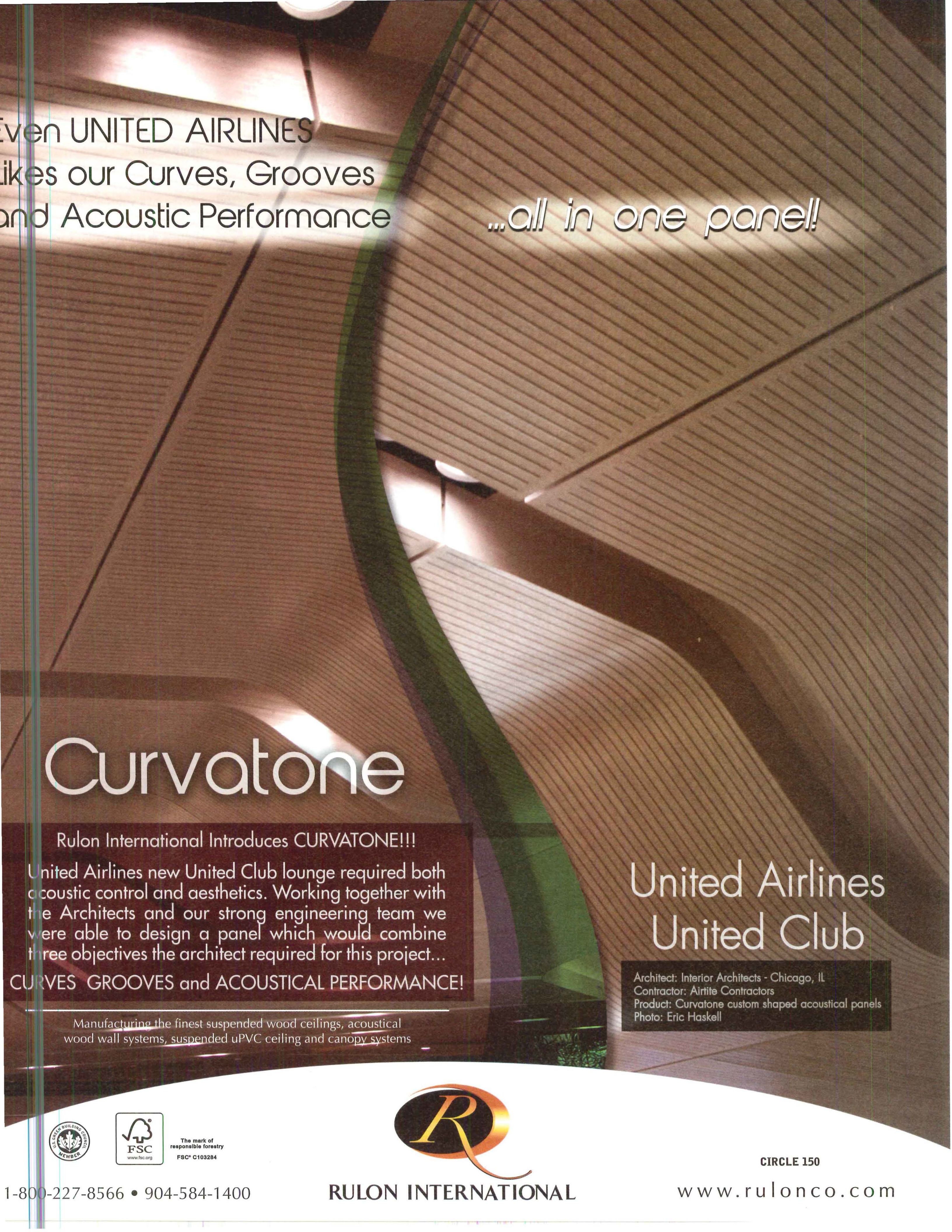
Aiming High

Building Seagram, *by Phyllis Lambert. Yale University Press, 2013, 320 pages, $65.*

Reviewed by Anthony Paletta

THE ERA in which it seemed possible to regard the work of Mies van der Rohe as a product of pure geometry untouched by mortal concerns on its journey from his brain to physical reality has happily passed. Never, though, has a single work been examined in such intricate and fascinating human detail as is his iconic New York tower in Phyllis Lambert's *Building Seagram,* a comprehensive account of the building's inspiration, design, construction, and preservation.

"Few imagine that a skyscraper of uncommon poise could have a complex, and even troubled, biography," Lambert notes. No one is better equipped to know the Seagram Building's tale than Lambert. The daughter of Samuel Bronfman, Seagram's founder, she objected in forceful terms to his original choice of Charles Luckman as the building's architect, saying in a June 1953 *(continued)*



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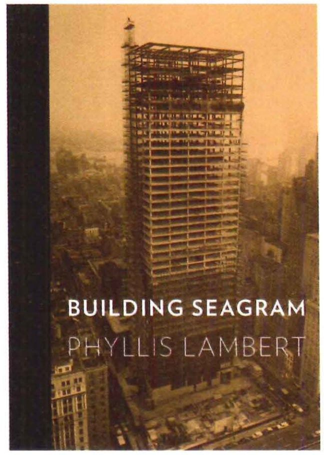
(continued from page 92) letter to her father: "NO NO NO NO NO." Soon she had essentially taken charge of the search for a replacement, working with Philip Johnson to briskly evaluate the premier architects of the day–dismissing Louis Kahn as "essentially suburban" and assembling a list that included Mies, Le Corbusier, Marcel Breuer, Pietro Belluschi, Walter Gropius, Paul Rudolph, I.M. Pei, Eero Saarinen, and Minoru Yamasaki. They picked Mies, and Lambert became the director of planning for the project, guiding everything from the contents of cabinets in the Seagram's executive suite to relations with the company's cost-cutting building committee. She battled and vanquished multiple parties in pursuit of her "mandate to make sure that Mies would build the building as he saw it." Obstacles included Bronfman himself, who at one point suggested replacing the plaza with a bank. Bronfman's requests, though, were few; he wanted bronze on the exterior, and he didn't want a building on stilts (too similar to the nearby Lever House, completed in 1952). Mies provided a slim tower framed by a plaza of unprecedented size for New York, offering both a new marvel and a perfect spot from which to view it.

The width of the tower was determined by an unusual 4-foot-7-inch module, which required all sorts of custom construction, as did countless choices of building materials, from glass (the only commercially available heat-absorbing glass was tinted green, which Mies rejected as clashing with the bronze frame) to special granite. Some of the book's most intriguing parts are devoted to the heavily artisanal roots of what has come to seem an exemplar of International Style mass production.

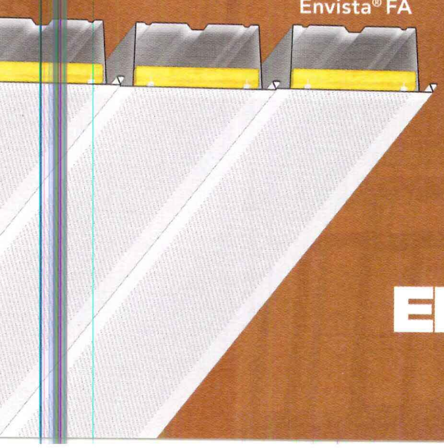


Phyllis Lambert oversaw the work of Philip Johnson (left in photo) and Mies van der Rohe on the Seagram Building.

After examining the building's construction and design, Lambert devotes a chapter to mapping its inspirations. She then covers the valiant work of securing landmark status for both the building and the Four Seasons restaurant interior.

Lambert's tour of the genesis and life of the building is an engrossing one, offering a superb account of both the unglamorous planning issues and the specific design choices involved in the project. Given her own obvious proximity to the subject, the book seems remarkably fair, a generous tribute to Mies and Johnson. Barry Bergdoll, who has Johnson's old job as chief curator of architecture and design at New York's Museum of Modern Art, notes, "Lambert reminds us that at the Seagram building, as with true masterworks, the work of understanding, interpreting, and extending is never finished." Yes, but this book gets us closer. ■

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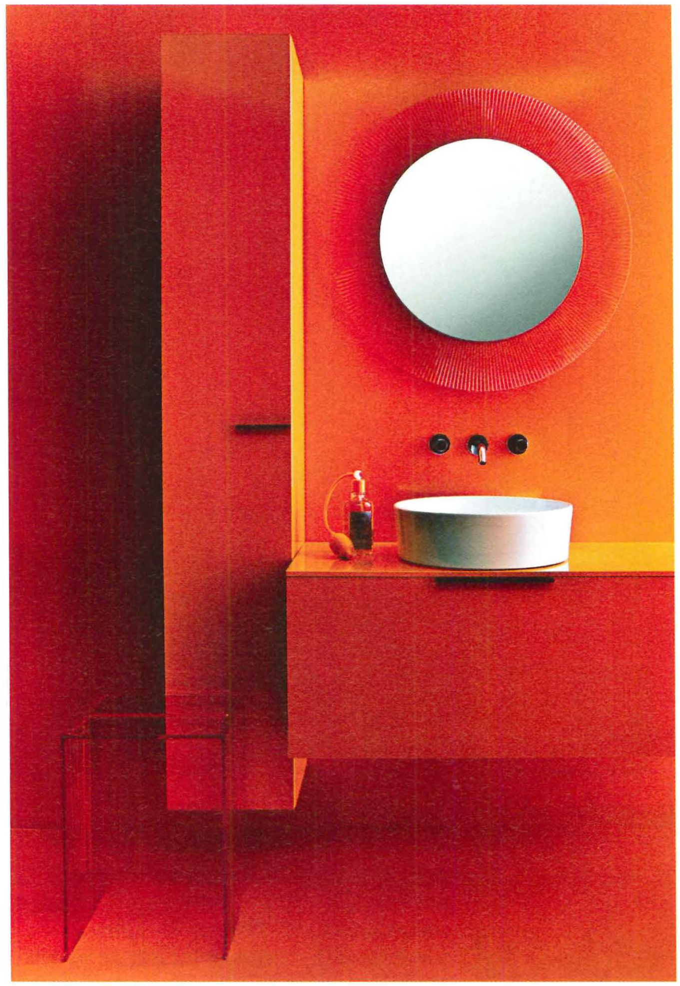
Entertaining Options

Bright colors, clean lines, and durable materials mark the latest furnishings, finishes, and lighting designs for hotels, restaurants, and spas.

By Rita Catinella Orrell

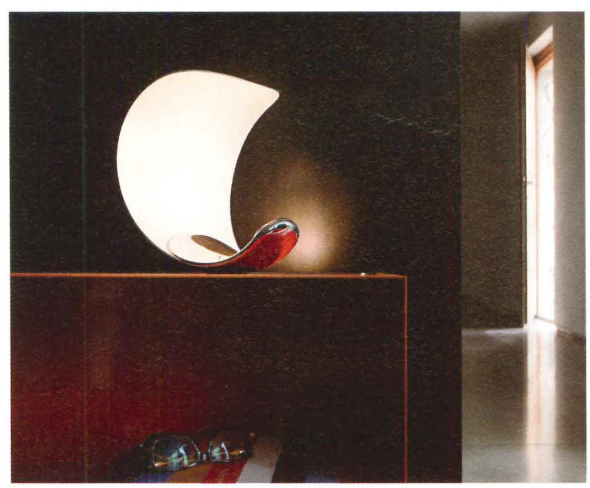


Kartell by Laufen

The Italian furnishings manufacturer Kartell and the Swiss bathroom specialist Laufen collaborated on a new contemporary bathroom-furniture collection that was unveiled at the Milan Furniture Fair in April. The collection includes tubs, shelving, mirrors, drawers, sinks, toilets, and accessories in transparent polycarbonate and a new material from Laufen, SaphirKeramik, which the company claims is thinner than and twice as strong as ceramic. Shown is a chest of drawers, a SaphirKeramik washbasin, and a transparent polycarbonate mirror and stool. laufen.com **CIRCLE 200**

Metropolitan Collection

Wolf-Gordon has added four new designs—a stripe, reptile skin, map pattern, and complex solid-colored weave—to its Metropolitan upholstery-textile collection. Woven in Bella-Dura fabric, a proprietary olefin blend, the new designs are intended for demanding indoor and outdoor commercial environments. Each item is solution-dyed, can be cleaned with bleach, and contains silver-ion technology for antimicrobial protection. The textiles withstand over 1,500 hours of UV light and over 50,000 double rubs on the Wyzenbeek test. wolfgordon.com **CIRCLE 201**



Cement Tile

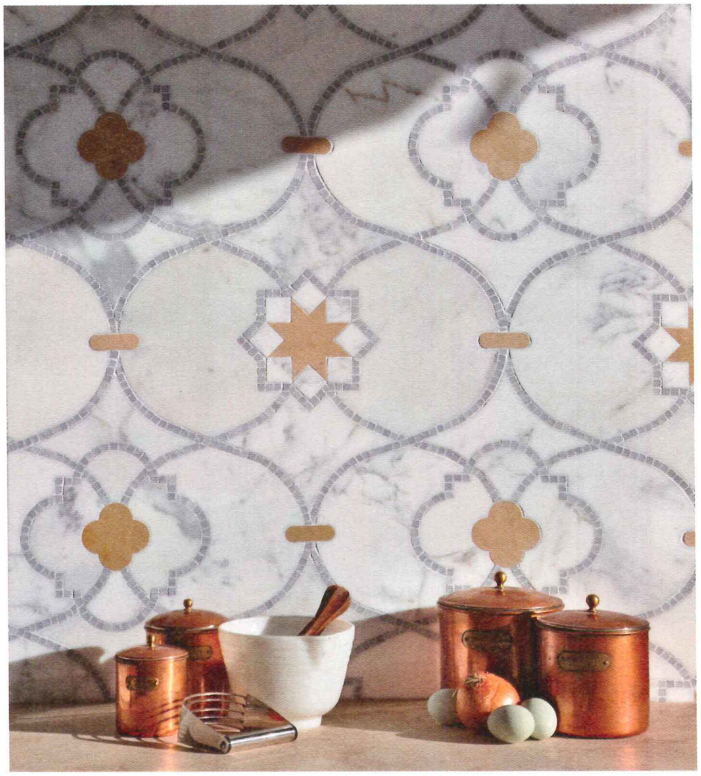
Los Angeles–based architect Barbara Bestor of Bestor Architecture selected Granada Tile cement tile for the floor of the new Beachwood Cafe in Hollywood. Granada's 8"-square Khufu pattern in bright yellow and blue helped the design team create a playful, relaxed ambience for the eatery, which received a 2012 Restaurant Design award from the Los Angeles chapter of the American Institute of Architects. granadatile.com **CIRCLE 202**

Curl Table Lamp

The Curl table lamp by London-based designer Sebastian Bergne features a white body of die-cast aluminum and adjustable LED technology that allows the user to vary the temperature of white light with a simple rotation of the diffuser. The lamp does not have a specific base, so it can be placed in a variety of positions to provide ambient light for any space. Bergne is an independent industrial designer who has created products for major brands including De Beers, Muji, Swarovski, and Vitra. luceplan.com **CIRCLE 203**

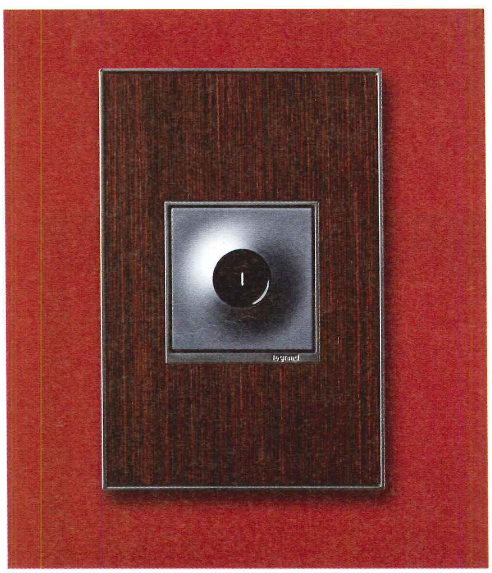
Miraflores Collection

New Ravenna Mosaics' Miraflores Collection includes 18 mosaic designs by San Diego–based interior designer Paul Schatz. The series, handcrafted in Virginia, was inspired by Schatz's travels throughout Spain, Portugal, and Mexico, and also reflects his passion for Islamic geometric art. Created in natural stone, the mosaics can be installed as floors or walls, indoors or out. Vittoria, shown at right, is a water-jet- and hand-cut mosaic that comes in Lagos Gold honed, Calacatta Tia, and Allure polished marble.
newravenna.com
CIRCLE 204



Outsider Lamp

The Jacco Maris lighting collection is now available in the U.S. and Canada through Global Lighting. Handcrafted in the Netherlands, the collection consists of five lights made of steel, brass, copper, iron, and sand-casted aluminum. Inspired by a tractor headlight, the modern-industrial Outsider fixture (above) features a cast-aluminum shade in black, aluminum, or white. The UL-listed indoor/outdoor fixture uses one 26W E26 lamp and comes as a 22.5" x 16.5" adjustable pendant on a rod or a pendant with an iron chain in 22.5" x 16.5" and 35" x 26" sizes. globallighting.com CIRCLE 205



Adorne Switches and Wall Plates

Adorne is a line of switches, dimmers, outlets, and wall plates that provide unique on/off activation. The line includes Touch, a switch with a translucent face in which capacitive touch technology controls lights; Wave, a switch (shown left) that activates lights with the wave of a hand; and the Pop-Out Outlet, which moves in and out from the wall when needed to provide three outlets. Wall plates come in 32 finishes, including cast metals, natural woods, and leather. All switches are flush with the wall plates and feature convenient locator lights.
adornemyhome.com CIRCLE 206

Agave Series

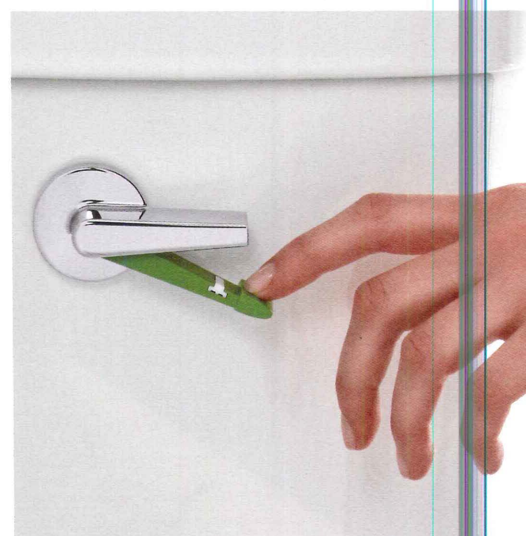
The Agave Series of cast-concrete landscape containers from Kornegay Design can withstand extreme weather environments and heavy pedestrian traffic. Agave is available in three sizes: 24" diameter x 13.5" high, 36" diameter x 18" high (shown), and 48" diameter x 22.5" high.
kornegaydesign.com CIRCLE 207

Play Chair

Designed by Alain Berteau for the Belgian manufacturer Wild Spirit, this solid-wood outdoor chair is a visual mix of polished Art Deco and rustic styles. Composed of mature 80-year-old teak, the stackable, ergonomic design is intended for both commercial and residential applications. The chair is available in the U.S. through the Manhattan-based design showroom D'Apostrophe.
dapostrophe.net CIRCLE 208

DriftBath

Aquatic's DriftBath features more than 70 ports located in the backrest and foot areas of the bath, which can create a blanket of water flowing in one direction. While typical whirlpool and air-bath systems use a mixture of air and water pushed into the bathing well to generate an invigorating or effervescent form of hydrotherapy, DriftBath eliminates air induction and minimizes the movement of water for a quieter, more serene bath. To add to the DriftBath experience, an integrated pump-and-motor unit captures the heat energy it generates and infuses it back into the water. aquaticbath.com CIRCLE 209

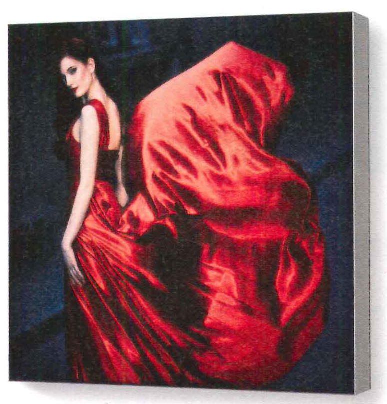


Kickflip

Alumen8A's Kickflip LED indirect/direct 180° adjustable wall-wash luminaire offers an asymmetrical lighting-distribution curve with minimal back spill. The fixtures are designed to fit discreetly into lobbies, corridors, stairwells, reception areas, and meeting rooms in hospitality and retail environments. The fixture is characterized by a highly contemporary, curved slender housing (made of 60% recycled aluminum) with an extruded clear acrylic lens and a range of slide-in options. Kickflip uses genuine Nichia LEDs available in 3,500K, 4,000K, or 5,000K color temperatures. alumen8a.com CIRCLE 210

Dual-Flush Trip Lever

Splitting the traditional trip lever into two levers—for light and full flush—allows Kohler to free up a toilet's tank lid for use as a shelf and make this water-conserving option easier to use than standard dual-flush toilets with actuator buttons on the tank lid. Actuating the bottom, or long, portion of the lever (shown in green) provides a 1.1-gallon light flush, while pressing down on the two pieces together provides the full 1.6-gallon flush. Available on several Kohler toilet models, this technology boasts significant water savings and carries the EPA WaterSense certification. Unlike standard dual-flush toilets, this option is ADA-compliant. kohler.com CIRCLE 211



Optima LED StretchLite Backlit Light Box

Stylmark's Optima LED StretchLite combines the brilliance, uniformity, and longevity of backlit LED technology with the dramatic dimensions of tension-fabric displays. Designed to accommodate readily available tension-fabric graphics, the fixture is particularly well-suited for large-format images—from conventional sizes to custom applications that can cover an entire wall. The light-box frame has a slender edge and an invisible perimeter-tensioning feature, which gives graphics a frameless appearance and enables users to change images quickly and easily. stylmark.com CIRCLE 212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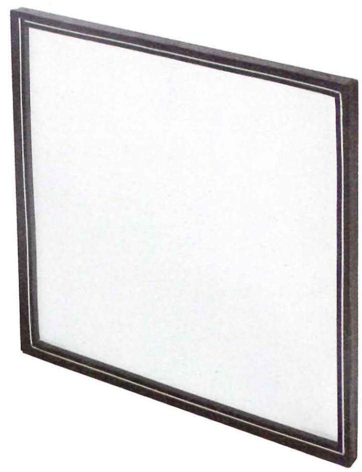


Marvin Square Sticking Option

Marvin Windows and Doors marvin.com

Marvin has devised a new option for its window sticking—the interior edge detail where glass meets wood. A new interior profile option offers a squared-off transition that creates clean sightlines and an open viewing frame for contemporary projects with large expanses of glass or designs with Arts and Crafts–style ornamentation. The option is also available on simulated divided lite bars. **CIRCLE 213**

Genius Window System

Deceuninck deceuninck-americas.com

Genius is the industry's first interlinked dual-sash window that enables thermal performance values to exceed R-14 without the use of exotic films or gases. An additional bonus airspace between the two sash members results in an effective thermal barrier. In addition, a unique thermal-activated ventilation system automatically brings solar-heated air into a building's interior in winter and draws it outside in summer. **CIRCLE 214**

AA 3350 IsoPort Window Series

Kawneer kawneer.com

Kawneer's updated AA 3350 IsoPort window now meets the demands of projects that require a 70 PSF design pressure for windows of particular sizes. Available in single-hung, double-hung, horizontal sliding, and fixed configurations, the window frame accepts a wider range of extrusions and accommodates a broader spectrum of renovation applications. **CIRCLE 215**

ADA-Compliant Window Hardware

Wausau wausauwindow.com

Most of Wausau's INvent Series window family and 4250-Z zero-sightline awning and casement insert vents now feature more accessible hardware options. These projected windows operate with one hand and require an operating force of 5 pounds or less to unlock, open, close, and lock without requiring a tight grip or twisting of the wrist. The designs can meet the operating-force and limited-motion requirements of ICC/ANSI A117.1. **CIRCLE 216**

Signature Series

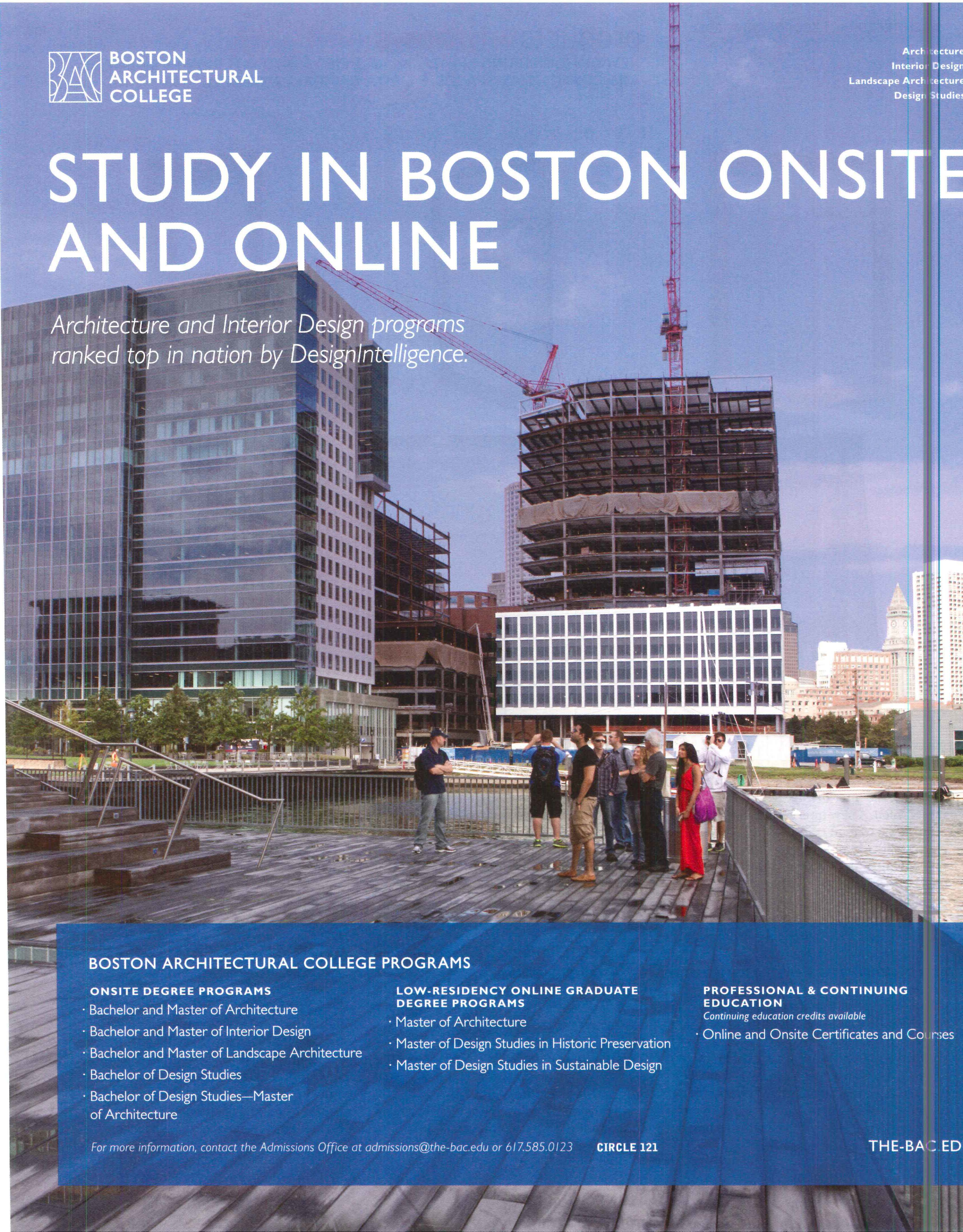
Weather Shield weathershield.com

The Signature Series of aluminum-clad wooden windows and patio doors is a midpriced collection including casement, awning, picture, double-hung, and other options. The double-hungs are among only a few in the industry to achieve a Class 3 AAMA rating. This is achieved via the company's Symmetry Balance System, which ensures superior air and water performance and easy operation. **CIRCLE 217**

SuperSecure II-XLS

Safti First safti.com

SuperSecure II-XLS is a fire-resistive security glazing product for openings in correctional facilities and other areas requiring security glazing. This clear, wire-free product provides the full range of 45 to 120 minutes of temperature-rise protection along with forced-entry security in dramatically larger sizes than wired-glass options. It has achieved a Class A-1 rating per California Department of Corrections 860-09a testing requirements. **CIRCLE 218**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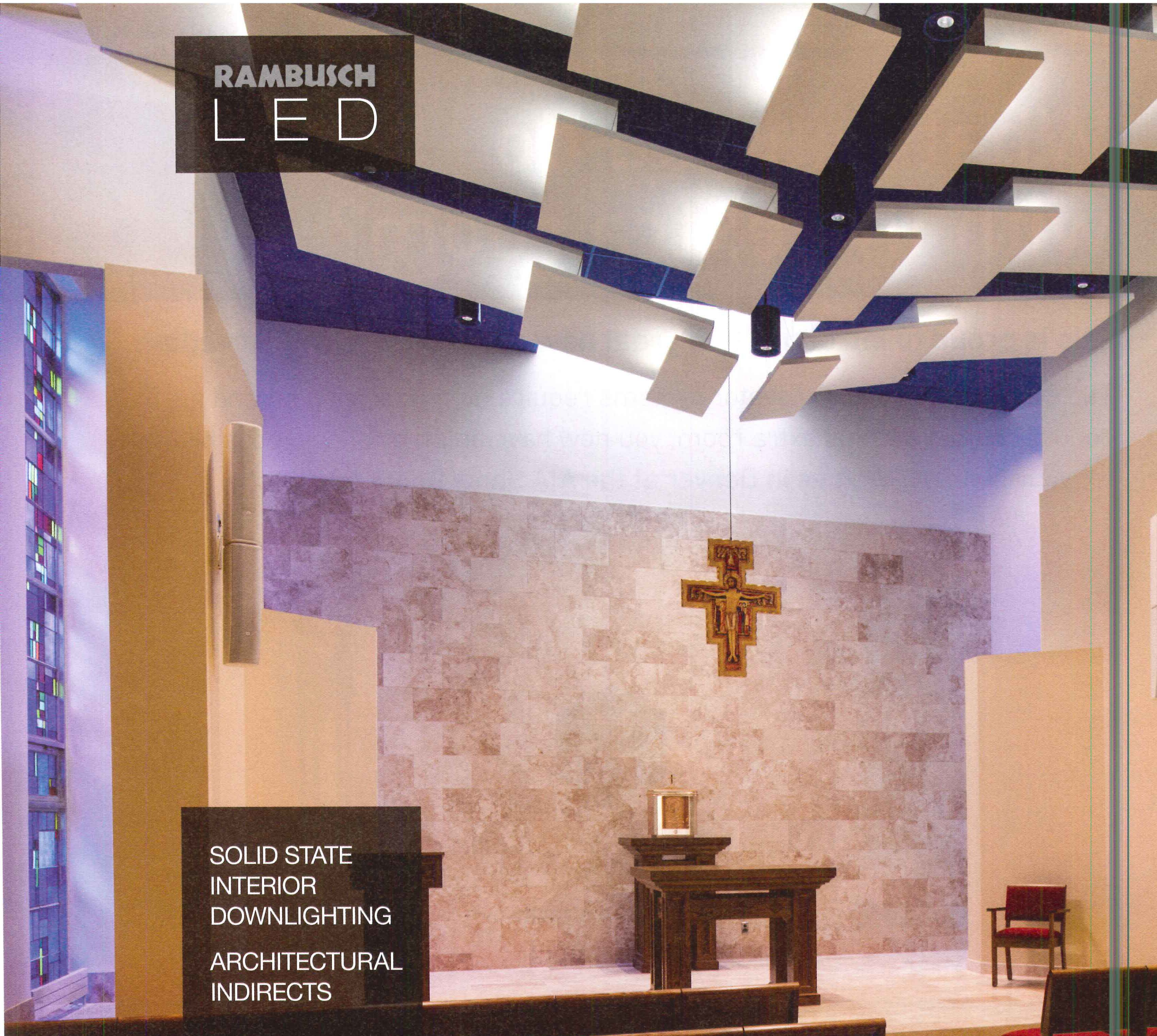
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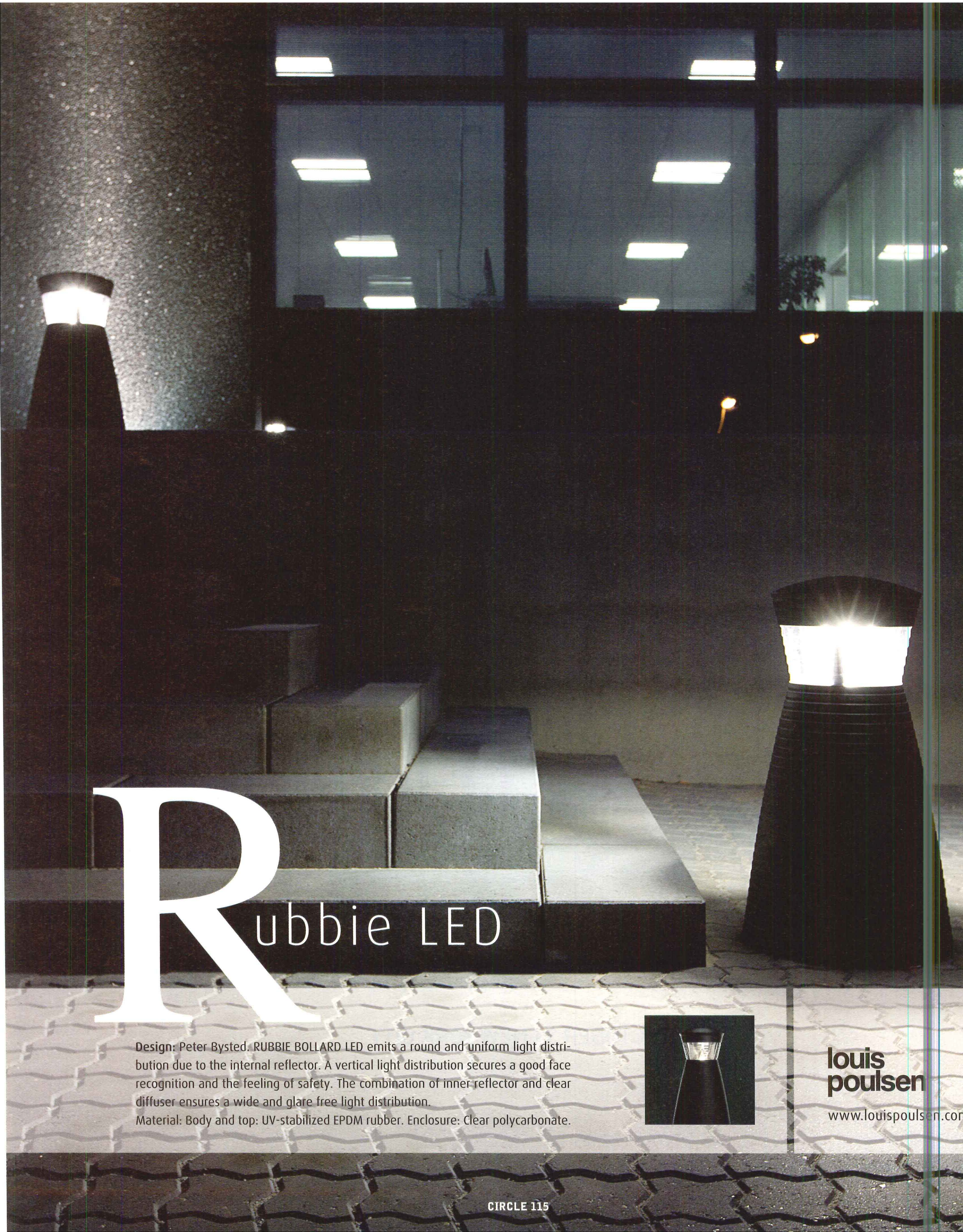
Rubbie LED
Design: Peter Bysted. RUBBIE BOLLARD LED emits a round and uniform light distribution due to the internal reflector. A vertical light distribution secures a good face recognition and the feeling of safety. The combination of inner reflector and clear diffuser ensures a wide and glare free light distribution.
Material: Body and top: UV-stabilized EPDM rubber. Enclosure: Clear polycarbonate.
louis poulsen
www.louispoulsen.com
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ARCHITECTURAL RECORD | 2013 AWARDS

good design is GOOD BUSINESS

ARCHITECTURAL RECORD recently bestowed its second annual Good Design Is Good Business Lifetime Achievement Awards on one design firm, Bohlin Cywinski Jackson (BCJ), and on one patron of architecture, Hines. Of course, we are also continuing our open competition, now in its 16th year, to highlight companies and organizations that take advantage of design to further business strategies in ways that are innovative but appear effortless (think of BCJ's Apple Stores). This year we celebrate such clarity of vision—on the part of the architects and their clients—with a dozen winning projects. From a power plant turned dance center (this page), to a new daylight-filled factory in Mexico, to a respectful renovation of an iconic 1950s bank in New York City, each sustainable scheme goes well beyond the bottom line and demonstrates the sweeping benefits of good design.

KPMB Architects
Centre for International Governance Innovation

BNIM
Todd Bolender Center for Dance & Creativity

Skidmore, Owings & Merrill
510 Fifth Avenue

LMN Architects
Vancouver Convention Centre West

BNIM
Iowa Utilities Board

Ingenhoven Architects
Daniel Swarovski Corporation

Pickard Chilton
Devon Energy Center

Julie Snow Architects
Target Plaza Commons

Lehman Smith McLeish
K&L Gates at One New Change

Davis Brody Bond
Planta Milenio

HKS
Salt River Fields at Talking Stick

Eskew+Dumez+Ripple
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Centre for International Governance Innovation
KPMB Architects
Waterloo, Ontario

BY 2009, the independent, nonpartisan Centre for International Governance Innovation (CIGI) was well on its way to fulfilling its vision to be the world's leading think tank on the global economy, global security, the environment and energy, and global development. Founded in 2001 by Jim Balsillie and Mike Lazaridis, cofounders of the Waterloo, Ontario–based wireless-technology firm Research in Motion (now BlackBerry), and strategically located in the province's Technology Triangle, CIGI had experienced rapid growth in its research programs, and had recently partnered with the University of Waterloo and Wilfrid Laurier University to launch the Balsillie School of International Affairs.

In an ambitious next step, CIGI hired KPMB Architects of Toronto to convert the city of Waterloo's former Seagram distillery site into a collaborative urban campus—a vibrant hub for research, education, and innovative thinking. Shirley Blumberg, founding partner of KPMB, says, "The client had very high ambitions for this as an academic center for excellence and a highly sustainable building that would stand for 100 years or more."

View additional images at architecturalrecord.com.

KPMB designed a three-story, 115,000-square-foot building—a contemporary reinterpretation of a traditional academic quad based on the Oxford model, integrating student workspaces, faculty offices, administrative offices, public spaces, a 250-seat auditorium/lecture hall, a bell tower, and a café. The building's solid masonry elevations, which honor the surrounding 19th-century industrial buildings, contrast with glass pavilions and expansive public spaces. It is both a quiet academic sanctuary and a site for social and intellectual interaction—a design that has catapulted the

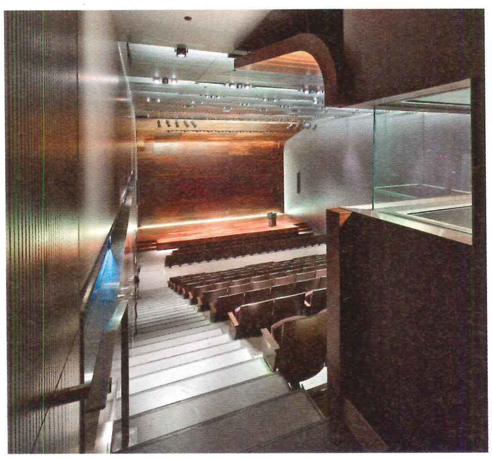
INTELLECTUAL PROPERTY The architects developed the site, which entailed the design of an academic building with classrooms, offices, and event and public spaces, and the renovation of a former Seagram distillery into CIGI offices. Instead of pursuing a LEED rating, the client opted to invest in the local economy, sourcing as many quality materials and suppliers from the area as possible, yet still achieving energy costs 50 percent lower than Canadian standards.

PHOTOGRAPHY: © MARIS MEZUZLIS

center to new levels of growth.

Since its completion, the campus has attracted more than 40 experts in international affairs, such as the journalist and vice chair of the United Nations' Global Commission on HIV and the Law, Shereen El Feki. In January 2011, CIGI announced $25 million in funding for a five-year partnership with the Institute for New Economic Thinking, a New York–based think tank founded by George Soros to explore innovations in economics.

Within six months of completion, the campus was one of 12 projects selected for the Royal Institute of British Architects International Award. The design has fast-tracked CIGI's standing as an increasingly respected think tank in global affairs. *Allison Craig*



THOUGHT PROVOKING Equipped with high-end technology, the 250-seat auditorium (top left) was designed to host high-security conferences, live webcasts, and public events without interruption to the rest of the campus. Transparent yet connected breakout and public spaces (above and left) are filled with daylight and catalyze the client's objectives for the spontaneous exchange of ideas among students, faculty, and leaders.

credits

ARCHITECT: KPMB Architects – Shirley Blumberg, design partner; Steven Casey, project architect

ENGINEERS: Blackwell Bowick (structural); Crossey Engineering (mechanical); HH Angus (electrical); Conestoga-Rovers (civil)

CONSULTANTS: Transsolar (energy); Tillotson Design (lighting); Phillips Farevaag Smallenberg (landscape)

CLIENT: Centre for International Governance Innovation

SIZE: 115,000 square feet

COST: withheld

COMPLETION DATE: 2011

SOURCES

LIGHTING CONTROLS: Lutron

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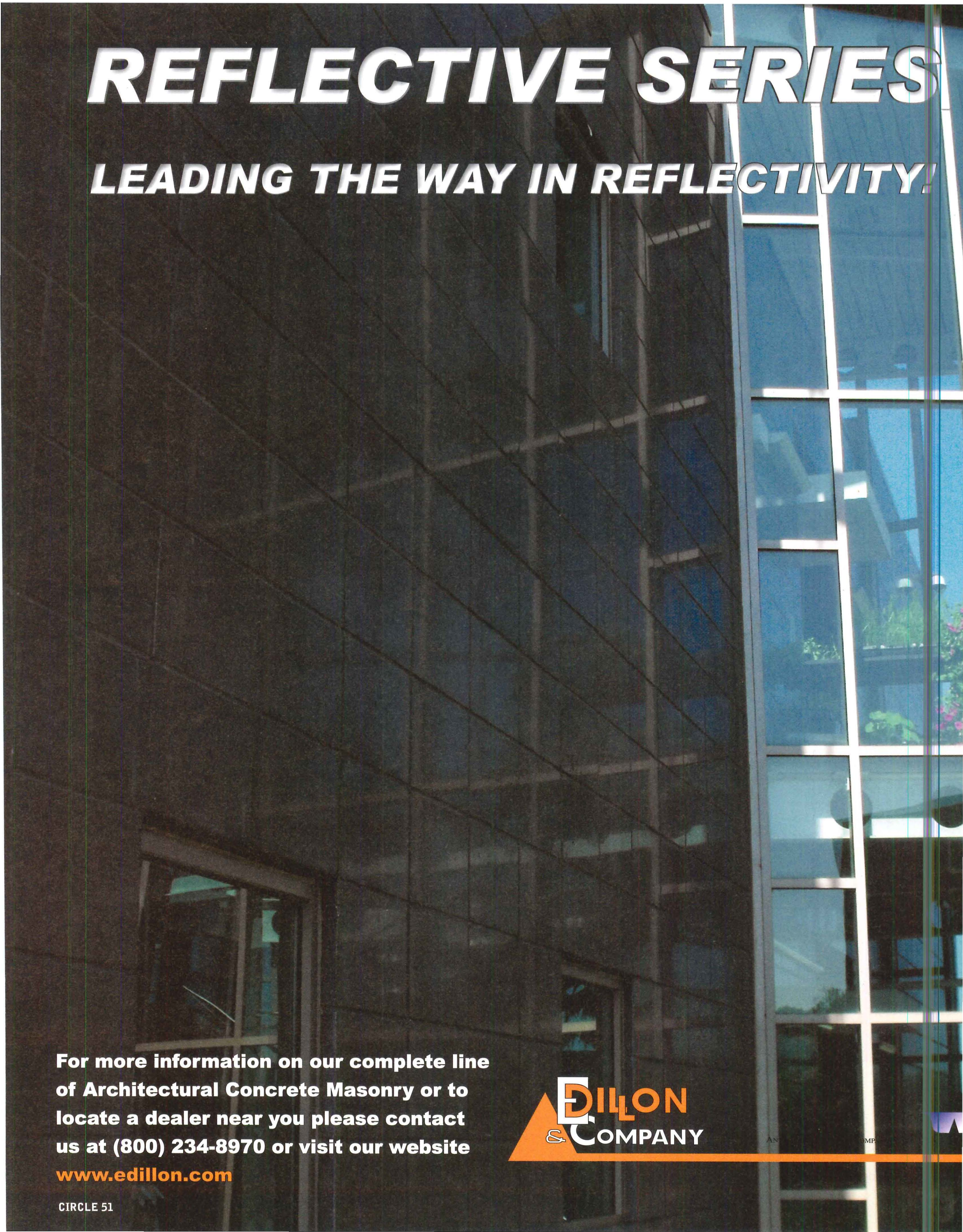
CIRCLE 168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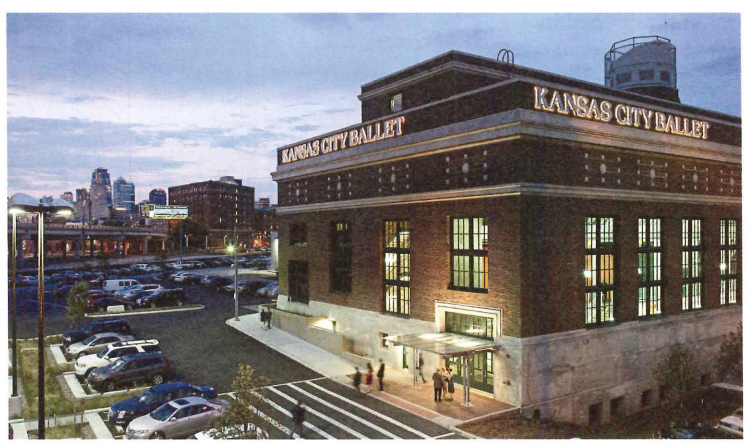
DILLON & COMPANY
CIRCLE 51

Todd Bolender Center for Dance & Creativity
BNIM
Kansas City, Missouri

SINCE THE curtain rose on the art form in the 17th century, classical ballet has required its practitioners to leap, lift, and chassé on-stage while making it all appear as effortless as a two-step. A 1914-era former coal power plant for the nearby Union Station train depot, then, isn't as unlikely a home for Missouri's Kansas City Ballet (KCB) as it may seem at first. It embodies the kind of industriousness and strength required to be a dancer. "There *is* something counterintuitive about putting a ballet school beside a rail yard," admits Steve McDowell, principal and design director at the Kansas City–based architecture firm BNIM. But the dissonance is a good thing,



CENTER STAGE
The Todd Bolender Center for Dance & Creativity is named for a choreographer, dancer, and director who led the Kansas City ballet from 1980 to 1995; he died in 2006. The center (left) is the final piece of a planned arts district in the area around the city's train-depot-turned-cultural-destination, Union Station. It includes rehearsal spaces for the company and studios for dance instruction (above).

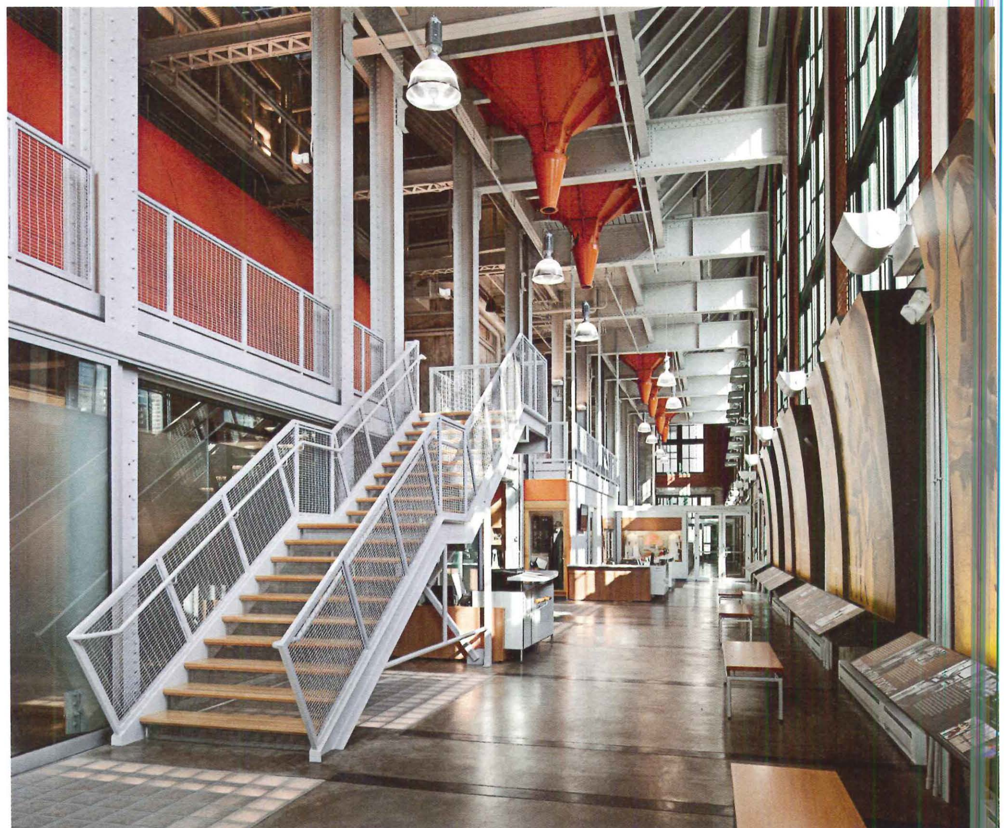
View additional images at architecturalrecord.com.

McDowell says: the building and its site gave the architects an opportunity to respond to the "muscularity and form of the human body" in motion while they created a new home for the city's ballet company and its school.

The KCB's former home was scheduled for demolition to make way for Moshe Safdie's Kauffman Center for the Performing Arts (for which BNIM was the architect of record), completed in 2011. Though the professional company would be staging productions in this new arts center, it set out to find another location for its school, rehearsal spaces, and administrative offices. The disused plant—known as the Power House—was part of a greater city plan to redevelop the area with Union Station at the heart of the project. It was an unusually advantageous option for the company because of its double-height ceilings and generous square footage. "The city considered the Power House for offices, a nightclub, a whole host of uses," says McDowell. But it lay vacant for 30 years until the ballet company set its sights on it.

To salvage the long-neglected industrial building and transform it into the Todd Bolender Center for Dance & Creativity, the crew gutted the entire 65,000-square-foot, two-story structure. The design team transformed the column-free north end of the building, once a cavernous engine room, into seven instruction and rehearsal studios. Administrative offices, dressing rooms, and restrooms occupy the building's south side. Certain industrial remnants—coal funnels, skylights, and the soaring Power House chimney, for example—were preserved in a careful choreography of new and old. Large new energy-efficient windows mimic the existing fenestration with exacting detail and provide abundant daylight penetration and views to the outside. Yet other interventions don't pretend to be old, says McDowell, referring to the 21st-century structural components used to build the mezzanine level and a second floor of dance studios.

Since the Todd Bolender Center opened in August 2011, the KCB reported a 70 percent increase in enrollment at its school from the 2010–11 year and a 92 percent increase in overall season attendance. "The Union Station complex is nearly finished now," with the center as a finishing touch, McDowell says. "People have been really enthusiastic about it."
Asad Syrkett



PAS DE DEUX The new center is the result of BNIM's careful choreography that seamlessly interweaves old and new structural elements. For example, the architects added a mezzanine level (above) in the old Power House, creating transparent instruction studios that have views out to the street and dance classes below (right).

credits

ARCHITECT: BNIM – Steve McDowell, principal; Rick Schladweiler, Joshua Hemberger, project architects

ENGINEERS: Structural Engineering Associates (structural); Taliaferro & Browne (civil)

CONSULTANTS: Acoustical Design Group (acoustical); Architectural & Historical Research (preservation)

CLIENT: Kansas City Ballet

SIZE: 65,000 square feet

COST: $39 million

COMPLETION DATE: August 2011

SOURCES

CONCRETE: Lafarge

CURTAIN WALL: Manko (metal/glass)

GLAZING/DOORS: A2MG, Manko (entrances, sliding doors); VT Industries (wood doors)

INTERIOR FINISHES: Armstrong (acoustical ceilings, suspension grid); PPG (paints and stains); Interface, Mohawk Group (carpet)

FURNISHINGS: Allsteel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CIRCLE 66

510 Fifth Avenue Renovation
Skidmore, Owings & Merrill
New York City

MID-CENTURY GEM Revisiting the original 1950s scheme of Bunshaft's building (left), the architects restored the Harry Bertoia screen (below) and mimicked the luminous ceiling, since replaced, with double-skinned acrylic diffusing panels that match the dimensions and corrugated texture of the original vinyl sheeting. New T8s with custom reflectors replicate the color temperature of the '50s cold-cathode lamps, for energy and cost savings over today's cold-cathode lamps, which must be custom-fabricated.

DESIGNED BY Gordon Bunshaft of Skidmore, Owings & Merrill (SOM), the Manufacturers Hanover Trust building's glass curtain wall and luminous interiors communicated a new transparency for financial institutions when completed in 1954. But the building that attracted 15,000 visitors on its opening day made less auspicious headlines in October 2010 when exiting tenants removed its site-specific Harry Bertoia sculptural screen and mobile. The change was just the latest in a long list of modifications that diminished 510 Fifth Avenue's original design. Flanked by two popular retail corridors—the established Flagship Row between 49th and 59th Streets and the Bryant Park area at 42nd Street—the address on the corner of West 43rd Street had also fallen out of favor among investors when Vornado Realty Trust acquired it three years ago.

Working with SOM, the new owners discovered that the key to the building's future lay in its past. Its original commissioner, Hap C. Flanigan, foresaw a need for adaptive architecture. "He talked about how many branch banks failed during the Depression," says SOM design partner Roger Duffy. "He didn't want to make the building overly specific."

The architects had to gain New York City Landmarks Preservation Commission approval for both interior and exterior modifications. Bunshaft's original design became the guiding principle: Duffy and the team reopened the volume by restoring the cantilevered second floor, which had been compromised by a glass ceiling during a previous renovation. They also restored the back-painted wire glass spandrel panels outlining the historic plate-glass facade, and reconfigured the entrance and escalators—originally on the side street—creating an inviting entrance on Fifth Avenue. Inside, they mimicked the original luminous ceiling with up-to-date materials. Even the Bertoia screen is back, if slightly repositioned, along with the mobile in its original place.

Vornado leased the building at a record rent to clothing retailer Joe Fresh before construction began. To fulfill the deal, the project team completed construction in just under a year.

The renewed building is already reviving the area, so that it is part of Fifth Avenue's retail corridor once more. With future tenants allowed only reversible changes, the building's course is much more controlled, says Duffy. "It appealed to a particular type of person in the 20th century, but now appeals to a much broader spectrum of people." *Jennifer Krichels*

credits

ARCHITECT: Skidmore, Owings & Merrill – Roger Duffy, design partner; T.J. Gottesdiener, managing partner; Jonathan Stein, project manager; Frank Mahan, senior design architect; Sam O'Meara, senior technical architect

ENGINEERS: Skidmore, Owings & Merrill (structural); Highland Associates (m/e/p)

CONSULTANTS: Brandston Partnership (lighting); Callison (tenant fit-out architect)

CLIENT: Vornado Realty Trust

SIZE: 30,000 square feet

COST: withheld

COMPLETION DATE: 2012

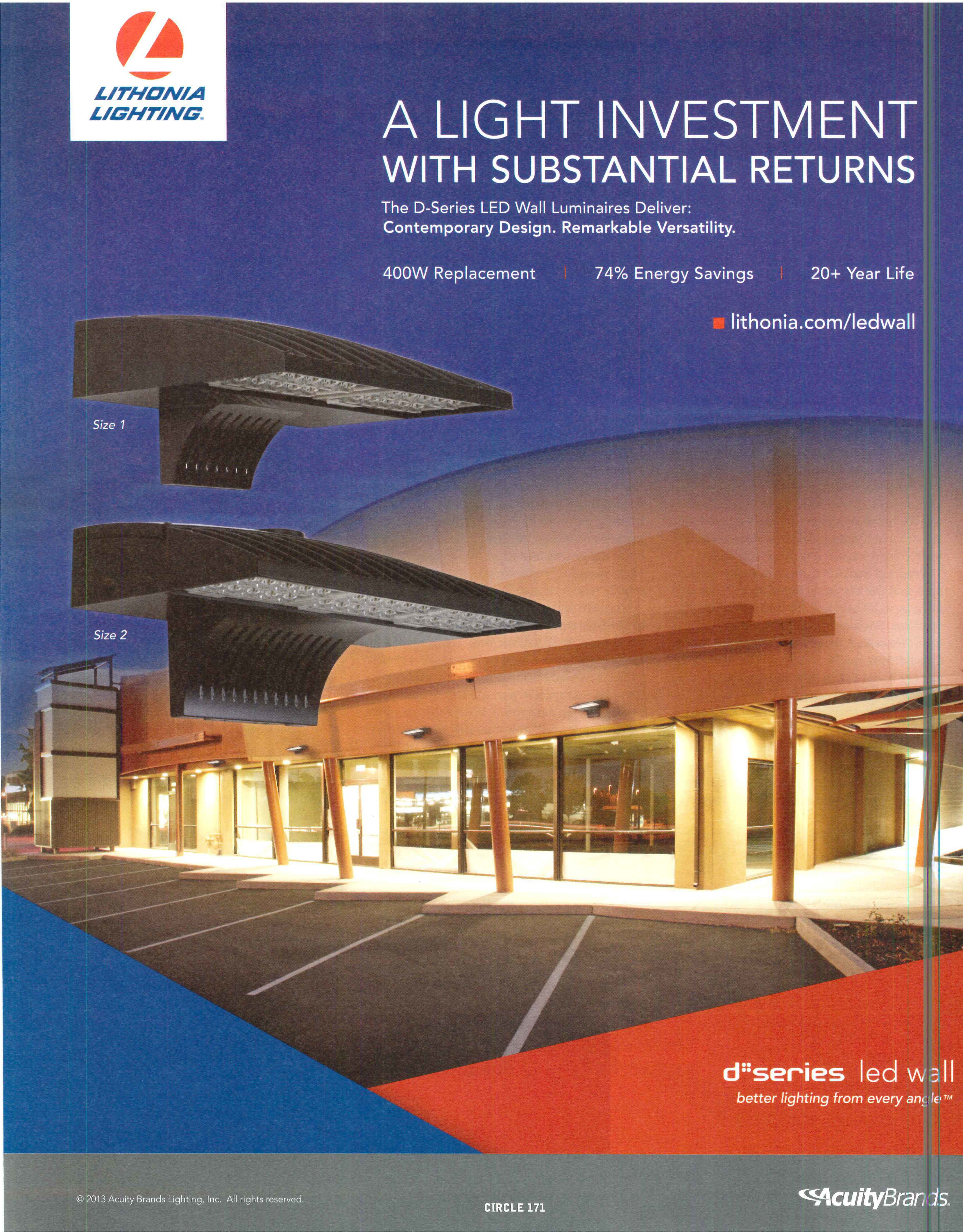
SOURCES

CURTAIN WALL: Empire Architectural Metal

LUMINOUS CEILING: Deglas (acrylic); Gordon (grid)

LIGHTING: A & L Lighting; Litelab; Lutron (controls)

View additional images at architecturalrecord.com.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CIRCLE 171
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GOOD DESIGN IS good business

LAND FORM The LEED Platinum building folds seamlessly into the landscape with a 6-acre living roof (above) that functions as a grassland ecosystem. It also extends the city's downtown core with vibrant public spaces and flexible interior areas that accommodate numerous events. Many of the terraces (left) and rooms are booked for banquets and weddings, while front and back of house are used for film and TV shoots.

credits

ARCHITECTS: LMN Architects (design architect); DA Architects + Planners, Musson Cattell Mackey Partnership (architects of record)

ENGINEERS: Glotman Simpson, Earth Tech Canada (structural); WorleyParsons Westmar (marine/foundation); Sandwell (civil); Schenke Bawol (electrical); Stantec (mechanical); Golder Associates (geotechnical)

CONSULTANTS: PWL Partnership (landscape); Horton Lees Brogden (lighting)

CLIENT: BC Pavilion Corporation (PavCo)

SIZE: 1.2 million square feet

COST: $625 million

COMPLETION DATE: April 2009

Vancouver Convention Centre West

LMN Architects

Vancouver, British Columbia

THOUGH VANCOUVER Convention Centre West spans 22 acres on the downtown waterfront and includes infrastructure for such future amenities as a seaplane terminal, the center is one of the city's more humble buildings. LMN Architects, with DA Architects + Planners and Musson Cattell Mackey Partnership, shaped 1 million square feet of exhibit halls, conference rooms, and event spaces into a sloping, grass-covered building that looks more like a stepped hillock wrapped in glass than a business complex.

Before the center's completion, in 2009, this swath of downtown Vancouver abruptly ended at a brownfield site on Coal Harbor. To connect the land back to the city, LMN brought the urban grid to the waterfront with public promenades. The architects saw the structure (built partly over the water) not just as a bridge between harbor and city but also as a platform for extending the area's marine and wildlife habitats. The center's living roof hosts bee colonies, for instance, and tiered concrete steps around the foundation piles create shallow waters for salmon. "We were really interested in seeing how the activities of people intersect the landscape and the marine systems, and trying to make them all better because they're connecting in one composition," LMN partner Mark Reddington says of the LEED Platinum building.

Working with the landscape architects at PWL Partnership, LMN treated the concrete-and-steel structure as a landform. To preserve sightlines for pedestrians, the architects pulled the meeting rooms and other interior elements in from the perimeter to keep the edges transparent. In some places, they dropped the 6-acre living roof down to eye level to frame views and provide a constant reference point to the landscape.

With three times the space of the adjacent Convention Centre East, the complex has doubled event attendance since its opening. In fiscal year 2012, the two centers together hosted 790,000 people (compared with 393,000 the year before the expansion was completed). By treating urban and natural habitats as one integrated mass, the project enriches the neighborhood even for Vancouverites who never set foot in the building. "It brings to the community a dense, diverse, ecologically strong place," says Reddington. "It becomes a focal point of life in the community." *Lamar Anderson*

View additional images at architecturalrecord.com.

Iowa Utilities Board/ Office of Consumer Advocate
BNIM
Des Moines

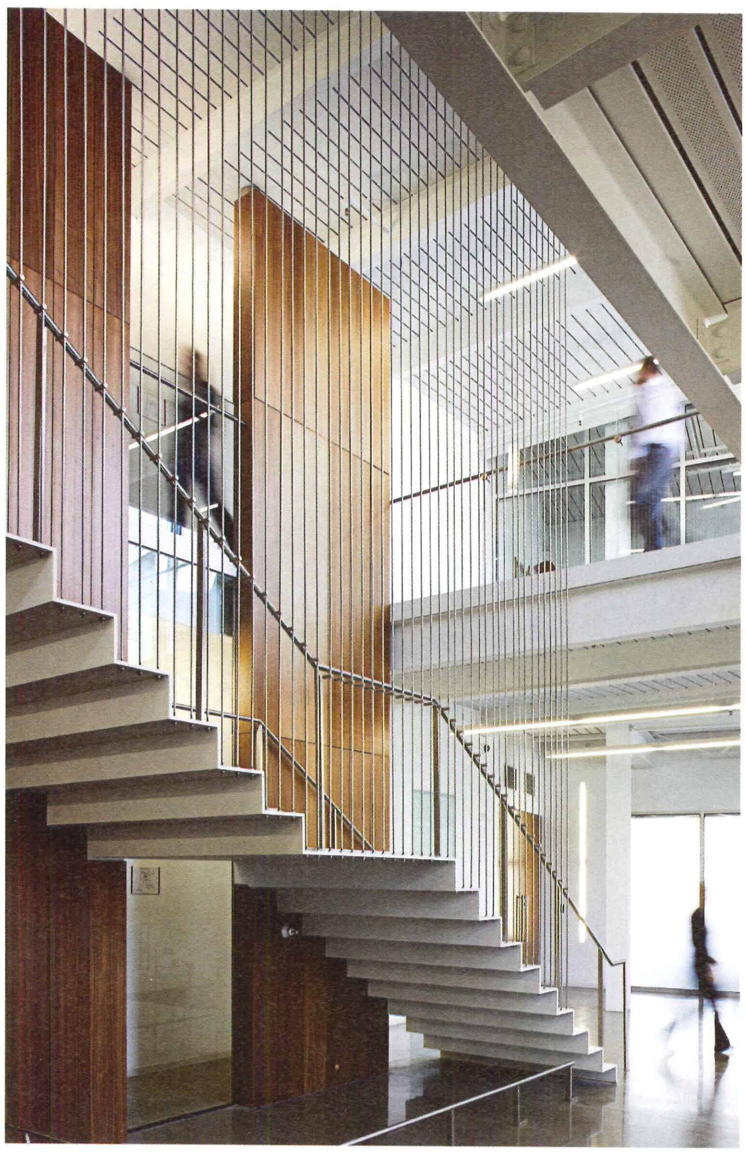
LOCATED ON a six-acre site that was once moldering landfill in Des Moines, a new complex for the Iowa Utilities Board and Office of Consumer Advocate is defying notions about what civic buildings look like, one sunlit, sustainably designed office at a time. This was all part of the two state agencies' plan to become models of energy efficiency and educate the community at large. The Des Moines office of Kansas City, Missouri–based BNIM was hired to accomplish these goals. "Our general design philosophy is 'resolve, rigor, and restraint,'" explains project architect Carey Nagle, describing the approach the firm took for this building, which came with a tight budget.

The result of BNIM's judicious strategy is a 44,700-square-foot building comprising two wings joined by a central lobby. The north wing, the larger of the two, contains the offices of the Iowa Utilities Board; the Office of Consumer Advocate occupies the south wing. BNIM designed the building to achieve an energy savings of 60 percent over the region's code baseline requirements and for optimum user comfort: the precast-concrete panels cladding the building are punctuated by large windows that allow daylight in and views out. Long and low, the office building has a quiet aesthetic that is meant to respect the older buildings in the nearby capitol complex, all while presenting a modest face for the agencies. "We tried to meet the client's needs simply, with sustainable and traditional design," explains Nagle.

For employees of the utilities board, the benefits are quantifiable: 98 percent of spaces have access to views and daylight, and 100 percent of occupants can get to a manually controlled window to let air in. The building's smart green systems have also made a mark: after two operational years, the annual energy savings amounts to nearly $42,000. At this rate, the utilities board will recoup its investment in these sustainable measures in less than four years. "And we've heard that the building has greatly facilitated collaboration," says Nagle. "Folks don't see themselves as working individually anymore." *Asad Syrkett*

View additional images at architecturalrecord.com.

CAPITAL GAINS For this, one of a complex of government buildings in Iowa's capital city, BNIM designed a long, low structure (above) on a site planted with native flora. Inside, light and air foster a feeling of openness, while small touches, like the walnut wall paneling in many rooms and common spaces (below), offer a sense of polish.



credits

ARCHITECT: BNIM – Rod Kruse, principal in charge; Carey Nagle, project architect; Tom Hilton, project manager

ENGINEERS: KJWW Engineering Consultants (m/e/p); Charles Saul Engineering (structural)

CLIENT: State of Iowa

SIZE: 44,700 square feet

COST: $10.1 million

COMPLETION DATE: April 2011

SOURCES

ROOFING: Firestone

WINDOWS: Wausau

GLAZING: Oldcastle BuildingEnvelope

INTERIOR FINISHES: Hunter Douglas (acoustical ceilings); Sherwin-Williams (paints and stains)

FURNISHINGS: Allsteel (chairs); Bernhardt (tables)

TASK LIGHTING: Herman Miller

ELEVATORS: Kone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CIRCLE 137

Daniel Swarovski Corporation
Ingenhoven Architects
Männedorf, Switzerland

IN THE rarefied world of Swarovski crystal there is a new jewel—the Daniel Swarovski Corporation headquarters. Situated on the tranquil eastern shore of Lake Zurich, in Männedorf, Switzerland, the new building, designed by Düsseldorf-based Ingenhoven Architects, is as beautiful a work environment as one could imagine.

For 118 years, since Daniel Swarovski invented the precision-cutting machine that revolutionized the crystal-glass industry, the company has grown to manufacture decorative products that are irresistible to such iconic fashion houses as Chanel, Schiaparelli, Balenciaga, and Dior, making Swarovski a tony household name.

Fast forward to 2010, when the $2 billion–plus company charged Ingenhoven Architects with designing a new building, which would

CRYSTAL CLEAR Inspired by the shape of the company's swan logo, the architects devised a curvilinear scheme (below) that takes advantage of its lakeside site. In addition to featuring a 10,760-square-foot green roof (right), the building is heated and cooled with water from Lake Zurich processed via a heat exchanger.

View additional images at architecturalrecord.com.

take teamwork and creative thinking to a higher level. The location was selected for the inspiring panoramic views of the lake it provides. The architects were asked to create an innovative and sustainable office building with an open, transparent interior plan. Additionally, they were asked to provide nearly all the company's 500 employees with well-appointed lake-view offices and workstations.

The design team's solution is an elegant boomerang-shaped structure that frames the lake for its occupants with a glazed facade. Internal glass walls allow views through the exterior offices, bringing the outdoors in from almost every direction. The result is an unparalleled feeling of spaciousness and light.

The new building houses administrative offices, the marketing department, and an in-house design studio. Employees enter a gleaming white lobby, where more general spaces include a lounge, a restaurant, and rooms for conferences and workshops. Every aspect of the layout has been designed for spontaneous interaction. Meanwhile, the open-plan work areas on the upper floor facilitate collaboration among employees, as well as easily configured organizational changes.

According to architect Ben Dieckmann, a member of Ingenhoven's project team, designing for optimum employee communication was particularly important to the Daniel Swarovski marketing department. "The main thing was to maximize the exchange of ideas," he says. "The U-shaped open space, where not only are all colleagues visible to each other, but also where all of the office workstations enjoy the panorama of Lake Zurich, is a major part of the success of the building." In fact, he notes, Swarovski has already outgrown the building and plans an extension on the grounds—"proof that the overall aim of the project was achieved." *Allison Craig*

WORK LIFE While the boomerang-shaped building seems symmetrical at first, its two wings are not equal in length in order to maximize views from inside (top). Flat ceilings in the work areas are made of a sound-absorbing acoustic plaster to reduce noise. In addition to an entrance lobby and reception area, the ground floor comprises dining facilities (above), including a 50-seat restaurant; informal gathering spots; rooms for conferences and workshops; and access to the grounds during warmer seasons.

credits

ARCHITECT: Ingenhoven Architects – Christoph Ingenhoven, principal; Ben Dieckmann, Thomas Höxtermann, project team

ENGINEERS: Werner Sobek Ingenieure (structural); Grünberg & Partner (mechanical)

CONSULTANTS: Inside Outside/Petra Blaisse (landscape); Tropp Lighting (lighting); Werner Sobek Ingenieure (facade)

CLIENT: Daniel Swarovski Corporation

SIZE: 204,000 square feet

COST: $63 million

COMPLETION DATE: July 2010

SOURCES

CLADDING AND ROOF: Josef Gartner

GLAZING: Schüco System

DOORS: Schüco System, Blasi (entrances); Hörmann (metal doors, fire-control doors)

INTERIOR AMBIENT LIGHTING: Zumtobel

FURNISHINGS: Vitra; Alias Milano

ELEVATORS: Kone


ONTO. A NEW FORM
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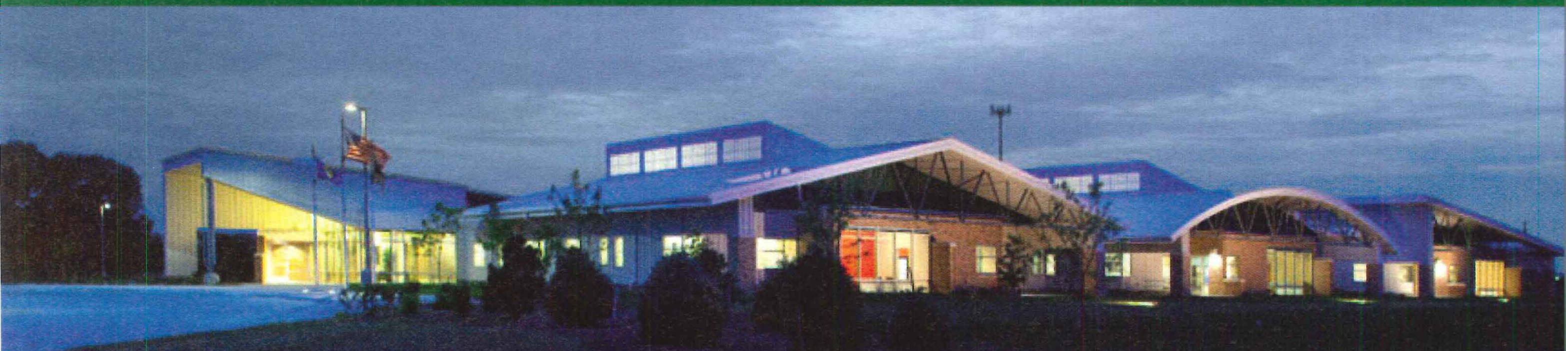
Le Monde
Onto, Matteo Thun

What do you do when you've been in the lead for 67 years? Widen the gap.



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CIRCLE 79

GOOD DESIGN IS good business

Devon Energy Center
Pickard Chilton
Oklahoma City

DEVON ENERGY Center in Oklahoma City sets a shining example for investing locally. Founded in 1971, Devon Energy, an independent oil and natural-gas exploration and production company, quickly grew to over 2,000 employees who were spread out across five different aging buildings downtown. The company needed to consolidate. But rather than relocating, management insisted on staying in Oklahoma and building from the ground up. "We could see in future years the city was going to be great," says Klaholt Kimker, the company's vice president of administration.

The company's new headquarters, by New Haven–based architects Pickard Chilton, is defined by a 50-story tower, surrounded by several low-rise components, that has quickly solidified the Devon brand and become an emblem of the prairie town's recent renaissance (RECORD, October 2012, page 80). But creating a complex that would include the city's tallest building was not the initial goal of Devon executive chairman Larry Nichols, notes principal Jon Pickard. "By following the logic of meeting Devon's business needs, we were able to create something that was compelling and could in fact become a key symbol for Oklahoma City, and it turned out to be a 50-story tower," he says. Recruiters cite the building – a poster child for density and targeted for LEED Gold – as a major factor for attracting talent, with applications up by 40 percent.

Integrating into the city's fabric to create a civic space was another Devon goal. Nichols insisted that the ground level be open to the public. A soaring rotunda buzzes with employees during the workday, but also with tourists and locals passing through. A café connects to a sun-filled seating area that leads to a public green space. As the project developed, the company asked the city to form a tax-increment-financing district to improve the adjacent Myriad Gardens and to upgrade downtown streetscapes. A deal was struck, and Devon lent $95 million to speed up the work, with more money added by the city.

In the end, the architects say pragmatism was a key driver. "We wanted to create a beautiful building, but at the same time, we respect silly things like efficiency and practicality," says Pickard. *Beth Broome*

View additional images at architecturalrecord.com.

GOLDEN ACHIEVEMENT Devon Energy Center employs such sustainable strategies as remediation of a brownfield site, green roofs on the podium, an advanced building-management system, floor-to-ceiling low-E insulated glass with interior shading, and vertical glass fins and horizontal tubes to reduce solar load.

credits

ARCHITECT: Pickard Chilton – Jon Pickard, William D. Chilton, Anthony Markese, partners in charge; John Lanczycki, project manager

ARCHITECT OF RECORD: Kendall/Heaton Associates

INTERIOR DESIGN: Gensler

ENGINEERS: Thornton Tomasetti (structural); Cosentini Associates (m/e/p/fp/information technology)

CLIENT: Devon Energy

SIZE: 1.9 million square feet (gross)

COST: withheld

COMPLETION DATE: December 2012

SOURCES

STEEL: Hirschfeld (structural); Permasteelisa (stainless steel)

PRECAST CONCRETE: Metromont

GLAZING: Viracon

SKYLIGHTS: Super Sky

SHADING: MechoSystems

GOOD DESIGN IS **good business**

Target Plaza Commons
Julie Snow Architects
Minneapolis

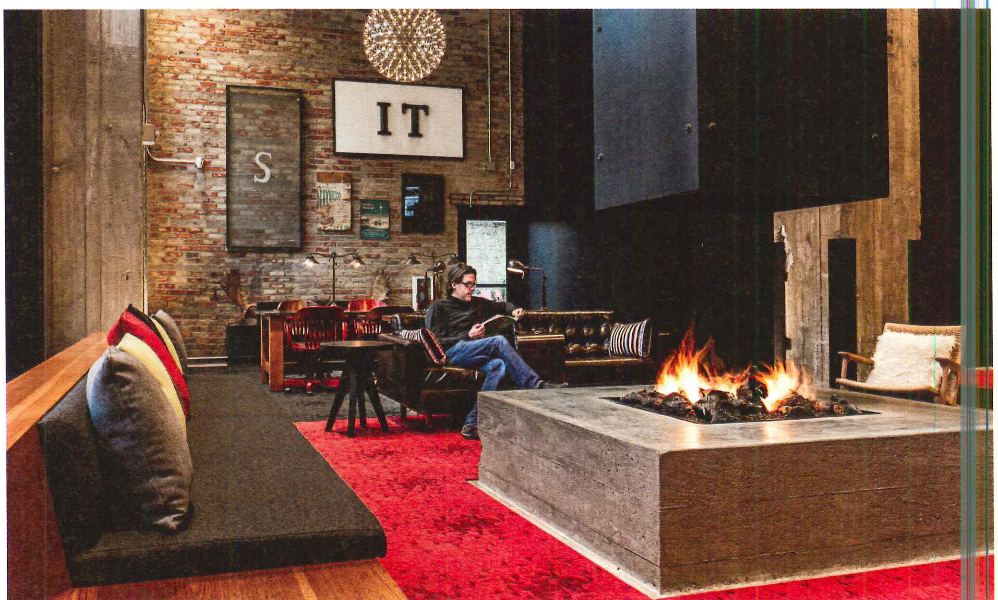
ON TARGET Julie Snow Architects converted two vacant storefronts—a former record store and a former Scientology center—into a lounge and recreation space (left) for roughly 10,000 Target employees working in downtown Minneapolis. Couches and bistro seating provide a casual atmosphere for meetings (below), while a mezzanine has an air-hockey table and other games for work breaks (bottom). A glass door in back opens out to an enclosed courtyard with a large lawn, basketball court, bocce court, and fire pit, among other amenities (opposite).

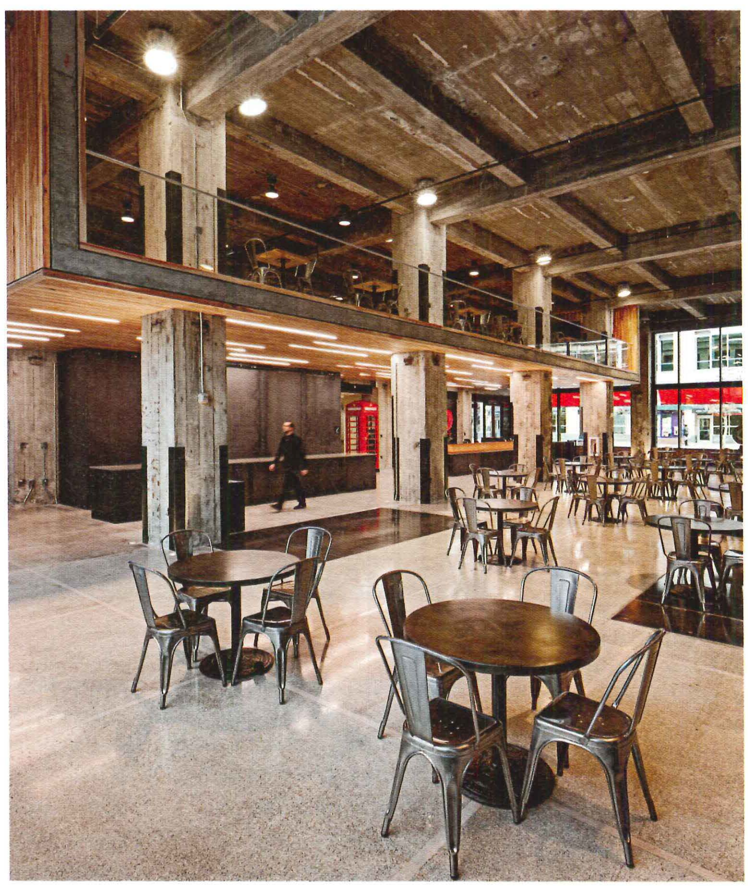
WHEN TARGET purchased two neglected commercial buildings on a prime site as a long-term real-estate investment, the company decided to adapt them during the interim. Across the street from its headquarters in downtown Minneapolis, Target Plaza Commons is a new space for employees to store their bikes, take yoga classes, play basketball—and perhaps do some work.

"It's different from anything they have at Target corporate. It's more raw," says Matthew Kreilich, principal at Minneapolis-based Julie Snow Architects, which oversaw the renovation of the 57,000-square-foot complex. Target hopes the rugged look—and the unsubtle references to California's start-up-friendly, no-frills offices in old warehouses—will bolster recruitment of young and creative employees, who might be looking for a reprieve from the buttoned-up vibe down the street. "The idea was to make it as noncorporate as possible. But that may be the new corporate, who knows?" says Julie Snow, the firm's founder.

Located at a major intersection, the larger of the two buildings—a two-story concrete structure built in 1920—has a double-height reception area and lounge on the first level, and a video lounge and game area on the wood-lined mezzanine above. Apart from the new mezzanine, the insertions were minimal: the architects stripped away decades of plaster and carpeting to reveal the building's original concrete walls and terrazzo floors. A glass hangar door, cut into the existing exterior back wall, opens out to a green lawn, full-size basketball court, and fire pit. Dating to 1914, the smaller building next door, with a back entrance, has bike storage, exercise space, and locker rooms. "They like to keep the spandex and suits separate," says John Montgomery, senior project architect with Minneapolis-based Ryan A+E, the architect of record.

By all measures, the space has been a roaring success. The exercise spaces are booked solid, and the bike racks are full. "People feel like it's a fun gift from the company to the team members," says Rich Varda, a senior vice president at Target. And while it was conceived as a temporary space, Varda says the company has no plans for demolition and expects to use the complex for at least a decade. *Laura Mirviss*





credits

ARCHITECT: Julie Snow Architects – Julie Snow, Matthew Kreilich, Carl Gauley, Pauv Thouk, Mike Heller, Don Wu, Cameron Bence, Tyson McElvain

ARCHITECT OF RECORD: Ryan A+E – Mike Ryan, John Montgomery, Jenna Hanner, Tony Solberg, Josh Ekstrand, Dan Elenbaas, Brian Heimerl, Kevin Pfeiffer

INTERIOR DESIGNER: Target Property Development

CLIENT: Target Corporation

SIZE: 57,000 square feet

COST: withheld

COMPLETION DATE: October 2012

SOURCES

GLAZING: Oldcastle BuildingEnvelope

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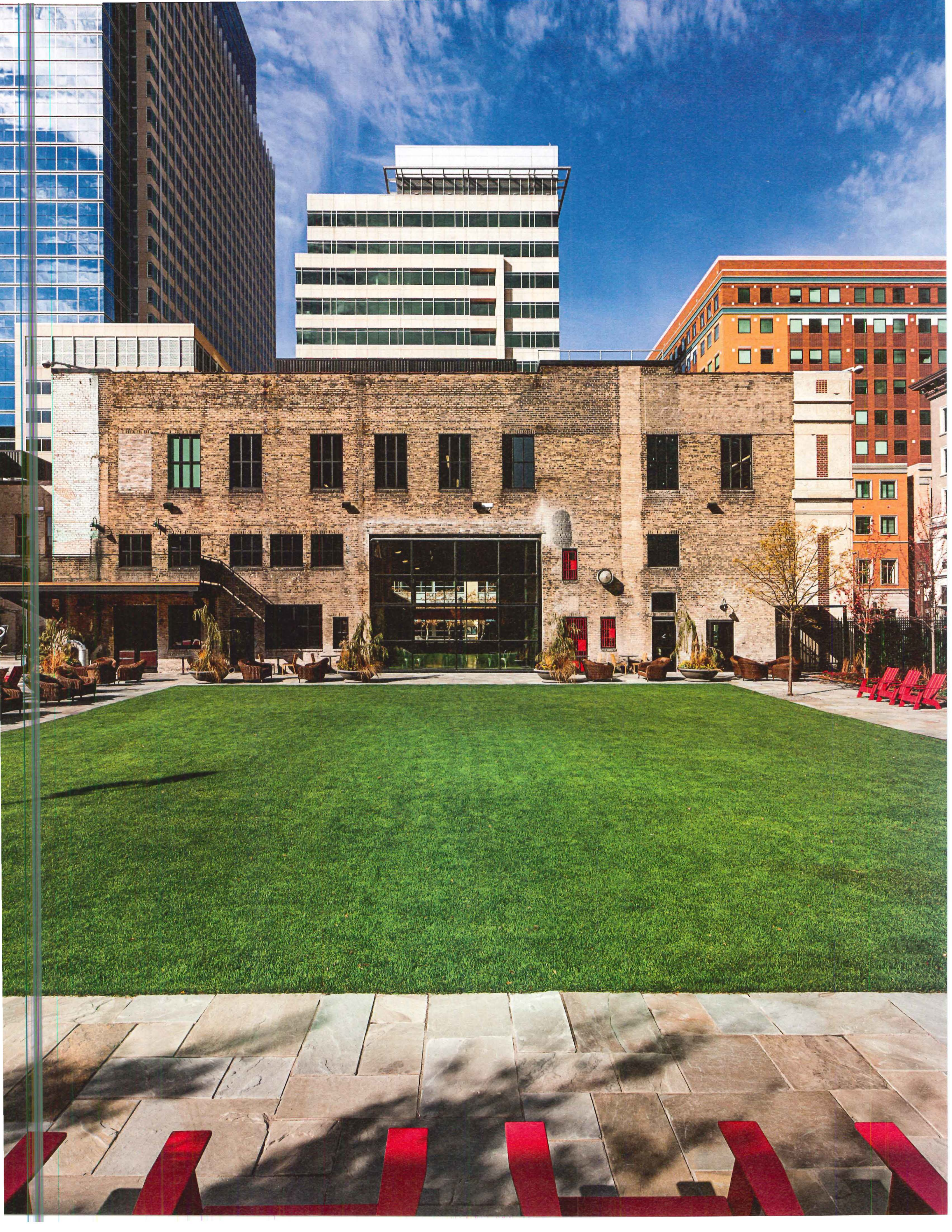


GOOD MOVE Located in Jean Nouvel's One New Change, in the City of London district, the law firm offers employees and clients stunning views of St. Paul's Cathedral from open meeting areas. Internal stairways and contemporary furnishings in lively gathering areas encourage staff interaction (below).

K&L Gates at One New Change
Lehman Smith McLeish
London

ENCOMPASSING A mere square mile of area, the City of London exemplifies a dense urban fabric. Commercial real-estate developers have typically responded to crowded conditions by reaching skyward: two of London's three tallest buildings—the KPF-designed Heron Tower and Renzo Piano's Shard, both completed in 2010—are within this downtown core.

The opening of One New Change that same year demonstrates that not every contemporary icon requires a place in the skyline. Located directly across from St. Paul's Cathedral (itself a onetime record holder in building height), Jean Nouvel's mixed-use complex comprises

View additional images at architecturalrecord.com.

560,000 square feet on only six floors. The low-slung arrangement created equally sprawling interiors for office tenants like the law firm K&L Gates. Previously, its 380 London-based employees occupied 75,230 square feet on nine floors at 110 Cannon, a nondescript mid-rise building a half-mile east of the cathedral. The move honored a commitment to staying within the transit-accessible City area, while expanding to 102,000 square feet on only two floors.

The space did not seem entirely usable at first. To protect views of St. Paul's, Nouvel had sculpted the building shell into a series of facets that, in turn, diminished ceiling heights of some interiors overlooking the narrow courtyard. Washington, D.C.–based architect Lehman Smith McLeish (LSM) configured the law firm's public spaces within this zone to make limitations appear intentional, exemplified by a double-height multipurpose room there.

"It's clear to see how they have embraced and enhanced the architecture of the building," says Kaela Fenn-Smith, head of leasing for Land Securities, which owns One New Change. Land Securities toured other potential tenants through the office to demonstrate the building's promise; it filled the last remaining vacancy in January.

Meanwhile, K&L Gates is reaping its own benefits from the scheme. The new office has 150 percent as much common space as the previous address. The design strategy, immediately embraced by employees, creates alternative work areas that promote connectivity to clients and within staff. During the first six months of occupancy, meeting bookings were 58 percent higher than in the same period the year prior; K&L averaged 385 meetings per month in 2011, increasing to 542 in 2012. Similarly, within that same year and a half, the London branch hosted 18 advertised events, compared with seven at 110 Cannon.

LSM interspersed double-occupancy workstations with teaming areas to encourage interaction among lawyers and support staff. Along with an iconic new address, the open, daylit floors and collaborative spaces have had a positive impact on employee output, client services, and, says administrative partner Antony Griffiths, lateral hiring from the firm's 47 other offices worldwide. This company shift of attorneys, with their clients, is largely responsible for boosting business and profits. According to chairman Peter Kalis, the London office increased revenue by 10 percent in 2011 and another 8 percent in 2012. *David Sokol*

LIGHT WELL An atrium cuts down through the levels, bringing daylight to the innermost spaces. LSM lined the transparent volume with offices, a café, and public areas to promote connectivity and interaction.

credits

ARCHITECT: Lehman Smith McLeish – Debra Lehman-Smith, Terese Wilson, Richard Bilski, partners; Donald Morphy, Gregory Weber, directors; Kelly Anderson, designer

ENGINEER: Hilson Moran

CONSULTANTS: Seider Design (lighting); Lisa Austin (art); Velvet Principle (graphics); Wheelerkänik (construction administration)

CLIENT: K&L Gates

SIZE: 102,000 square feet

COST: withheld

COMPLETION DATE: May 2011

SOURCES

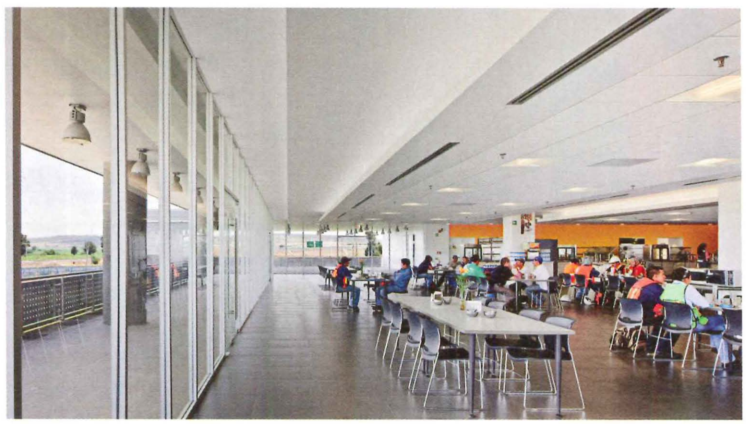
INTERIORS: Unifor (glass/solid partitions, sliding/telescoping doors, furniture, technical walls)

STONE: Campolonghi Italia

CARPET: Miliken; Vorwerk

LIGHTING: Zumtobel

Planta Milenio
Davis Brody Bond
Irapuato, Mexico



WORKERS' COMP Balanced with an energy-efficient lighting system, a series of shed roofs and skylights were installed to infuse the factory with ample daylight—said to boost employee productivity—and also to mitigate the harsh Mexican sun (above). Amenities, like the sun-filled cafeteria (left), provide comfortable employee downtime and a place for management to share ideas with the production team.

COMPLETED IN 2010 in Irapuato, a city in the south-central region of Mexico's Guanajuato state, Procter & Gamble's (P&G) Planta Milenio illustrates the potential gains of rethinking the architecture of today's factories. While the design, by architects Davis Brody Bond with structural engineer Arup, is rooted in the company's industrial process, it balances utilitarian goals with those that have emerged in the global economy—environmental sustainability, worker retention, and productivity.

"They wanted as much flexibility as possible," says Davis Brody Bond partner Christopher K. Grabé. The design team held workshops with P&G employees to understand the manufacturing process. "The idea was to come up with scenarios in which they could move equipment to make the factory more efficient, productive, and ergonomic," says Grabé.

The team convinced the client that equipment should hang from the ceiling on tracks, while pipes for plastics (the factory makes razors) would run through a walkable underground tunnel, penetrating the floor beneath molding machines. The flexible infrastructure enables reconfiguration, permitting adjustments for future technologies and strategies.

The design also applies moves that until now have been more common in office towers than on factory floors. The architects focused on the issue of daylight, mitigating the harsh Mexican sun with a sawtooth shed roof and skylight system that controls heat gain and withstands the region's torrential rainfalls. Combined with energy-efficient lighting, the strategy gives P&G an average annual savings of $450,000, more than 7 percent of its energy budget. Added to savings from a 100 percent water-reuse plan and other efficient active systems, that number comes to well over $1 million.

Amenities such as a cafeteria, a gym, and athletic fields create collaborative areas where engineers and machine operators can share ideas. Meetings can overlook the production floor for a sense of cohesion in the manufacturing process. "Having a comfortable flow is important," says Grabé. In a 1.13 million-square-foot facility, a design that fosters direct communication between production, management, and testing labs ultimately saves time and money. The plant is the first of its kind for P&G in Latin America. Given the significant savings, it won't be the last. *Jennifer Krichels*

credits

ARCHITECT: Davis Brody Bond – Christopher K. Grabé, partner in charge; Oliver Sippi, project architect; Beatrix Oetting, Nnadozie Okeke, Matthew Mulkeen, Jao Santos, Takehiko Katayama, Gabriela Hodara, Bruce Dole, project team

ENGINEER: Arup – Duncan White, principal; Joshua Yacknowitz, lead mechanical engineer; Julian Astbury, lead electrical engineer; Carlos Valverde, design manager

ARCHITECT OF RECORD: Grupo Sagmac

CONSULTANTS: Entorno Arquitectura de Paisaje (landscape); Arup (lighting, acoustics)

CLIENT: Procter & Gamble

SIZE: 1.13 million square feet

COST: $100 million

COMPLETION DATE: 2010

SOURCES

CEILINGS: USG (acoustical)

LIGHTING: Cooper (interior, exterior); Schneider Electric, Legrand (controls)

DOORS: Stanley (sliding)

View additional images at architecturalrecord.com.

Salt River Fields at Talking Stick
HKS
Scottsdale, Arizona

WHEN THE Arizona Diamondbacks and the Colorado Rockies decided to move their spring-training operations from Tucson and share a new facility in the Phoenix metropolitan area, the teams wanted more than a state-of-the-art ballpark. For the hundreds of thousands of supporters who come out each spring to watch practice games, picnic on the stadium lawn, and cut loose before the baseball season begins, the Diamondbacks and Rockies (who are otherwise unaffiliated) set out to create the best fan experience in the major leagues.

The teams found a home in the Salt River Pima-Maricopa County Indian Community, which invested in creating just such an off-season venue called Salt River Fields at Talking Stick, designed by HKS. Unlike a traditional stage-managed sports arena, Salt River Fields invites fans to choose how they experience the game. Visitors enter via ramped sidewalks with views that clarify the logic of the site. To encourage them to explore Salt River as they would a regular park, the architects organized the site in an organic circular pattern around the concrete-and-steel-structure stadium. If the fans don't want to sit in the 11,000-seat stadium or on its large lawn, they can walk around to see the activity at the dugouts, batting cages, and practice fields. "Rather than have one or two places to watch, we probably have 25 ways you can see a game," says HKS principal Morris Stein.

All that flexibility has paid off. Since the stadium opened in 2011, Salt River Fields has enjoyed the highest spring-training attendance in the major leagues. In 2012 the complex beat the previous record (Peoria Sports Complex's 230,407 fans in 2008) by 60 percent, topping out at 369,393 fans. During the off-season, the park brings in an additional 200,000 people for youth sports, food-truck festivals, concerts, and parties.

The Native American community's investment in Salt River has already spurred local economic growth. Two golf courses have doubled the number of games played, hotel bookings are up, and a nearby shopping center is adding tenants, according to Stein. "This is not just creating income from selling baseball tickets or hot dogs and Cokes, but a real economic engine," he says. "One plus one equals far more than two." *Lamar Anderson*

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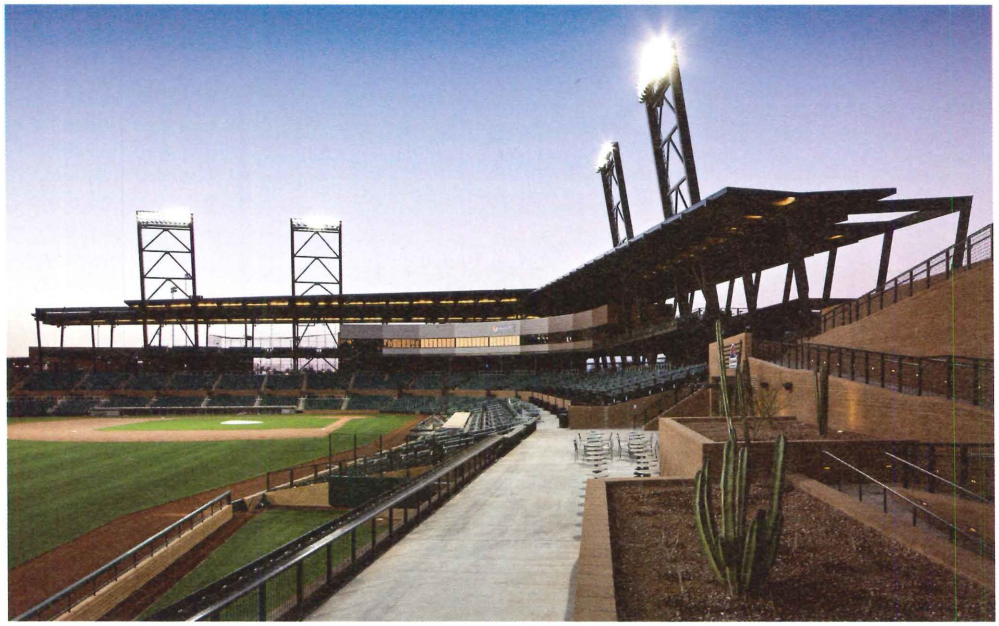

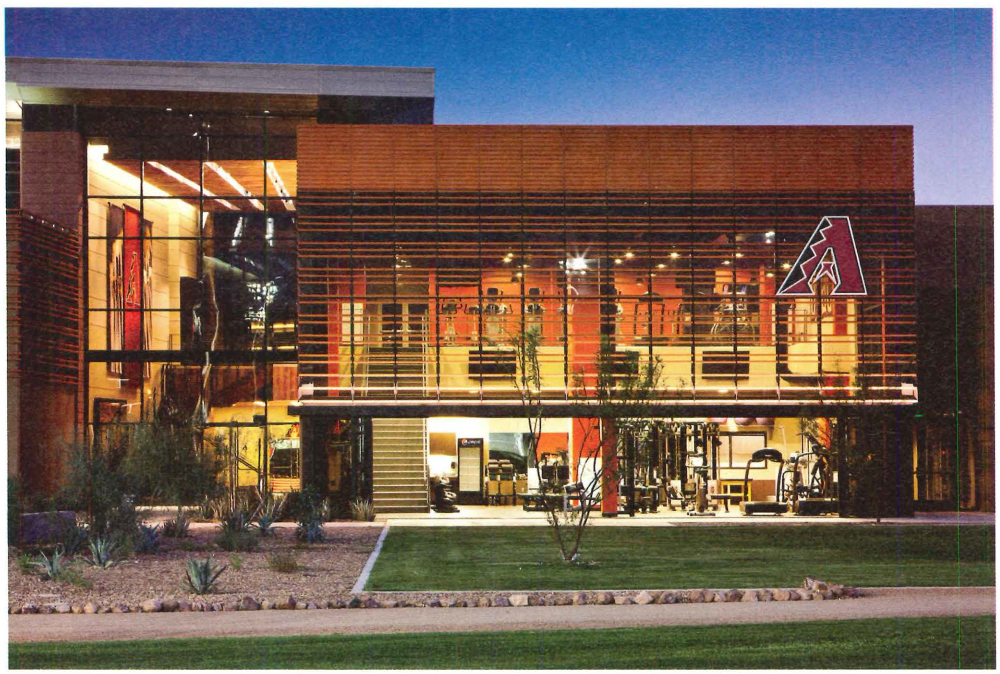

HOME RUN Two team clubhouses (above, the one for the Diamondbacks), 18 practice fields, and a Native American community park encircle the stadium (top). Achieving LEED Gold certification for the project—a first for a baseball stadium or a spring-training or MLB complex—HKS sourced 40 percent of the building materials from local suppliers, using aggregate mined from the site to create sandy-brown concrete blocks that complement the landscape.

credits

ARCHITECT: HKS - Morris A. Stein, principal; Andrew Henning, project manager; Bryon Chambers, project designer; Deva Powell, Thomas Smith, project architects

ENGINEERS: HKS (structural); WSP Flack + Kurtz (m/e/p); Lloyd (civil)

CONSULTANTS: Ten Eyck (landscape architect); Focus (graphic design)

SIZE: 140 acres; 279,600 square feet (buildings)

CLIENT: Salt River Pima-Maricopa Indian Community

COST: $13.7 million

COMPLETION DATE: January 2011

SOURCES

EXTERIOR WALL PANELS: Centria

GLAZING: Viracon

WINDOW WALLS: Nana Wall (operable); Kawneer (curtain wall)

ROOFING: Johns Manville

LIGHTING: Musco, GE (exterior); Lightolier, Elliptipar (interior)

Lamar Advertising
Eskew+Dumez+Ripple
Baton Rouge, Louisiana

WHEN THE Baton Rouge, Louisiana–based billboard company Lamar Advertising outgrew its headquarters, finding another traditional office building would have been the natural next step. But a 1970s data center across the street hit the market, and management decided to make the leap—despite the building's closed-off precast-concrete facade and stingy allotment of windows. "You can imagine staff saying, 'What, we're going to move into that?' " recalls architect Steve Dumez of the New Orleans–based firm Eskew+Dumez+Ripple (EDR). "It took a tremendous amount of vision to look at that building and say, 'This is going to be our new headquarters.' "

Choosing a frumpy building may seem like a puzzling move for a graphics company, but for CEO Sean Reilly, it was the interior that mattered. "It's not important for us to brag, but rather to create a space that makes our employees feel welcome," Reilly says. The three-story, 115,000-square-foot building, which opened in March 2012, includes a large training room, open-plan workstations, a ground-floor cafeteria, and an outdoor patio shaded by oak trees.

To boost employee collaboration, EDR sought to unify the steel-and-precast-concrete structure's three levels into one light-filled space. The architects removed a central portion of the roof and upper floors and inserted a glazed open-air courtyard above a ground-level training room. To encourage chance encounters, they made taking the stairs an appealing option. A set of ipé-wood bleachers, with a stair linking the first and second floors, serves as a gathering spot and makes moving around the office inherently social. Glass rails preserve sightlines between departments.

The EDR team jazzed up the interiors by hanging items from Lamar's trove of vintage billboards, including early painted canvas specimens. For a mural on the ground floor, they screen-printed an image of a 1950s-era roadside scene onto aluminum signage panels.

By renovating the existing building instead of demolishing it and building new, Lamar saved 30 percent on construction costs. Since the move-in, the company estimates, employee collaboration has jumped 25 percent. "It gets us together more often and in different ways, and you never know where the conversation will go," says Reilly. *Lamar Anderson*

View additional images at architecturalrecord.com.

'70S REDUX The design team transformed the precast-concrete former data center with (from above) a glazed courtyard; a shaded patio for outdoor lunches; and bleachers edged by stairs that provide a friendly spot for company events, impromptu gatherings, and moving around the office.

credits

ARCHITECT: Eskew+Dumez+Ripple – Steve Dumez, principal in charge

ENGINEERS: Henderson (m/e/p); Fox-Nesbit Engineering (structural/civil); Dean C. McKee (structural); ABMB Engineers (civil/site)

CONSULTANT: Spackman Mossop and Michaels (landscape architect)

CLIENT: Lamar Advertising

SIZE: 115,000 square feet

COST: $13.8 million

COMPLETION DATE: March 2012

SOURCES

SHADES: MechoSystems

INTERIOR FINISHES: Benjamin Moore (paint); Armstrong, Hunter Douglas (ceilings); Media DPI, Knoll Textiles (wall coverings); Formica, Wilsonart (plastic laminate); Corian by DuPont (solid surfacing); J & J/Invision, Tandus (carpet)


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Some things in life just aren't worth rolling the dice on...

Crashing the Boys' Club

DENISE SCOTT BROWN, ON-SITE AT THE LEARNING FROM LAS VEGAS STUDIO, 1968.

In the 45 years since Denise Scott Brown came on the scene, female architects have come a long way. Or have they? An essay by Sarah Williams Goldhagen investigates the serious obstacles that remain. In addition, RECORD asked a number of women in architecture to comment on their experiences in the profession. Join the conversation at archrecord.com.

Sarah Williams Goldhagen, the architecture critic for the New Republic, *is writing a book on the experience of the contemporary built environment.* RECORD *assistant editor Laura Mirviss contributed research.*

BY SARAH WILLIAMS GOLDHAGEN

Think back to the late 1960s, when 94 percent of the students enrolled in American architecture programs were men. Or to the early 1990s—decades after the Civil Rights Act's Title VII outlawed discrimination by gender—when more than 80 percent of architects were still men.

Times have changed: more than 40 percent of graduates from architecture school are women. Attitudes about working women have also changed; nobody questions their presence in design charrettes or client meetings, and of the few architects to win a MacArthur "genius" grant, two, Elizabeth Diller and Jeanne Gang, are women; since 2004, two women, Zaha Hadid and Kazuyo Sejima (the latter with her design partner, Ryue Nishizawa), have won the Pritzker Prize. Thanks to the Beverly Willis Architecture Foundation and the International Archive of Women in Architecture, women's historical contributions to the field are better known. Women-owned practices are common, as are female-male—often wife-husband—partnerships. And today, architecture's future rests largely in the hands of men and women nurtured on the precepts of gender equality.

Given all this, one might anticipate that soon, most of what still hinders women architects on their climb up the professional ladder will disappear. But statistics—the lamentably few that are available—suggest a less heartening outcome. Consider this: despite near parity in architecture schools, men outnumber women in the profession four to one, according to the U.S. Labor Department. Salary inequities in the U.S. remain the norm: the median salary for women working full time is roughly 28 percent lower than for men working full time. Women remain grossly underrepresented in the uppermost echelons of American practice: take just five prominent firms—Ennead; HOK; Kohn Pedersen Fox; Skidmore, Owings & Merrill; and Pei Cobb Freed—and note that their leadership teams are nearly entirely male. In general, 17 percent of principals and partners are women.

These figures paint a far bleaker portrait of women's status in architecture today, one that is comparable to other laggard professions, such as communications (15 percent of executive leaders), business (4.2 percent of CEOs in the Fortune 1000), and law (15 percent of equity partners in law firms).

Attitudes, anecdotal evidence, and numbers conflict. What do they mean? Are these numbers merely an artifact of past discriminatory practices? Does the success of many women practitioners today represent ongoing improvement? Will this social injustice slowly disappear?

As much as all of us would like to answer yes, statistics suggest that the answer to these questions is no. Abundant research on law, medicine, and business reveals that women's progress in those professions has plateaued. Why should we think architecture is any different? For at least a decade, the number of female architects has hovered around 20 percent. And women's attrition from the profession is shockingly high: in the critical, career-building years between the ages of 35 and 44, *four times* more mothers than childless women drop out of the field, according to a U.S. Census Bureau report. This greatly exceeds the dropout rate for mothers in comparable professions.

Going forward, absent a sea change, the highest-profile, most highly profitable commissions will continue to go to larger, male-dominated practices. The field's less profitable sectors—public projects; academic and other nonprofit work—will continue to be where women-owned and wife-husband-partnership practices see the greatest success. Many talented women will stagnate, underchallenged and inequitably compensated for their labors. Or they'll bail.

Architecture remains rife with discriminatory practices. Why?

First, the workplace continues to be biased against women, despite an abundance of good intentions. In a *New York Times* article about Denise Scott Brown's exclusion from the 1991 Pritzker Prize awarded to her partner, Robert Venturi, curator Barry Bergdoll of New York's MoMA said architecture is "thought to be boy's stuff." Men are assumed to command more authority with clients and contractors, to be more confident making large-scale interventions in the environment, to have superior abilities in engineering and technology. This is nonsense, but the assumptions are likely to subtly guide hiring and promotion.

Second are the intertwined issues of mentorship (career advice from an experienced elder) and sponsorship (concrete professional opportunities from the same). Mentors and sponsors are critical to a young professional's success. As Facebook's COO, Sheryl Sandberg, reports in her bestselling book *Lean In*, studies show that mentors (and presumably sponsors) overwhelmingly choose protégés who remind them of themselves—whose gender they likely share. Men still largely control architecture's higher reaches. And they're more likely to lavish attention on younger men.

Third, the structure of the architectural workplace is rigged against mothers, which 82 percent of American women eventually are. Think about it. What makes a successful career in architecture? Aptitude, talent, and training, yes. But that's not enough. You must be able to clock the 50- to 60-hour (or more) workweeks common in this 24/7 profession. Because intensive collaboration is intrinsic to making architecture, those hours must be mostly clocked *at the office*. You must

> **When I was a kid, I fell in love with erector sets. My parents were cool with that and bought them for me. They encouraged everything. So I'm not touchy about gender bias.** ***Audrey Matlock, Audrey Matlock Architect***

> **When I entered the profession I was completely naive. I thought we were all equal. I often side-stepped questions of gender. I wish I had confronted them more directly.** ***Jennifer Luce, Luce et Studio***

> **Regarding the work-life balance, "balance" is not a word that characterizes many architects who are serious about what they are doing. Balance is something that is continually shifting and adjusting.** ***Marion Weiss, Weiss/Manfredi***

21C MUSEUM HOTEL, BENTONVILLE, AR; DEBORAH BERKE PARTNERS, 2013

> **Today there is a lot of horizontal mentoring among women. We talk to each other about work. We're closer than we've ever been. As I got older, mentoring got better and more collegial.** ***Wendy Evans Joseph, Cooper Joseph Studio***

Twenty years ago when I sat down in an airplane and a guy next to me asked, "What do you do?" and I said, "I'm an architect," he would say, "Oh, do you do interiors?" That's less likely now. So I think perceptions have changed. ***Deborah Berke, Deborah Berke Partners***

WEBB CHAPEL PARK PAVILION, DALLAS; COOPER JOSEPH STUDIO, 2012

SKLZ PRO PERFORMANCE, CARLSBAD, CA; LUCE ET STUDIO, 2012

57 IRVING PLACE, NEW YORK CITY; AUDREY MATLOCK ARCHITECT, 2013

It's definitely an old man's profession ... and the architects I admire are mostly men, but I admire them for their breadth of work, their vision, and their tenacity. I would say the same things about a woman who has these same qualities. It's genderless. The important thing is to focus on the work and the practice and not be worried about how many men or women there are. I choose to not let it keep me up at night. ***Stephanie Goto, STEPHANIEGOTO***


EMS STATION 27, BRONX, NY; WXY ARCHITECTURE + URBAN DESIGN, 2011

› In school women work hard and win awards and accolades. In the business world, it is more about whom you meet, relationships, plus real knowledge and expertise. It's more about confidence and risk taking, being willing to step up when you're given an opportunity, and figuring out how to do it. ***Jill Lerner, principal, Kohn Pedersen Fox***

› In our studio, people work eight to nine hours a day. We're effective while we're here, and try to manage our workload so we can have a family, if that's what we want. We've blown the cover of all-night charrettes and their ability to produce really refined and thoughtful work. I don't know if that's a woman's perspective—it's a straightforward business perspective. ***Julie Snow, Julie Snow Architects***

› We try very hard to have an even gender split among our employees. It's better for staff, it's better for dynamics, it's just better all around. It's not always exactly 50/50, but we try to keep it pretty even. ***Mimi Hoang, partner, nARCHITECTS***

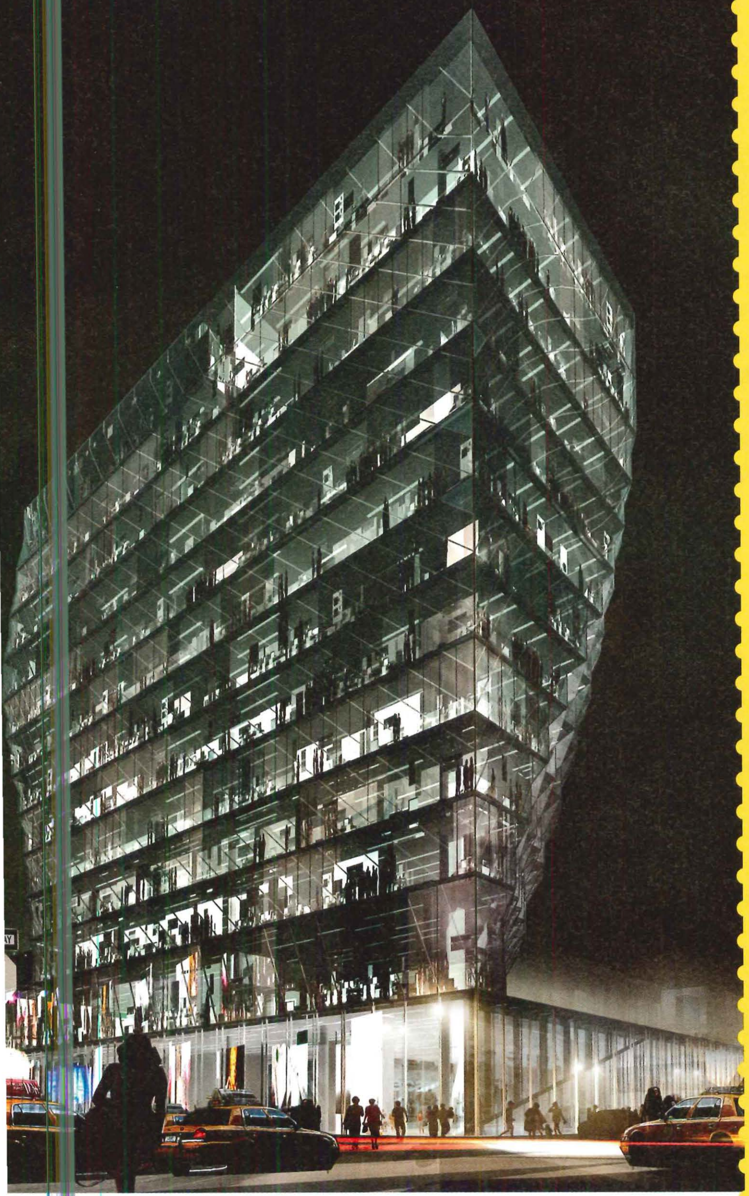
› A big stereotype that women in architecture face is that they are good managers. That helps explain why women aren't given other types of roles. Why aren't many women running design studios in large firms? Why aren't more women getting commissions for tall buildings? ***Claire Weisz, principal, WXY Architecture + Urban Design***

› I know that I lead teams differently from some of my [male] partners. They have a more command-and-control approach to leadership: "I'm going to tell you what to do." Mine is much more collaborative: let's establish goals together, let's make sure everyone has some skin in the game. ***Sylvia Smith, senior partner, FXFOWLE***


U.S. LAND PORT OF ENTRY, VAN BUREN, ME; JULIE SNOW ARCHITECTS, 2013

There was no bias in my family—we were four girls. I never felt that I wasn't taken seriously on the construction site, and there have not been any complaints in my office that women weren't taken seriously on the job. ***Jeanne Gang, Studio Gang Architects***

SOLAR CARVE TOWER, NEW YORK CITY; STUDIO GANG ARCHITECTS, UNBUILT



travel, sometimes on short notice. And in off-work hours, you must network, establishing your ability to attract new clients and promote the firm. All this for pay at the lower end of the white-collar scale, in a profession highly vulnerable to the economy's ebbs and flows.

Which demographic group is most likely to be derailed by such workplace conditions? Women with young children, as the Labor Department statistics indicate. Most professional women have children in their 30s, a few years out of school—years that UC Berkeley law professor Mary Ann Mason calls the "make-or-break" period in a career. These are years when an architect must establish not only her competence but her commitment and profitability to a firm.

This may explain why many of architecture's most successful women are childless and/or run their own offices. Of the architects I spoke with for this article, every top professional who is also a mother volunteered that during her own "make-or-break" years, she took home less income than she spent on child care, and worried that she saw less of her children than they needed. Every one considered dropping out.

Children have fathers, too. But the structure of today's professional workplace is such that men are not penalized for procreation. According to Joan C. Williams, director of the Center for WorkLife Law at UC San Francisco (who happens to be my sister), nearly 40 percent of male professionals work more than 50 hours a week, while fewer than 14 percent of college-educated mothers work that much.

Such workplace conditions could foster bias against not only mothers but all women in their "make-or-break" years. Given the number of young women who opt out, who would be surprised if some employers weren't concluding that it's cheaper and easier to invest in men?

Discrimination is discrimination, whether it's because women become mothers (or *could* become mothers) or because an employer presumes that customers don't want to be served by minorities. It's unethical, and it's illegal.

Who loses out? Men, women, and children do. Men who want to participate more in the raising of their children, but can't. Women who, having invested substantial money, time, and hope preparing to become architects, discover a culture that often forces them to "choose" between their career and opting out.

Architecture also suffers. Most studio professors will tell you that they teach as many gifted women as men. Since the reasons women leave architecture have little to do with talent, discrimination diminishes the overall quality of the profession.

Is architecture diminished in other ways? Whether a woman *qua* woman brings anything special to architecture is a tricky, uncomfortable question. So let's leave it aside and consider this instead. Might women, owing to the roles they typically play in the workplace, the family, the community, and the public realm, experience physical environments differently than men? Probably yes. If so, crowding women out of design creates a built environment in which men's experiences are disproportionately concretized in built form. That's not good for anybody.

How can architecture's pervasive patterns of gender discrimination be redressed? By starting a substantive conversation about the structure of the workplace and the inequities it systematically and predictably produces—and then refusing to let the subject drop until changes are made. By demanding that the American Institute of Architects better track and publicize data on women's status in the profession. By celebrating firms that promote women and establish *measurably effective* family-friendly policies, and by shaming firms that don't. By warning young women that success in school is no guarantee of a successful career. And most of all, by admitting there's a problem, and demanding that equality become a reality, not just a good idea. ■

My biggest disappointment is that as we came into the profession as a group, we didn't change the culture — we adapted to the culture already in place. ***Julie Eizenberg, Koning Eizenberg***

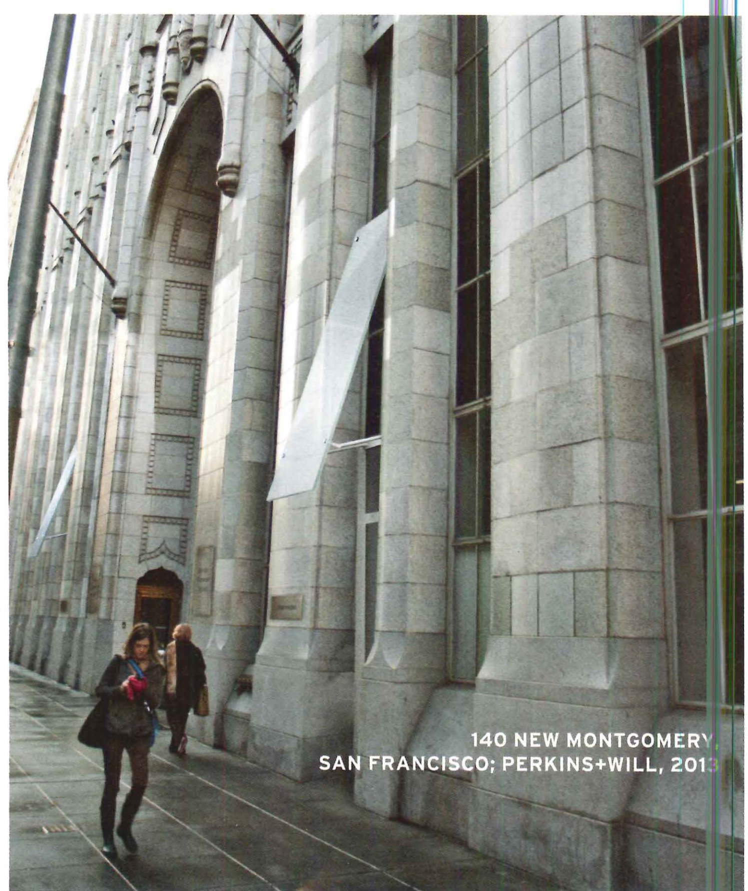
SOBIESKI HOUSE, SOUTH PASADENA, CA; KONING EIZENBERG, 2012

Clients want to look across the table at themselves. They want to look at someone they aspire to be. There is a problem when you don't look like your client. I had a partnership for a New York minute, but then realized I only wanted clients who wanted to work with me. ***Ronnette Riley, Ronnette Riley Architect***

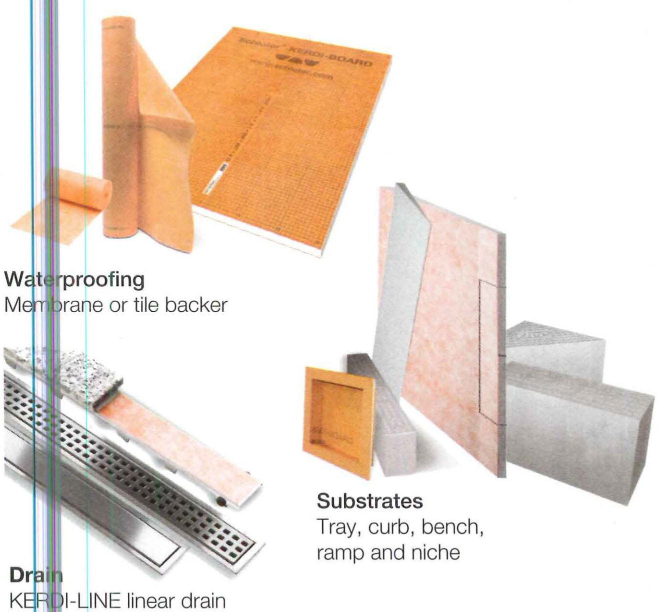
Women architects have made a substantial and qualitative difference in the profession and its culture at large, even though we are not showing it in the body count. If we cannot document and promote these qualitative changes, numbers will not follow. ***Toshiko Mori, Toshiko Mori Architect***

Join the conversation online at archrecord.com.

The biggest stereotype that has been broken is the idea that women design buildings differently—round ones, or ones with nice kitchens—from those that men do. What we design is not gendered. We want to be judged on a level playing field with all architects. ***Cathy Simon, design principal, Perkins+Will***



140 NEW MONTGOMERY, SAN FRANCISCO; PERKINS+WILL, 2013



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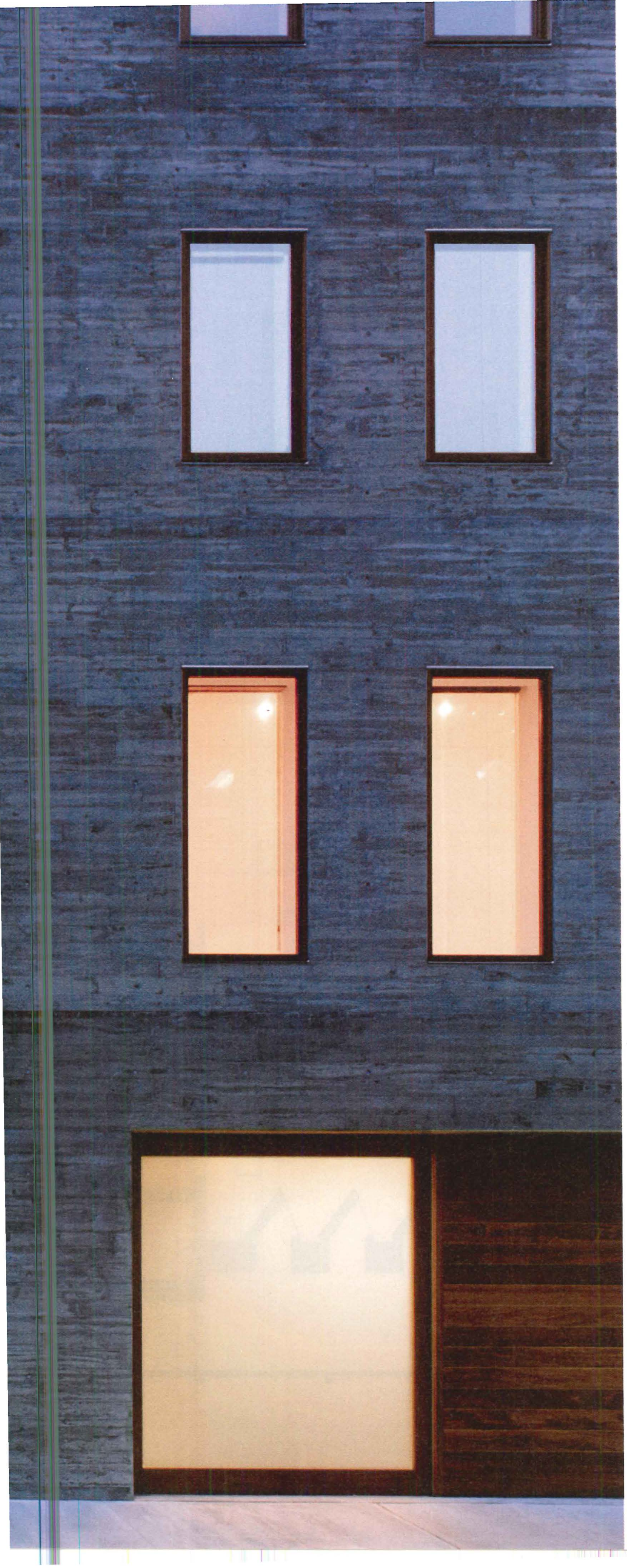
GAME CHANGERS

In architecture, the work speaks for itself. You can decry inequality, you can crunch the statistics, you can analyze the many factors that affect the diversity of practice. And you can fight for change. But at the same time, let's applaud great new architecture that spotlights the contributions of women. In the pages ahead, we explore a variety of building types, from a high-rise office building in Zurich to a townhouse in San Francisco to a cultural center in Hong Kong that elegantly weaves old and new structures into a lush urban landscape. The increasing significance of women in the field—whether as lead designers, partners, or members of larger teams—is what ultimately is changing the game.

The lobby of FRAC Bretagne in Rennes, France, by Studio Odile Decq.

David Zwirner | New York City | Selldorf Architects

THE ART OF THE MATTER



On the site of a former parking garage, Annabelle Selldorf creates a gallery building that exudes restrained drama and quiet rigor.

BY JOANN GONCHAR, AIA

PHOTOGRAPHY BY JASON SCHMIDT

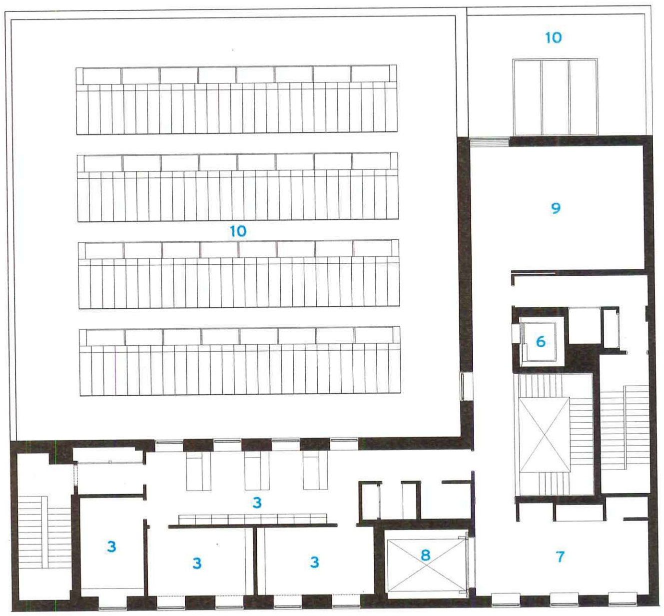
"IT IS SPECIAL and ordinary at the same time," says architect Annabelle Selldorf while standing on West 20th Street in Manhattan's Chelsea neighborhood. She's gazing at the board-formed-concrete facade of the new gallery her firm has designed for art dealer David Zwirner. The exterior has the texture and warmth of Le Corbusier's *béton brut* and the precision of Tadao Ando's poured-in-place structures. With rows of teak-framed windows set just a few inches in, the elevation reads as both a skin, stretched taut, and a hefty, weight-bearing mass. It acknowledges two seemingly incongruous aspects of the surroundings, making a nod to the area's not-so-distant gritty past while seeming perfectly at home in a district now dominated by art galleries and the High Line.

Zwirner has two other galleries, both designed by Selldorf and both in existing structures—one occupying three buildings a block away, the other in a London townhouse—but the 20th Street location presented an opportunity to build from the ground up. Although Selldorf studied the possibility of adapting, rather than replacing, the parking garage that stood on the site, she found that the three-story structure's configuration, height, and circulation were poorly suited to the gallery's program.

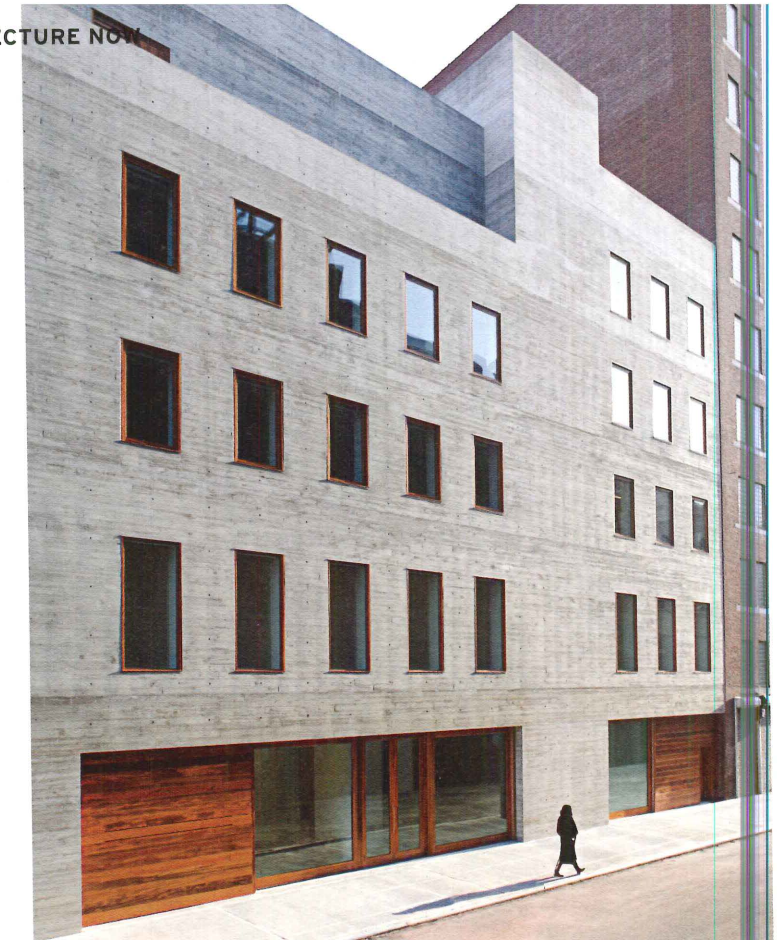
With this clean slate, Selldorf's team has created a 30,000-square-foot building primarily of reinforced concrete. It houses an ensemble of spaces conceived for secondary-market sales (the category includes older pieces by Zwirner's artists or pieces from the estates he represents), especially large-scale installations like the building's inaugural exhibition featuring the work of Dan Flavin and Donald Judd, presented earlier this year. The main display space—a 65-by-68-foot, and roughly 18-foot-tall, column-free room topped by four north-facing light monitors—occupies most of the ground level. An L-shaped, five-story volume containing more intimate exhibition spaces, private viewing rooms, offices, and support areas wraps the main gallery. The configuration allows almost all of the building to be illuminated by daylight, despite its midblock location with structures directly to the east and west.

The materials and color palette are restrained: white walls, and floors of concrete, oak plank, or, in a few places, travertine, keep the focus on the artists' work. But the building's interior has one dramatic architectural statement—a skylit stair connecting all five floors and defined by the same exquisitely crafted board-formed concrete found on the exterior.

Constructing the formwork for the stairway's walls was a process akin to cabinetmaking, according to Julie Hausch-Fen, Selldorf Architects' project manager. For example, the grade of pine for the 8-inch-wide tongue-and-groove boards was selected to produce just the right amount of wood-grain texture, including knots, on the concrete's surface; the length of each board was carefully considered so that the vertical joints

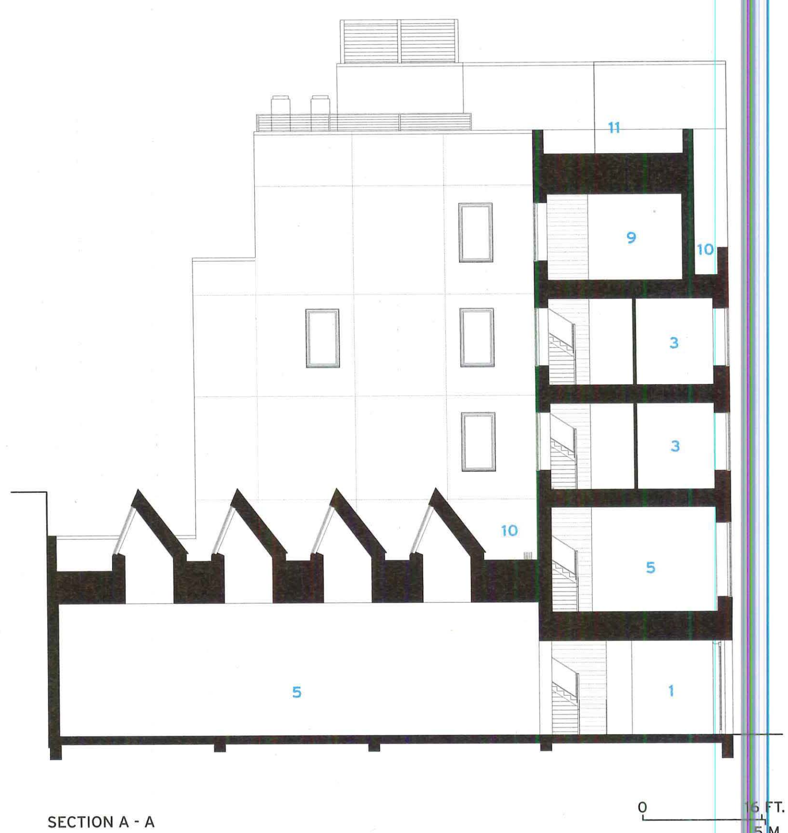


THIRD FLOOR



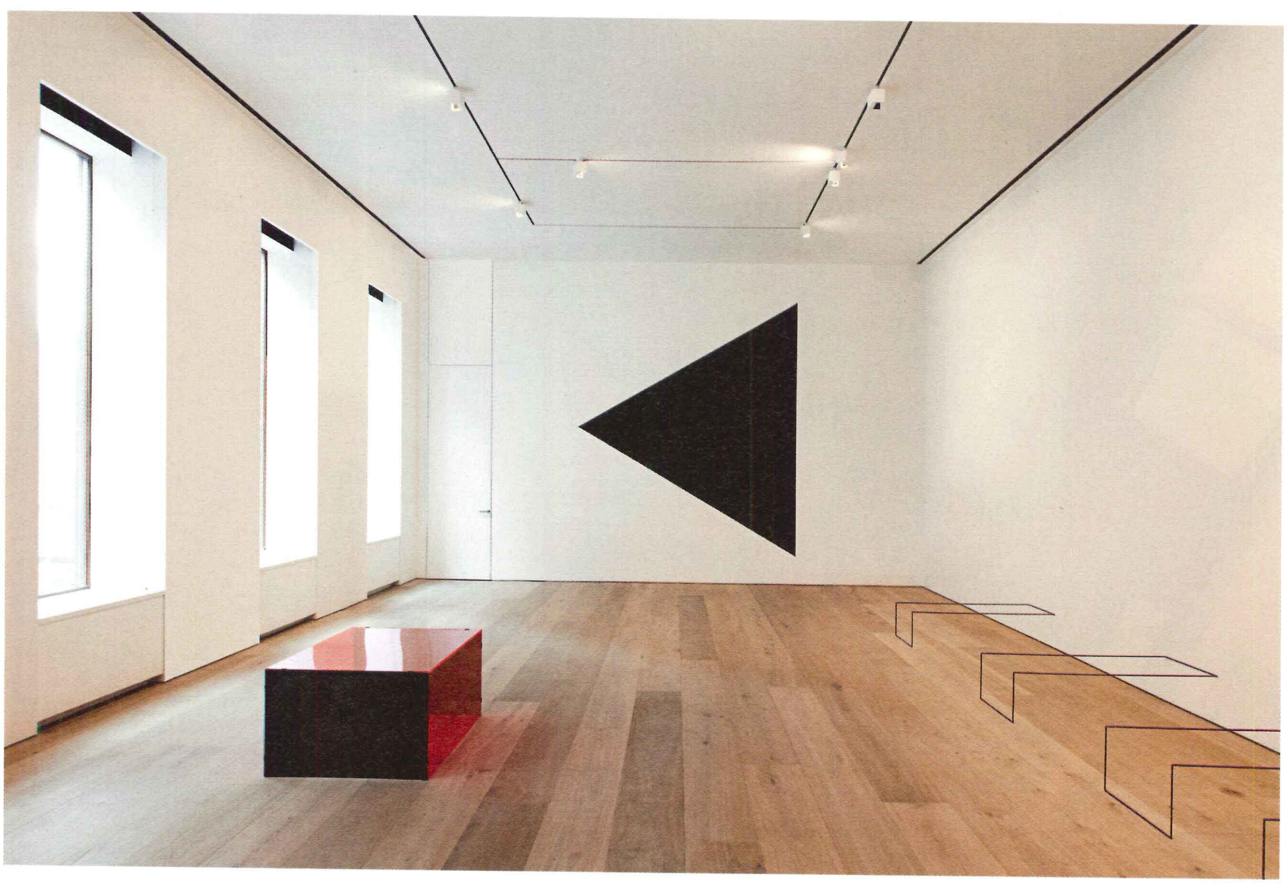
GROUND FLOOR

1 ENTRANCE
2 RECEPTION
3 OFFICE
4 MECHANICAL
5 EXHIBITION
6 PASSENGER ELEVATOR
7 ART HANDLING
8 FREIGHT ELEVATOR
9 VIEWING ROOM
10 GREEN ROOF
11 TERRACE

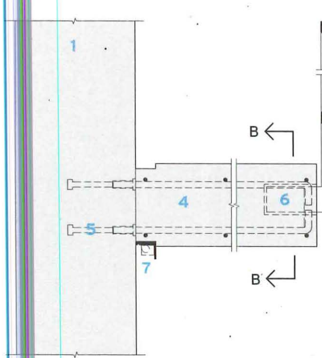


SECTION A - A

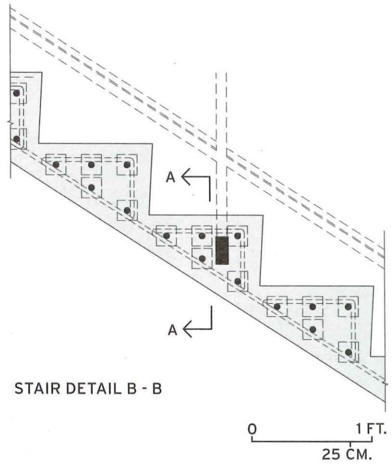
OPTICAL ILLUSION
Teak-framed windows set in just a few inches from the surface of the board-formed-concrete facade (opposite) make the front elevation appear to be both a stretched skin and a weight-bearing mass. The windows help illuminate a variety of spaces, including an intimate second-floor gallery, shown at right with pieces by (clockwise from back wall) Richard Serra, Fred Sandback, and Donald Judd. The 4,400-square-foot main gallery (above) captures daylight with four north-facing light monitors. For the building's inaugural exhibition, the space was subdivided into two and featured work by Judd (shown) and Dan Flavin.



SKINNY AND SLEEK
The walls surrounding the building's grand stair (opposite and left) are made of the same board-formed concrete of the facade. However, the concrete steps that cantilever from these were constructed with smooth forms and are extremely thin: the depth of each run's throat is only 3 inches. A more typical depth is 6 inches.

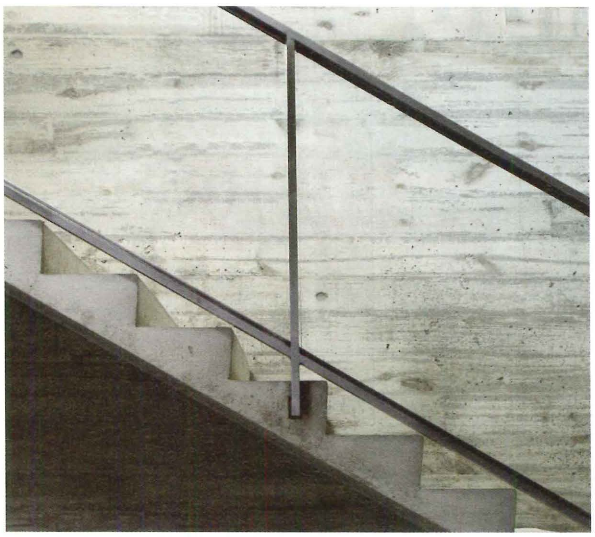


STAIR DETAIL A - A



STAIR DETAIL B - B

1 CONCRETE WALL
2 GLASS PANEL
3 STEEL HANDRAIL
4 CONCRETE TREAD
5 FORM SAVER FOR STAIR REBAR
6 STEEL SLEEVE FOR HANDRAIL UPRIGHT
7 LED LUMINAIRE



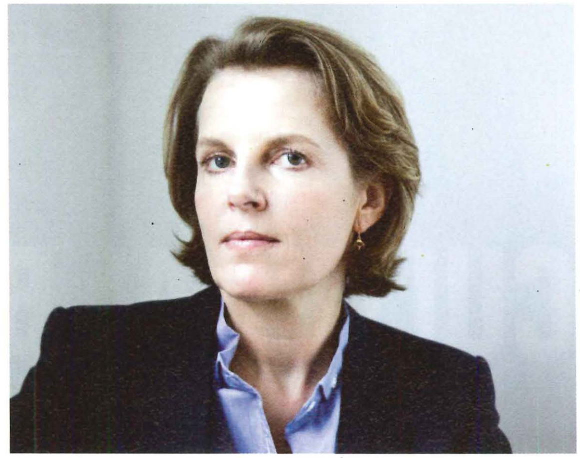
would not align; and corners were sealed with gaskets to ensure crisp edges.

The steps that cantilever from these walls were made with smooth forms, but their details are no less exacting than those for the surrounding walls. They are incredibly thin—the depth of each run's throat (the narrowest point where the tread meets the riser) is only 3 inches. A half-inch reveal between the steps and the wall reduces this dimension even further, and it creates the impression that the stair is almost floating. Of course there is plenty of steel inside the concrete to ensure its structural integrity, but the amount of rebar and the slenderness of the stair's components made for challenging pours, says Hausch-Fen.

The meticulously designed stair and countless other details conspire to create a museum-quality environment. This characterization extends to invisible features, such as climate controls that maintain temperature and humidity within the tight range that museums demand of other institutions wanting to borrow pieces from their collections. In addition, the mechanical equipment is highly efficient: along with elements such as planted roofs, a thermally robust building envelope with triple-glazed windows, and low-consumption plumbing fixtures, the climate controls have put the project on track for LEED Gold.

Although certification is an impressive goal (the project is expected be the first commercial gallery to achieve a LEED rating), other elements more directly affect the experience of the architecture, though in subtle ways. The most significant is the daylight entering through windows and skylights, which gently pulls visitors from space to space. There are also a few sleights of hand, including the loading dock ingeniously incorporated into the facade composition and concealed behind an oversized, frosted-glass sliding door. Such devices become apparent only gradually. The approach is "the architectural equivalent of slow food," says Selldorf. "Not everything reveals itself at first glance." ■

A conversation with: Annabelle Selldorf



Selldorf started her practice 25 years ago after working for Richard Gluckman Architects and Fox & Fowle Architects. Her first solo project was a "tiny little" kitchen renovation, followed by the renovation of a kitchen and two baths, and then an apartment. Since that time, the scale and variety of her work has grown. The 50-person firm has designed both public and private spaces, including museums, libraries, and an almost-complete 125,000-square-foot recycling facility in Brooklyn. With the help of her three partners—Sara Lopergolo, Lisa Green, and Bill Bigelow—Selldorf is able to maintain involvement in all of the office's work and collaborate with the entire staff. "It is an interesting reality that one person has to take a leadership role," she says. "But leadership isn't about pulling rank. It is about shaping a direction."

credits

ARCHITECT: Selldorf Architects – Annabelle Selldorf, principal; Sara Lopergolo, partner; Julie Hausch-Fen, project manager; David Moore, project architect; Susan Parapetti, Matthew Kanewske, Laura Samul, Dylan Sauer, project team

CONSULTANTS: DeSimone Consulting Engineers (structure); AltieriSeborWieber (m/e/p); Langan (geotechnical); Atelier Ten (LEED/sustainable design); Renfro Design Group (lighting); Piet Oudolf (terrace garden design); Reginald D. Hough (concrete)

CLIENT: David Zwirner

GENERAL CONTRACTOR: Eurostruct

SIZE: 30,000 square feet

COST: withheld

COMPLETION DATE: February 2013

SOURCES

WINDOWS AND STOREFRONT: Artistic Doors & Windows

GLAZING: Viracon; Rochester Insulated Glass

WALL SHEATHING: Dow

WOOD FLOORS: Dinesen

WINDOW AND SKYLIGHT SHADES : MechoSystems; DFB

PAINTS: Benjamin Moore

LIGHTING: Philips; Nulux; Edison Price; Pinnacle

LIGHTING CONTROLS: Lutron

PLUMBING FIXTURES AND FITTINGS: Vero; Sloan; Toto

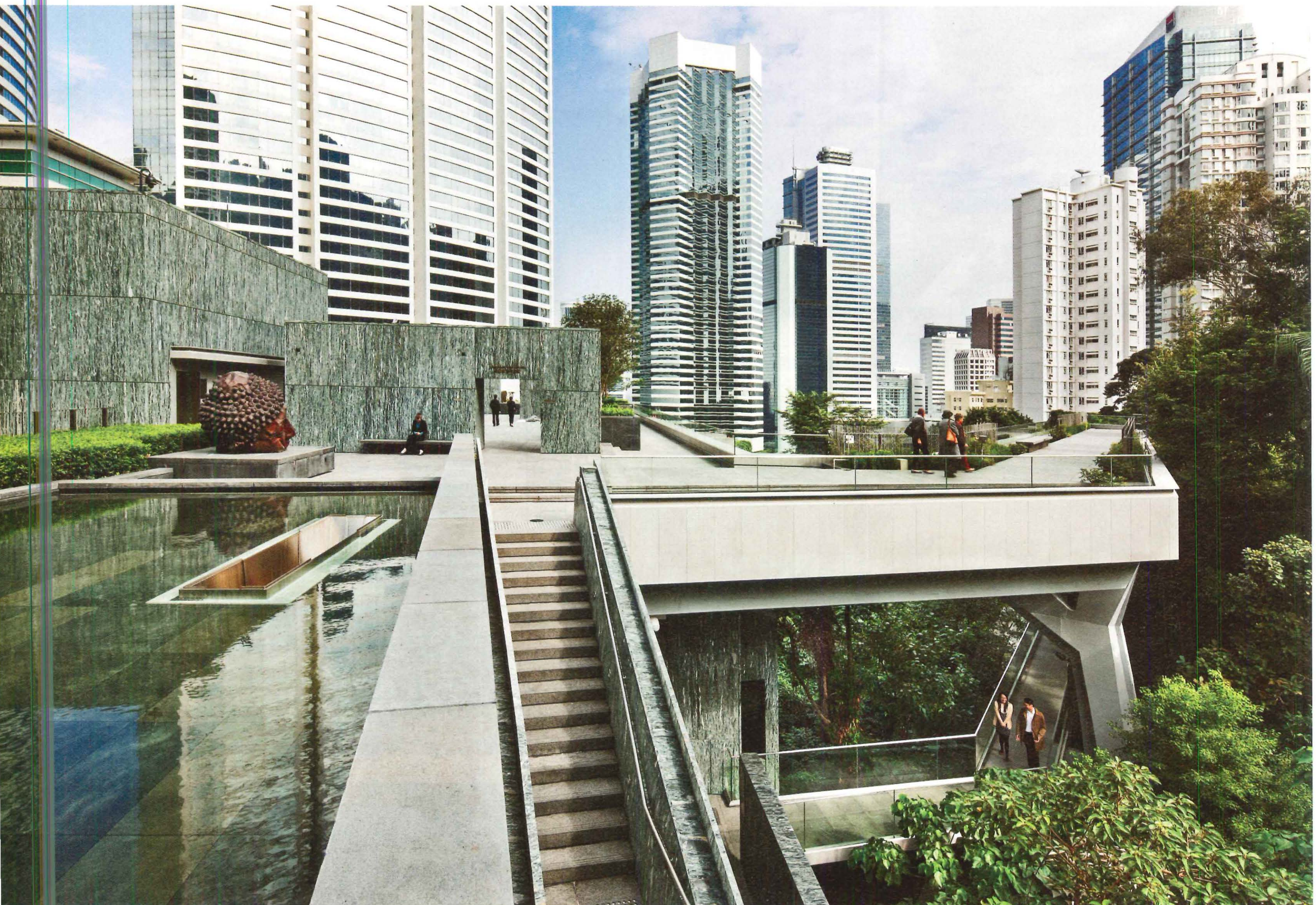
Asia Society Hong Kong Center | Hong Kong | Tod Williams Billie Tsien Architects

CULTURAL BRIDGE

On a thickly overgrown slope of Hong Kong, Tod Williams and Billie Tsien create a journey through time and space for the Asia Society.

BY SUZANNE STEPHENS

PHOTOGRAPHY BY MICHAEL MORAN



SPILLING DOWN
Three structures formerly used for munitions storage and a laboratory at the upper part of the site have been renovated for a theater, an art gallery, and a conference wing (opposite). A pedestrian bridge links them to the new main pavilion on the lower site. On the pavilion's roof garden (above), visitors can enjoy an oasis in green marble amid skyscrapers and thick vegetation.

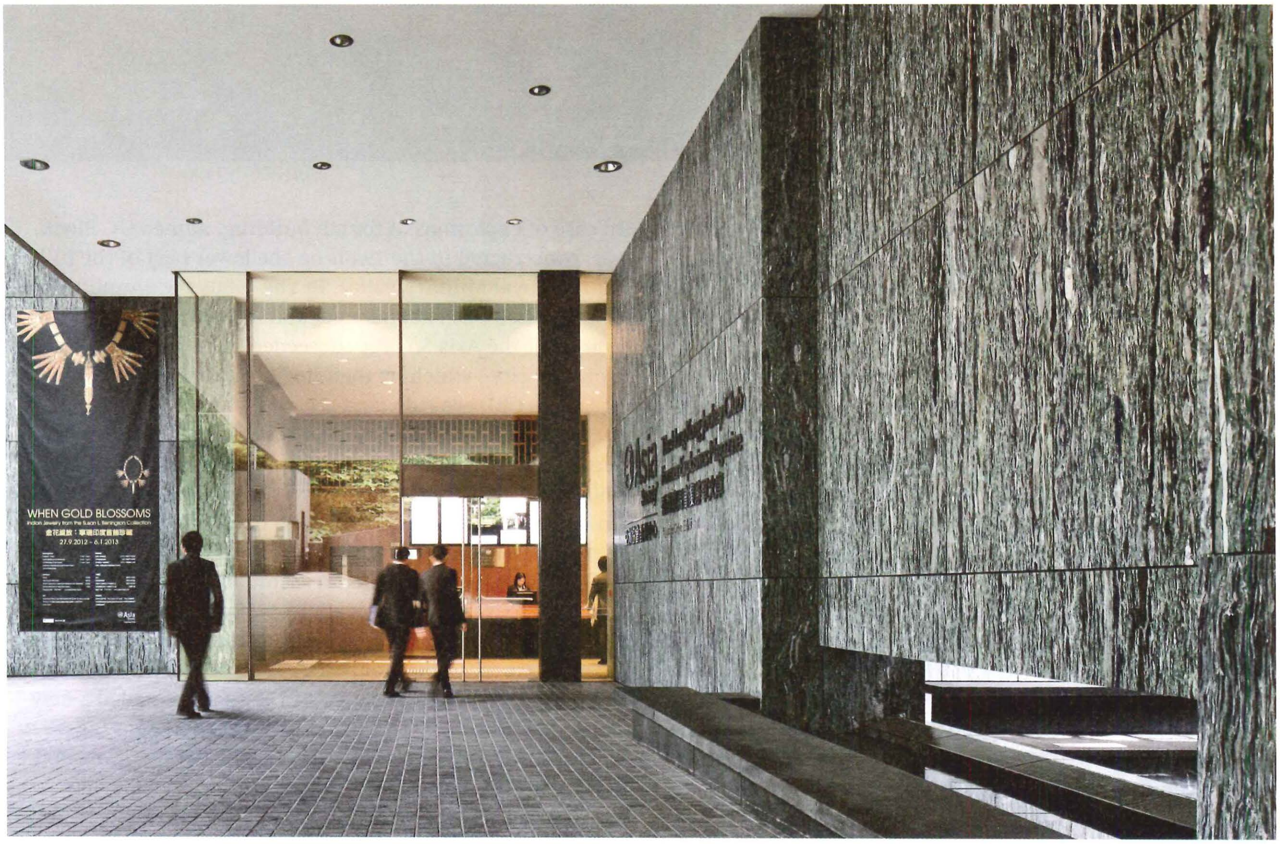
OVER SEVERAL decades of designing together, Tod Williams and Billie Tsien have steadfastly emphasized the serene and assured manipulation of spaces, planes, and materials, and exhibited an impeccable sense of craft. In addition, they have cannily united large- and small-scale architectural elements into integrated compositions, as seen in their new Barnes Foundation in Philadelphia (RECORD, June 2012, page 46) and—now possibly threatened with demolition—their Folk Art Museum in New York City (RECORD, May 2002, page 202). But in their design for the Asia Society Hong Kong Center, completed in 2012, they took on even more challenges. Their scheme shows the firm's prowess at blending architecture into the landscape while balancing new construction with renovated historic structures.

Immersed in the lush hills of the Admiralty area of Hong Kong Island, the Asia Society's new 65,000-square-foot center occupies more than 3 acres of rainforest that had been the Explosives Magazine Compound for the British Army. There, between 1860 and 1907, the colonial rulers had created two ammunition-storage facilities and a munitions lab at the top of the steep site, with earth berms positioned between them in case of explosions. A fourth building, named GG Block, was constructed in the 1940s on the lower part of the hill for the Royal Military Police. By the 1980s the ammunitions complex had been abandoned, and in 1999 the Hong Kong branch of the Asia Society succeeded in leasing the property from the city—which by then had been transferred from British to Chinese rule.

The society, founded in New York in 1956 to foster cultural and business interaction between America and Asia, obtained major funding from the Hong Kong Jockey Club Charities Trust to create a satellite home in this burgeoning metropolis. Its program called for salvaging the munitions buildings on the upper site, in accordance with the recommendation by a landmarks advisory board, although the structures were in a sorry state of disrepair. In addition to making use of 17,000 square feet of these existing spaces for cultural facilities and offices, the society needed a new building for visitors' orientation, dining, and meetings.

In its winning scheme for the invited competition, Tod Williams Billie Tsien Architects (TWBTA) placed a new 10,170-square-foot main pavilion next to the GG Block, now

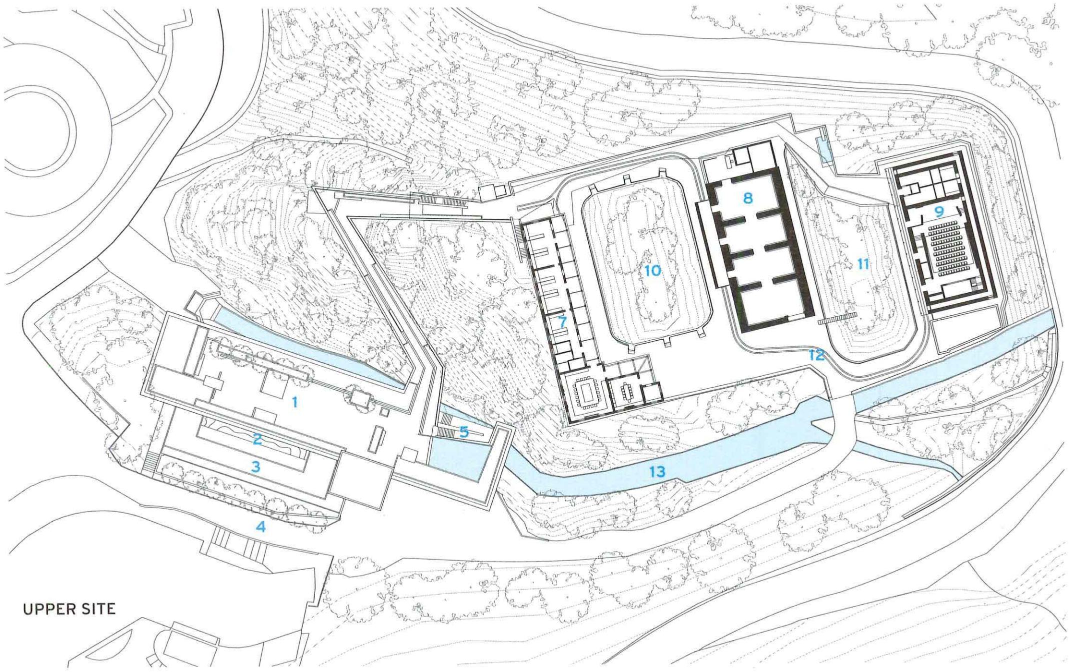
View additional images at architecturalrecord.com.

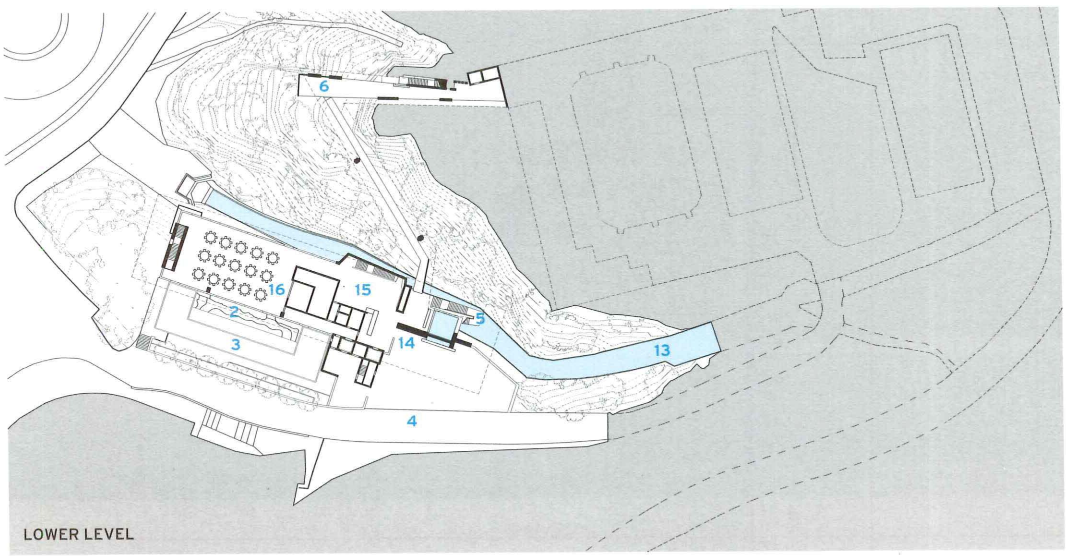


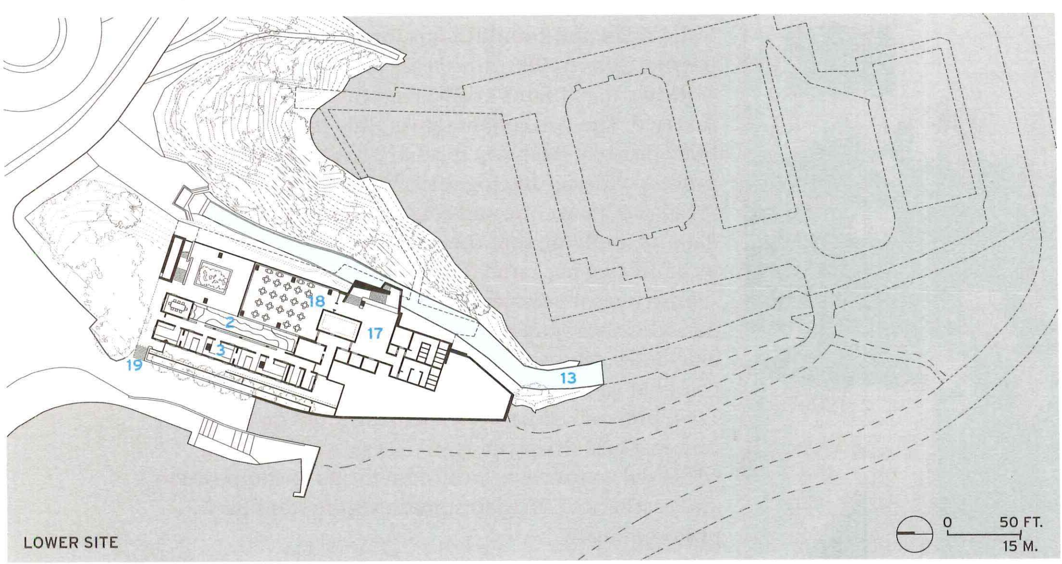
HIDDEN GRANDEUR
The center's entrance is located at what is called the Hong Kong Jockey Club Former Explosives Magazine on Justice Drive (top left). Stairs lead to the GG Block, built in the 1940s for the Royal Military Police and now used for offices. Next to it is the new pavilion, designed for visitor orientation, events, and dining (left). Striated Chinese-marble walls define the entrance as well as the lobby plaza on the east (opposite, top), where a waterfall cascades from the roof.

A conversation with: Billie Tsien and Tod Williams

Billie Tsien and Tod Williams formed a professional partnership in 1986, nine years after Tsien started working at Williams's office and three years after they married. The two collaborate closely on the design of their projects—they say it is hard to properly parse the process of designing together. Williams says of Tsien: "She's the smart one and controls the world." Tsien demurs, replying that they make decisions together by bantering back and forth, to which Williams adds, "Sometimes we disagree. We do butt heads, yet the period is short and resolved without bruising." Tsien elucidates, "But we don't compromise—the decision comes at the end of a long and interesting conversation." Tsien praises Williams for focusing more on construction and visualizing easily in the third dimension, while she volunteers, "I think in terms of composition and aesthetics." Williams notes, "Billie steps back philosophically."







1 ROOF TERRACE
2 GARDEN
3 OFFICES (GG BLOCK, 1940s)
4 JUSTICE DRIVE
5 STAIR TO ROOF TERRACE
6 FOOTBRIDGE
7 CONFERENCE (LAB, 1860s)
8 GALLERY (MAGAZINE A, 1868)
9 THEATER (MAGAZINE B, 1907)
10 BERM A
11 BERM B
12 AMMUNITIONS TRACK
13 NULLAH RIVER
14 ENTRANCE
15 LOBBY
16 JOCKEY CLUB HALL
17 SHOP
18 RESTAURANT
19 RESTAURANT ENTRANCE

credits

ARCHITECT: Tod Williams Billie Tsien Architects – Tod Williams, Billie Tsien, principals; William Vincent, project architect

ASSOCIATE ARCHITECTS: AGC Design (core and shell); Associated Architects (interiors)

ENGINEERS: Severud Associates, Arup (structural); AltieriSeborWieber, J. Roger Preston (mechanical); Arup (civil)

CONSULTANTS: Architectural Resources Group, Ivan C.C. Ho (restoration and preservation); ADI (landscape)

CLIENT: Asia Society Hong Kong

SIZE: 65,000 square feet (gross)

COST: $51.5 million

COMPLETION DATE: February 2012

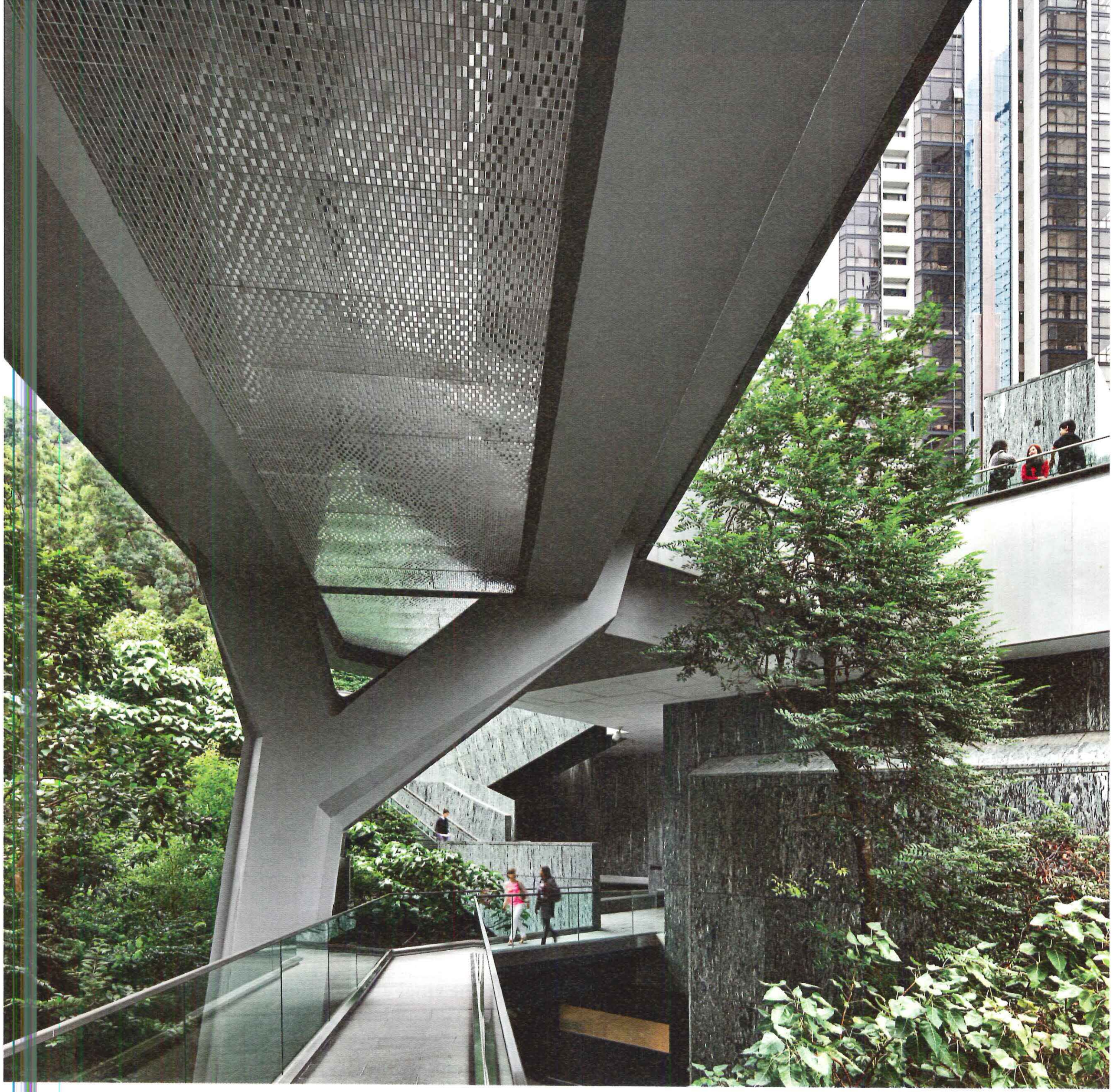
SOURCES

INTERIOR AMBIENT LIGHTING: ERCO

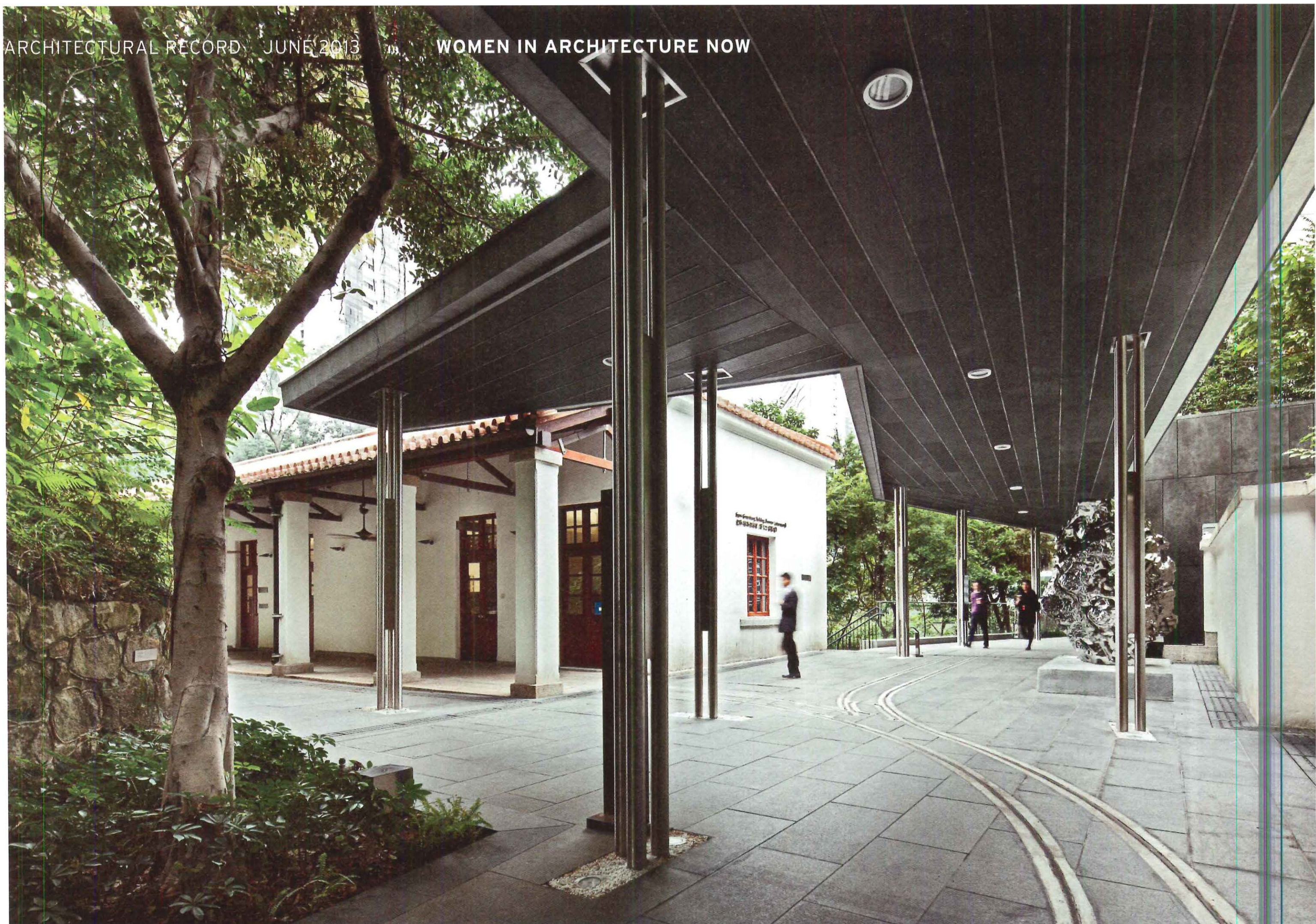
CARPET: Tandus Flooring

GLAZED CERAMIC TILES ON UNDERSIDE OF FOOTBRIDGE: YCC China

ACOUSTICAL DRAPERY: Knoll Fabric



LIGHT LIFTING
A double-level footbridge extends on the east from the roof garden of the new main pavilion and the plaza of the lobby level below (left). The walkway, marked by concrete Y-shaped supports, glazed ceramic tiles (on the underside of the upper level), and glass balustrades, angles from the lower site through the lush thicket to the former explosives compound at the top. The Jockey Club Hall on the second floor of the main pavilion (below) offers expansive views of the scenery by virtue of 17-foot-high glass window walls extending 110 feet on the east and west elevations.



renovated for offices. The architects then linked this lower portion of the slope to the three existing structures at the top by creating a two-level concrete bridge, reminiscent of Hong Kong's own elevated walkways. Instead of busy streets, this pedestrian path on Y-shaped supports angles over, around, and through the lush growth to avoid harming fruit bats in the palm trees.

Ultimately the walkway deposits you at the renovated cluster from another era: the former lab from the 1860s, now used for conferences; next, Magazine A, built in 1868 and transformed into a gallery; and finally Magazine B, built in 1907, which the architects converted to a 100-seat theater.

Hong Kong preservation architect Ivan C.C. Ho guided the firm in the finer points of rebuilding the red-tile roofs and reproducing teak doors, window frames, rafters, beams, and joists, as well as restoring masonry- and granite-walled structures. TWBTA's interventions are discreet and minimal—such as the elegant glass-and-steel entrance to the gallery—and accommodate new uses without irreversible changes to the old structures. It helped that the firm put mechanical equipment underground in the western part of the upper site.

In visiting the center you arrive at the lower site, first passing the GG Block, and then move on to the new main pavilion, a two-level, poured-in-place-concrete structure. There, a grandly proportioned plaza sheathed in a strikingly striated Chinese marble announces the entrance. Beyond the cream-colored and gray stone surfaces of the lobby, you find the majestic Jockey Club Hall. This rectangular multipurpose room seems to float out into the vines and trees, owing to laminated-glass curtain walls, 17 feet high and 110 feet long, on the east and west elevations. Downstairs is the shop and AMMO, a brashly gleaming restaurant designed by Joyce Wang of Wang Design in Hong Kong in a steampunk aesthetic—the only note at the center that is counter to Williams and Tsien's Zenlike spaces.

The Zen aspect is most apparent when you ascend the outside stairs from the lobby to the roof of the main pavilion. Here an elegantly composed terrace with planting, courtyards, fountains, and seating immerses you in both the city and the jungle. The roof terrace, also lavishly surfaced in green Chinese marble, connects you to the upper level of the walkway along the east side for your jaunt to the upper site.

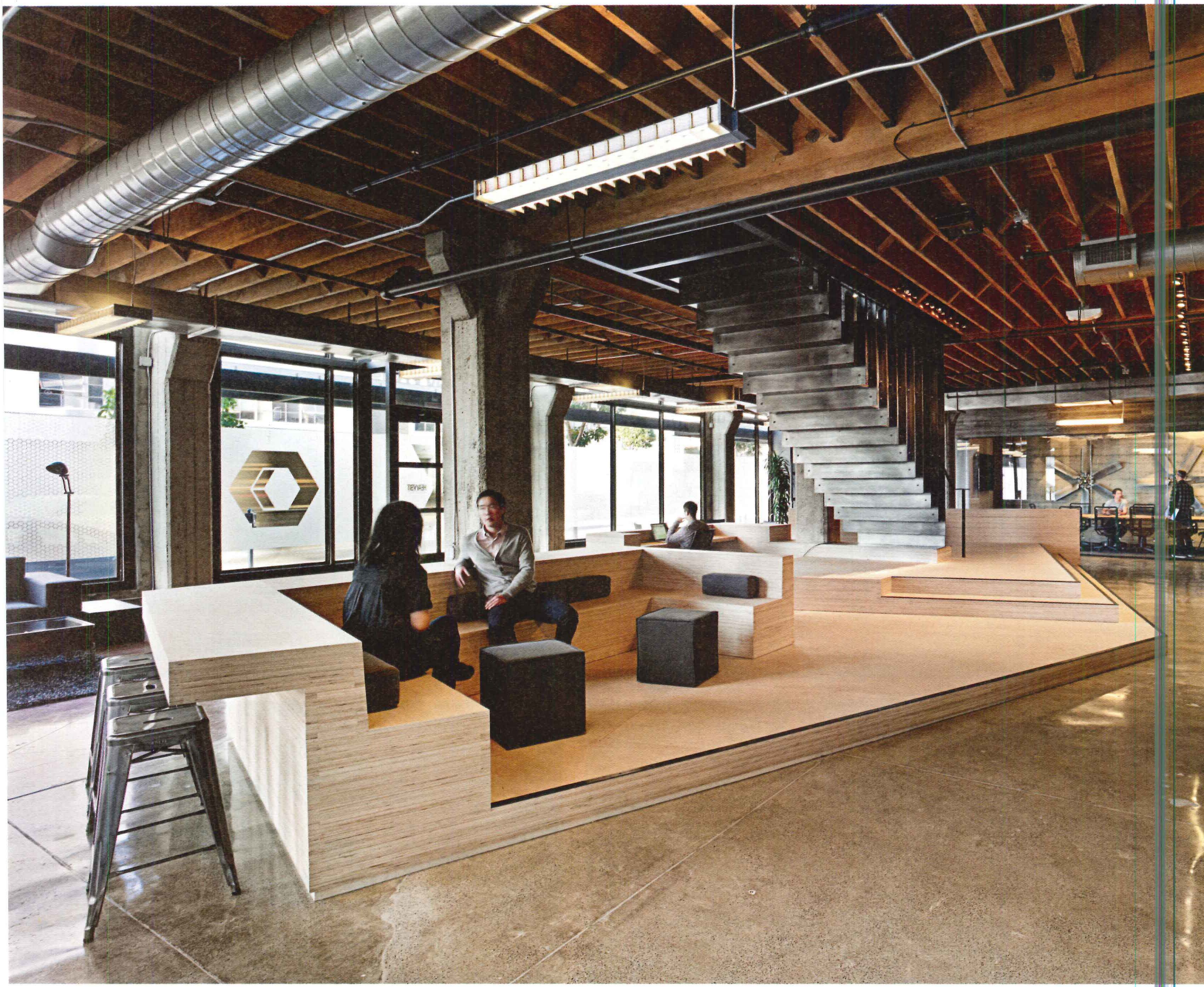
The project's cascading-down-the-slope configuration means that its most visible element is actually the pedestrian bridge and the roof terrace of the pavilion. Indeed, the only overall view of the Asia Society center is an aerial one, which a cluster of nearby skyscrapers can provide. As Tsien puts it, "This is a horizontal building in a vertical city."

A year after the $51.5 million complex opened, Alice Mong, executive director of the Asia Society Hong Kong, notes that the center "has been a big hit with the community"—although the staff already needs more room. This oasis in the middle of a bustling city offers a feeling of tranquility desperately desired and surprising to find. And in doing so, it transports you through time and space, between old and new architecture. ■

UNDER COVER
Next to the new main pavilion on the lower site is the renovated GG Block (opposite, top), which Williams and Tsien converted to administrative offices. They also glazed and covered the veranda of this masonry structure. In the Explosives Magazine Compound at the top of the hill, the architects restored and renovated an 1860s laboratory for conferences (above; opposite, bottom right). Magazine A (1868), with granite walls and brick barrel-vaulted ceilings, is now an art gallery (opposite, bottom left). Its thick walls help keep indoor temperature and humidity in check.


Devotional Jewelry
宗教性首飾
Temple
寺廟

Heavybit Industries | San Francisco | IwamotoScott Architecture



OPEN PLATFORM

Treating weighty materials with a light hand, a local design team transforms a former warehouse into a communal workspace for cloud developers.

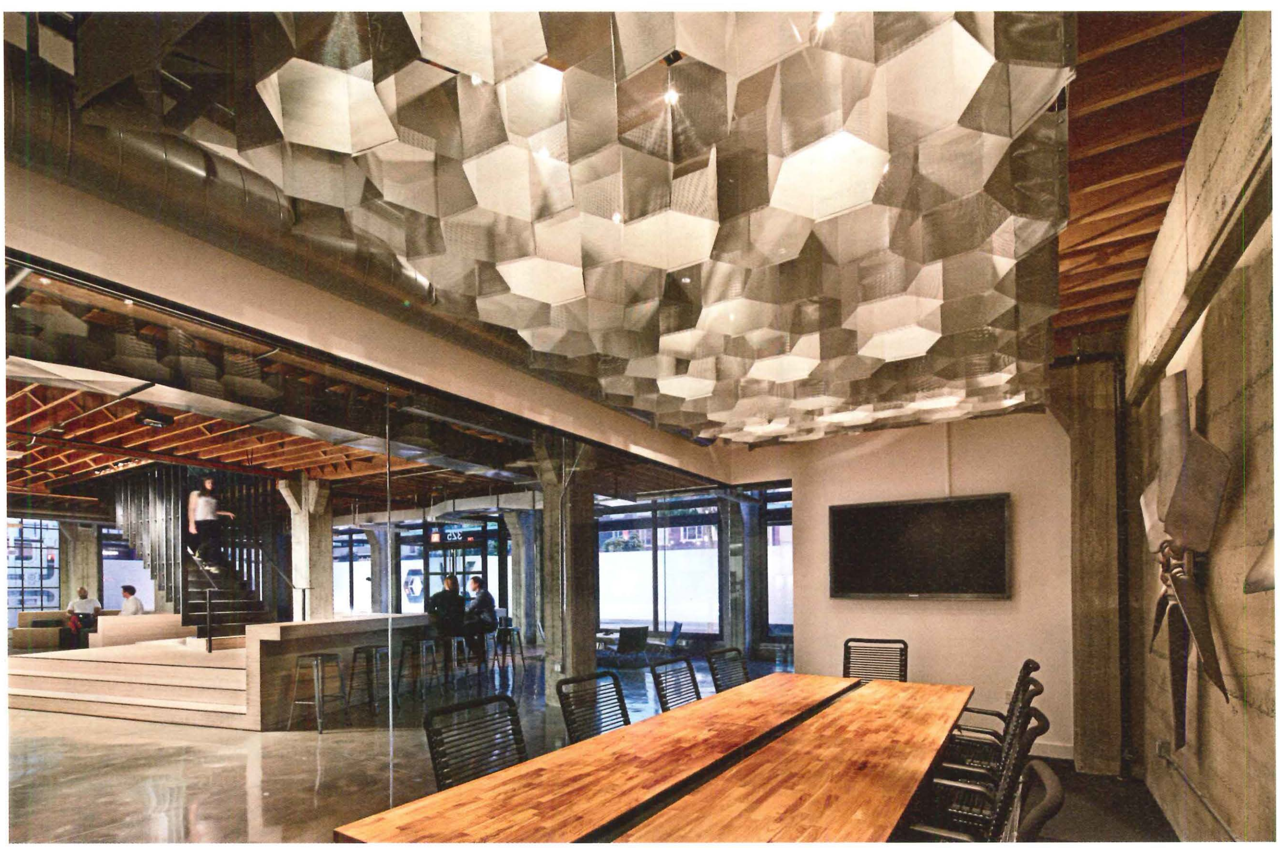
BY LAMAR ANDERSON

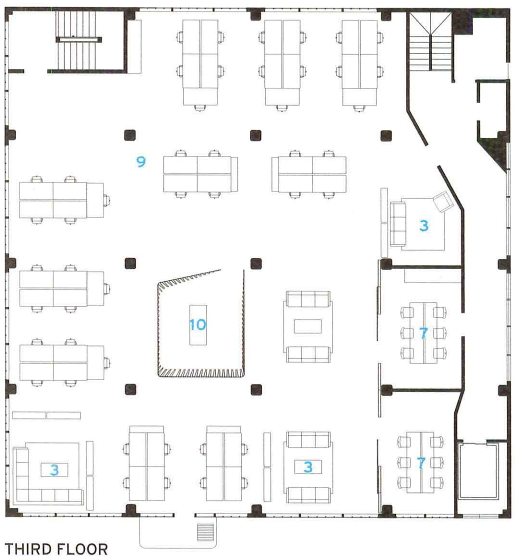
PHOTOGRAPHY BY BRUCE DAMONTE

THE CLOUD has an image problem. The term—which refers to the distributed networks of servers that store data and power all kinds of Internet services—gets tossed around a lot, but it doesn't evoke much beyond a vague nimbus of Amazon orders and MP3 files. So when James Lindenbaum, CEO of a communal workspace for cloud developers called Heavybit Industries, decided to set up shop in San Francisco's tech corridor, he needed an office that would convey the engineering muscle behind his members' software. "We wanted a building that had a really heavy and serious look from the outside," says Lindenbaum, who compares developing for the cloud to building the roads and laying the pipes that allow individual companies to operate. "I didn't want this to feel theoretical when we go out and tell the world about it. There's a place where people do this thing. It's real."

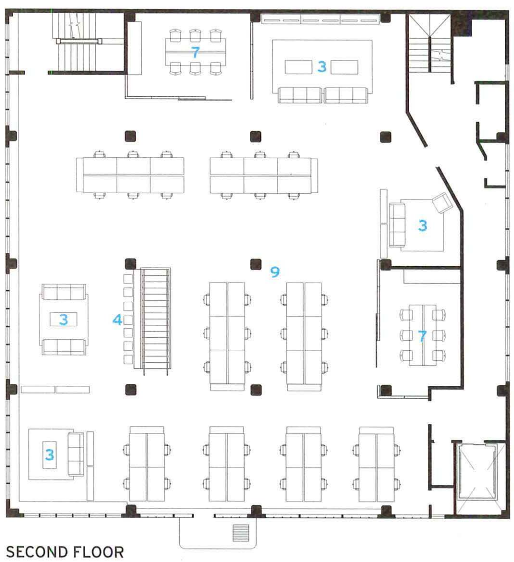
Heavybit operates like a residency program for nascent software-development

CLOUD NINTH
The exterior of the former warehouse on San Francisco's Ninth Street (left) retains much of its original character. A wood platform serves multiple functions and anchors the lobby's common area (opposite). The designers fabricated a light fixture out of nonwoven mesh for the conference room (below).

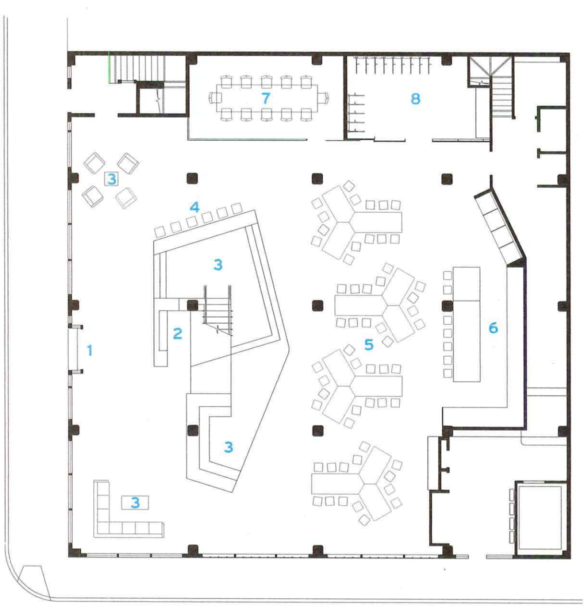




THIRD FLOOR



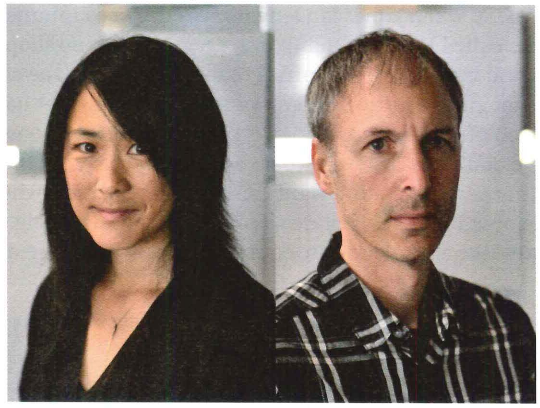
SECOND FLOOR



FIRST FLOOR

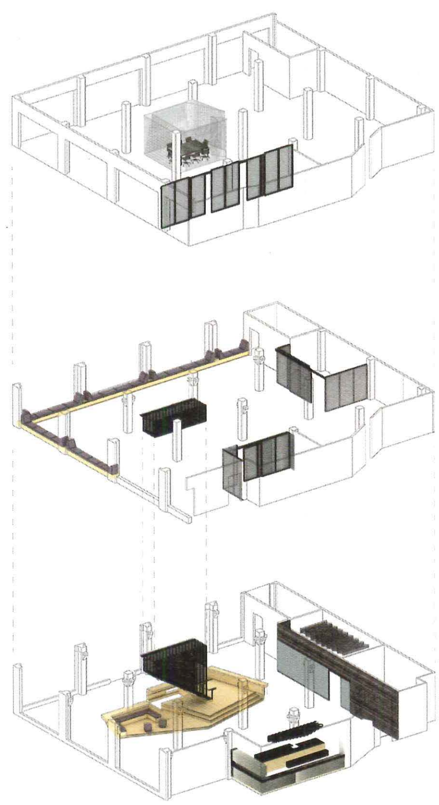
0 20 FT. 5 M.

A conversation with: Lisa Iwamoto



As collaborations go, Lisa Iwamoto and Craig Scott (left) aren't so much egalitarian as exceedingly practical. The duo, who run a five-person firm in San Francisco, have a small enough practice that they can both devote themselves to every project. "It's so fluid," says Iwamoto. "We're each doing 100 percent rather than half." Some regular clients tend to talk to one partner or the other depending on whom they met with initially, she adds. "It's almost a matter of circumstance."

If anything, Iwamoto says, she sometimes gets more than her share of credit. On every project she and Scott list their names alphabetically, so her name always comes first—as it does in their firm name, IwamotoScott. "If it were the other way around, it would sound like one Japanese man, Scott Iwamoto," she says. And while no one underestimates her design role, Iwamoto has noticed that clients usually ask her the questions about interior finishes and furniture. "I think it's just a default reaction," she says. "Clients tend to look to me, but Craig is the one who knows every product in the world."

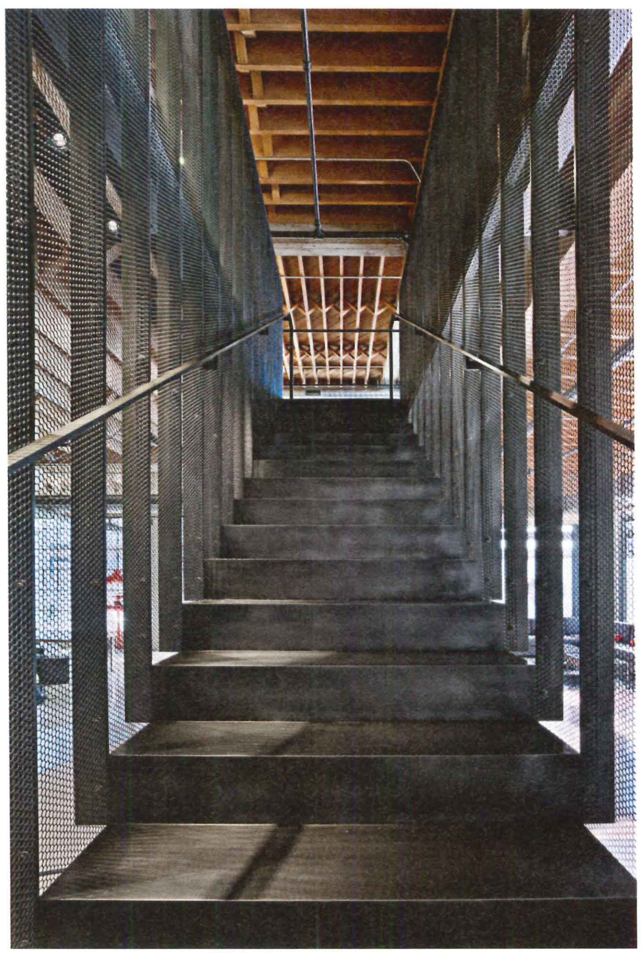


1 ENTRANCE
2 RECEPTION
3 LOUNGE/MEETING
4 IDEA BAR
5 COLLECTIVE DINING/MEETING
6 KITCHEN
7 CONFERENCE ROOM
8 BIKE ROOM
9 WORKSPACE
10 "ROPE ROOM" MEETING SPACE

companies, each of which spends nine months under the program's wing. Lindenbaum wanted an office that would encourage these young businesses to share ideas as they build their products, refine best practices, and pick up tips from Heavybit's speaker series. In early 2012 he enlisted Lisa Iwamoto and Craig Scott, principals of the San Francisco–based practice IwamotoScott Architecture, to renovate a converted warehouse he had leased in the city's South of Market district. That May the duo, who often introduce digital fabrication and design-build elements into their projects, set about transforming the three-level concrete-frame structure into a workshop for building the intangible infrastructure of the cloud.

The warehouse's owner had already restored the shell, sandblasted the structure's Douglas-fir ceiling joists, and replaced the storefront windows on the main level. "It was just a big open space, totally disconnected from the upper floors," says Iwamoto. The architects divided the ground floor into a common room with flexible seating, a gunmetal-hued kitchen, and a conference room and bike-storage area defined by a reclaimed-wood wall. To open up and visually connect the first two levels, the team removed a central portion of the second floor and suspended a steel staircase in the gap. Viewed head on, the risers look sturdy and substantial, but in profile they almost disappear. "It wanted to be as thin as possible," says Scott, "so that it could appear to be floating but still feel heavy at the same time."

Throughout the project, it is this careful balance of solidity and transparency that keeps Heavybit from getting bogged down by its own hefty image. To carve up the ground floor and still preserve sightlines, the designers



STEELY SPAN
The architects used folded steel plate for the kitchen's island (above) as well as for its light fixture, which they digitally fabricated in hexagons that recall the six-sided nut in Heavybit's logo. Viewed head on, the main stair's narrow steel risers (left) look substantial, but in profile they almost disappear.

built an angular seating platform out of stacked laminated-plywood sheets. The feature's shape and height vary to serve different functions: it is a stair landing, a podium for speakers, a reception desk, a standing "idea bar," and bench seating in one continuous form. The architects countered its smooth, folding surfaces by leaving the lap joints raw and unfinished on the ends. "This is a laminated platform, but it also feels like a hewn thing because of the edge grain at the sides," says Iwamoto.

While IwamotoScott focused Heavybit's limited budget on the ground level, the firm's refined treatment of rugged materials carries over to the office spaces as well. The architects removed walls on the upper floors to make way for open-plan workstations and conference rooms, with sliding polycarbonate doors to let light through. And on the third level, they fashioned a breakout space with curtainlike walls of industrial rope and electrical conduit suspended from the ceiling. Like the stair, the rope room reads as heavy, but the gaps between the strands keep it from becoming a solid mass. "The materials are so rough," says Iwamoto. "And yet the details tame them, but not enough for you to lose the visceral response."

Iwamoto and Scott's buoyant treatment of weighty surfaces turns Heavybit's shop-class approach to programming into a tactile experience. And, though the cloud itself remains intangible, its software developers are now a lot more visible. ■

Lamar Anderson is a frequent contributor to RECORD *who is based in San Francisco.*

credits

ARCHITECT: IwamotoScott Architecture – Lisa Iwamoto, Craig Scott, partners in charge; Sean Canty, Chretien Macutay, Ryan Beliakoff, Kelvin Huang, Julianna Raimondi, design team

ENGINEER: TSA Structural Engineers

METAL FABRICATION: Chris French Metals

GENERAL CONTRACTOR: Matarozzi Pelsinger Builders

CLIENT: Heavybit Industries

SIZE: 16,000 square feet

COST: withheld

COMPLETION DATE: December 2012

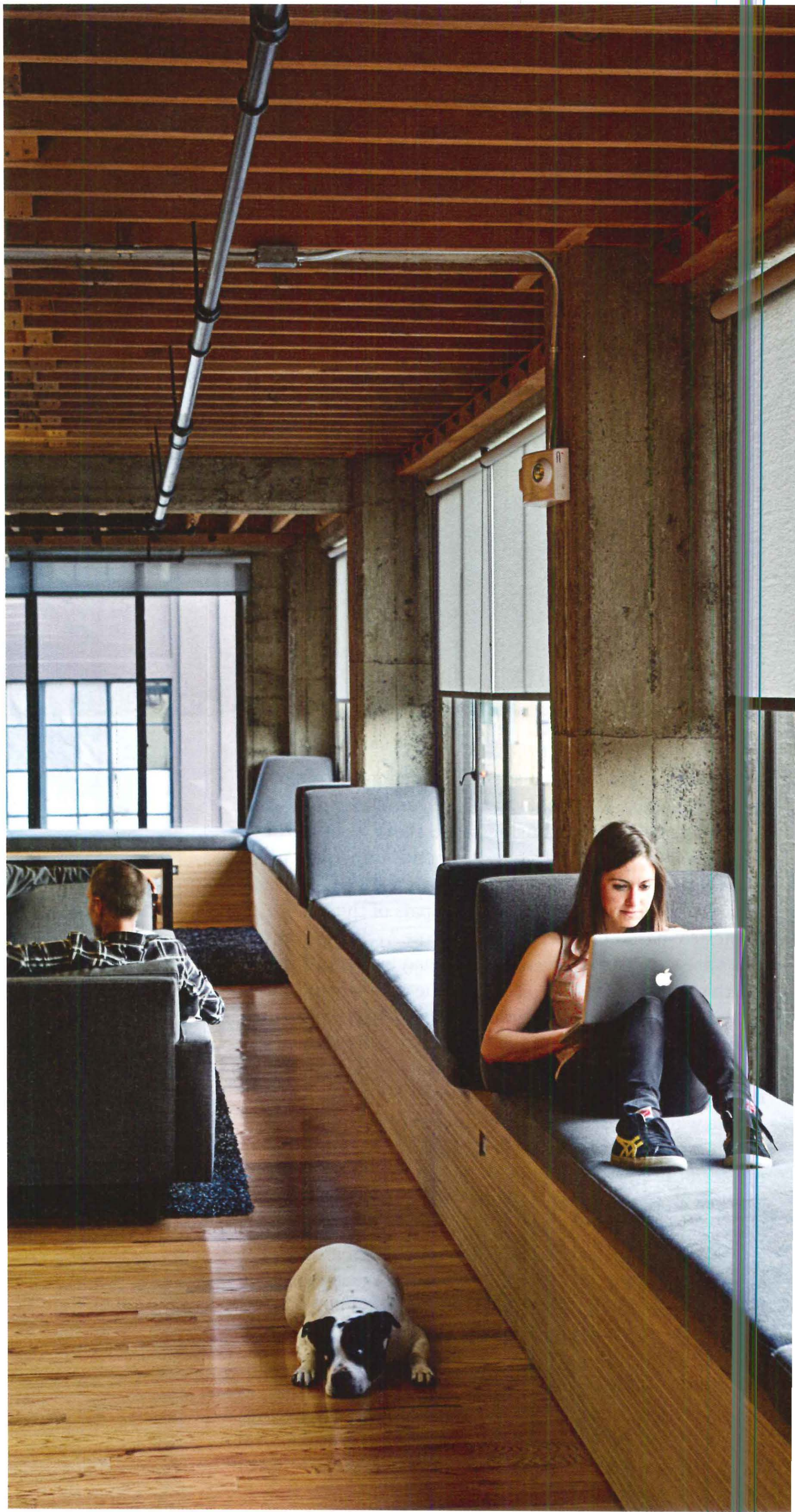
SOURCES

WALLS/CUSTOM DOORS: Polygal

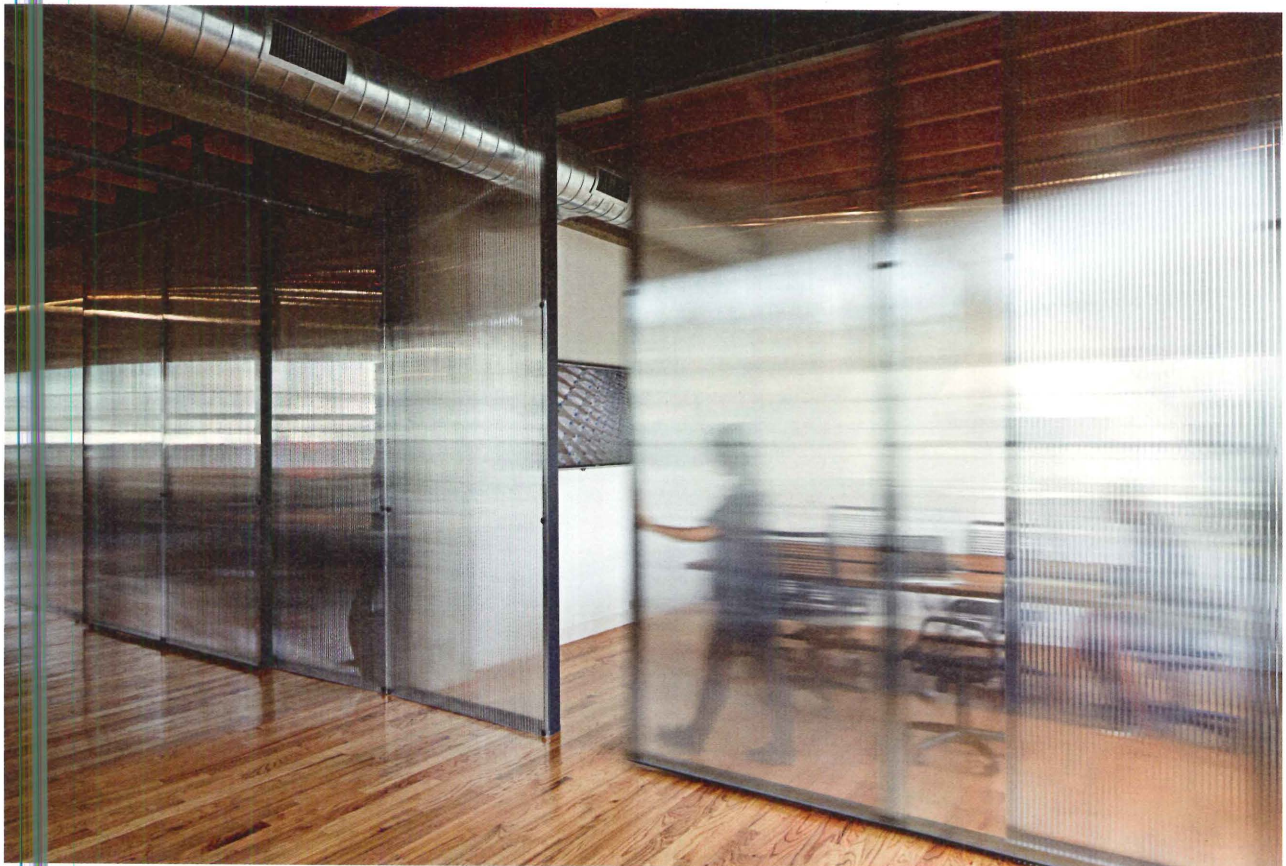
KITCHEN COUNTER: Caesarstone

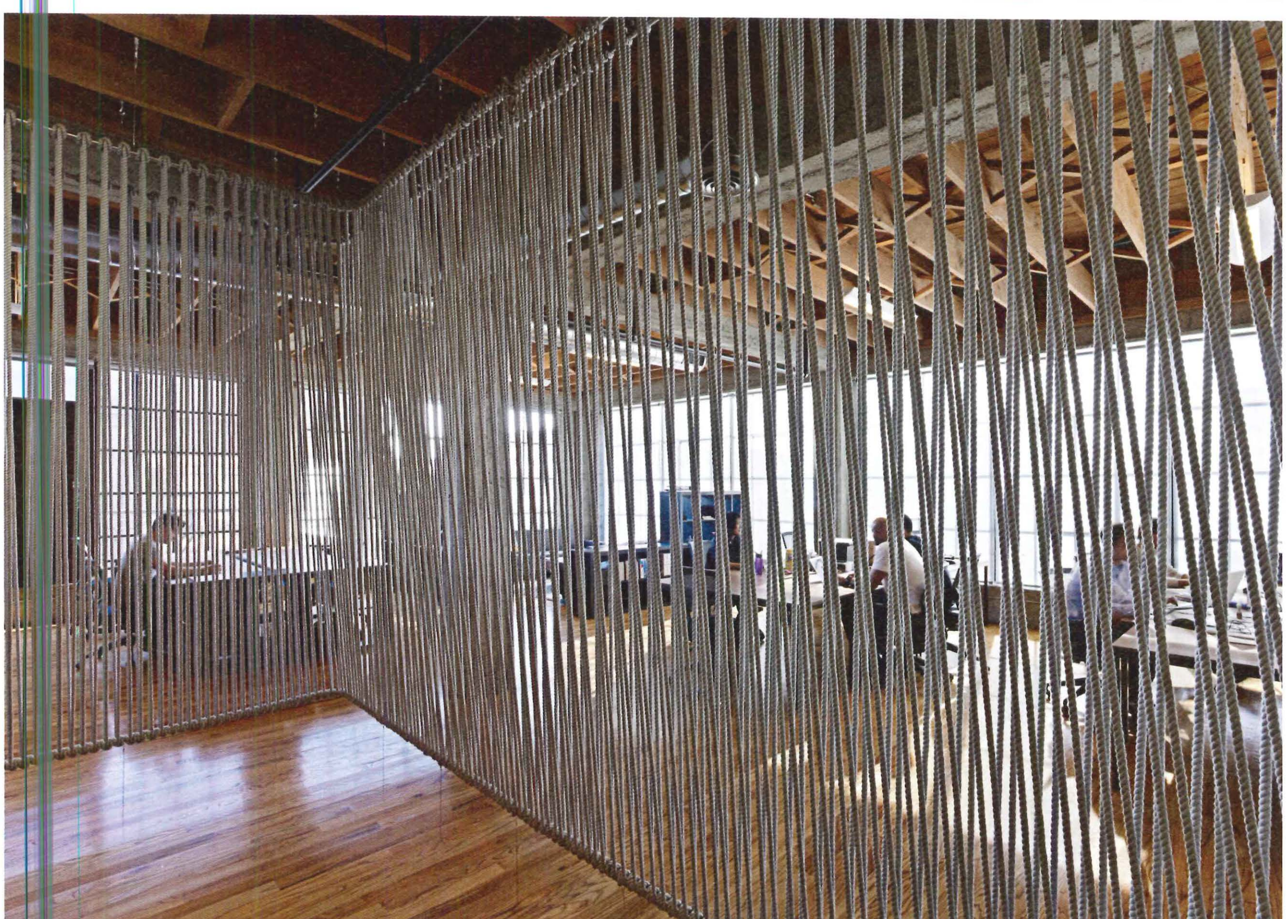
PAINTS AND STAINS: Benjamin Moore

REFRIGERATOR: Frigidaire Commercial



BAY WATCH For the open-plan offices on the second floor, the architects built a generous window seat from plywood.





CURTAIN CALL
Polycarbonate sheets segment off conference rooms while still letting light through (top). On the third floor the designers fashioned a breakout space from industrial rope and electrical conduit (bottom). They leavened the room's heavy look by suspending the curtain several inches above the floor.

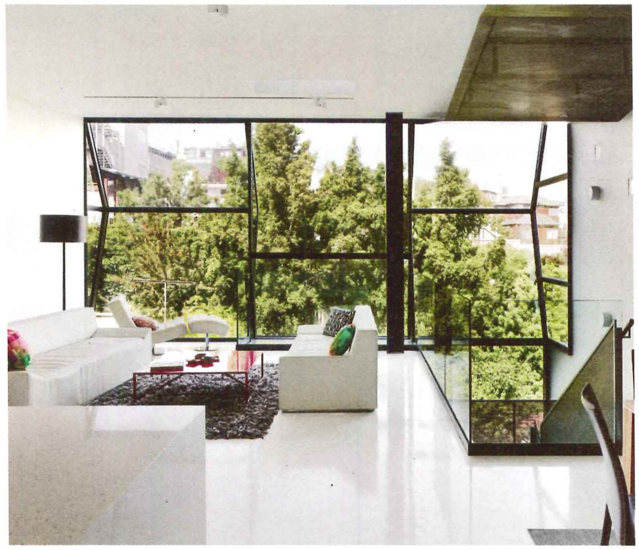
Flip House | San Francisco | Fougeron Architecture

PUSHING THE ENVELOPE

Constraints enhance creativity as Anne Fougeron demonstrates in a San Francisco house renovation.

BY LYDIA LEE

PHOTOGRAPHY BY JOE FLETCHER



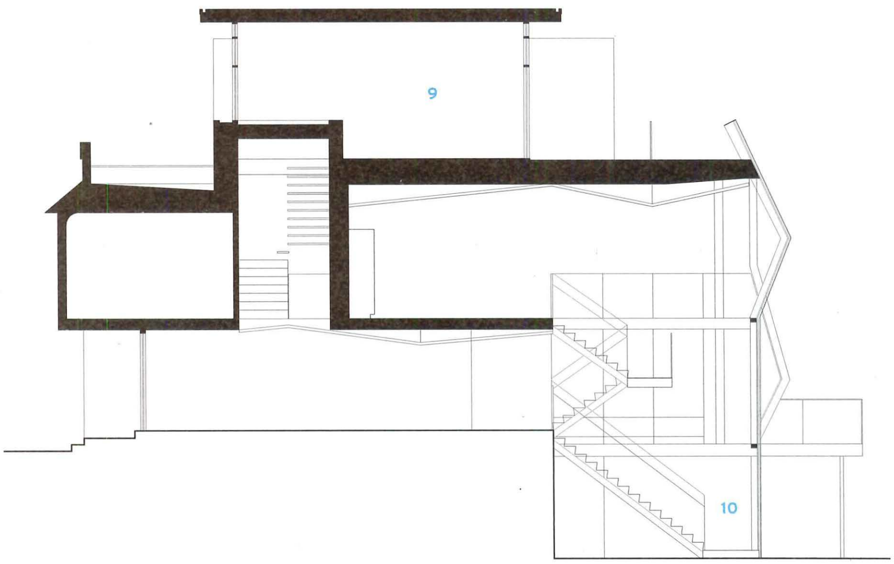
LOOKING OUT The architects reoriented the plan of a conventional San Francisco house so that public living areas look out to the rear (opposite) and private ones face the street. Vertical strips of field glazing—bonded to the frames on site—bring light and views to the living area on the second floor (left) and to the guest room underneath (below).

IT'S SAFE to say that the San Francisco Planning Commission never envisioned a bay window like the ones architect Anne Fougeron created for the Flip House. The city's residential code allows windows to project out to 3 feet, encouraging architects to retain the form of San Francisco's traditional bay windows. When she was called upon to do a major renovation to a 1930s rowhouse in the Potrero Hill neighborhood, Fougeron figured out how to make the code work to her advantage. "We wanted to maximize that downtown view to the north, which the clients [a couple with two young children] were obsessed with," she says.

The back facade of the dwelling is now completely transparent: three vertical strips of glazing, bonded to their frames on-site, angle out to seize the view, particularly to the north. To get the full panorama, you go to the end of the living area and look over a glass balustrade that protects you from a 2½-foot gap between the floor and the facade. Here you can not only survey the city but gaze down to the guest suite below. The facade seems to float off the back of the house—a daring form of perpetual scaffolding.

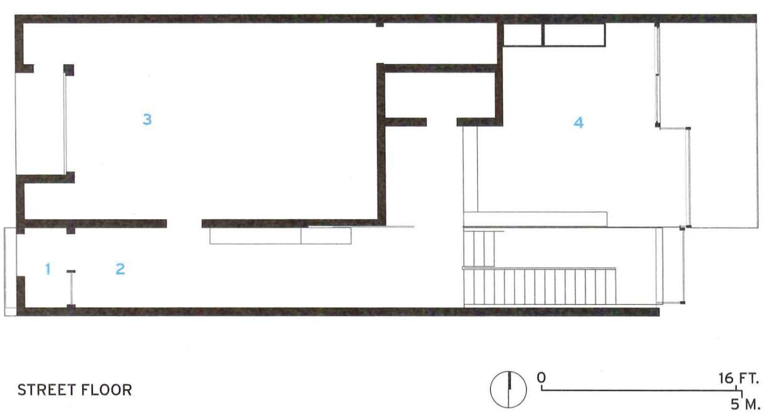
"The house was like a pancake before, with floors stacked on top of each other and no relation between them," says Fougeron. "So we came up with a design where the window system isn't visibly interrupted by the different levels." Also enhancing the view, the flow of space, and the light is a semitranslucent staircase of 3/16-inch perforated steel, bent to form treads and risers. A canopy of perforated steel also defines the dining area and mimics the rear facade as it dips over the stairwell.

A strong practical reason motivated this $850,000, 2,800-square-foot renovation. The name "Flip House" refers to how Fougeron flipped the public and private quarters in plan. Two modestly sized children's bedrooms now face the street above the garage and main entrance on the lower level, and the kitchen/dining/living area is integrated into one expansive space in back. The new layout enables the clients to isolate the kids' wing and entertain in peace, simply by



SECTION A - A

SECOND FLOOR



STREET FLOOR

1 ENTRANCE VESTIBULE
2 ENTRANCE HALL
3 GARAGE
4 GUEST ROOM
5 BEDROOM
6 LIVING AREA
7 KITCHEN
8 DINING AREA
9 MASTER BEDROOM
10 BACK HALL

A conversation with: Anne Fougeron

"For generations of women, it has been easy to be a little recessive," Anne Fougeron says. "You aren't trained to speak up. But if you don't, nobody's going to notice you. You have to lean in, as Sheryl Sandberg puts it." Fougeron studied architecture at the University of California, Berkeley, and spent her early career working for architect Daniel Solomon. In 1986 she went solo, starting with small remodeling jobs. It took time to become recognized—and then a 1999 Palo Alto residence she designed with channel-glass walls garnered awards and media attention. "You have to believe you can do it, because it's going to take a lot of hard work and a long time," she says. "You also have to get used to dealing with men, since most contractors and developers are male." Her office is now composed of 10 people—four women and six men—and she currently has a mix of private residential and multifamily projects, including a 43-story tower in San Francisco on which she is collaborating with Skidmore, Owings & Merrill.

credits

ARCHITECT: Fougeron Architecture – Anne Fougeron, principal; Ryan Jang, project architect; Todd Aranaz, project manager

ENGINEER: Yu Strandberg Engineering (structural)

CLIENTS: Lisa Koshkarian and Tom Difrancesco

GENERAL CONTRACTOR: Dermot Barry Construction

SIZE: 2,800 square feet (gross)

COST: $850,000

COMPLETION DATE: August 2012

SOURCES

SKYLIGHTS: Velux

SOLID SURFACING: DuPont Corian

EPOXY FLOORING: Nor-Cal Coatings

PERFORATED METAL: Flynn & Enslow

closing a pocket door. (A master suite—a previous addition by another architect—sits on the roof.)

To enhance the translucency and meet earthquake codes, Fougeron beefed up the wood-frame structure with steel moment frames and steel-tube columns. With its all-white interior, the house looks like a small museum—an impression augmented by the clients' collection of contemporary art. The unusual three-dimensional facade fits nicely into Fougeron's ambitions to break out of the city's comfort zone. "We're interested in the evolution of architecture and what new glazing and steel structural technology allow you to do," she says. Who knows? In the future, visitors may be asking for aerial tours of San Francisco's backyards instead of riding ersatz cable cars to see the "Painted Ladies." ■

Lydia Lee is an architecture writer and editor based in San Francisco.

LIGHTEN UP

The transparency of the living spaces is accentuated by the balcony-like design of the living room (above) and the perforated-steel stair (left). The stair connects the living and dining area (far left, top) with the guest room below and, ultimately, the ground on this sloping site. The street facade (far left, bottom) reveals the master bedroom previously added to the roof, but gives no clue of the striking glazed rear.

FRAC Bretagne | Rennes, France | Studio Odile Decq

THE STRONG SILENT TYPE

For a contemporary art center, an architect plays with light and transparency to create a new home for the collection as well as an experience for discovering it.

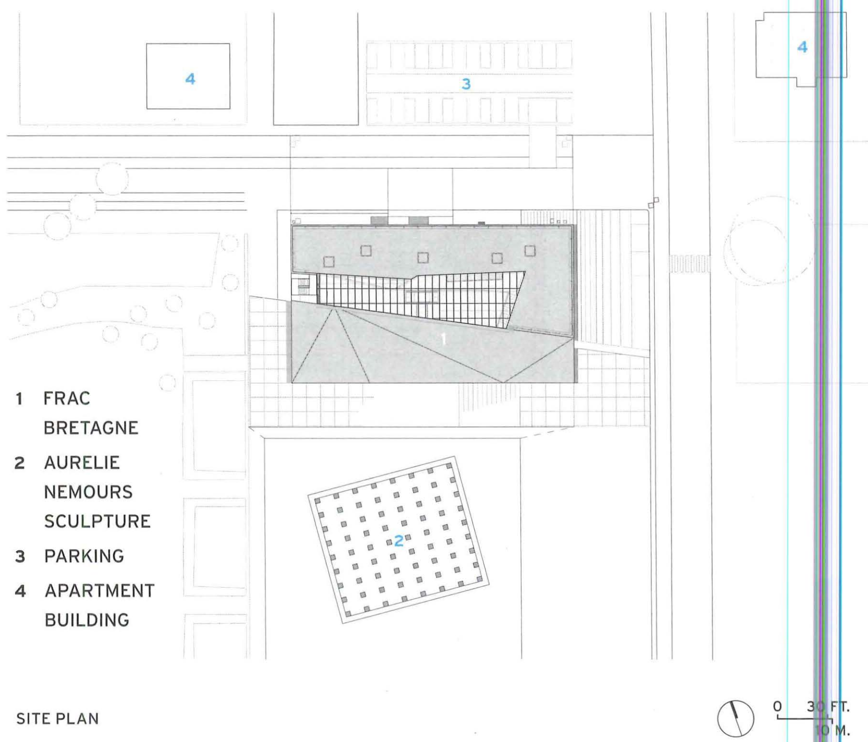
BY BETH BROOME

PHOTOGRAPHY BY ROLAND HALBE

WHILE RENNES, the capital of France's Brittany region, does not make most travel guides' must-see lists, the university town of 200,000 still has its charms: crooked medieval streets lined with half-timbered buildings, stately 18th-century edifices, and cafés that spill out onto picturesque squares. But all this fades away by the time you reach Beauregard on the city's northern fringes. Here, open fields have yielded to a scattering of bland apartment buildings that began appearing in a wave of development in the 1990s. Built into a slight rise at the end of a long, grassy park, FRAC Bretagne's new center for contemporary art, designed by Paris-based Studio Odile Decq, punctuates this prosaic setting with a staunch—though subdued—assertion of French modernism.

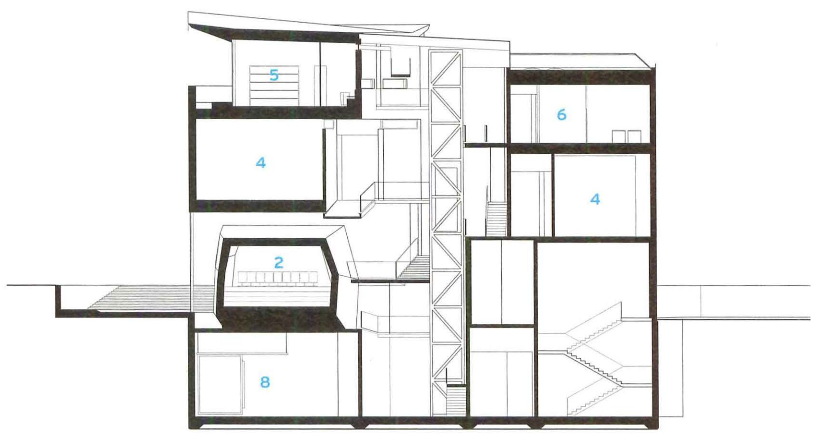
Starting in the early 1980s, the French state and its regions created Les Fonds Régionaux d'Art Contemporain, or Les FRAC, a family of 23 cultural institutions across the country dedicated to the promotion of contemporary art within each region. Between 2013 and 2015, "new generation" FRAC buildings—including those designed by Bjarke Ingels Group, Jakob + MacFarlane, and Kengo Kuma—are opening for six of the regions in an effort to expand their collections and diversify their missions. Decq's FRAC Bretagne was the first to be inaugurated, in July 2012.

Though largely unremarkable, the suburban site did have one eminent neighbor already in residence. In 2005 the state installed *Alignment for the XXI Century,* by French artist Aurelie Nemours. Composed of 72 marching granite



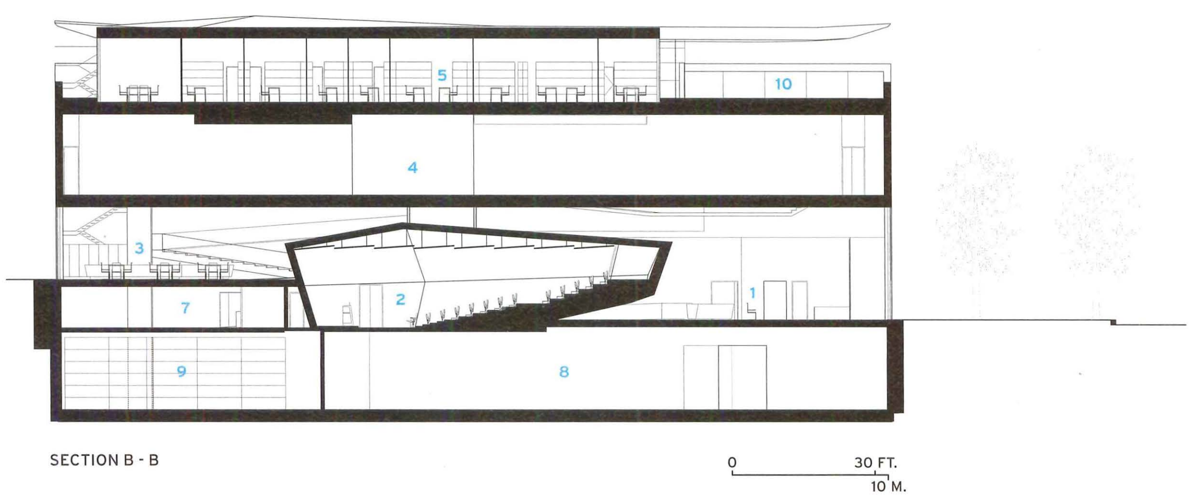
SITE PLAN

LIGHT SENSITIVE Under bright sun, the building appears opaque (previous pages), while simultaneously reflecting the adjacent sculpture by Aurelie Nemours. In lower light levels and illuminated inside, it becomes transparent, providing views in to the lobby and auditorium (above). The steel-and-glass volume is cantilevered off a concrete one (opposite). The main entrance is concealed in the black glass on this facade (with black tinted stainless steel panels above), so as not to compete with the sculpture.

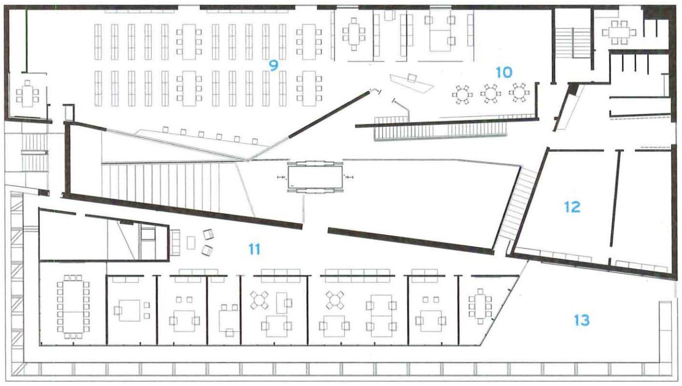


SECTION A - A

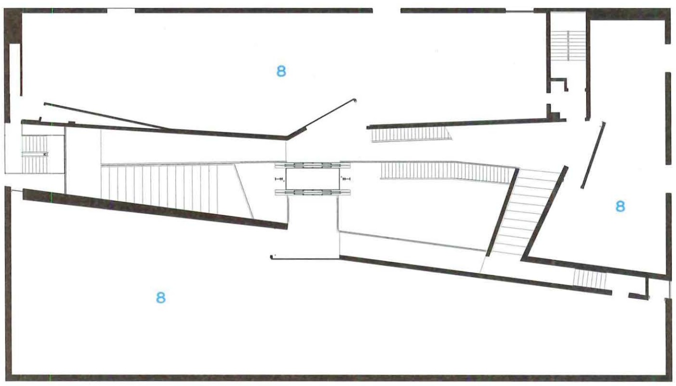
1 ENTRY HALL
2 AUDITORIUM
3 CAFÉ
4 EXHIBITION
5 ADMINISTRATION
6 LIBRARY
7 DRAWING STORAGE
8 PAINTING STORAGE
9 SCULPTURE STORAGE
10 ROOF DECK



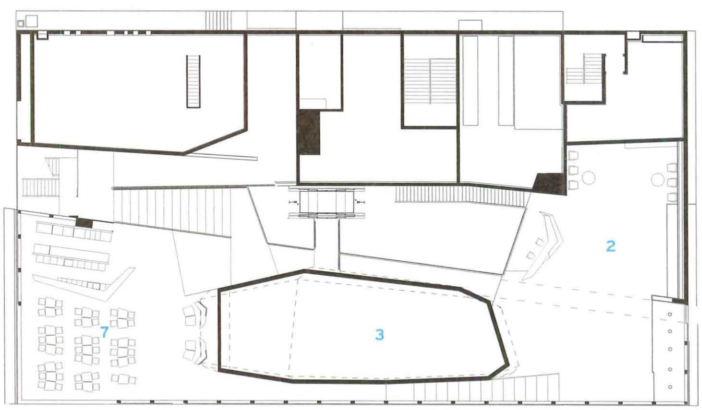
SECTION B - B



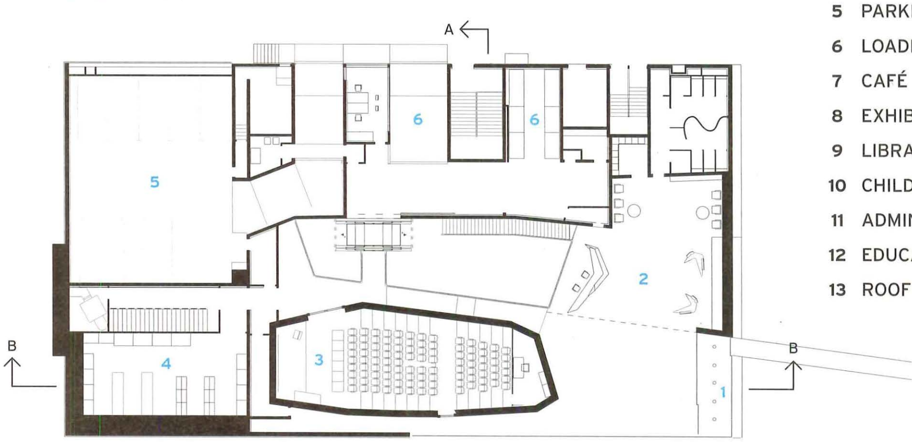
FOURTH LEVEL



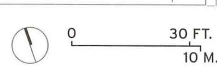
THIRD LEVEL



SECOND LEVEL



GROUND LEVEL



A conversation with: Odile Decq

In 1979, fresh out of architecture school, Odile Decq founded her practice in Paris. In 1985 she formed a partnership with Benoît Cornette—creating Odile Decq Benoît Cornette—whom she met while studying and who had become her life partner. Tragically, in 1998, Cornette died in an automobile accident. Decq continued to practice and to win awards and, just this past March, renamed her firm Studio Odile Decq. The change—15 years after Cornette's death—was prompted, says Decq, by her portrayal in the media. "They were still referring to my work from the time I was with Benoît, and I was fed up," she says. "It was a sort of sexist attitude that didn't recognize the work as solely mine, even as it has evolved since 1998." From now on, the firm's projects will bear only Decq's name, "to be clear that I am the architect," she says. "I try to explain to young women that practicing architecture is really complicated and it's very hard, but it's possible. I discovered early on that to be an architect you have to have a little bit of talent and a maximum of determination and not focus on the complications."

1 MAIN ENTRANCE
2 ENTRY HALL
3 AUDITORIUM
4 DRAWING STORAGE
5 PARKING
6 LOADING DOCK
7 CAFÉ
8 EXHIBITION
9 LIBRARY
10 CHILDREN'S LIBRARY
11 ADMINISTRATION
12 EDUCATION
13 ROOF DECK

credits

ARCHITECT: Studio Odile Decq
ENGINEERS: Batiserf; Carig
CONSULTANT: Aida (acoustical)
CLIENT: Région Bretagne
SIZE: 53,800 square feet (gross)
COST: $15.8 million
COMPLETION DATE: July 2012

SOURCES
CONCRETE: Lafarge
STAINLESS STEEL: Aperam
GLASS: AGC Glass Europe
LIGHTING: iGuzzini

columns, the sculpture is a minimalist interpretation of prehistoric stone—or menhir—alignments, like the one at Brittany's Carnac. Before her death in 2005 at age 94, Nemours expressed a desire that the impending FRAC be deferential to her work. "She asked that the building have a silent facade," says Decq. "This meant we had to be calm—and I realized that the only thing I could play with would be light and reflection. To be very silent, for me, is to be black."

Exploring the boundaries of the color, the architect glazed the lower portion of the front facade with glass that moves from gray to dark black to opaque. Above are three gradations of black-tinted stainless steel panels, and then dark glazing again at the setback on top. The colors and level of reflectivity and transparency shift with the light. In bright sunshine, the building becomes a mirror for the adjacent artwork and park and, from a distance, appears as a solid black form. "In a way, I built a new monolith," admits Decq, again referring to the menhirs.

For the new building, the city stipulated a tight, rectangular footprint. Sensing that the resulting boxlike form would be ill suited to a cultural institution, Decq and her team cut a crevasse lengthwise through its middle, creating two volumes. The one at the back is rendered in concrete and supports the structure for the steel-and-glass volume at the front. Cantilevering the steel side so that the entry is free of columns, say the architects, was the main structural adventure here. The crevasse, or atrium, which is topped with a skylight, creates an open interior that belies the solidity of the exterior and exposes the various levels and functions inside while creating dramatic public spaces. Previously, FRAC Bretagne occupied an old school building in Châteaugiron, to the southeast. It served as a repository for collecting and conserving regional and international art, but did not facilitate exhibition—a central theme of the new center. "It's a second life for this FRAC, establishing it as a museum and creating public spaces," says Decq, who grew up in Brittany and began her studies in Rennes.

Taking lessons from her MACRO museum in Rome (RECORD, July 2011, page 54), the architect pushed the program—exhibition, education, a library, and administration (with art storage below grade)—to the sides, resulting in this concrete-and-steel crevasse at the center. Decq placed the main entrance on the building's short, street-facing side, so as not to interfere with Nemours's work. Through the soaring lobby, visitors move up a long, shallow stair that squeezes them between the red, bloblike auditorium and

BLANK CANVAS FRAC's three gallery spaces, in contrast to the black-and-red public spaces, are all white. Able to accommodate artworks of varying scales, they employ concrete floors, plywood walls, and ceilings open to decking and ducts. The galleries are daylit by large windows or, in the case of the uppermost space (not pictured), ribbon skylights along the exterior walls. Fluorescent tubes are concealed on the exposed beams above.

the sculpture just outside the floor-to-ceiling glass. A series of ramps and stairs of varying heights and widths slice through the void, creating a winding vertical promenade that connects the different programmatic elements and provides an immediate understanding of the building's organization. This journey brings visitors past a café, through a kind of dreamy industrial landscape, to three discrete, well-proportioned, bright-white gallery spaces, and then up to the library above. "You have to be a little bit out of the normal life to digest the art," says Decq of the abstract and conceptual work on display. "It's not so easy, so you have to enter into another world."

As Decq has done before (for the Shanghai Exhibition Information Center, MACRO, and her restaurant at Paris's Opera Garnier, for example), she has imbued the public areas here with a deep, shocking red, representing the lifeblood of the building. Her longstanding use of this hue illustrates her comfort with repetition. But she is also not afraid of the future. In her office the architect keeps a sample sheet of the red that she conceived so many years ago, and snips off a small piece when paint is mixed for a new project. "What will happen when the sample is gone?" a colleague asked Decq recently. "We will make a new color!" she replied.

Against Beauregard's unlikely setting, Decq has created this other world to which she alludes. Masked behind the reflective black box that—save for its jaunty thrusting crown with an overhanging roof—could be mistaken for an office building, Decq has made a home for the art inside, as well as an experience for discovering it. Like entering a science-fiction story, penetrating the building's opaque facade to its airy interiors beyond is a journey through a familiar time and place that is, at once, entirely new and foreign. ■

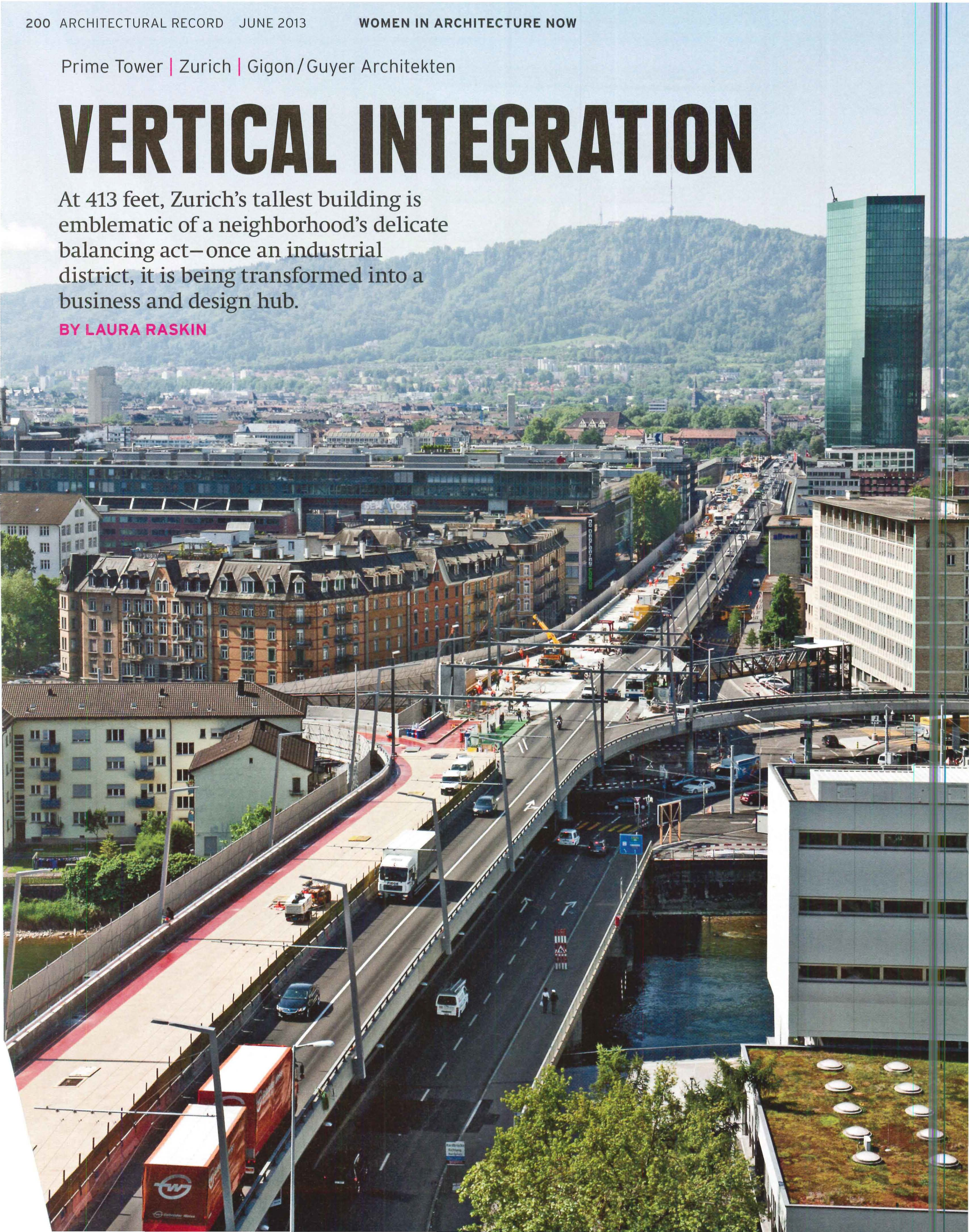
INTO THE GAP
The procession begins at a low stair leading off the lobby (above) and past the 110-seat auditorium, contained in a red plywood blob. The central atrium (opposite) is topped with a large skylight. Here metal panels mimic those on the exterior, steel plates cantilever to form a steep rise of stairs, and a glass-and-steel elevator transports both visitors and artworks.

Prime Tower | Zurich | Gigon/Guyer Architekten

VERTICAL INTEGRATION

At 413 feet, Zurich's tallest building is emblematic of a neighborhood's delicate balancing act–once an industrial district, it is being transformed into a business and design hub.

BY LAURA RASKIN

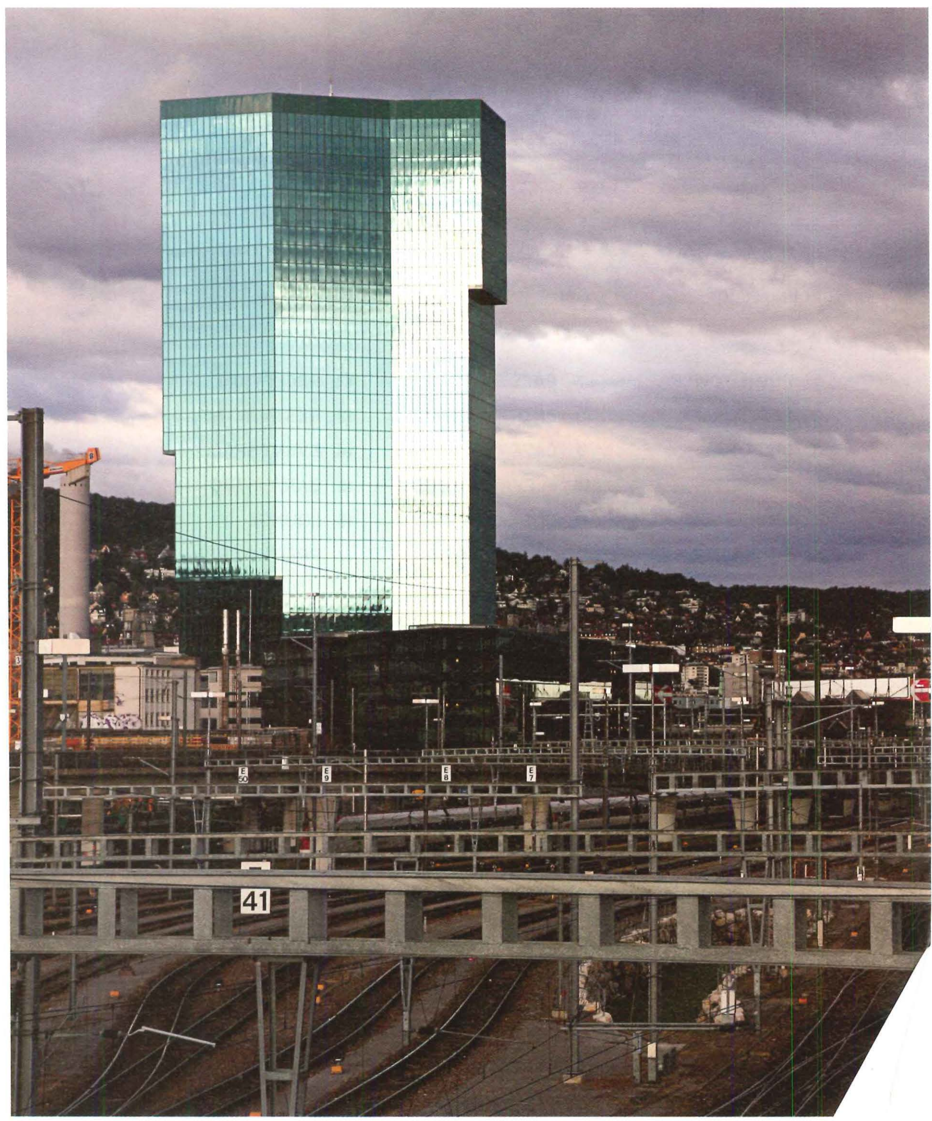


TOWERS PIERCE the skyline in New York, London, and Dubai. In low-rise Zurich, however, there is only one skyscraper, and it is a very recent addition, completed in 2011 by the Zurich-based firm Gigon/Guyer Architekten. Rising 413 feet, the Prime Tower changes shape and color depending on one's vantage point. From the nearby Hardbrücke railway station, its emerald, triple-glazed facade stands out against the gray train tracks and postindustrial warehouses of its neighborhood, Zurich West. But from a stroll along the nearby viaduct turned into a promenade, the tower nearly fades into a white sky.

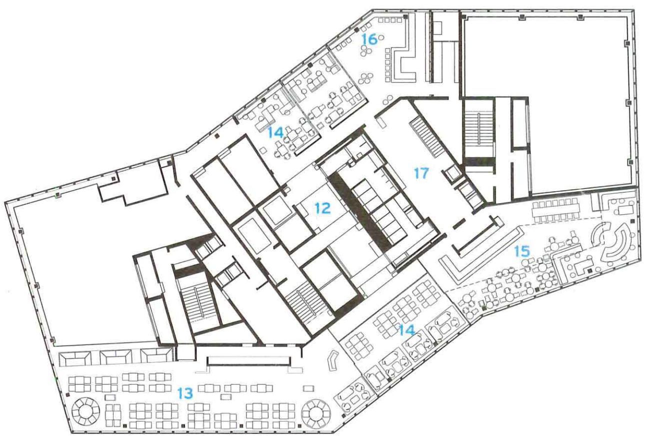
Annette Gigon and Mike Guyer, who formed their practice in 1989, won the competition for the tower in 2004, beating out Herzog & de Meuron, Josep Lluís Mateo, Sauerbruch Hutton, and others. When asked why she thinks her firm won—it had never designed a tower before—Gigon suggests: "Maybe because we had this interesting form?" In plan, the office tower is a condensed zigzag. "Two rectangles have been melted into each other," says Gigon. Several small cantilevers upend the typical skyscraper taper, from top to bottom instead of bottom to top. "It oscillates between a jewel, a crystal, and becoming something like a torso," she says. "It has a figurative association."

The 36-story tower is supported by a poured-in-place-concrete core and floors and precast-concrete columns, as is typical in Swiss construction. Every second or third window is operable—tenants can push them open parallel to the facade for a 6-centimeter opening—creating an ever-changing, pixelated surface. Gigon/Guyer was also commissioned to design the fit-out of some floors, including the marble lobby and a law office featuring reflective metal cladding, a light fixture by Olafur Eliasson, and wall paintings by Sol LeWitt. The architects also curated the 35th-floor restaurant and bistro. The warm tones of the bistro, with its brass bar and wood-paneled back wall, provide high contrast to the abstract tapestry of crisscrossing train tracks visible through the floor-to-ceiling windows.

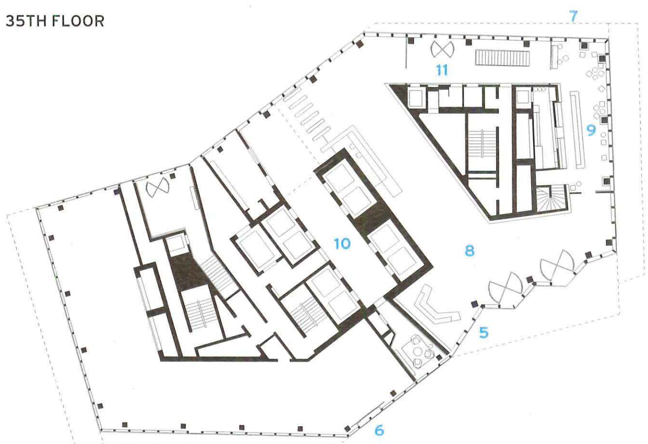
In 1999 the city and the developer began negotiating the permitting process to build such a tall building in Zurich with the hope of transforming the underused neighborhood into a financial district. (The master plan for the site is by Diener & Diener Architekten and M. & E. Boesch Architekten.) "Besides having a nice old town and lake, Zurich deserves to have a more urban and metropolitan character," says Gigon, adding that there is now public support for this kind of development. Back in the 1980s, artists began to move to Zurich West and adapt industrial buildings into studios and galleries, the start of a process of gentrification. Gigon says the speed of change in the neighborhood has been relatively slow—and that's a good thing. "There are still a lot of parts that are not posh," she says. "This is a great



STANDING TALL A view from the north of Gigon/Guyer's Prime Tower (opposite). The triple-glazed windows do not have exterior frames, and every second or third one can be opened parallel to the facade, creating a pixelated surface (top). The tower makes a bold statement in Zurich West; the neighborhood is becoming more metropolitan, offering art, design, restaurants, shops, and entertainment (right).



35TH FLOOR



GROUND FLOOR

0 30 FT. 10 M.

1 PRIME TOWER
2 PLATFORM
3 DIAGONAL
4 CUBUS
5 MAIN ENTRANCE
6 BANK ENTRANCE
7 CAFÉ ENTRANCE
8 ENTRANCE HALL
9 CAFÉ
10 ELEVATOR LOBBY
11 UNDERGROUND PARKING ACCESS
12 RECEPTION
13 RESTAURANT
14 EVENT SPACE
15 BAR/BISTRO
16 LOUNGE
17 PREP KITCHEN

SITE PLAN

0 150 FT. 50 M.

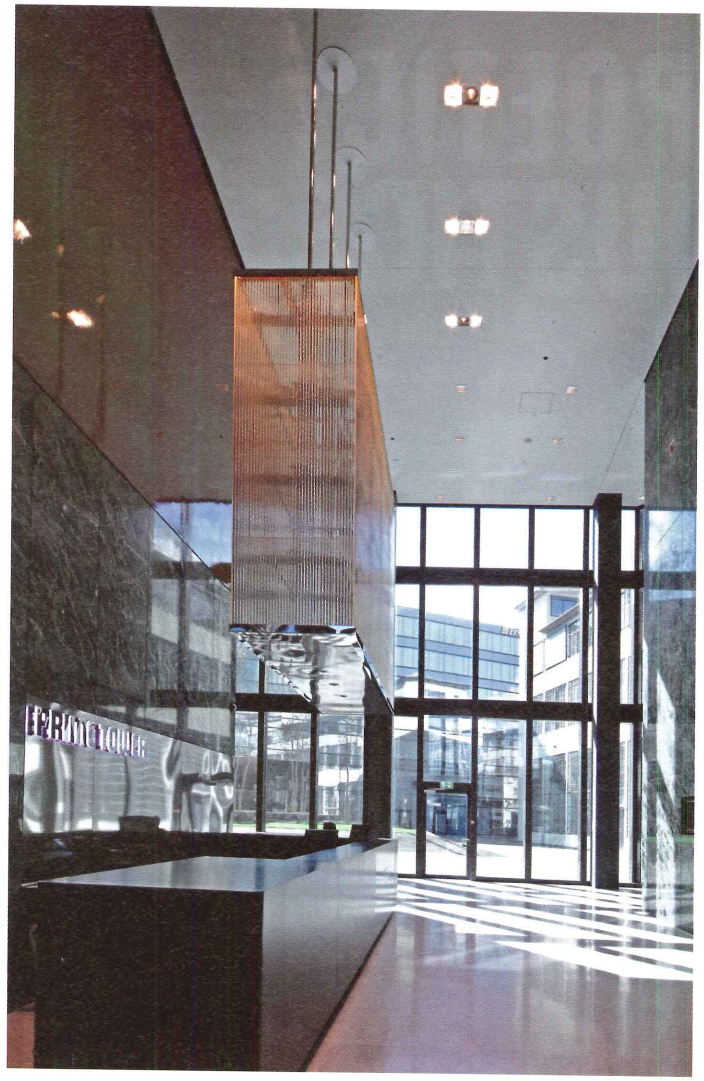
A conversation with: Annette Gigon

When Annette Gigon and Mike Guyer (above) won a 1989 competition to design the Kirchner Museum Davos, completed in 1992, they kicked off their professional union. They are not romantic partners, however—they both have families of their own. "This is a good combination," says Gigon. She comes from a family of watchmakers and dentists and doesn't recall having a female architect role model, though she was inspired by Eileen Gray. Gigon was simply drawn to the work, and nothing stood in her way. "I'm younger than Denise Scott Brown, and maybe society has advanced since then," she says. But she can relate to Scott Brown's anger about not receiving the Pritzker Prize along with her husband and partner, Robert Venturi, in 1991: "It would have killed me," she says. Though Gigon hasn't encountered many obstacles as a woman architect, she does note that some clients "have been quite nasty and just wanted to see the men." She describes her collaboration with Guyer as even: "We split competitions. Sometimes we work closely together, and discuss, quarrel, and find solutions. This process—you do it alone or together. It's not easy; it's always work."

moment in time as long as both are there. The city is interested in keeping both."

The Prime Tower, while embodying the push for a more vibrant Zurich West, doesn't really fit its surroundings but serves as a kind of landmark. People buzz across its mini-campus, which includes three smaller commercial buildings designed (and in one case renovated) by Gigon/Guyer and connected by a public plaza. The buildings, dubbed the Cubus, Platform, and Diagonal, contain restaurants, galleries, offices, a day-care center, and a copy shop, among other amenities.

"When I started at ETH [the Swiss Federal Institute of Technology, where Gigon and Guyer met as students], high-rise buildings were not popular," says Gigon. "They were anxious about building too much in Switzerland." Now, she says, a few other towers—though only about 260 feet high—are being built in the vicinity, following on the heels of the Prime Tower's success. ■



Credits

ARCHITECT: Gigon/Guyer Architekten – Annette Gigon, Mike Guyer, partners in charge; Stefan Thommen, team manager; Christian Maggioni, deputy team manager; Pieter Rabijns, project manager from 2007

ENGINEERS: Walt + Galmarini, Dr. Schwartz Consulting, Dr. Lüchinger + Meyer Bauingenieure, Bänzinger Partner, Freihofer & Partner (structural); Hefti Hess Martignoni (electrical); PB P. Berchtold (heating/cooling); GRP Ingenieure (plumbing)

CONSULTANTS: Schweingruber Zulauf Landschaftsarchitekten (landscape); Dr. Heinrich Jäckli (geotechnical); Ernst Basler + Partner (lighting)

CLIENT: Swiss Prime Site

GENERAL CONTRACTOR: Losinger Marazzi, Karl Steiner

SIZE: 528,730 square feet (tower)

COMPLETION DATE: December 2011

SOURCES

CURTAIN WALL: Dobler Metallbau

STONE: Carlo Bernasconi

DOORS: Hammer Metallbau

ELEVATORS: Schindler Aufzüge

PRIME LOCATION
The Prime Tower campus (above left) includes three smaller commercial buildings designed by Gigon/Guyer: from left in photo, the Cubus, the renovated Diagonal, and the Platform. The lobby of the Prime Tower (above) has a light fixture designed by the architects and Hannes Wettstein and an iridescent wall painting, seen above the marble paneling, by Adrian Schiess. An access zone (left) in a law firm on the 28th floor offers views of the city and features a wall painting by the artist Beat Zoderer.

U.S. Courthouse | Austin, Texas | Mack Scogin Merrill Elam Architects

POETIC JUSTICE

An innovative pinwheel plan brings daylight into a rugged cubic building that strengthens the public realm's imprint in a historic part of the Texas capital.

BY CLIFFORD A. PEARSON

PHOTOGRAPHY BY TIM HURSLEY

UNLESS YOU'RE a lawyer, you probably don't look forward to spending time in courthouses, since most of us associate them with jury duty or maybe lawsuits. Courthouses of the past captured our attention with their handsome expressions of judicial authority and civic pride. But in recent years, security concerns have turned many of these buildings into glorified bunkers. Americans today have an uneasy relationship with government; we want our public institutions to instill respect and project strength, but we don't want them to cost much or be too powerful. In their design for the new U.S. Courthouse in Austin, Texas, the Atlanta-based architects Mack Scogin and Merrill Elam wrestled with these conflicting notions, finding resolution in a building that's muscular in its

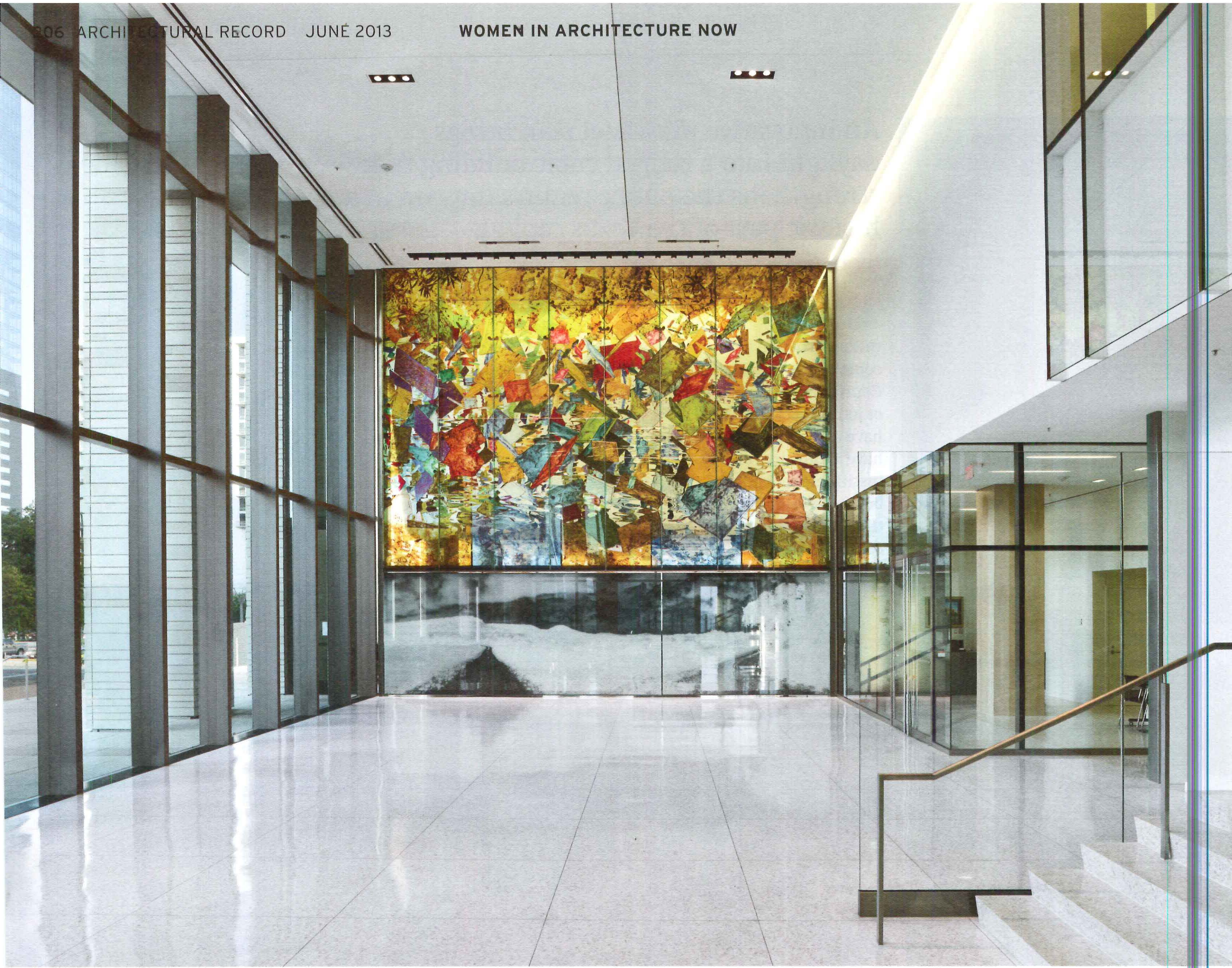
massing and materials but engaging in its use of daylight and transparency.

The 252,000-square-foot, $102.6 million courthouse replaces a smaller one a few blocks north, which was designed by local architect Charles H. Page and New York architect Kenneth Franzheim and opened in 1936. Like its predecessor, the new courthouse was built during a severe economic downturn, thanks to stimulus spending. Its full-block site, west of Republic Square Park, one of the city's three remaining downtown historic squares, places it strategically near Antoine Predock's City Hall (2004), Andersson-Wise's 37-story W Hotel and Residences (2010), and all the honky-tonk bars on West Sixth Street.

To connect the courthouse and Republic Square, the architects closed a city street that runs between them and turned it into a plaza landscaped with hardy sycamore trees and wood benches. "We wanted the building to be of its place, of Austin," says Elam, "so its relationship with Republic Square was critical." Now a farmers' market that takes place in the square every Saturday spills onto the plaza, right up to the wide courthouse steps.

Scogin and Elam had to pack a lot of program–eight courtrooms and accompanying jury-deliberation spaces, judges' chambers, offices, attorney/witness conference rooms, a jury-assembly room, and various holding spaces for defendants–onto a fairly tight site. So they envisioned the building as a cubic

TEXAS SWAGGER
Scogin says he and Elam wanted the building to feel bigger than it is so it would have a presence in the burgeoning city (above). With that in mind, they used a rugged palette of limestone, stainless steel, and black, preweathered zinc. A new plaza (opposite) connects the courthouse and its wide stairs to Republic Square Park (just out of view on the right of photo).



A conversation with: Merrill Elam and Mack Scogin

"Merrill was a renegade," says Mack Scogin about his wife and business partner. "She didn't show up on time, and she didn't follow the rules." He would know. The two have worked together since 1968, first at Heery and Heery and then at their own firm. Both acknowledge their ex-boss George Heery for allowing Elam's talent to shine. Scogin and Elam are jointly concerned with each project, with one taking the lead as principal in charge, and each as co-lead designer. "But sometimes all that switches around as the project progresses," says Elam. "There's no hierarchy." It's a collaboration that works, says Scogin, because they don't try to find common ground, but to maintain their individuality, together. "You have to be continuously fascinated by the other person's ideas," he says.

GROUND FLOOR
A large glass artwork by Clifford Ross separates the main lobby (opposite) from the jury-assembly room (above). Its colorful upper portion brings together pieces of a photograph of a Colorado mountain; the lower part is a pair of pivoting glass doors imprinted with a photo of a Texas landscape. Daylight helps animate the elevator lobby (above right).

structure practically bursting at the seams. The largest courtroom—the only one on the ground floor—pushes out 2 feet on one side, while roof canopies jut out at two corners to cover terraces carved from the building mass. Courtrooms are expressed on the outside with vertical windows and corner glazing. The overall effect is that of an enormous Rubik's cube—a stately, orthogonal mass subverted by smaller components that look as if they might have been rotated from their original positions.

Scogin and Elam clad the courthouse in the same local limestone seen on many nearby public buildings to tie it to its context, but applied the material in a very different way. Instead of turning the rough face out, they used the smooth side as the facade. To add texture to the exterior, they made a subtle quilt of the stone—varying the dimensions of the pieces, sloping some out from the vertical and others in.

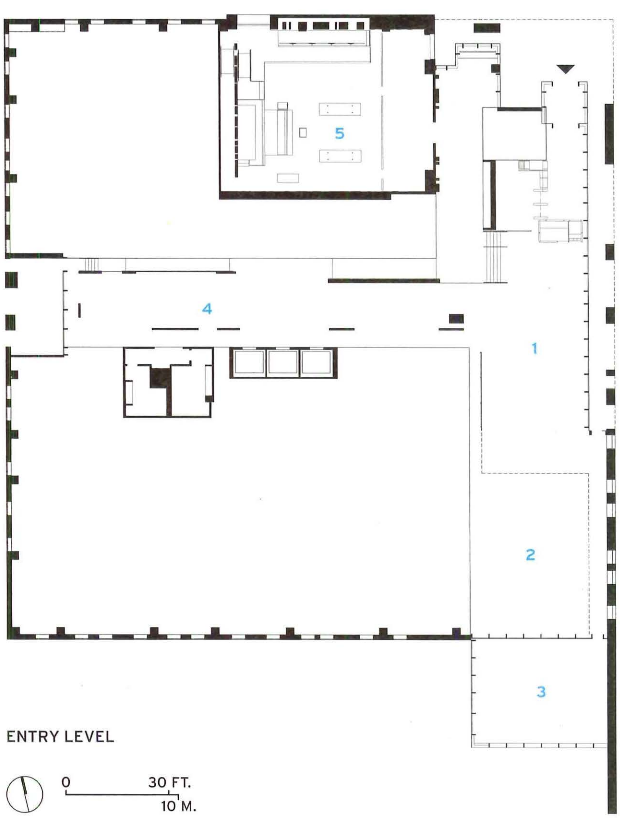
During the design process, the architects toured a number of courthouses with U.S. Magistrate Judge Andrew Austin and other members of the project's building committee. They noticed that most of these buildings have convoluted hallways, in part because courthouses must have three distinct circulation systems: one for the public, one for court staff (restricted), and one for prisoners and government marshals (secure). Many buildings tucked courtrooms inside large floor plates, away from windows. "At the old courthouse here in Austin, the courtrooms had daylight and views outside," says Judge Austin. "All of the judges wanted to keep that in the new building."

So Scogin and Elam devised an unusual plan with two cores (one with separate elevators for the public, staff, and prisoners, and the other just for restricted and secure use) that help reduce hallways and keep floors as compact as possible. While two cores are more expensive than one, the architects say their scheme is more efficient in organizing interior spaces and minimizing building envelope, and therefore did not cost more to construct.

The plan also allowed them to maximize daylight in important spaces by placing a pair of courtrooms (and their jury rooms and judges' chambers) on alternating corners of the building and carving out a terrace shared by each pair of courtrooms. Because the courtrooms are double-height spaces, while the jury rooms and judges' chambers are

1 LOBBY
2 JURY ASSEMBLY
3 PATIO
4 ATRIUM
5 SPECIAL-PROCEEDINGS COURTROOM
6 COURTROOM (SIXTH FLOOR)
7 COURTROOM (SEVENTH FLOOR)
8 ATTORNEY/WITNESS CONFERENCE

COMPOSITE PLAN - FLOORS 6 AND 7



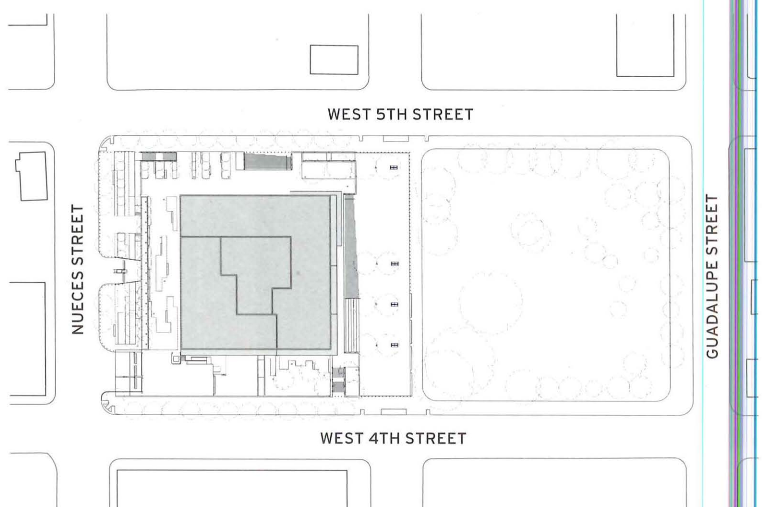
ENTRY LEVEL

0 30 FT. 10 M.

single-height, the architects rotated their placement on the different corners and inserted a wood-clad interior stair to connect each pair of floors. For example, on the sixth floor, the two courtrooms bookend the northeast corner, while on the seventh they sit on the southwest corner. "Bringing in daylight drove everything we did," says Scogin. "The trick was to create a pinwheel plan around a double core. That allowed us to provide natural light to all of the courtrooms, and also the jury rooms and offices."

The building stands on a one-story podium, which allows parking to be tucked underneath and provides the blastproof walls required by current security mandates. Unfortunately, the long walls on its three street sides and the wide steps on Republic Square undermine the goal of engaging with the city. Once you walk up those steps, though, you're greeted by a double-height lobby with a long glazed wall overlooking the square and a four-story atrium that houses the elevators and helps distribute daylight deep inside the building.

A product of the General Services Administration's Design Excellence program, the U.S. Courthouse in Austin shows what can happen when top-tier architects work on public projects. The result here is a building that may not be warm and fuzzy, but asserts a rugged sense of civic pride that seems just right for Texas. ■



SITE PLAN

0 150 FT. 50 M.

credits

ARCHITECT: Mack Scogin Merrill Elam Architects – Mack Scogin, principal in charge; Merrill Elam, collaborating principal; John Trefry, David Yocum, Carrie Hunsicker, project managers

ENGINEERS: PageSoutherlandPage (m/e/p/fp, civil); Architectural Engineers Collaborative (structural)

CONSULTANTS: Hargreaves Associates (landscape); Lam Partners (lighting); Shen Milsom & Wilke (acoustical)

CLIENT: General Services Administration

GENERAL CONTRACTOR: White Construction

SIZE: 252,420 square feet

COST: $102.6 million

COMPLETION DATE: November 2012

SOURCES

STAINLESS STEEL PANELS: Rimex Metals

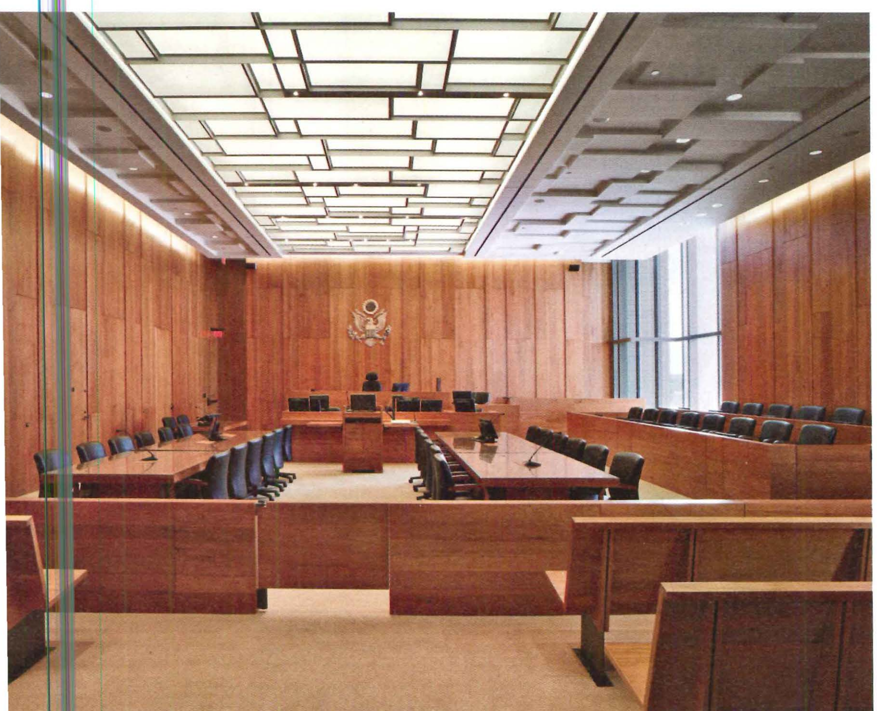
ZINC PANELS: VMZINC

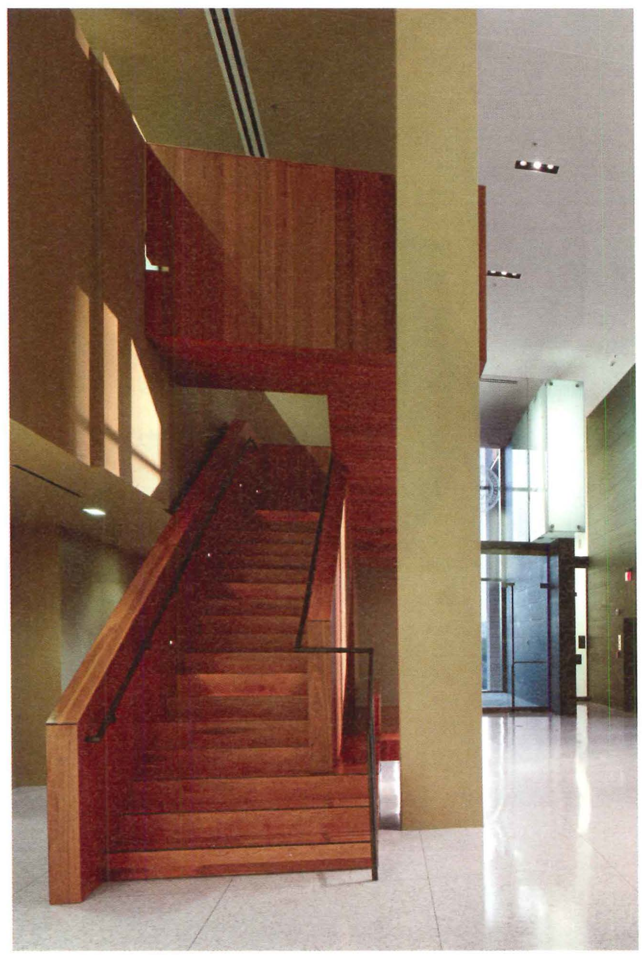
GLAZING: Harmon

ENTRY DOORS: Ellison

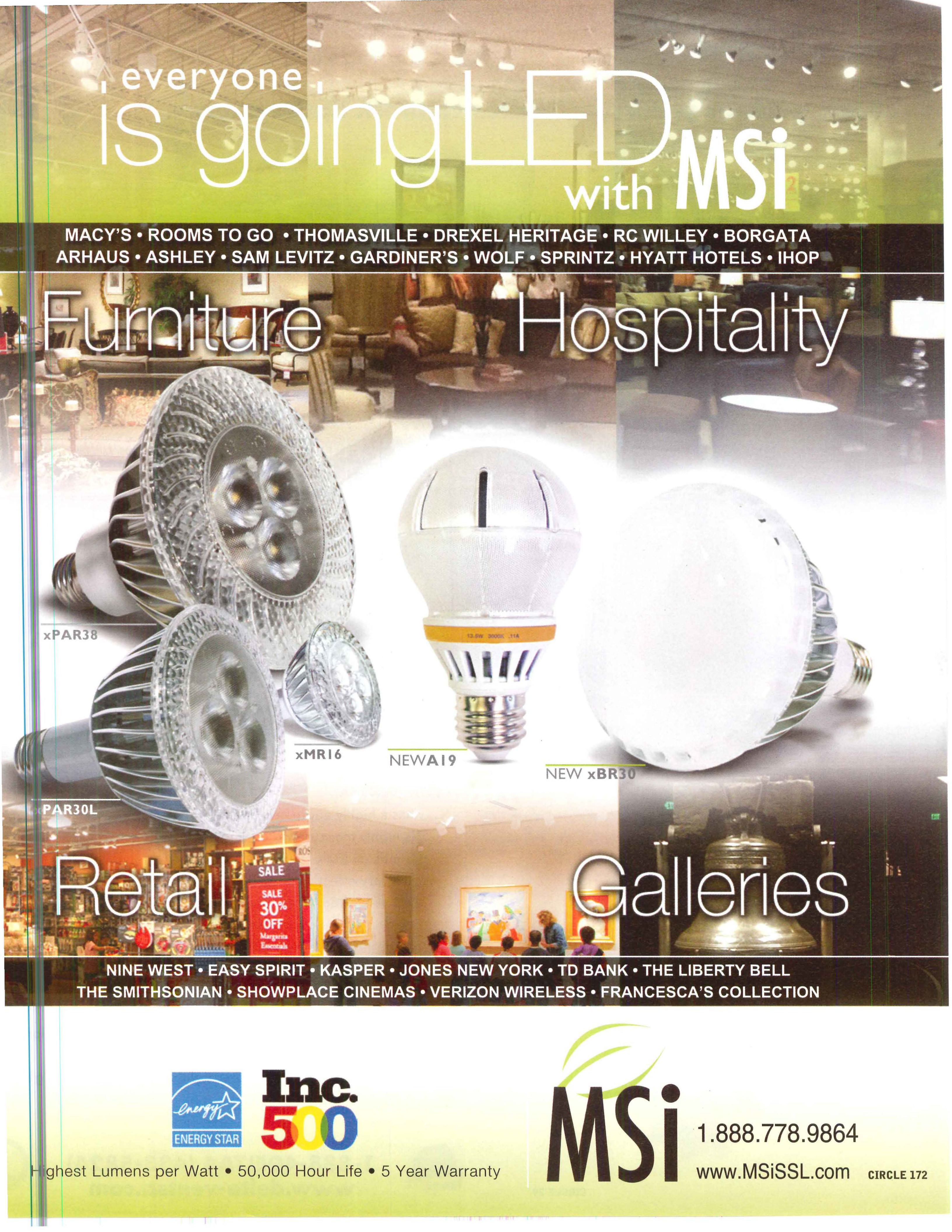
TERRAZZO FLOORING: National Terrazzo

GLASS FIRING AND LAMINATION FOR LOBBY ARTWORK: Steindl Glas





ORDER IN THE COURT Internal stairs (top and right) face outdoor terraces and connect double-height courtrooms with single-story spaces for jury deliberation and judges' offices. In each courtroom, the architects brought daylight in from two sides and paneled walls with pecan veneer (above). In most cases, they were able to extend some windows above the ceiling height to bring in extra light.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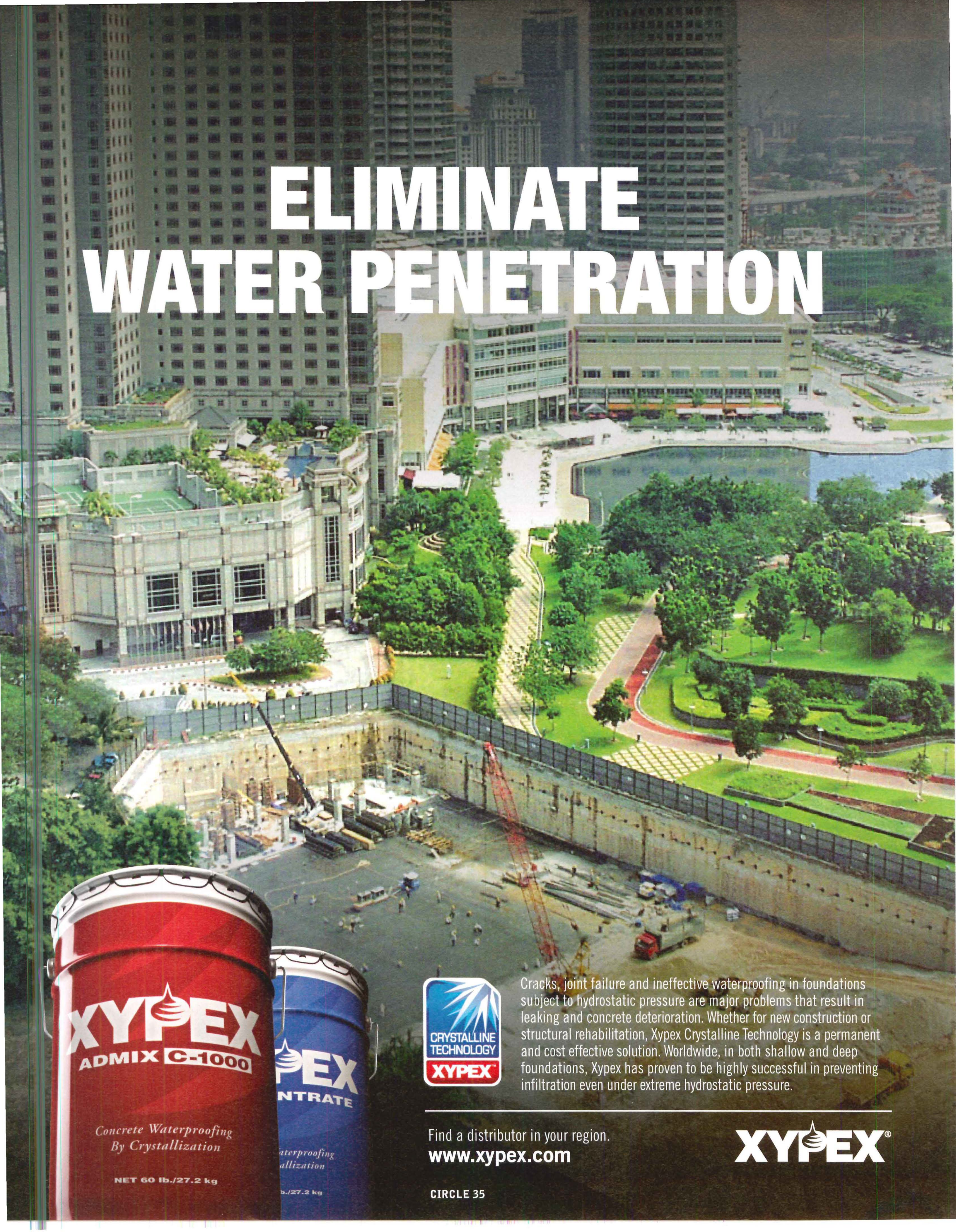
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A Deeper Shade of Green

A Seattle office building aims to be self-sustaining, offering a new model for commercial development in dense urban settings.

By Joann Gonchar, AIA

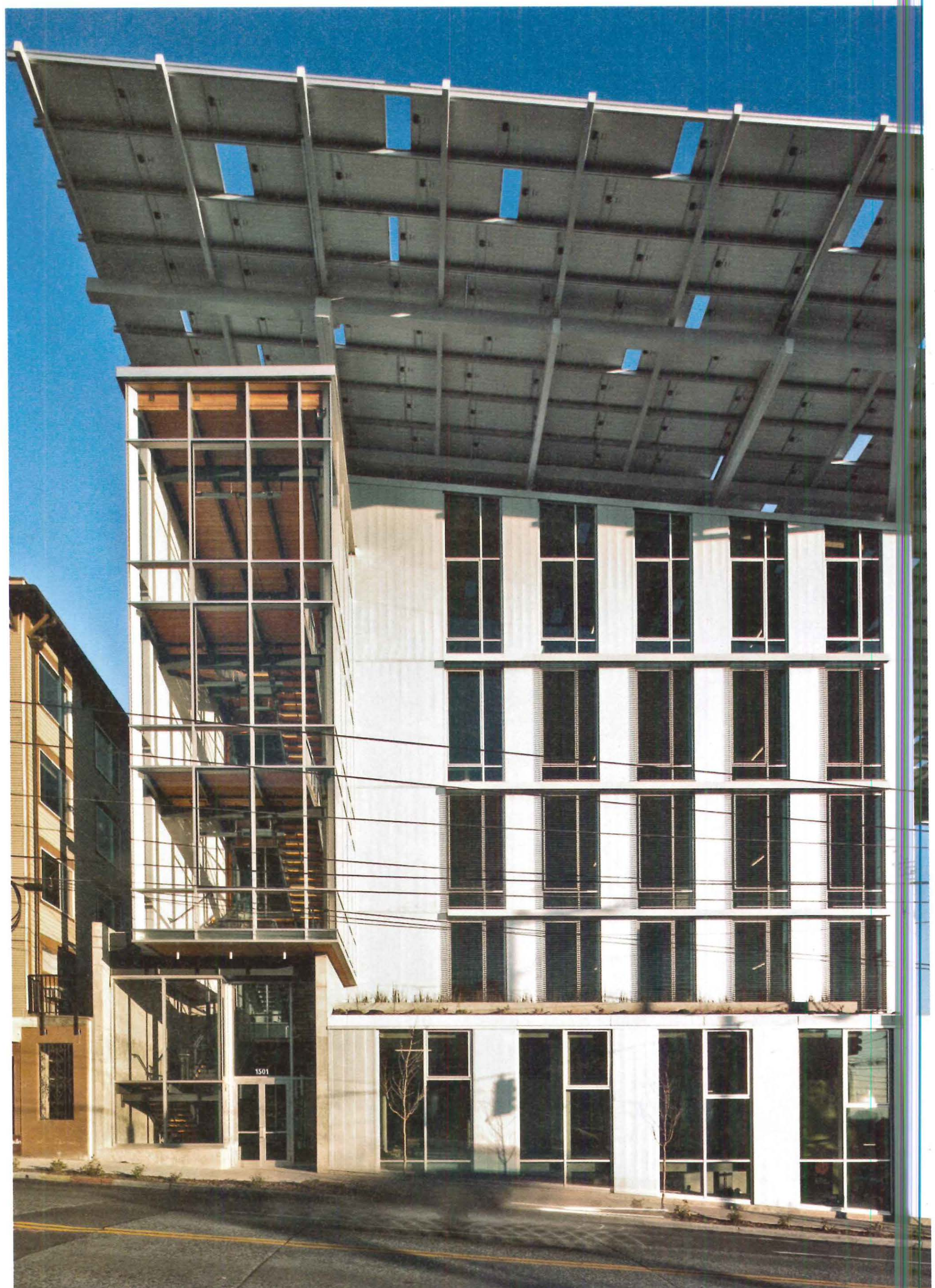
WITH ITS silvery zinc panels and glass cladding, and a canted photovoltaic (PV) array that projects beyond the edges of the roof like the brim of a hat, the recently completed six-story Bullitt Center doesn't at all resemble a Douglas-fir forest, admits Denis Hayes. Nevertheless, Hayes, who is president and CEO of the Bullitt Foundation, is fond of describing the 52,000-square-foot office building in Seattle's Capitol Hill neighborhood as just such a forest. "It functions like one," he says.

Appearances aside, the comparison with a living organism is apt. If the $18.5 million building designed by the Miller Hull Partnership operates as intended, it will be self-sufficient in much the same way a forest is: it will obtain all its water from the rain that falls on the site, and over the course of a year will consume no more electricity than is generated by the roof's PVs.

The structure, which serves as the headquarters for the environmentally focused foundation and as office space for like-minded tenants, is being billed as the earth's greenest commercial building. Its goals include Living Building Challenge (LBC) certification—a process that entails satisfying 20 mandatory "imperatives" organized into seven "petals," or performance areas: site, water, energy, health, materials, equity, and beauty. The New Age terminology belies the system's rigor: the LBC is widely regarded as the world's most stringent green-building certification program. It has many tough-to-achieve requirements, including submission of a year's worth of post-occupancy data to demonstrate net-zero operations for energy and water. Certification is so arduous that since the LBC's launch in 2006, only four projects have achieved living-building status. Approximately 150 others, located all over the world, are registered with the LBC program, administered by the International Living Future Institute (ILFI). Of the 15 completed projects seeking certification, the Bullitt is the largest commercial building, and one of the few located in a dense urban environment.

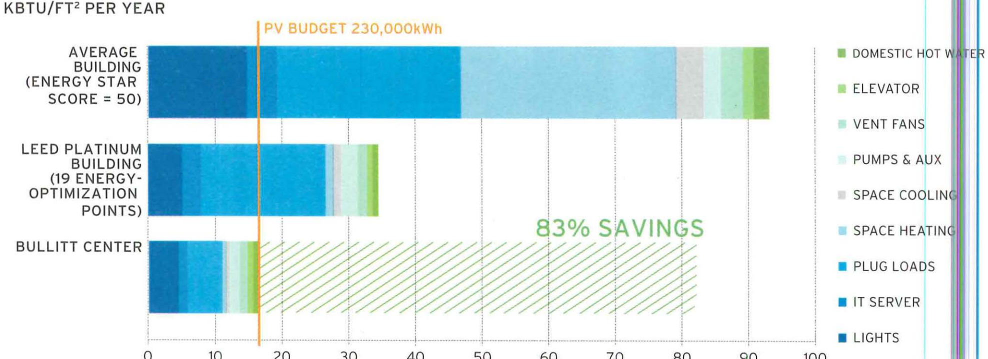
Tenants began moving into the building earlier this year. Many, such as ILFI; the property's developer, Point32; and the Bullitt's m/e/p engineer, PAE, have some connection to the project. These organizations have sustainability in their DNA and might be willing to put up with some inconvenience for the sake of the environment. However, Hayes was determined to create a comfortable workplace. "Denis was clear that it couldn't be too much of a hippie experience," says Craig Curtis, a Miller Hull partner. It had to be a place, says Curtis, where people would want to be and where they would enjoy working.

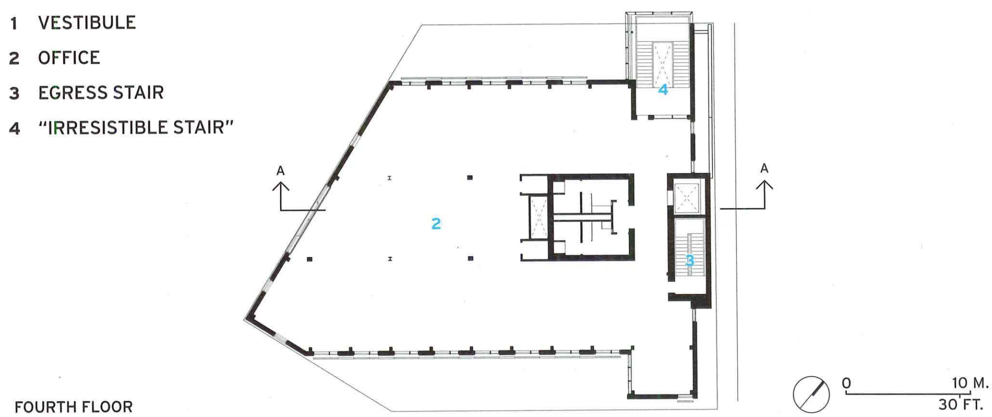
Toward that end, the project team devised a building with four floors framed in heavy timber above a two-story poured-in-place-concrete podium. Designers left the handsome wood structural components exposed, including laminated beams supporting decking of 2-by-6 dimensional lumber set on edge. They gave the Bullitt 14-foot floor-to-floor heights and correspondingly tall but thermally efficient glazing—a configuration that allows daylight to penetrate deep into the interior. And with the aim of making walking up the stairs more appealing than riding the elevator, they created what Hayes has dubbed the "irresistible stair," with wood treads and glass balustrades. It is a prominent feature of the facade and provides views of the city's skyline.



EXERCISE ENTICEMENT With the goal of making the stairs a more attractive option than the elevator, the Bullitt's designers created an "irresistible stair" (opposite) with wood treads and glass balustrades. The stair's glass enclosure, which provides views of the downtown skyline, is a prominent feature of the northwest facade (right). But the exterior's defining feature is its 242-kilowatt rooftop PV array (below), which overhangs the edges of the building by as much as 20 feet.

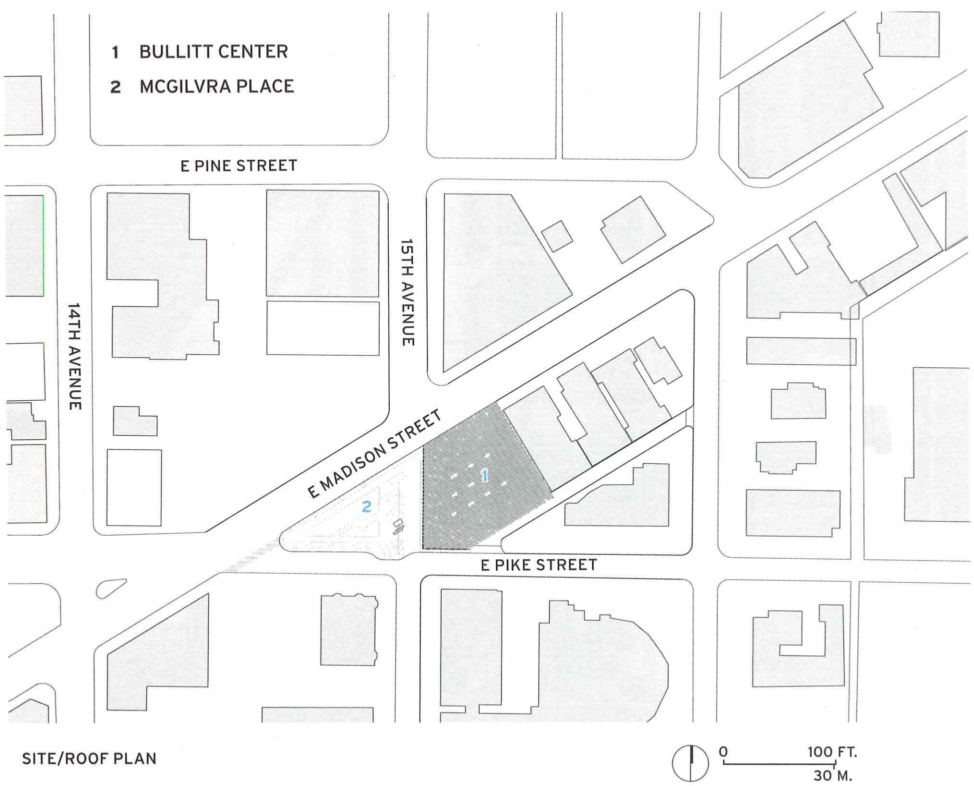
ENERGY USE + SOLAR BUDGET
KBTU/FT² PER YEAR





FOURTH FLOOR

SECTION A - A



SITE/ROOF PLAN

The choice of heavy timber—which is durable and modifiable—was motivated in part by the decision to target a 250-year life span for the building. But the structure also provides a regional character and visual warmth. And if the carbon-sequestration capacity of the wood is taken into account, it offers a carbon-positive structural system, explains Brian Court, Miller Hull project designer.

Despite all these benefits, other materials were also considered. Reinforced concrete for the entire building was an early favorite, according to Court, because the project team wanted a material that would provide thermal mass—one that would dissipate heating or cooling energy slowly and remain at a constant temperature over a long period. In order to achieve this inertia against temperature fluctuations while maintaining the advantages of wood, the designers opted to keep the heavy-timber structure and to add a 3-inch topping slab to each floor. The decision slightly complicated the design of the structure, since engineers needed to ensure that the timber components could carry the extra load. "We had to make sure that the decking, columns, and beams could go along for the ride," says Phil Johnson, an associate at DCI Engineers, the project's structural consultant.

In addition to the wood and concrete elements, the building has a steel lateral system to help resist seismic forces. "It's a hybrid," says Court. "We used each material where it made the most sense."

Climate control at Bullitt depends in large part on passive means: the thermal mass provided by the topping slabs and the podium structure, a high-performance building envelope, and natural ventilation through automated, operable windows. But when it is too hot or too cold to open the windows, a heat-recovery mechanical ventilator kicks in.

The building also has a radiant floor system that taps the consistent temperature of the earth via 26 geothermal wells, each 400 feet deep. Although this system provides both heating and cooling, its capacity was determined by the estimated loads for heating, says Paul Schwer, PAE's president. The approach helped keep initial costs in check by eliminating the need for additional geothermal wells and other equipment. However, as a result, there will likely be some parts of the building that occasionally creep above 78 degrees—the upper limit of what is generally considered comfortable in a conventional office building. But the radiant slab, along with ceiling fans, should make the rooms feel cooler than the actual air temperature, says Schwer.

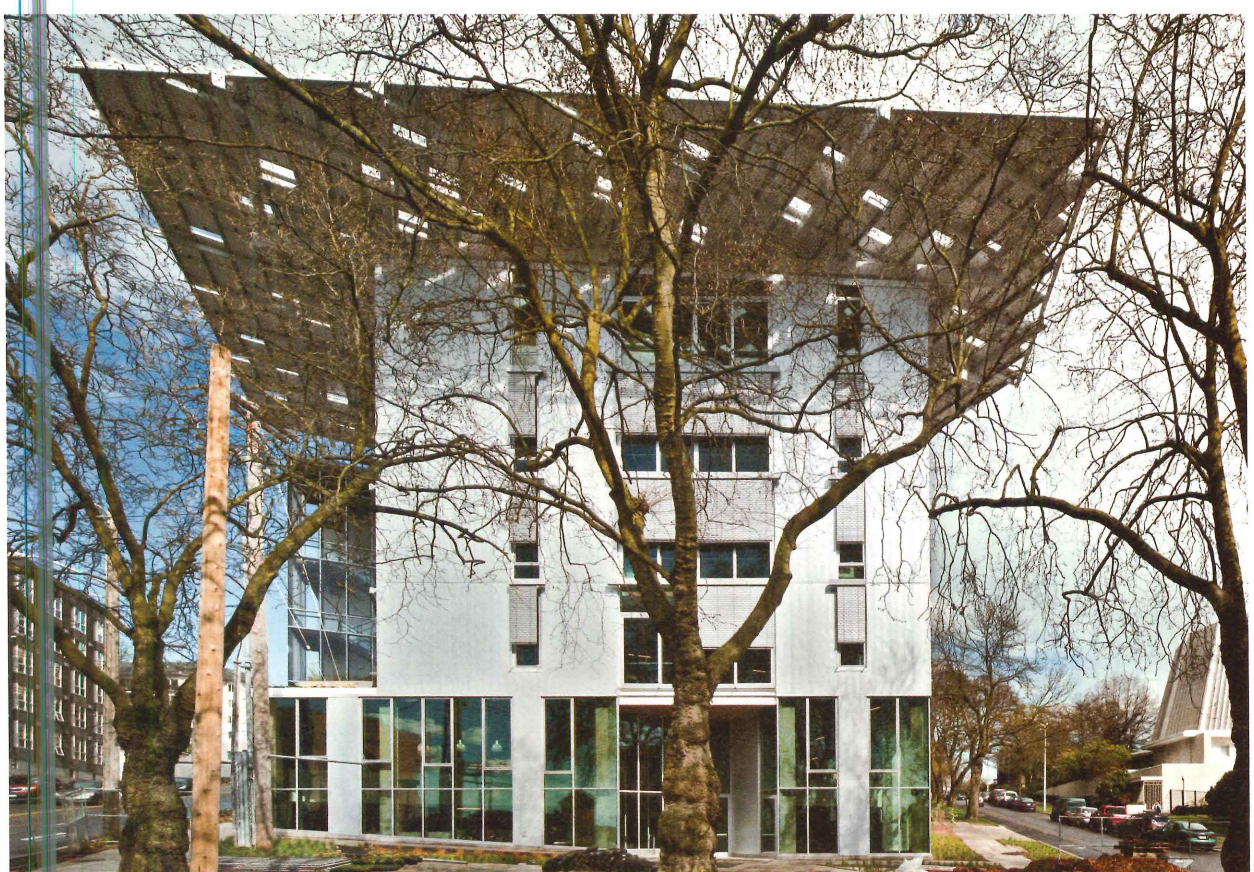
In order to create what they felt was the most effective configuration of the building systems, the project team developed a thermal-comfort model. The simulation took into account outdoor and indoor conditions such as air temperature, humidity, building orientation, and wind direction. And it included the particulars of building elements, such as the depth of the topping slab and the height of partitions that might obstruct the path of the breezes traveling across the floor plates. Engineers say that such an analysis is critical for designing successful deep-green buildings, though it is far from routine.

The process for creating the building's energy model was also somewhat atypical. Although the engineers relied on the same energy-modeling software used by most of the industry, their projections contain an unusual amount of detail. The estimates even account for the electricity consumed by the sensors, thermostats, and other energy-sipping devices that make up the building-controls system. This granularity was crucial, since the Bullitt's dense surroundings and its vertical configuration meant the amount of space that could be devoted to PVs was limited.

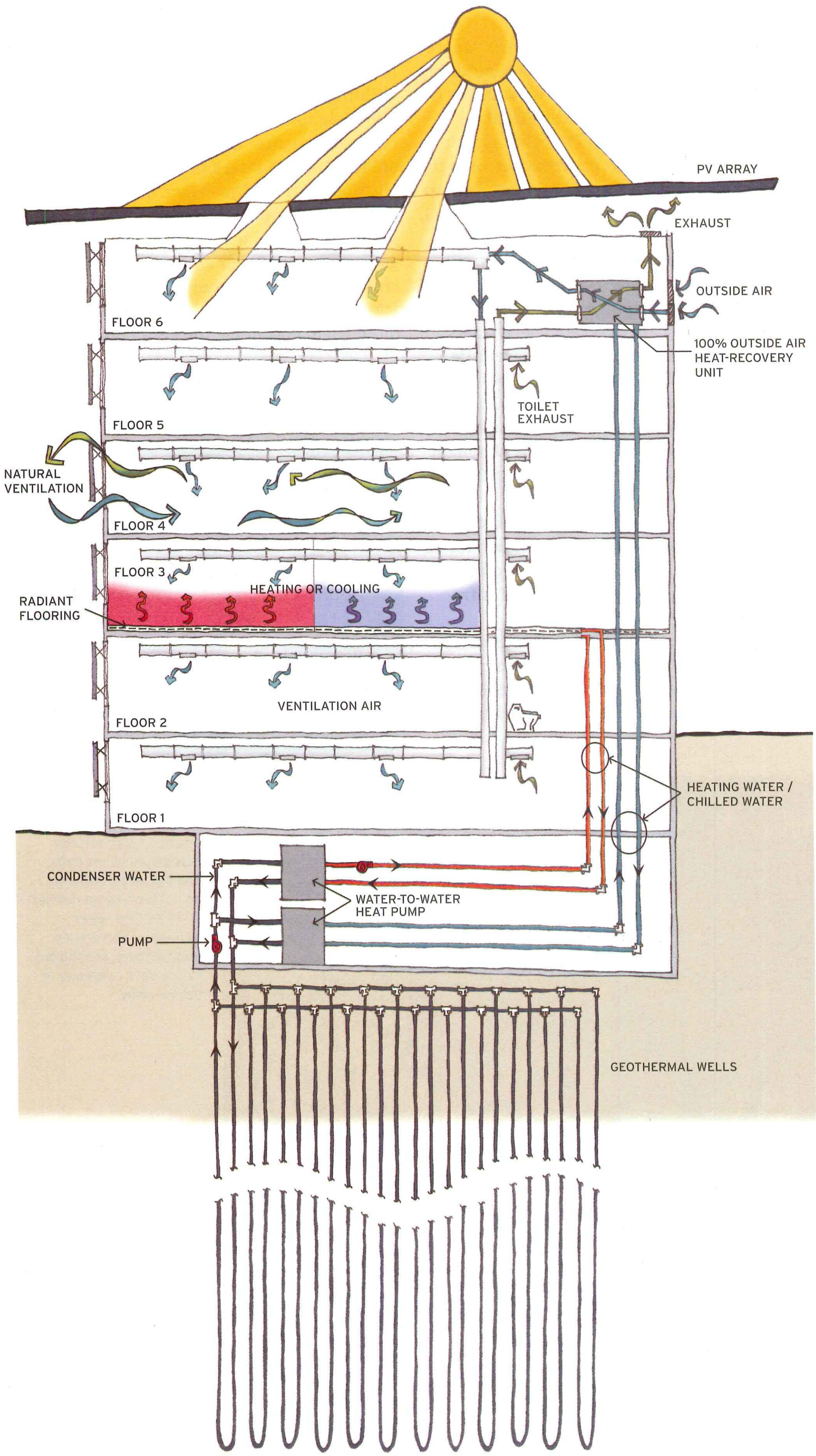
Through an iterative process that involved balancing the solar-energy potential of the site with the building's power needs, the project team arrived at an extremely aggressive energy-use intensity (EUI) target of 16kBtu per square foot. (EUI is a metric that describes a building's energy use relative to its size.) This number is more than 80 percent below the EUI of an average office building, and it leaves a razor-thin margin of only 2 to 3 percent between the power expected from the 242-kilowatt rooftop PV array and the building's estimated demand, say the designers. They predict that almost half the electricity used in the building will be consumed by so-called plug loads—devices such as printers, computers, and other appliances powered by an AC receptacle. Owners and property managers typically have little ability to control these unregulated loads, as they do for major building systems, like HVAC or water heating. However, at Bullitt, in order to keep plug loads in check, each tenant has agreed to an energy allowance as part of its lease.

The limits have prompted tenants to closely monitor their operations. In preparation for its move there, PAE analyzed its own electricity use and subsequently revamped its IT infrastructure and replaced equipment.

Getting the project built required clearing many regulatory hurdles. For example, providing enough PV panels to bring the net-zero energy goal within reach in cloudy Seattle meant an array covering 14,000 square feet, projecting as much as 20 feet beyond the building's perimeter. This extension over the public right-of-way involved a special "design-review departure" from Seattle's Department of Planning and Development. Bullitt's generous floor-to-floor dimension, an essential element of the daylighting scheme, was the product of a similar allowance—one that granted the developer an extra 10 feet of building height. The project obtained both allowances as part of a city pilot program intended to encourage the development of



SUN PROTECTION
To mitigate heat gain, the Bullitt's windows are equipped with exterior automated blinds (left). The top level's windows do not have these devices since its floor areas, including a conference room (above), are shaded by the deep overhang of the PV array.



NET-ZERO-ENERGY DIAGRAM

ultrahigh-performance buildings.

The developer and the foundation are still working on designating the building as its own water district. If granted this status by the local utility and the state Department of Health, the Bullitt will use rainwater collected from the roof and stored in a 56,000-gallon basement cistern to supply showers, sinks, and water fountains, after a multistep filtering and purification process. In the meantime, the project has an exemption from ILFI allowing it to rely on the municipal utility for potable uses but still satisfy the LBC net-zero water imperative. Other water-conserving strategies include irrigation that utilizes graywater and what the project team says is the world's only six-story composting toilet system.

One of the most labor-intensive aspects of the project has been the vetting of building products for compliance with the LBC's materials-selection criteria. These include limits on the distances that building components can be shipped—a restriction intended to reduce the energy embodied in materials and spur

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Learning Objectives

1 Summarize the goals of the Living Building Challenge (LBC) and discuss the requirements for certification.

2 Describe structural and mechanical systems at the Bullitt Center in Seattle and explain how these systems should help the project satisfy the LBC net-zero energy requirement.

3 Describe the energy-modeling process used by the Bullitt Center team and explain how it should help the project achieve its ambitious performance goals.

4 Identify some of the regulatory hurdles encountered by the Bullitt Center project team and explain how these hurdles were overcome.

AIA/CES Course #K1306A

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LOFTLIKE The 14-foot floor-to-floor dimension, full-height windows, and exposed heavy-timber structural components give the Bullitt's interior spaces an open and decidedly regional quality.

the development of a regional green economy. The standards also prohibit the use of 14 potentially toxic substances on the challenge's Red List—many of which, such as PVC, added formaldehyde, and halogenated flame retardants, are commonplace in building materials. These stipulations are designed to ensure a healthy environment for occupants, reduce pollution and resource depletion, and provide an incentive for market transformation; the hope is that the requirements will encourage manufacturers to examine their supply chains.

Joe David, a project associate with Point32, estimates that he devoted a year and a half to investigating about 1,200 products. He points to several materials specified at Bullitt as proof that the LBC requirements are serving as a catalyst for change. One example is the wall assembly's fluid-applied air-and-weather barrier. Although it was an essential part of the high-performance building envelope, David's research determined that the barrier contained phthalates, a Red Listed family of chemicals often added to plastics to increase their flexibility. In response to the project team's queries, the barrier's manufacturer, Prosoco, reformulated the product to eliminate the phthalates.

Another key element of the Bullitt's exterior curtain-wall assembly is the window system. The project team had identified an operable, triple-glazed unit that opens straight out as the best option, since the configuration maintains a tighter seal than casement or awning windows when closed. But the desired windows were manufactured well outside the allowed transportation radius, in Germany. In order to address the problem, the project team connected local glass-and-glazing contractor Goldfinch Brothers and the manufacturer, Schüco. The two companies now have a licensing agreement that allows Goldfinch to fabricate and install Schüco products.

It will be some time before the Bullitt has sufficient post-occupancy data to complete its LBC documentation. But the building is already making a mark on the design and construction industry. The response of the air-and-weather barrier's manufacturer and the window-licensing agreement are just two indications. And if the Bullitt's bid for living-building status proves successful, it could serve as a blueprint for an ecologically restorative office building almost anywhere in the world, says Jason McLennan, ILFI's CEO: "People won't be able to say that living buildings aren't practical anymore." ■

credits

ARCHITECT: Miller Hull Partnership – Ron Rochon, partner in charge; Craig Curtis, design partner; Brian Court, project designer; Margaret Sprug, project manager; Steve Doub, Jim Hanford, project architects; Maaike Post, Adam Loughry, Will Caramella, project staff

CONSULTANTS: PAE Consulting Engineers (m/e/p); 2020 Engineering (water); Springline Design (civil); DCI Engineers (structural); Solar Design Associates (solar); Berger Partnership (landscape); Luma Lighting Design (lighting)

CLIENT: Bullitt Foundation/Point32

GENERAL CONTRACTOR: Schuchart Construction

SIZE: 52,000 square feet (gross)

COST: $18.5 million

COMPLETION DATE: April 2013

SOURCES

HEAVY TIMBER COMPONENTS: Calvert

WINDOWS: Schüco/Goldfinch Brothers

GLASS: PPG/Northwest Industries

ZINC PANELS: Northshore Sheet Metal/Metal Sales

WEATHER-RESISTIVE BARRIER: Prosoco

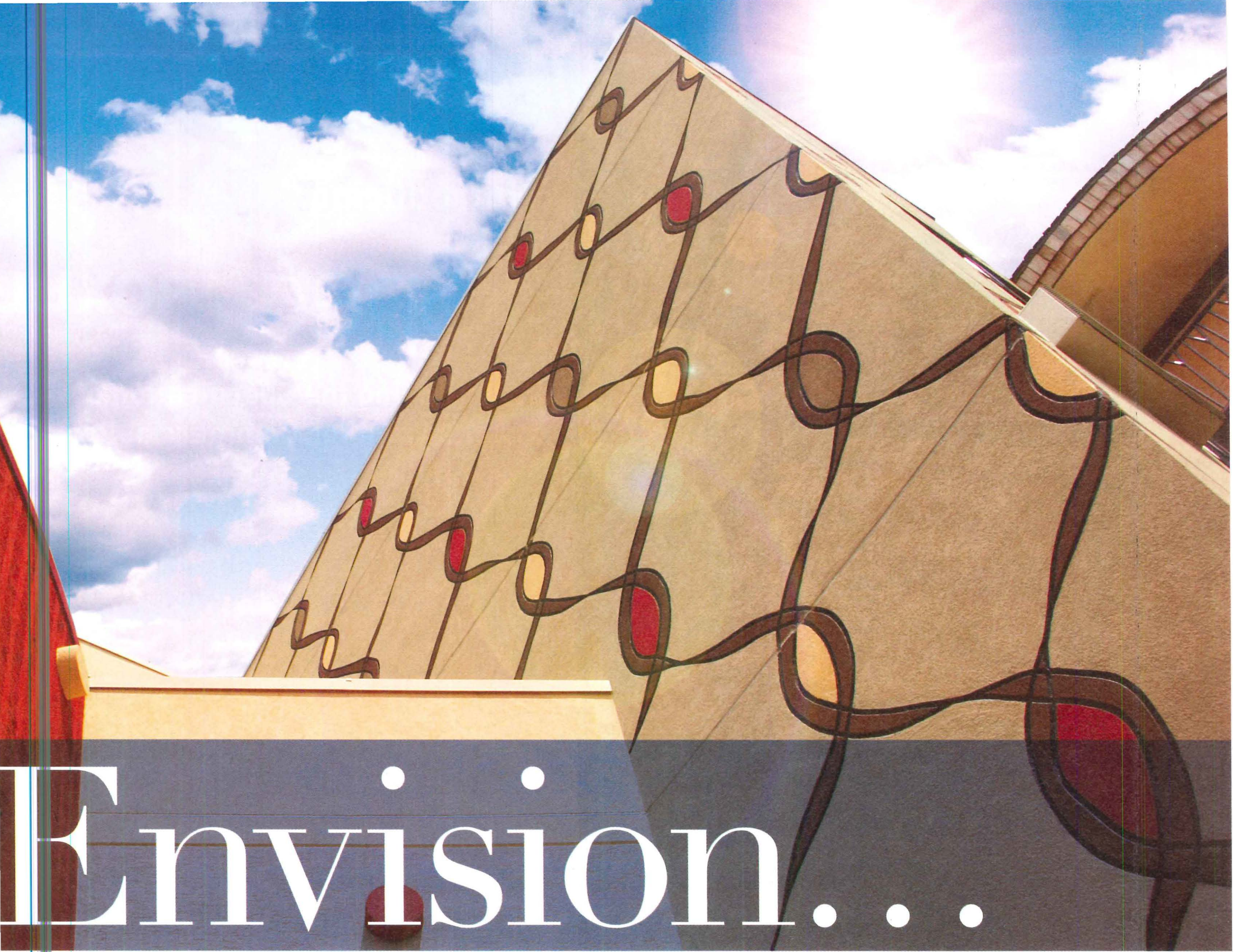
EXTERIOR BLINDS: Warema

LIGHTING: Architectural Lighting Works; A-light; Amerlux; Cree; MP Lighting

DRYWALL: CertainTeed

PHOTOVOLTAICS: SunPower

PLUMBING FIXTURES AND FITTINGS: Advanced Composting Systems; Sloan; Chicago Faucets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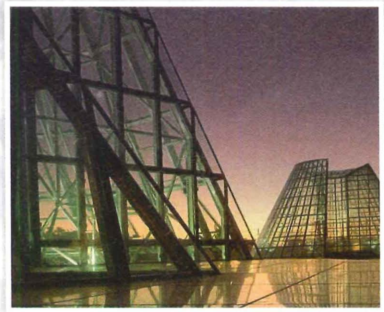
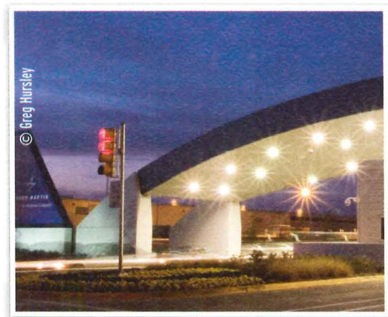




BUILDING TYPES STUDY 935 HOSPITALITY

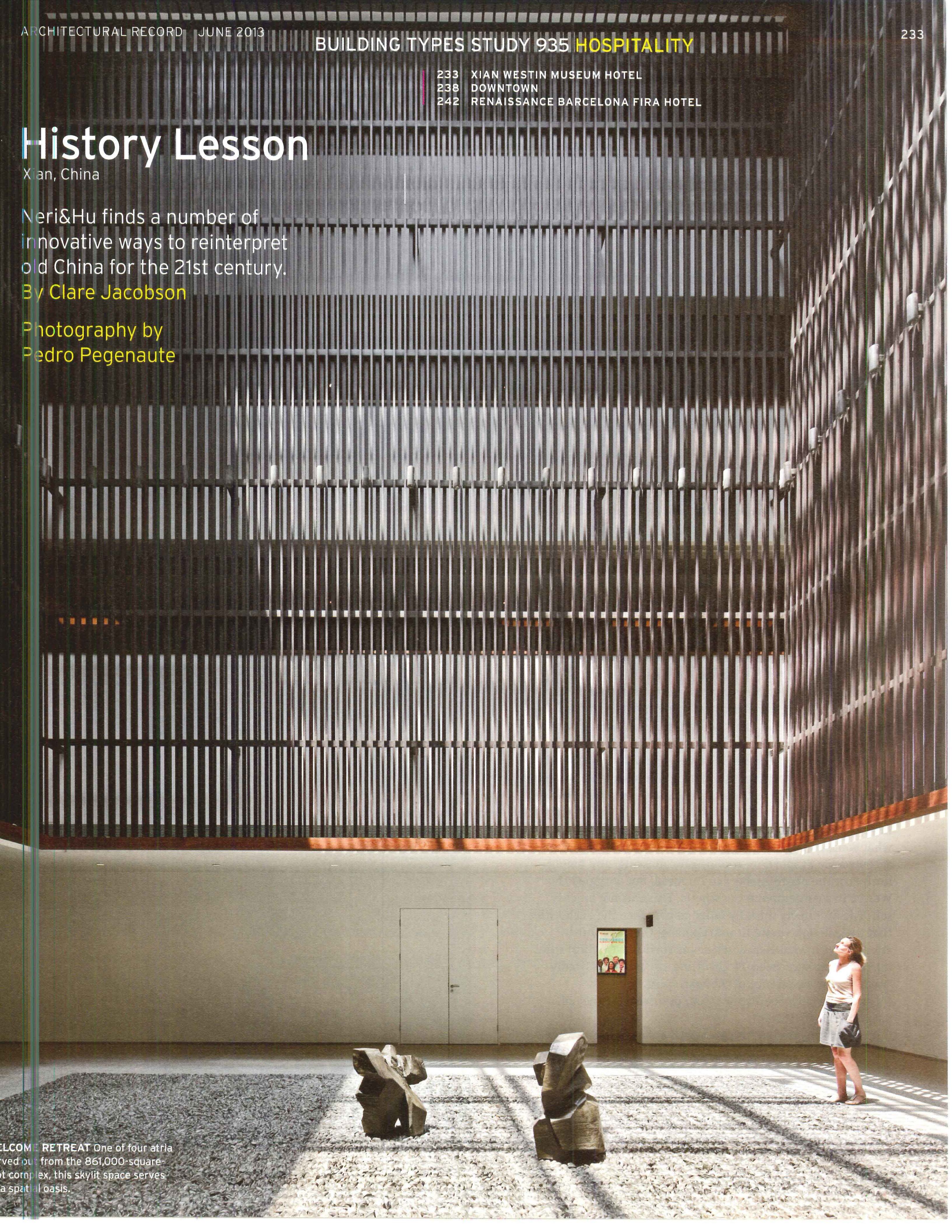
History Lesson

Xian, China

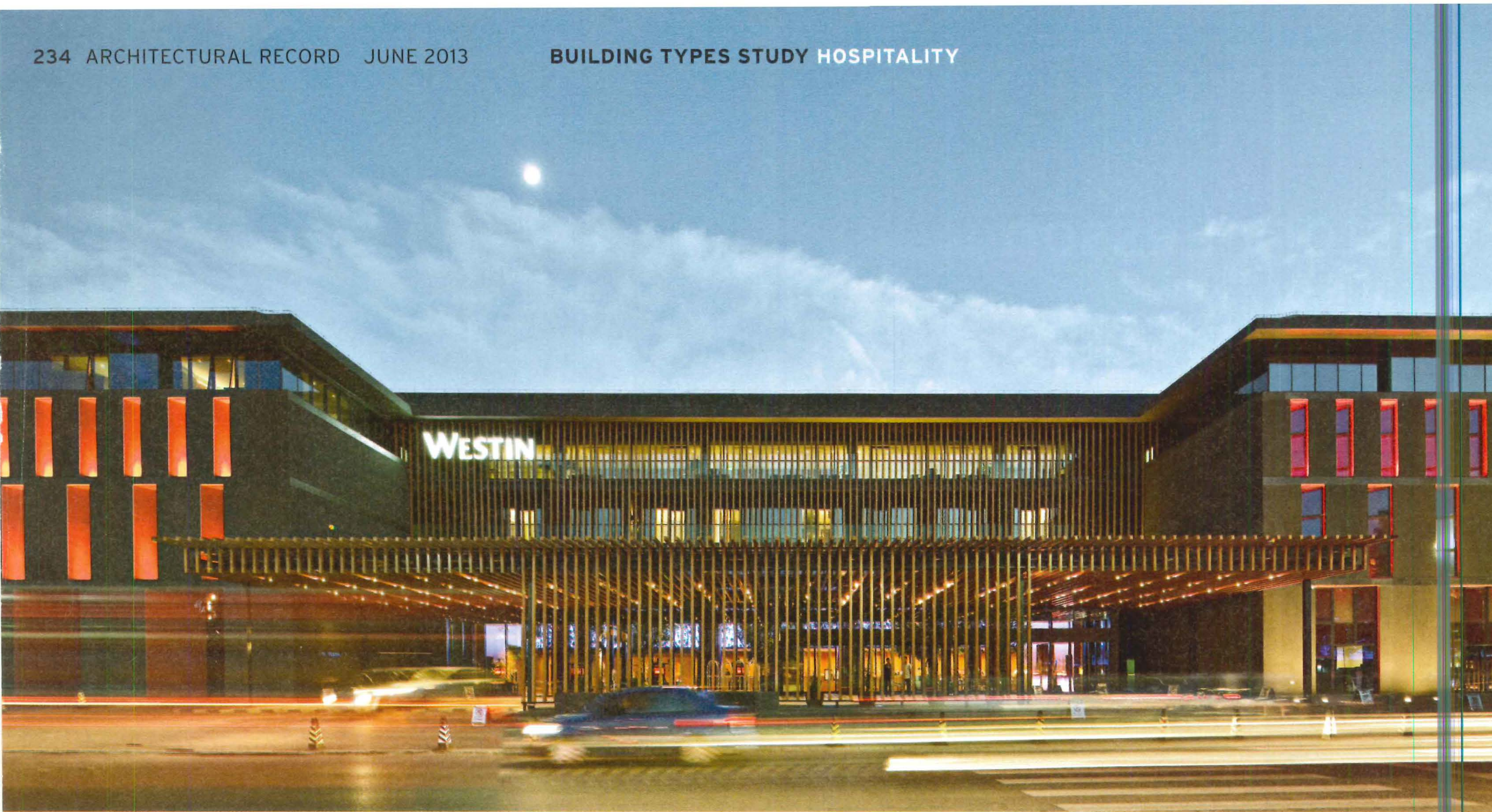
Neri&Hu finds a number of innovative ways to reinterpret old China for the 21st century.

By Clare Jacobson

Photography by Pedro Pegenaute



ELCOME RETREAT One of four atria rved out from the 861,000-square- ot complex, this skylit space serves a spatial oasis.



"WHEN WE were given the project," says Lyndon Neri of his Xian Westin Museum Hotel, "it was clear that the local planning bureau had a very strong say on what this part of the city should be." That is, it should reflect the Tang Dynasty (A.D. 618–907), when Xian was the capital of China. Though best known for its Terra-Cotta Warriors, Xian boasts Tang-era landmarks such as the Big Wild Goose Pagoda, which is northeast of the Westin and sets the tone for the surrounding Qujiang New District. Recent projects in the area, like the Tang Paradise theme park and the Nikken Sekkei–planned Great Tang All Day Mall, say "Tang" in name only, while serving up standard commercial construction.

Neri and his Shanghai-based firm, Neri&Hu Design and Research Office, proposed something different. "We wanted a new breakthrough to the Tang Dynasty," says Neri, "otherwise it becomes just a replication of what was there." For him, tradition is "more than what you see in elevation; it's what you experience"—not just facial but spatial. Neri&Hu accepted the proportion, roof profile, massing, and height limit that the planning bureau imposed, but wrapped the Westin in a contemporary aesthetic. This was not an easy sell. The architects initially failed to convince the authorities that their design would fit into Qujiang. On their third attempt, with what Neri describes as their most radical submission, they succeeded. By that time, the planners finally "understood the essence of the Xian spirit," he says. "Abstraction does not distract from or disrespect the old, but rather augments it."

In their final design, the architects referenced the Xian spirit typified by the massive, ancient wall that encircles the city's historic center. The wall's current iteration surrounds an area of 5.4 square miles and measures 49 to 59 feet wide at its base. Neri&Hu echoed its monumentality in the Westin by designing a thick building envelope. The hotel's 4-to-6-foot-wide walls are slight by comparison to their predecessor,

TIME WARP Deeply set windows on the entry facade (above left) and other elevations emphasize the thickness of the building's envelope and link the project to the massive wall surrounding Xian's ancient core. On the south side, the architects cut a series of wide steps into the site (above, left, and far left) to bring people from a nearby shopping mall to a museum in the hotel's basement. The sequence recalls the underground site of the city's famous Terra-Cotta Warriors.

...windows emphasize their heft. The surfaces ...ig the recessed windows are bright red and ... to frame views of the historic pagoda (or, for ...on other elevations, for dramatic effect).

...erior's heaviness is tempered by a wooden screen ...y at the main entrance facing the pagoda. Inside, ...eight lobby with walls, columns, and ceilings ...wood greets visitors as they arrive. A second ... the east employs a similar screen and is ...y a cascading stairway that descends two levels ...e to the Xian Qujiang Museum of Fine Arts, ...ents ancient wall murals encased in glass and ...er-coated-metal frames. Neri&Hu persuaded the ...veloper to build the stairs down from the Great ... Mall so the museum can attract the public, ...el guests. The descent to the museum recalls ...nean resting place of the Terra-Cotta Warriors ...iles from Xian – one of the main reasons for the ...hotels.

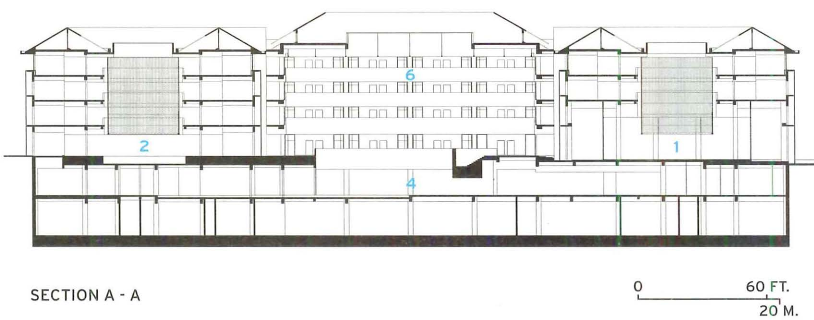
...the Westin does not mimic the enormous rectan-...by Xian's city wall. Rather, the 329-room hotel ...gether what appear to be four small buildings, each ... wraps around a square atrium. One of these open ...erves as a café and lounge with a view to the pagoda. ...d orange shades and a dark floor and furnishings ...ie light from the street, while dozens of chandeliers ...de warm spotlights. Neri&Hu designed all the interiors ...e Westin except the guest rooms.

...he three other atria – tall, wood-screened spaces – serve ...Zenlike internal gardens. The architects arranged them in ...ing around a large rectangular courtyard that brings light ...own to the restaurants, gym, and spa below and includes a stair slicing through a boxy enclosure to the basement. The courtyard's bright-white finish contrasts with the earth tones used elsewhere and helps guests navigate the 861,000-square-foot project.

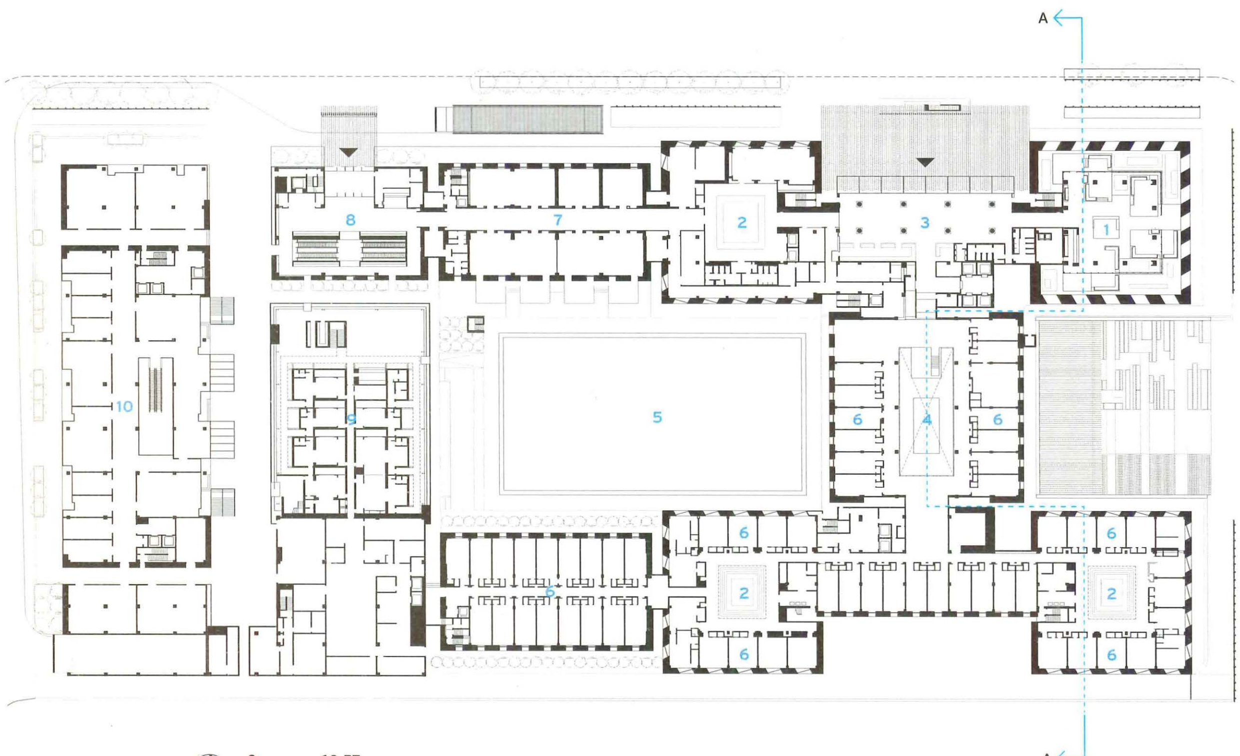
The complex extends to the west of the hotel with a wing that includes a sunken garden, function spaces, and shops. On the top floor, a Chinese restaurant (to be completed in July) will be crowned with a surprising gabled roof with dormer windows. For this, Neri says, he considered, "What would a Tang designer do today? The celebration of the roof was very important in the Tang Dynasty."

Neri makes this statement with tongue in cheek, but it does suggest the extent to which Tang references have been abstracted in his firm's design. Historical models, though, might in fact have less to do with the hotel's spatial sense than with its quiet ambience. Its smooth surfaces, rational plan, and neutral colors evoke the simplicity of the Big Wild Goose Pagoda itself. Nestled near a water-fountain show claiming to be Asia's largest, the Qin Han Tang shopping plaza with its 32,000-square-foot LED ceiling display, and all the noise that comes with a new district in a big Chinese city, the Westin Xian provides a calm counterpoint. ■

WRAPAROUND
To organize the sprawling hotel and help guests navigate it, the architects laid out each of its four main blocks around a multistory atrium and arranged the blocks around an internal courtyard (opposite, top) that brings in daylight and takes people to restaurants, a gym, and a spa in the basement. One of the atria serves as a café and lounge (opposite, bottom).



SECTION A - A



FIRST FLOOR

1 CAFÉ/LOUNGE
2 ATRIUM
3 MAIN LOBBY
4 INTERNAL COURTYARD
5 EXTERIOR GARDEN (BELOW)
6 GUEST ROOM
7 BUSINESS CENTER
8 BALLROOM LOBBY
9 RESTAURANT
10 RETAIL

credits

ARCHITECT: Neri&Hu Design and Research Office – Lyndon Neri, Rossana Hu, principals in charge; Mariarosa Doardo, associate in charge; Briar Hickling, associate; Joy Qiao, senior project manager; Willow Zhang, Eva Wieland, Qi Xiaofeng, Amy Hu, Candice-Lee Browne, Kevin Azanger, Alena Fabila, design team

LOCAL DESIGN INSTITUTE: China Northwest Building Design Research Institute

CONSULTANTS: Meinhardt Facade Technology (curtain wall); Shen Milsom & Wilke (acoustics); Chroma33 (lighting); I.S. Lin & Associates (m/e/p)

CLIENT: Yungao Hotels (Group) Development

GENERAL CONTRACTOR: Shanghai Construction No. 5 Group

SIZE: 861,000 square feet

COST: withheld

COMPLETION DATE: January 2012

SOURCES

EMPEROR LIGHTS IN RESTAURANT: Moooi

PENDANT LIGHTS IN RESTAURANT: Bocci

BUBBLE CLUB SOFA: Kartell

CARPETS: Custom by Neri&Hu

Making a Scene

Mexico City

A young firm converts an old building into a primer on contemporary Mexico City style.

By William Hanley

EVERYTHING INSIDE Downtown—a buzzing hotel, hostel, restaurant, and retail complex in the center of Mexico City—has a story. The mescals you sip on the mezzanine come from small producers, their biographies explained by a bartender presiding over rows of minimalist glass bottles. Around the corner, a boutique sells modern dresses made with traditional weaving techniques by artisans who share 50 percent of the shop's profits. The building itself, constructed during the late 17th century, was once home to the Countess of Miravalle, for whom the city's Condesa neighborhood is named. An imposing manse with heavy masonry walls, it was used as a hotel in the 19th century and returned to a private residence in the early 20th. Most recently, it served as a jewelry market, with its walls plastered over and a courtyard converted into a garage.

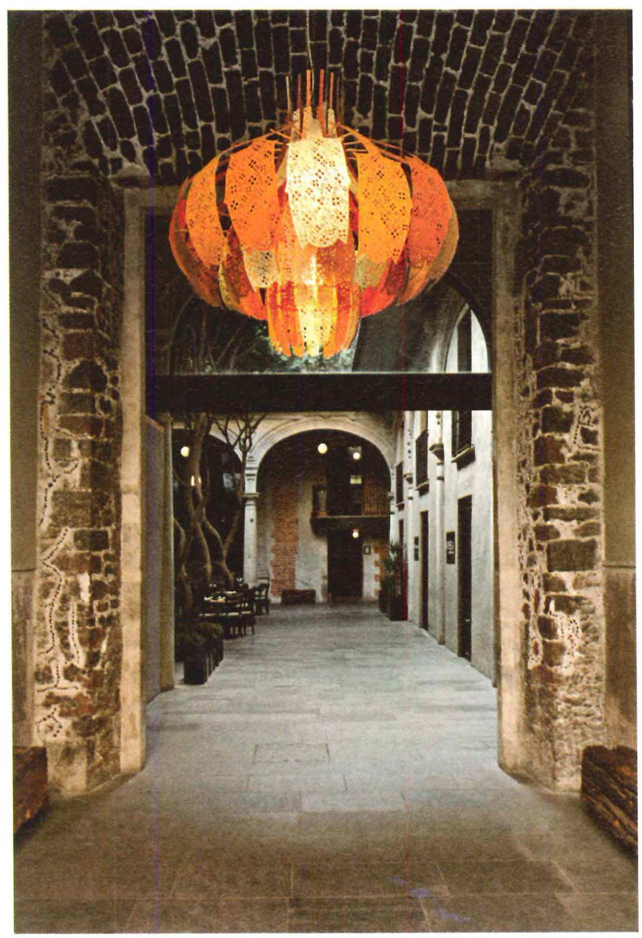
For the building's latest chapter, a young local firm, CheremSerrano, has renovated it into a platform for all things cool in Mexico City, a self-conscious embodiment of the capital's reputation for food, art, design, and culture. "It was important to create a scene," says principal Abraham Cherem, who has slowly begun renaming his firm Cherem Arquitectos following the tragic murder of cofounder Javier Serrano at age 29 just a few months before the project opened. The scene they set has a cosmopolitan affect and a fetish for authenticity discernible in its bohemian mix of architectural elements. The designers preserved remnants from each era of the 38,000-square-foot, four-level building's history, peeling back finishes, salvaging materials, and making careful alterations to the landmarked structure. "We wanted to make it particular," says Cherem, "to be contemporary but with a Mexican flavor in the materials."

The building sits two blocks from the Zócalo, the city's main square. Following a wave of investment in the area, the project's developers acquired the property and brought in Grupo Habita—the indomitably hip hoteliers behind the Americano in New York (RECORD, December 2011, page 90) and Endémico on the Baja peninsula (RECORD, June 2012, page 108)—to turn it into a flagship destination in the formerly downmarket district. The hotel group devised the Downtown brand, playing off the building's history, a renewed interest in the neighborhood, and a taste for haute Mexican craft, and selected Cherem and Serrano to help refine and execute the idea, working it into the fabric of the structure.

The architects kept large storefront retail spaces for tenants able to pay a premium to occupy the street-side exposure. Beyond a massive front door, they placed restaurants (helmed by well-known chefs and designed by separate firms) in two of the building's courtyards. Up a curving 19th-century stair that dominates the main patio, the mezzanine level holds smaller retail spaces with less expensive rents to accommodate independent shops. On the building's upper floors, the architects identified space for 16 luxury hotel suites, and, following a recent trend, they placed 17 hostel rooms around a third courtyard to take advantage of a warren of small existing spaces. "We couldn't market $200-plus-per-night stays in rooms that used to be the mansion's servants' quarters, but we couldn't demolish any of the original walls either," says Rafael Micha, one of Grupo Habita's managing partners, "so a well-designed hostel made sense."

The architects made significant but deft interventions in the structure. They uncovered the masonry walls and rein-

TOPIARY TROMPE L'OEIL A stand of trees shades a restaurant patio in the building's primary courtyard (opposite, top). Upstairs, the designers had the canopy pruned to create the appearance of a lawn in the center of a third-floor balcony (opposite, bottom), which serves as the hotel's lobby. A stair painted with a 1945 mural by Manuel Rodríguez Lozano connects the two spaces (the top of the painting is visible in the background, opposite, bottom). Dating from the late 17th century, the former palace's thick masonry walls face a busy shopping street in Mexico City's Centro Histórico neighborhood (above). An illuminated work by Cuban artist Jorge Pardo hangs above the entrance hallway (right), which opens into the main courtyard.



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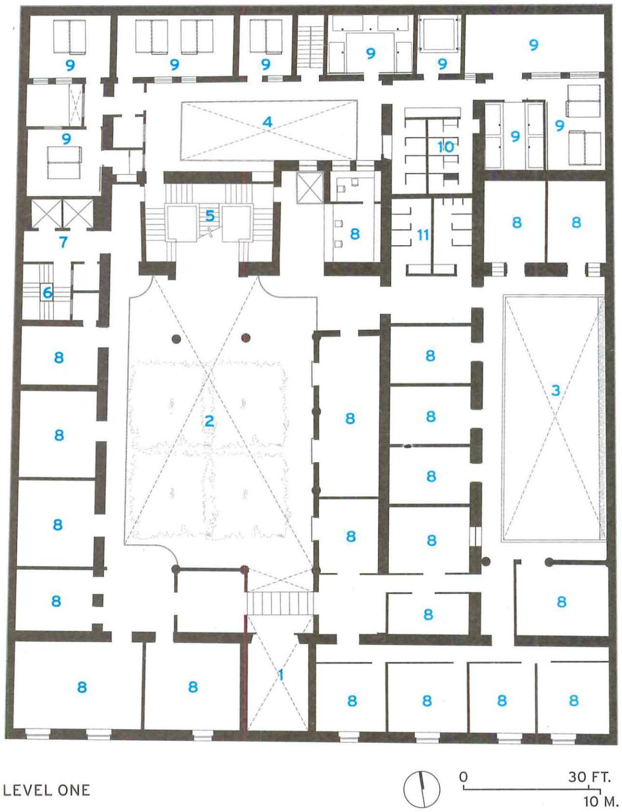


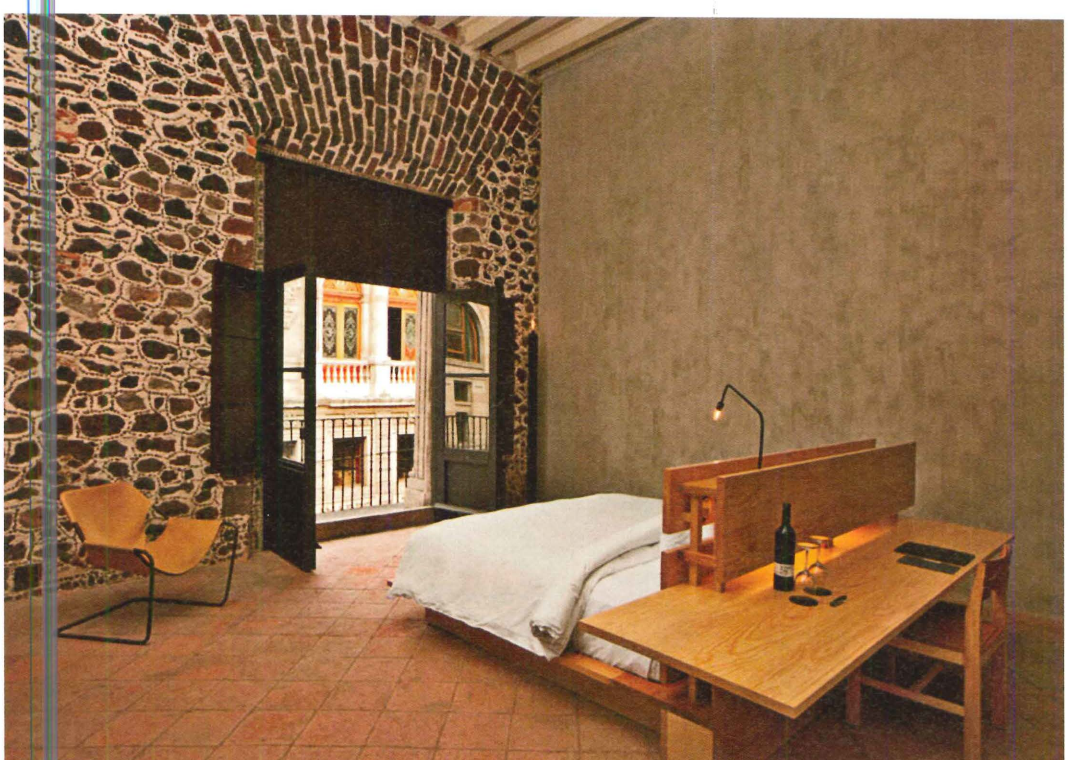
1 ENTRY
2 PRIMARY COURTYARD
3 SECONDARY COURTYARD
4 HOSTEL COURTYARD
5 19TH-CENTURY STAIR
6 CONTEMPORARY STAIR
7 ELEVATOR
8 RETAIL
9 HOSTEL ROOM
10 HOSTEL BATHROOM
11 PUBLIC BATHROOM

forced them to meet contemporary seismic standards. They added a steel deck to the roof to support a pool and bar. They also inserted a new stair without modifying the floor plan by dropping it through an air shaft cut into the building decades ago to house HVAC equipment.

To create continuity among the varied spaces, the firm devised a simple brick lattice motif that reappears throughout the complex. In the hotel suites, it forms partitions between living, sleeping, and bath areas with a natural finish that echoes the historic materials. In the hostel, the firm used it for bunk beds—the project's most fun move—painting the bricks a Barragán-inspired acid yellow. "They're like sculptures in the middle of the room," says Cherem of the feature, which gave the hostel, Downtown Beds, its name.

Layered and atmospheric, the building invites exploration, and each space—from a restored 19th-century elevator to the thoughtfully curated shops—fits a rough but chic aesthetic that reads as distinctly Mexico City, but with a playfulness that keeps it from feeling overly precious. "International travelers want to be a part of a story—a story about a Mexican designer, a brewer, a chocolatier, or a countess," says Micha. "It's about going back home and saying, 'I just discovered this amazing thing.'" ■

SET IN STONE The architects removed the roof over a secondary courtyard that had been turned into a garage (above), adding a green wall to soften the Mexico City sun. They added a roof deck with a bar and a pool between the courtyard openings (opposite, top left). In some of the hotel suites (opposite, bottom) and the hostel rooms (opposite, top right), the designers inserted new floor plates above the existing ceilings to preserve their historic materials. They paid homage to the original masonry with brick lattices that appear throughout the project, including in bunk beds designed for the hostel.



credits

ARCHITECT: CheremSerrano - Abraham Cherem Cherem and Javier Serrano Orozco, principals; Jose Antonio Aguilar, Jessica Franco, project team

ENGINEER: Max Tenenbaum Engineering (structural)

CONSULTANTS: Luis Lozoya (lighting); Paul Roco (furniture); Verde Vertical (living wall)

CLIENT: Sacal Family

SIZE: 38,000 square feet

COST: $1.5 million

COMPLETION DATE: July 2012

SOURCES

WINDOWS: Alfonso Reyes (wood frames); Mauricio Ponze (glazing)

METAL DOORS: Federico Garcia

PLUMBING: Dornbracht; Jose Alfonso

STONE SURFACING: Stones Piedras Naturales

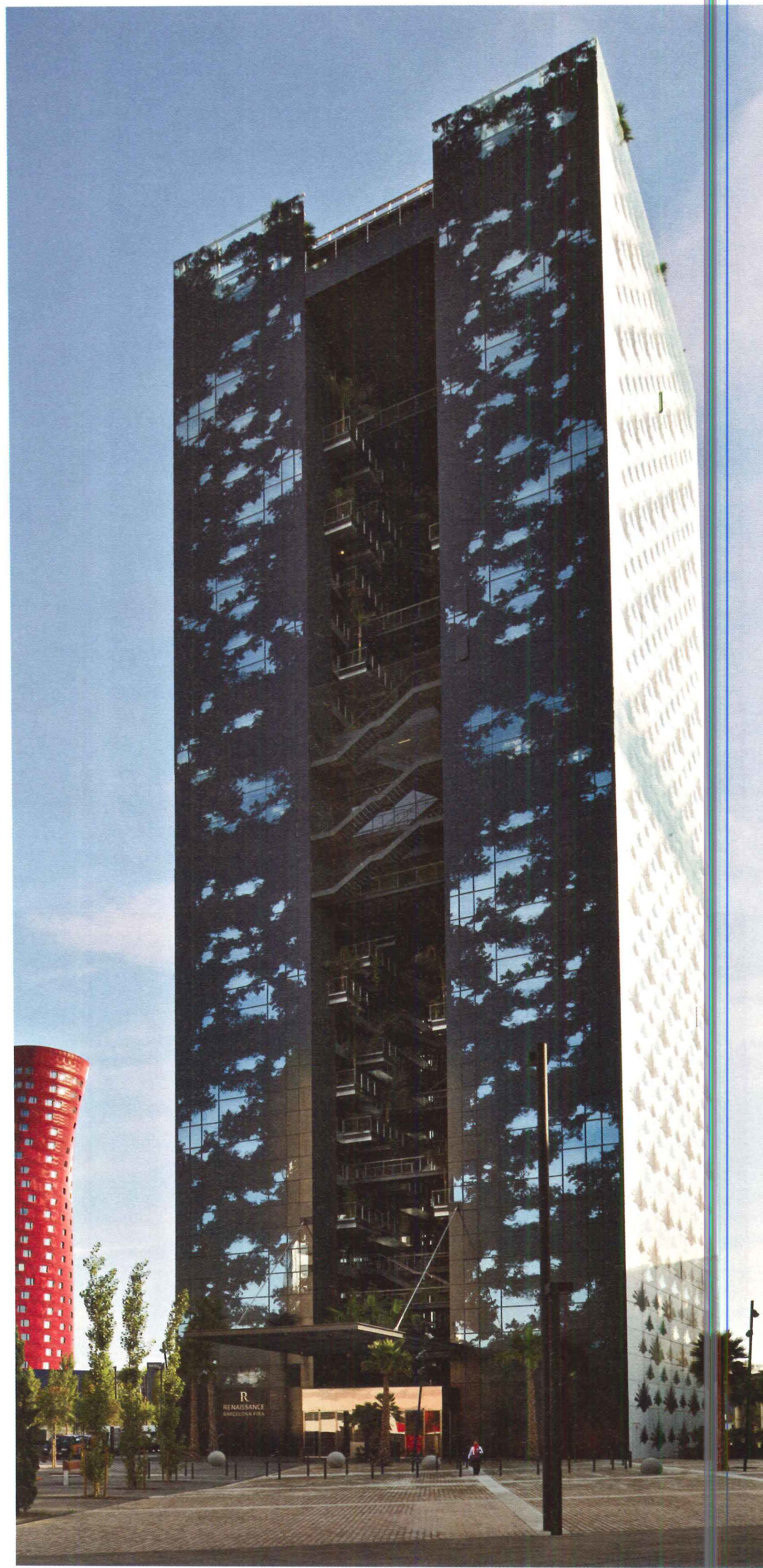
LIGHTING CONTROLS: Leviton

ELEVATORS: Kone

Urban Oasis

Barcelona

Ateliers Jean Nouvel creates a lively, playful hotel tower amid the city's dismal fringes. By David Cohn



FOR THE Renaissance Barcelona Fira Hotel, sited near a convention center on the highway to the city's airport, Jean Nouvel took on the challenge of making meaningful architecture out of what Rem Koolhaas famously defined as "junkspace"—the anonymous, generic sprawl that rings cities everywhere. Nouvel's response was to use the concept of an oasis or refuge from the uninspiring surroundings as a design theme in both literal and figurative terms.

The literal oasis is a central open-air garden that runs vertically through the hotel's 26 floors, filling every level with palm trees and other vegetation. This vertiginous, north-facing void, animated by zigzagging fire stairs, rises between two solid volumes containing guest rooms. These are accessed from single-loaded open galleries that overlook the garden and its spectacular views to the city. As project leader Damien Renchon points out, "It's really a vertical motel." The central void is interrupted by a restaurant on the 14th floor, as well as penthouse suites and a rooftop bar and swimming pool, which are all surrounded by glass-enclosed terraces housing more greenery.

The apparent whim of the central garden solved a serious design problem, as the large square footprint required by the site's urban plan was impractical for laying out hotel rooms. Cutting out the core also resulted in a building with "more elegant proportions," says Renchon; the architects persuaded local authorities not to count the central space as part of the permissible built area, allowing for a taller, and proportionally slimmer, volume.

On the figurative side, Nouvel carries the oasis concept into a branding theme for the facades. Inside every guest room, he cuts a window out of the structural precast-concrete wall in the shape of the jagged crown of a palm tree. Outside, these openings are visible behind a continuous curtain wall of milk-white glass, silkscreened with palms at different scales, that blurs the reading of floor lines. Rooms on the northern facade, with negligible solar load, look out through a contrasting black-glass curtain wall, silkscreened with patterns of leafy shade. The other facades fade into full transparency at the restaurant floor as well as at the building's top. The result, both inside and out, is unexpected, campy, and fun.

Throughout the building, Nouvel expands on the palm-tree motif to shape perceptions of light, shade, and space. He silkscreens reflective and transparent surfaces with patterns of palm fronds, including the glass walls of guest-room baths, the reflective steel walls of the open corridors, and the windows in the lobby, where images of leafy shade

EN PLEIN AIR A vertical garden planted with palm trees cuts through the center of the tower (left). Guests access rooms via galleries overlooking the greenery. Nouvel extended the oasis theme to the facades, with patterns of sky and shade on the north face (opposite) and palm-tree cutouts for guest-room windows (top left). The silkscreened curtain wall becomes transparent on three facades surrounding the 14th-floor restaurant and the penthouse. The southern exposure (above) features narrow oval view openings to mitigate solar load. Nouvel designed furnishings throughout, including a cubic light fixture (visible in photo, top left) that projects changing patterns of palm fronds on the walls.

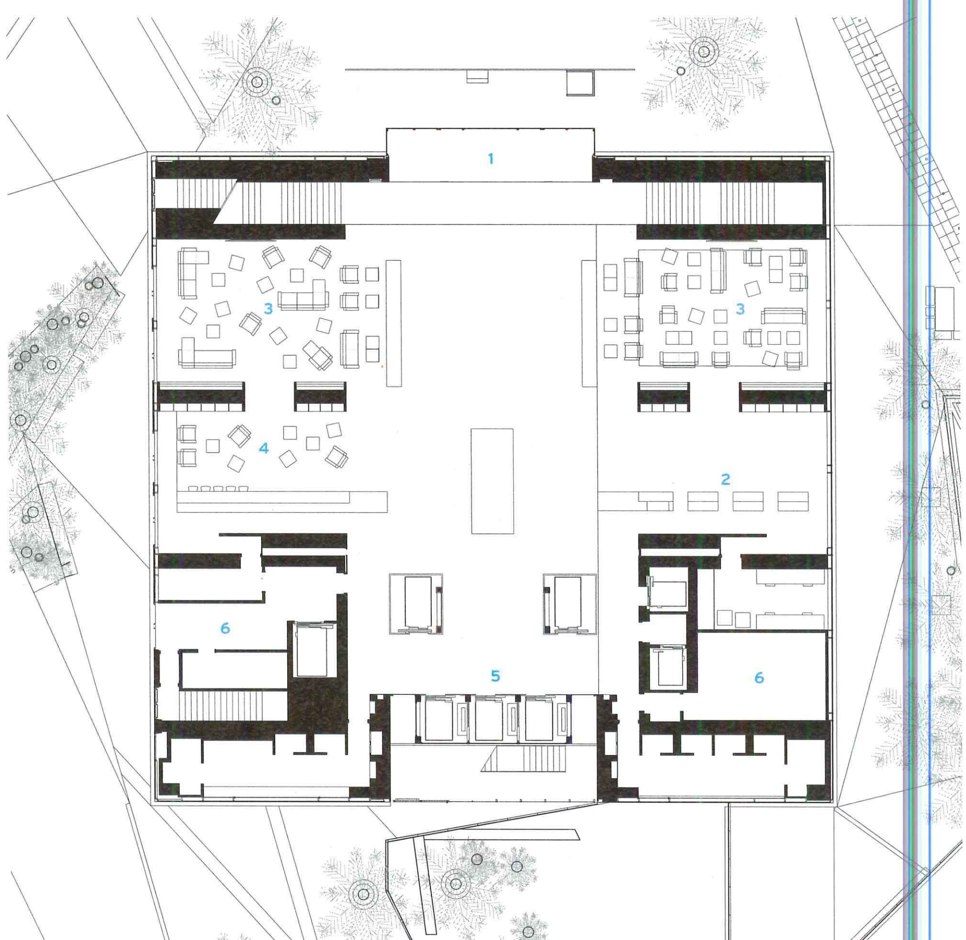
mix with glimpses of the real thing outside. In one endearing detail for the architect's otherwise discreetly elegant furnishings (with selections from his own line), each guest room has a kinetic light fixture that projects a changing play of palm-frond patterns over the walls, a bedtime version of a disco ball.

The project is not Nouvel's first to try a lively strategy for a dismal site. In Madrid's Puerta América Hotel he oversaw the work of 15 star architects, each designing a different floor (RECORD, September 2005, page 96). At the Fira, Nouvel repeats some of the features he introduced there, including the rooftop bar and pool deck, and suites with large interior sliding glass panels for staging different spatial configurations. And, like his Agbar Tower in Barcelona, the new hotel has a structural concrete shell (for thermal insulation) that is sheathed in glass, although here he handles the openings with greater aplomb.

With its green thumb and pop motifs, Nouvel's design demonstrates how mainstream architecture has caught up with some of the more iconoclastic green architects of the recent past, including James Wines, Emilio Ambasz, and Ken Yeang. But he brings to the oasis theme a playful sophistication and spatial intricacy that are entirely his own. ■

TYPICAL FLOOR

1 ENTRANCE
2 RECEPTION DESK
3 LOUNGE
4 CAFETERIA AND BAR
5 ELEVATOR BANK
6 SERVICE AREA
7 TYPICAL ROOM
8 SUITE
9 ATRIUM



GROUND FLOOR

0 20 FT.
5 M.

credits

ARCHITECT: Ateliers Jean Nouvel – Jean Nouvel, principal; Damien Renchon, José Miguel Pomares, project leaders

ASSOCIATE ARCHITECT: Ribas & Ribas Arquitectes

ENGINEERS: Manuel Arguijo y Asociados (structural); Ramón Roca (HVAC)

CONSULTANTS: Biosca & Botey (facade); Manuel Colominas, Bet Figueras (landscape); Lumières Studio (lighting)

CLIENT: Hoteles Catalonia

SIZE: 280,000 square feet

COST: $72 million

COMPLETION DATE: September 2012

SOURCES

METAL CURTAIN WALL: Wicona

PRECAST CONCRETE: Escofet

INTERIOR FINISHES: DORMA (demountable partitions); Ecophon Saint-Gobain (acoustical ceilings)

ELEVATORS/ESCALATORS: Kone

Anthony Hospital / Zimmer Gunsul Frasca Architects / Gig Harbor, W.A. / Application: External / Product: **Facade**

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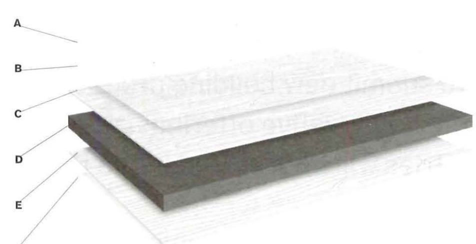

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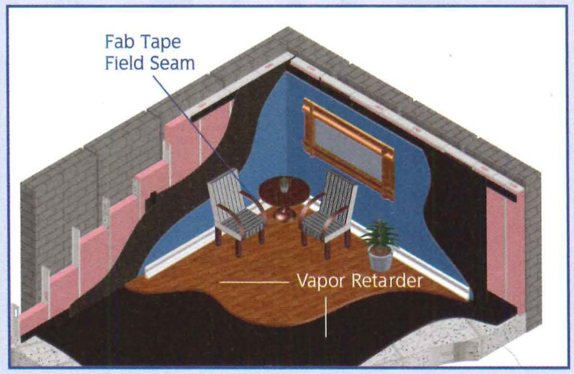
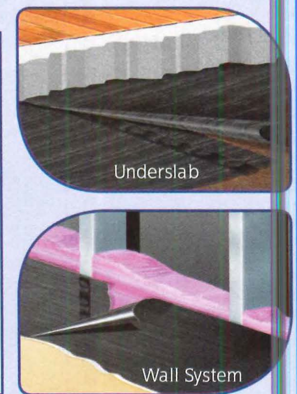
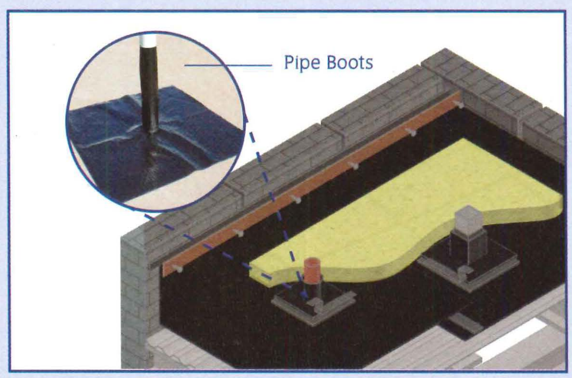
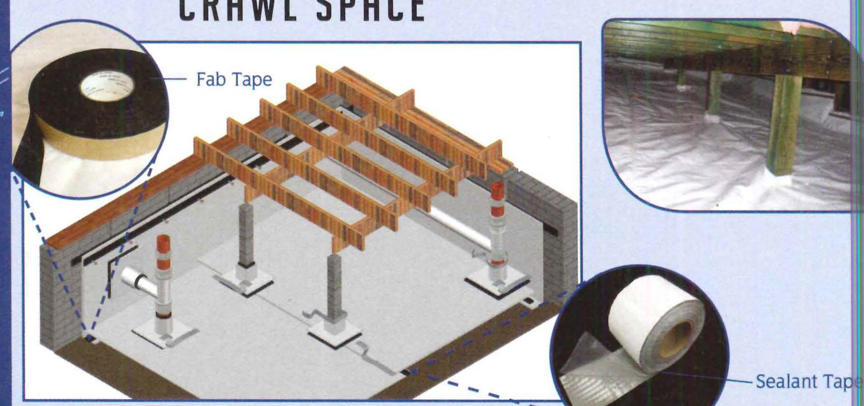




ROOF DECK



CRAWL SPACE



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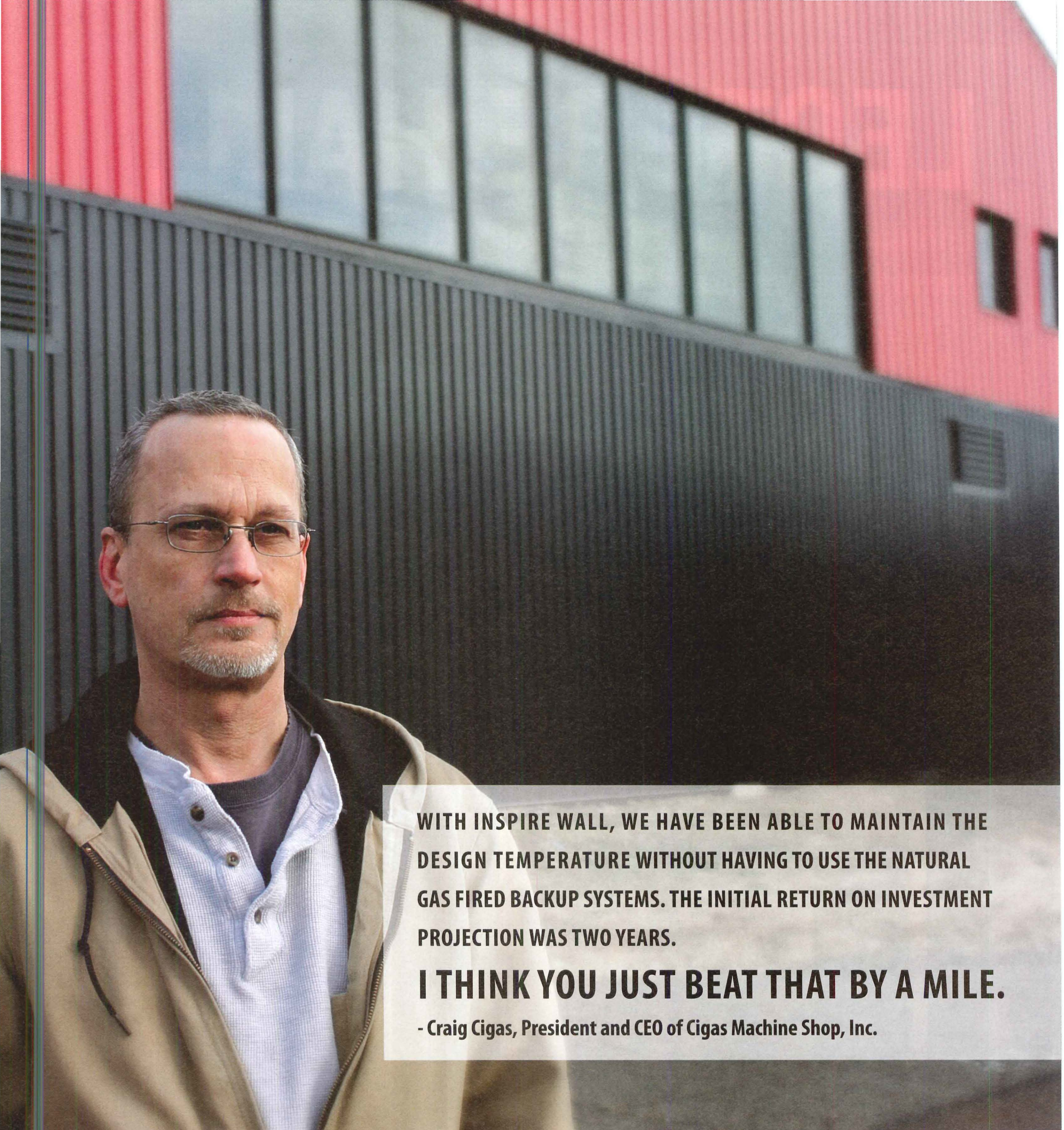


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By Joann Gonchar, AIA
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1 Explain how evaluation of programmatic requirements and environmental conditions helped designers generate the form of Kuwait City's Al Hamra Firdous Tower.
2 Describe the key structural elements of the tower and its foundations.
3 Explain the structural and construction challenges presented by the tower's geometry.
4 Describe how construction methods were adapted for the harsh desert environment.
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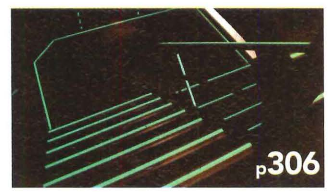

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RR RENOVATION AND RESTORATION
SU SUSTAINABILITY
ST STRUCTURAL

Photo courtesy of bulthaup

Minimalist kitchens are both efficient and aesthetically pleasing.

Minimalism in the Kitchen

Form follows function in new generation systems that maximize efficiency, ergonomics, and aesthetics

Sponsored by bulthaup

Every architect knows Louis Sullivan's famous maxim, *form (ever) follows function*, a guiding tenet of the modern aesthetic. Sullivan's idea that the purpose of a structure should be the starting point for its design has produced minimalism, which seeks to eliminate all non-essential forms, features, and concepts—no easy feat to accomplish.

Noted architect John Pawson maintains that minimalism is not merely a case of "throwing out the sofa and painting the walls white." "This is not architecture of absence: It is defined not by what is not there, but rather by the rightness of what is," Pawson writes. "You reduce, you simplify and at first there is less and less to look at. Then, as you go on attenuating and compressing, you come to a point at which you go through a barrier and pass through into…a kind of mirror world, in which you see, looked at with enough clarity, not emptiness but a sense of richness."

In the kitchen, a form follows function minimalist philosophy has resulted in transformation of a traditional space to flexible structures and systems that are both efficient and sculptural, and that mirror current social trends, accommodate changing lifestyles, and satisfy people's longing for individuality and authenticity.

This article will explore these kitchen systems and their components in the context of current trends and social ideals, as well as their consistency with ergonomic, sustainable, aesthetic, and cultural goals.

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

1. Identify the design philosophy of a minimalist kitchen as it relates to health, safety, and welfare.
2. Discuss the ergonomic rationale for placement of elements within a kitchen space.
3. Explain how the interior design of drawers and pull-outs relates to a personal sense of space and autonomy.
4. Describe how kitchen design and materials can achieve sustainability goals through resource conservation and energy efficiency.

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KITCHEN TRENDS

Food preparation is in. The past years have seen a booming interest in food—healthy, gourmet food made at home. Cooking has become a pastime enthusiastically embraced by both women and men. This applies not only to family meals but in light of the recent economic downturn to a return to in-home entertaining. All these factors have given rise to a new importance of the kitchen, and today's kitchens are increasingly recognized as the hub of the house. They are open-concept, flexible spaces and often an extension of the great room—a trend that designers say will continue to prevail. "Homeowners know that the kitchen is truly the center of the home well beyond food preparation," says New York architect and residential design specialist Judith Raymond. "The separation between kitchens and dining rooms is coming down to create a more open space where family and friends can gather as dinner is being prepared and after dessert as well. People don't want to have to go from room to room to entertain. The kitchen is where they want to be."

To further their culinary pursuits, home cooks increasingly want chef's kitchens and the latest in appliances and workspaces. To enhance the kitchen's appeal as an entertainment area, many consumers are turning to sophisticated, high-end design solutions that incorporate both practical and aesthetic advantages in an integrated look. "As designers, we have to combine the 'showplace' living room with the 'down and dirty' kitchen functions—incorporating all sorts of cooking, refrigerating, and dishwashing equipment, while balancing the qualities of form, proportion, materials, lighting, color, and details that make a room beautiful and convey the owner's style," says Raymond. Contemporary minimalist kitchens, which by their very nature are stylish, clutter-free, and ergonomically developed, continue to be popular choices in all demographics, from young urbanites to retirees renovating a country home.

THE SYSTEM DEFINED

New generation kitchen systems combine functionality and ergonomics in a sensual minimalist form. The design itself is based on a scientific look at workflows and movements in the kitchen. In conventional kitchens it is difficult to reach certain areas without bending down or stretching. The pivotal ergonomic principle of minimalist systems is that everything should be within easy reach and, as a result, the system eschews all hard-to-access areas located high up or down low. Instead, the middle functional area directly above the worktop becomes the focus, with slender, modular panels allowing for flexible kitchen design that mixes visible functional zones. Drawers and pull-outs give users the freedom to shape, structure, and fill space according to their unique tastes and needs. In line with the principle of intuitive function, people become "directors" who modify the scenography of their kitchens, making changes as they like and purchasing additional functions and elements as they need them.

Design Precedents—Bauhaus, Donald Judd, Shaker Furniture

Rooted in the Bauhaus tradition, today's kitchen design systems take inspiration from the minimalist artists of the 1960s, notably Donald Judd. A chief proponent of minimalism, Judd used industrial materials to create objects that were severely reduced in form and not presented on the usual pedestals, but created an interplay between interior and external form, and light and shadow. It is this imitation of sculptural yet lightweight appearance that minimalist kitchens mirror.

Another influence was Shaker furniture of the 19th century, the iconic self-made, high-quality home furniture that combined functionality, material authenticity, and simplicity. Particularly influential was the movement's seminal wooden peg rail from which clothes, everyday objects, and small items of furniture hung from finely crafted hooks, arranged at regular intervals.

The Active Wall and Other System Installation Options

While inspiration may have come from Shaker peg rails and contemporary art, the idea of "actively using the wall" was the core innovation of some minimalist kitchens. In these kitchens, a multifunctional wall becomes the structural base element of the entire kitchen system. Affixed to the wall is a sturdy steel skeleton from which cabinets and worktops, cooktops and

A KITCHEN SYSTEM OF STAINLESS STEEL AND MARSH OAK

In Berlin, the architect and the new owners of a historic home decided to incorporate a modernist touch. While upstairs, the bedrooms, marble bathroom, and children's rooms remained as they were a century earlier, the ground floor had been divided differently. Since servants who once prepared and served meals were no longer a feature of the house, it seemed obvious to place the kitchen next to the dining room. Combining owner preferences and the principles of "objectivity, function, and quality," a system made of stainless steel and marsh oak was selected. A monoblock integrated with sink and gas cooktop was chosen to form the focal point of the room. The former ladies' parlor and the music room had been joined to form the dining room. Only the floor—a dark basalt in the cooking area, an authentically reconstructed parquet floor in the dining room whose marsh oak takes the color of the kitchen fronts—provides a visual distinction between the cooking and the dining areas. To honor architectural conditions and existing materials, the kitchen makes use of special veneers, for planning and implementing kitchen architecture.

Photo courtesy of bulthaup

The kitchen utilizes a monoblock in stainless steel and marsh oak with customized side panels.

water points, electrical appliances, and a myriad accessories all hang on special hooks, making the unit appear to "float." The steel frame is secured both to the wall and the floor and should be able to support up to 2,200 pounds per foot, and transfer the forces into the ground. Power and gas supply lines are routed behind the wall. This scenario enables maximum use of the space between the wall and base units, and offers the ergonomic advantages of eliminating the need to bend down to reach a bottom drawer, and enabling the area underneath the units to be easily cleaned.

To properly use the multifunction wall's steel supporting frame, wall conditions must be suitable and wall thickness adequate. As a general guideline, wall-hung scenarios are suitable for units of up to 26 inches deep, even if loaded with heavy crockery and large electrical appliances. When units are 30 inches deep or more, however, only the foot-supported or floor-standing versions are feasible. All three types of installation can create a "floating" kitchen, which both facilitates working efficiently within the space and imbuing it with a stylish, lightweight appearance.

In cases where the structural requirements for the wall-hung kitchen are not met and a floating impression is still desired, kitchen elements in the wall line can be placed on a support platform, with working heights that are chosen to meet individual needs. Designers can select from different types of feet. A U-shaped, curved type foot will give the kitchen furniture an airy appearance, while a classic, strict pillar foot will accentuate the rectilinear look of the systems.

Floor-standing elements are the best solution for traditional room designs where storage space must be maximized. A minimalist design with a nearly invisible recessed plinth means that these elements do not dominate the room and maintain the kitchen's "floating" appearance. The floor-standing version is ideal for a classic kitchen island, positioned in the center of the room.

Achieving the Rectilinear Look—Laser Technology and Seamless Joints

Contemporary architecture and modern product design require the consistent, continuous, rectilinear use of form and the use of uniform materials that are the linchpin of the minimalist aesthetic. Laser welding technology has long enabled manufacturers to create design solutions that eliminate joints and fuse surfaces together seamlessly. To achieve a seamless stainless steel finish, for example, ultra thin fronts are made of a light carrier plate, which is surrounded by two stainless steel half shells. The half shells are laser welded to the edges and, after polishing, the stainless steel front appears completely seamless, as if it were made from a single mold.

The technique is also applied to laminates. The laminate edges are heated and then fused together to create an optically imperceptible seam. The advantage of this is that the bond is formed without the usual adhesive, which can become visibly discolored in time. Thus fabricated, laminate fronts appear as if they have been made from a single mold with the appearance of an expensive lacquered front, yet without the cost premium and high maintenance of lacquer. Manufacturers also apply this process to aluminum and wood. Laser welding enables other connections, too, including seamless integration of the water point into the worktop.

WORKSPACES

In the minimalist kitchen, efficiency is key. Several areas within the kitchen are used as workspaces.

The Active Wall

As the cornerstone of a minimalist kitchen, the active wall offers numerous design and functional advantages as a result of wall panels and accentuation of the horizontal lines. Wall panels can be suspended with or without shelves. For added strength, shelves can be bonded invisibly at the factory to the panels. Kitchen designers make much use of what is known as "the functional gap," a small, less-than-half-an-inch space located between the panels, to suspend all manner of useful elements—cookbook holders, paper towel holders, knife blocks, herb pot holders, shelves with or without inserts for spice jars, and food containers as well as coffee makers, and TV and audio systems. These elements are not fastened to the panels themselves but are instead suspended in the gaps, which confers great freedom in changing their order or placement, or substituting other elements. Functional elements can be suspended at any point and at any height in the function gap, or fastened directly at gap height.

The Monoblock

A key component in sculptural kitchen architecture is the monoblock, a base unit that integrates worktops, burners, and plumbing. The dimensions and material can be selected to suit, with the precision-finished stainless steel or laminate structure concealing the selected base cabinets into a single unit.

A purist-looking, seamless stainless steel body with a homogenous appearance appears like a solid block of metal, with no visible seams between the back, side, and top surfaces. For true minimalist design, fronts can be exclusively stainless steel with handle-free drawers, and designed to create contrasts with other kitchen surfaces such as wood, lacquer, or laminate. Handleless doors, drawers, and pullouts open with a simple touch and close at an individually adjusted speed that corresponds to how full they are. Alternatively, handles can be stylishly shaped with the cut out in the handle indicating the direction in which the door or pull out opens, or designed as a long open shape, from which dish towels can be hung.

In addition to stainless steel, monoblocks are available in laminates. Monoblocks using solid wooden fronts are constructed using a sandwich technique, in which three solid wooden layers are combined with two stabilizing aluminum sheets. In some cases, the minimal thickness of the solid wood and the fine aluminum sheets can be exposed at the edge, revealing the high-tech

The monoblock integrates worktop, burners, and plumbing, and appears like a solid block of metal with no visible seams for a true minimalist design.

Photo courtesy of bulthaup

AN OPEN MOBILE KITCHEN

Following the minimalist principles of "clearing away anything superfluous" and allowing maximum customization, this kitchen prototype assures that everything needed for a two-person household is visible at a glance and within reach. Starting from the philosophical origins of every living space—the fire and water points—this open and mobile kitchen is based on a workshop layout comprising three main elements: a workbench housing the sink and cooker; tool cabinet for utensils, crockery, and food; and appliance cabinet for the oven, dishwasher, and fridge.

Opening the in-door storage doors provides an overview of the entire kitchen domain. Once the doors are closed again, the beauty of the simple purpose-oriented form becomes clearly apparent. The compaction of the storage space makes pull-outs and drawers unnecessary. Even the diversity of units is smartly minimalist—just a few basic types and materials, such as oak and walnut veneer combined with worktops made from stainless steel, oak, walnut, and gray sandstone offer a limitless range of design variations. With its flexible structure, modules can be combined at will, and new worktops, water points or appliance modules can be put onto the workbench, adapting it to the owner's personal habits and customs. Elements can be extended to suit if the circle of family and friends increases, for example, or when new appliances come on the market, and changed if a different material is desired for the worktop.

Photo courtesy of bulthaup

This minimalist open kitchen is composed of a workbench, tool cabinet, and appliance cabinet.

construction technique. Wall panels and side panels can also be produced in a similar manner. The monoblock can be planned as a freestanding island, with or without rear panel, as a peninsula or standing in front of a wall

The Worktop

Only inches thick, today's minimalist worktops are the most rigorously used areas of the kitchen and must be able to withstand pressure, shocks, acidity, and heat as well as being easy and quick to clean. Although worktops can be less than half an inch thick, they are engineered to withstand extreme pressure. Such ultra-thin worktops are offered in stainless steel, seamless laminate, laminate with aluminum edges, and synthetic stone. Dyeing the laminate throughout the surface and edges gives the best results. Laminate worktops can also be edged in aluminum to protect against pressure and humidity.

Function Boxes

The most important area in the kitchen is the worktop, with preparation and serving zones, a water point, and a cooking area. In the classic fitted kitchen, there are only two solutions, as the worktop is neglected. Some minimalist kitchens, however, provide solutions that maximize use of this previously neglected area—the space between the worktop and the wall unit. The solution is based on "function boxes," which provide storage for spices, oil and vinegar, kitchen tools, knives, and small containers—most things needed in preparing or serving food, cooking, and cleaning. When the doors of the function boxes are closed, the pure minimalist form of the kitchen is uninterrupted, concealing ergonomically arranged storage solutions. The doors can be opened either completely or just halfway. In contrast to sliding doors, where one side is always hidden away, this solution keeps everything in view.

There are function boxes in variable widths, depths, and heights that can be planned for all manner of uses to suit individual needs. Wing lights with fluorescent tubes can be integrated for illumination and energy efficiency, as can an integrated mixer tap for the water point that is positioned high enough to enable even bulky crockery to be rinsed easily and tall pots to be filled with water.

Function boxes can be subdivided to create multiple compartments. The lower flap of the boxes can house both dividers and a knife block, or cutting and breakfast boards. Some manufacturers also offer compatible containers for storing sugar, salt, utensils, and other foods for an integrated look and operational efficiency. Such containers can be arranged according to themes, type or season, creating colorful patterns that reflect the preferences and cooking style of the user in a unique way. While a good fit for the functional spaces of the kitchen, the containers can be easily removed and placed in other locations, such as on dining tables or worktops, shifting their orientation from chef to diner.

Shutters or top box units placed on top of the worktop or integrated into tall units offer extensive storage space and can accommodate even larger kitchen appliances stored at ergonomically sensible heights. Equipped with compartment shelves, insert boxes, sockets, and interior lighting, shutter boxes can remain open in daily use and give the user access to their contents without doors getting in the way. One visual advantage characterized by the shutter units in particular is that they accentuate the horizontal lines.

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

1. Explain the color and design choices that benefit the developmental stages of children in the school environment from grades K through 12.
2. Describe the philosophy of educational professionals, design authorities, and education researchers on the basic principles of school design and structure that promotes the health, safety, and wellbeing of students.
3. Discuss each color palette combined with an understanding of light reflectance values in the design process to create effective school environments.
4. Identify appropriate color and design choices for major areas and rooms within the education environment.

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Functional Color and Design In Education Environments

Smart choices in color and design facilitate the learning process

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Color is a powerful communicator. It impacts us on many psychological and physiological levels. Color can enhance or impair learning, morale, and behaviors. Studies have shown that color affects a student's attention span and perception of time and can reduce absenteeism and vandalism. In addition to color, incorporating nature and the five senses into design scenarios for schools can have a positive impact on the learning process. While no one color or design scheme is infallible—and are heavily influenced by a host of factors—certain principles apply. This article will discuss the findings of extensive research and explore the role of the color palette, light, nature, and the five senses in the process of designing for preschool, elementary, middle, and high school. Optimum color and design scenarios for each room of the school will be highlighted.

COLOR RESEARCH—WHAT THE EXPERTS SAY

There is extensive research regarding design initiatives and their importance in the school environment. Study after study concludes that there is an explicit relationship between the physical characteristics of school buildings and educational outcomes. Four studies that evaluated the relationship between school buildings and student achievement reported higher test scores for students learning in better buildings and lower scores for students learning in substandard buildings. One of these studies showed a difference in student test scores ranging from 5 to 17 percent. Another report evaluating school facilities in Milwaukee, completed by the Council of Educational Facility Planners International, found that facility condition may have a stronger effect on student performance than the combined

OPPOSITE: **Study areas engender equilibrium, balance, and stillness and should be quiet in design and allow for concentration.**

LEFT: **Keep creative areas neutral with small accenting.**

influences of family background, socioeconomic status, school attendance, and behavior. In his article "'Effects of School Lighting on Physical Development and School Performance," Warren E. Hathaway clearly shows that the visual environment is one of the most important factors in learning, affecting mental attitude, class attendance, and performance.[1]

Education experts agree that getting an education is more than just memorizing facts and figures. It involves a positive social climate within the school and a sense of caring and guiding. Both young children, who enter school for the first time and are away from home, and teenagers facing the pending responsibilities of adulthood, need the support that only a positive school environment provides.

Color helps create an unthreatening learning environment that improves visual processing, reduces stress, and challenges brain development through visual stimulation/relationships and pattern seeking. According to a study by Simmons in 1995, visual stimulation actually rewires the brain, making stronger connections while fostering visual thinking, problem solving, and creativity. The choice of color in schools can have a critical impact, either favorably or unfavorably, on students. Studies have shown that color affects a student's attention span and perception of time and can reduce absenteeism and vandalism. Yet using more than six colors in a learning environment strains the mind's cognitive abilities—a conclusion that underscores the need for a careful approach to color and design in the educational environment.

DESIGN CONSIDERATIONS—THE ROLE OF NATURE AND THE FIVE SENSES

Nature rises to an extraordinary level of importance in designing for education, particularly in terms of its bright colors, full-spectrum lighting, its view out into the world, and learning outdoors. In response to the question of where they would like to be to alleviate stress, 95 percent of individuals respond that they are most comforted and soothed by being outdoors. Many of the field's seminal thinkers have underscored the importance of nature in design. Erich Fromm understood humans' link to nature and created the term *biophilia*. Noted social critic Edward Wilson stated that we seek a "deep-rooted" connection to the natural world. Steve Kellert, professor at Yale University School of Forestry and Environmental Studies, feels that biophilia is an essential part of sustainable design. Harvey Berstein, vice president of industry insights and alliances for McGraw Hill Construction/Greenbuild 2012 panel discussion, claims that a 32 percent reduction in absenteeism and 68 percent improvement in test scores were recognized in schools with green features.

Another important design consideration is use of the five senses. Educational psychologist A. Jean Ayres notes that "Sensory integration is the ability to take in information through senses...to put it together with prior information, memories, and knowledge stored in the brain, and to make a meaningful response." In 2002, Susan Mazer, president and CEO of Healing Healthcare Systems, stated: "We need to look beyond the visual aesthetic and raise our awareness of sensory influences. Information we receive via all our senses evokes physiological and emotional responses of anxiety or serenity."

Color Palette—What it Means

As early as 1810, Goethe explored the psychological and soulful implications of color, and stated that how we experience an object depends on a combination of the object itself, its lighting, and our perceptions of these. The energy of color is derived from light and that energy evokes both psychological and physiological responses in the body.

Colors carry very different implications. In the built environment, white walls can be devoid of character and, although they may highlight architecture, they do not add emotion to an environment. Studies show that, left in an environment devoid of color, animals and humans had increased anxiety, distress, and

Long hallways are opportunities to incorporate color along with graphics, art, hue-blocking visuals, and design solutions to brighten and shorten these areas.

fear, and that this lack of stimulation from color resulted in irritation, restlessness, difficulty concentrating, and excessive emotional responses. Conversely, color can create a calm and soothing environment for the student to study and contemplate, or it can create excitement where it is desired such as in an activity area or a gymnasium. In an educational setting, it is advisable to incorporate a balance of all colors in the spectrum for optimum emotional and physiological responses. In classrooms, additional elements of color in artwork or accents should be incorporated for the full spectrum benefits they provide (A. Starkweather et al/2005). (See chart online that summarizes the characteristics and the feelings engendered by various colors.)

Still, it is important to emphasize that there are no rigid rules in applying color. Proper color decisions are tempered by a host of other factors. The location and regional culture of the school, for example, may guide the design direction. A school in Arizona with the desert in the background would be designed very differently from one in Paris. In the Sunbelt, where the sun shines most days, orange may be too over-stimulating a color choice. In the Northern U.S., where winters tend to be colorless, taupe or gray in quantity is not a good choice. On the West Coast, where day to day life is less conservative, bright accent colors, such as oranges, bright blues, and lime greens are popular choices. On the more conservative East Coast, traditional and muted toned-down colors, such as hunter green and burgundy or pastels, are preferred. In the Southwest, more saturated colors are favored, possibly because of the area's stark landscape. In addition to considering the population, community, culture, and location of the school in formulating color and design decisions, architects can also look for inspiration from teachers, students, and home design. The rationale being that those who work and learn in these settings provide needed insight into the colors and finished elements that best suit their needs and dreams.

AREA	LRV Percentage
Ceilings	70% - 90%
Walls	30% - 70%
General Wall Color in Classrooms	60% - 70%
Feature Walls	20% - 50%*
Work Surface	30% - 80%**
Floors	15% - 40%

**Research recommends classroom feature walls to be approximately 40 percent to 50 percent LRV; however, depending on the color, room lighting, size, window, and light exposure, a lower LRV may be considered for visual comfort. In the yellow family, these LRV values may be higher.*
***Work surface reflectance values have a vast range due to the variety of tasks performed in schools. Some desktops require wood surfaces; some labs require dark counters; low lighting may require lighter counters; art surfaces may need to be near white. Consider all elements of room design in specifying a work surface.*

LRV (Light Reflectance Value)

A measurement commonly used by design professionals to identify the percentage of light that is reflected from a surface, light reflectance value (LRV) supports our understanding of the amount of light that will be reflected from the surface. Numerous studies attest to the benefits of views and light—particularly full spectrum light—in the educational environment.

LRV specifications have a great degree of variability. While the accompanying guide establishes what has been documented to support the specifier in determining LRV values, the designer must still balance LRV concepts with experience, knowledge, and expertise, and consider work surface reflectance values, which have a vast range due to the variety of tasks preformed in schools. Some desktops, for example, may require wood surfaces; some labs require dark counters; low lighting may require lighter counters; art surfaces may need to be near white. For optimum visual clarity, government safety guidelines specify that a 30 percent value difference should be maintained between ceiling, wall, doors, and floor surfaces.

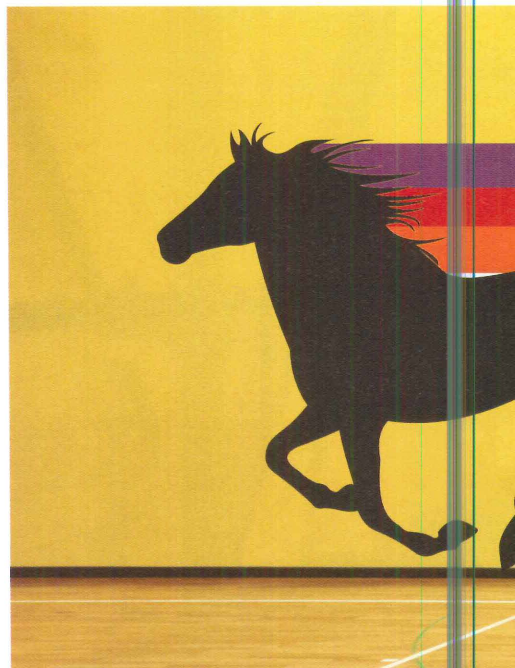
COLOR PREFERENCE BY AGE

Color supports a child's developmental process. Noted education planner, Kathie Engelbrecht, maintains that being sensitive to each age group's different responses to color is key in creating an environment stimulating to their educational experience.

Dr. Heinrich Frieling of the Institute of Color Psychology studied the color preferences of 10,000 children from around the world. He found that:

- Most children 5 – 14 rejected black, white, grey, and brown
- Children 5 – 8 preferred red, orange, yellow, and violet
- Children 9 – 10 preferred red, red-orange, and green-blue
- Children 11 – 12 preferred green and yellow
- Children 13 - 14 preferred blue, ultramarine, and orange

Frieling acknowledged that the pure hues noted above were not appropriate for large fields of color in the school environment. Frank Manhke, president of the International Association of Color Consultants, worked to convert the color preference test results into suitable colors to be used as a palette guideline, stressing that it was merely a guideline and not a formula, as color decisions will also depend on architectural conditions, light characteristics, geographic, and cultural situations.



ABOVE: **Gyms for teens should use active colors and graphics.**

RIGHT: **As younger students enter their school, the environment should embrace them, welcome them, and provide feelings of support and enrichment.**

Preschool

Today's young children spend many hours in a "new" environment—child care. Some children who begin attending child care in infancy may spend as much as 12,000 hours in this setting. This massive number of hours in one environment demands that the space be carefully designed to create the "best" place possible for young children.

Young children gravitate towards bright colors, primarily warm colors, such as red and yellow, orange, and violet. Dr. Frieling also notes that warm and bright color schemes seem to complement the active, energizing nature of children. However, they may be better used as accents as these colors may be too harsh on full walls. While color brightness and intensity are useful in attracting attention, they may not be conducive to learning. Other considerations in designing supportive environments are based on age-appropriate developmental patterns. Preschoolers, for instance, pretend they are doing adult activities, and their language ability explodes. Creation of learning centers is desirable to divide activities and clearly communicate areas for thoughtful activity, rest and private spaces, group activity, and role playing.

Kindergarten and Early Elementary

Like preschoolers, elementary students prefer a warm, bright color scheme that complements their natural extroverted nature. Younger children find high contrast and bright colors stimulating with a growing penchant for colors in graphics.

Designed environments for kindergarten and early elementary schools include spaces for privacy and active play, with open areas being the ideal place to run with abandon and expend physical energy. The visual environment must include activities for children to develop their visual acuity during the first eight years. Art materials will encourage more thoughtful interactions with color and designs. Providing soft elements such as flowers will instill a sense of gentleness, while having heavy metal toys will encourage children to play forcefully.

Enhanced organization and minimization of clutter will support children as they focus. Designers should consider mild soothing colors such as warm, soft shades of whites, light creams as a base color, with stronger, brighter mid-tone colors and accents as a focal point. Children's artwork should be incorporated into the environment to provide color and inspiration.

Middle School and High School

Middle school and high school teens have a growing appreciation of sophisticated color and tend to view primary colors as immature. Often influenced by prevailing fashion, young teens typically reject neutral colors in favor of blue, ultramarine, and their current favorite, orange. In selecting a color scheme for middle schools and high schools, there may be more leeway, depending on the objective. Subtle colors work well, such as light sage greens and refreshing blues and greens, with brighter, trendy, and more saturated hues used as accents.

For adolescents, cooler colors and more subdued hues provide enough stimulation without creating distractions or inducing stress. Blue, in particular, seems to be strongly associated with math and science. High schoolers prefer burgundy, gray, navy, dark green, deep turquoise, and violet. A variety of color is important, and it is advisable to incorporate a full spectrum in designing educational environments.

Color can be used strategically in a classroom to avoid distraction from equipment like televisions, video monitors, and projectors. Another option, in the case of middle and high schools, is the use of school colors to promote school spirit.

See endnote in the online version of this article.

Continues at ce.architecturalrecord.com

Hydroponic Living Plant Walls

Creating reliable living indoor environments

Sponsored by Nedlaw Living Walls, Inc. | *By Peter J. Arsenault, FAIA, NCARB, LEED AP, and Alan Darlington, PhD*

It is commonly noted that people currently spend on the order of 80 to 90 percent of their time indoors. This has several impacts. First it means we are predominantly breathing indoor air and, as a result, indoor air quality (IAQ) has been the focus of numerous studies, standards, and programs that seek to create healthy indoor environments. Common approaches to achieving better IAQ results, particularly in green building design, include careful selection of materials used and increasing ventilation rates. Second, time spent indoors typically means that we are living life deprived of interaction with nature. To overcome both of these indoor environmental concerns, it has been common to incorporate plants into indoor environments. However, potted plants alone can have only limited impacts. An emerging option that is more effective and more appealing for many designs is to use a vertical wall of hydroponic plants. Designed properly, these plant walls not only provide a connection to nature, they can provide real and significant improvements to indoor air quality as well.

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Learning Objectives

After reading this article, you should be able to:

1. Summarize and explain the principles of living plant walls used for indoor air biofiltration that affect indoor air quality.
2. Analyze and compare the different aspects of soil-based indoor planting systems and hydroponic-based systems.
3. Investigate the critical elements of a hydroponic living plant wall system related to growing media and irrigation.
4. Specify the construction of an indoor living plant wall that can be used as a biofilter system in a building.

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Living hydroponic plant walls provide a connection to nature, a design focal point, and can be used for biofiltration of indoor air.

Photo courtesy of Nedlaw Living Walls, Inc.

LIVING PLANT WALLS OVERVIEW

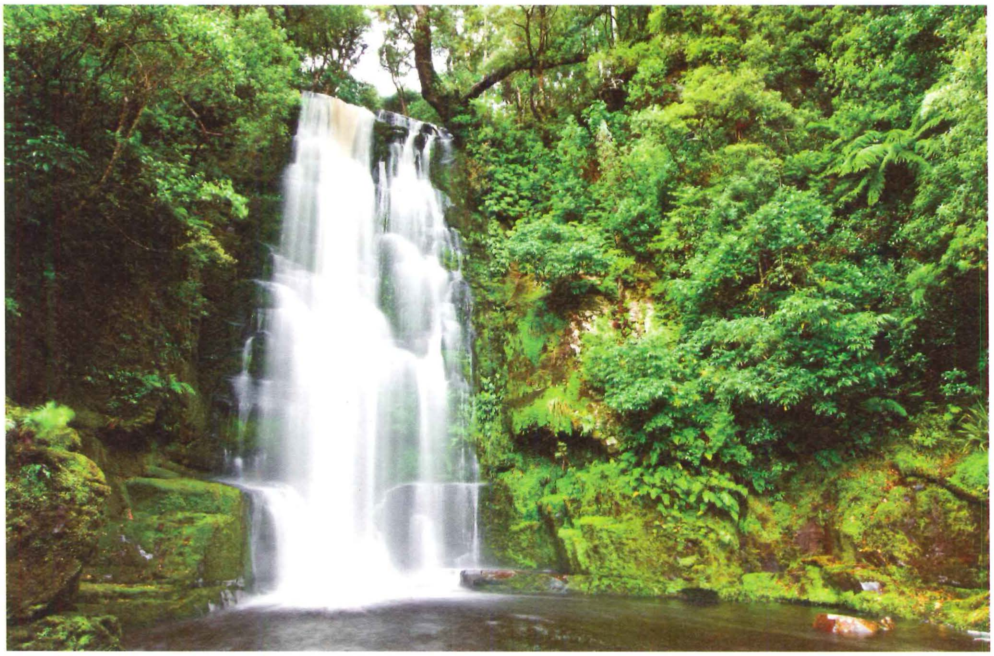
There is increasing interest in the integration of natural systems such as living plant walls and green roofs into the built environment. Of the two, living walls is the less mature industry. There has been considerable consolidation in the green roof industry over the past few years with the design community settling on a few well-tested methods of design, typical of sector maturation.

A recent analysis by Aditya Ranada of Lux Research on the use of green living walls in the built environment predicts that the rate of new installations of green roofs in Europe will substantially decrease over the next five years due to saturation of the market. Contrary to this, the living wall sector is still very much in the early phases of development. The same study by Lux Research, predicted a 16-fold increase in the accumulated area of plant walls between 2012 and 2017. Ranada predicts no decrease in the rate of installations in European living walls as seen with green roofs in the foreseeable future.

There are two very distinctive categories of plant walls. The first being a plant façade where the plants are rooted at the base of the wall and with the aid of a mechanical system, the plant "climbs" the vertical surface. The second group of walls is where the plants are planted into rooting material that is attached to the vertical surface or "wall" and not at the base as seen in plant façades. While green roofs frequently use prairie grasslands or savannas as a natural analogy for their design, the non-façade type green walls are frequently described as cliff type ecosystems.

Two relatively distinctive approaches are used for the culture of planted vertical surfaces (non-façade) and are commonly available. Both are based upon traditional agricultural systems adapted to the vertical plane. The first is simply a modification of conventional potted plant culture. In these systems, plants are rooted into separate pots that may be arranged anywhere from having the pots parallel to the ground and opening outward from the wall to the pots aligned parallel to the wall and opening towards the pot above it.

The second alternative planting approach is to modify traditional hydroponics to the vertical condition. Hydroponics is a method of growing plants that does not use conventional soil. It is commonly thought that plants need soil to survive but this is entirely not true. Plants need water, air, light, nutrients, and support. Soil facilitates many of these requirements but is not in itself required. Hydroponics is a cultural method where the role of the "soil" or planting media has been reduced to little more than a support substrate such that this media does little more than keep the plants from falling over.



Living plant walls occur naturally outdoors in areas where water and nutrients combine to support them. People enjoy the benefits of these walls whether they are located indoors or outdoors.

LIVING PLANT WALLS AND BIOFILTRATION

The increasing interest in living plant walls is well founded for a number of reasons; these plant walls can greatly improve the built environment through connecting the occupants to the natural world while occupying only a minimum footprint in the building. The aesthetic appeal of the plant walls is exceptional which has also been demonstrated to improve occupants' emotional well-being. Further, indoor air biofilters (a special subgroup of living plant walls) have been clearly able to demonstrate improvements in the physical qualities of indoor environmental quality (IEQ). In fact recent studies conducted by the University of Guelph in Canada have demonstrated that indoor living wall biofilters reduce common indoor air pollutants by 30 percent. This completely biological (i.e. natural) method of maintaining the quality of indoor air has become recognized as an exceptionally functional and very aesthetic system that can truly enhance indoor environments in many ways.

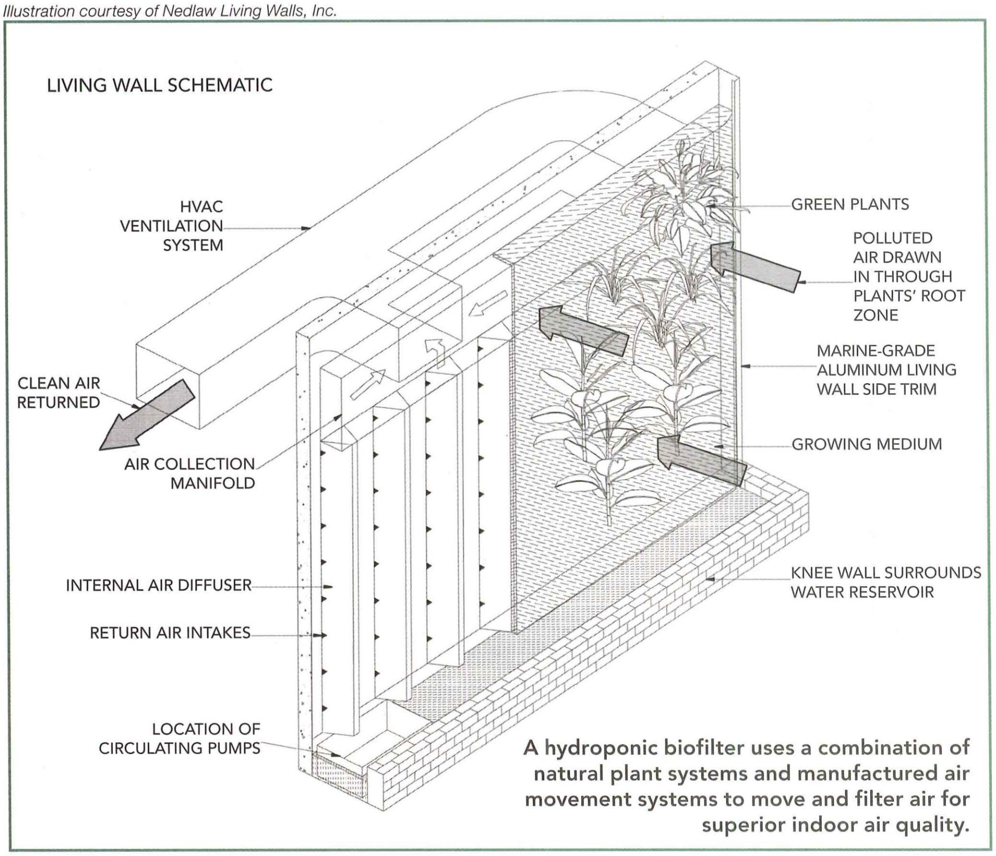
A particularly effective means of creating this indoor biofiltration is to use hydroponically grown plants in the system. By utilizing many of the benefits of hydroponic growing techniques, they are able to integrate engineering technologies to create an interior plantscape that effectively removes common indoor contaminants and improves the living environment.

At its heart, the hydroponic plant wall is an indoor vertical wall of green plants. However, the plant wall is most effective when it is actually an integrated part of the air handling system for the building to form a biofilter. Ambient air is actively forced through the wall of plants and as the dirty air from the space comes in contact with the growing (rooting) media, contaminants are moved into the water phase where they are broken down by beneficial microbes in the root zone. Highly specialized biological components on the hydroponic media and roots of the plants actively degrade pollutants such as formaldehyde and benzene in the air into their benign constituents of water and carbon dioxide. The clean air is then dispersed throughout the space by a fan system that may be built into the system or may be remote. In essence, the indoor air biofilter is a part of the air handling system for the building with plants integrated right into it as a living air filter.

From an internal processing standpoint, the biofilter is an adaptation of two separate processes. First is biofiltration, which is described as the passing of a contaminated air stream through a biologically active substrate where beneficial microbes use the pollutants (such as VOCs) as a food source. The second process is phytoremediation, which uses green plants to help the growth of these beneficial microbes.

The biofilter improves the indoor environment in a number of ways. First in terms of its impact on contaminant levels in the air, a single pass through a hydroponic biofilter can remove 90 percent of harmful chemicals. Second, a hydroponic biofilter improves the aesthetics of the indoor space. There are increasingly strong links between greening the indoor space and the well-being of the occupants. Greening the space has been shown to reduce stress levels, increase work productivity, and reduce absenteeism. Because of the combination of these documented results, plant wall biofilters are one of the few indoor

Illustration courtesy of Nedlaw Living Walls, Inc.



A hydroponic biofilter uses a combination of natural plant systems and manufactured air movement systems to move and filter air for superior indoor air quality.

uses of green plants to receive recognition from the U.S. Green Building Council LEED® program as an innovative means of improving the indoor air quality. They have recognized these systems as a unique use of green plants which leads to a substantial positive impact on the indoor environment.

Much of the effectiveness of the indoor air biofilter is because of the hydroponic nature of the system. To have a real impact on indoor air quality, the biofilter must be able to deliver very large volumes of air in a very efficient manner directly to the beneficial (i.e., contaminant-eating) microbes, which are typically found on the plant roots. The beneficial microbes responsible for the degradation of the contaminants in the indoor air biofilter are also present in "normal" soils. But in typical soils whether in vertical walls or with potted plants, the microbes are not adequately exposed to the contaminants to have a substantial impact on air quality.

To be biologically degraded, the contaminants must first be exposed to the microbes. This is very difficult in normal potted plants because the pot itself forms a barrier to the movement of gases into the soil. In other words, the container acts as a barrier between the microbes and the contaminants. The soil itself is also an extremely highly resistant pathway for air to interact with the microbes—it is simply too difficult for the air to penetrate into the soil to have any real impact on air quality. Further much of the surface of the soil is covered with plant material which acts as an additional barrier to the exposure of the soil microbes to the airborne contaminants.

Instead of soil-based growth medium then, the use of open matted hydroponic rooting material means that air can be easily drawn through the mat, placing the air in close contact with the root zone of the plants and their associated microbes. This type of system can support air fluxes up to 20 cfm per square feet with pressure drops of less than a quarter of an inch of water. In order to understand more about the differences between soil-based and hydroponic-based systems, let's look at each more in depth.

ISSUES WITH SOIL IN PLANT WALLS

The inert nature of hydroponic rooting media is very different from the typical cultivation of plants in soil where the rooting substrate facilitates many aspects of the life of the plant. The simplest is that the physical structure and weight of the soil offers the method of anchoring the plant in place. But more than this, natural soil is composed of particles of a range of sizes and origins, with organic and inorganic constituents. These particles can range in size from tiny clay particles to large grains of sand. The small particles clump together to form larger aggregates which give the soil its structure. Tiny spaces between the particles in the clumps can become filled with water during times of plenty and will act as a reservoir for the plant when water is needed. The large spaces between the aggregates act as channels for air to deliver the oxygen required for normal metabolism of the roots and allow for water drainage.

Soil can act as a reservoir of nutrients for the plants in a manner similar to its water-holding ability. Electrically charged surfaces of the particles bind with the charged nutrient ions during times of plenty and slowly release the materials to be taken up by the plant. The management of soil-based systems can take advantage of the capacity of the soil to "hold" water and nutrients which works as a buffer to the actions of the manager or gardener. The manager knows they can rely on the soil to add water and nutrients to the plants without their constant input. Soil culture is typically less complicated, but with all of the buffering action from the soil, one never really knows what the plant is getting.

However, soil systems may not necessarily be the cultural method of choice for use in living wall venues. Compared to plants grown in native soils, plants on a wall are much more intensively managed. Being of a substantial shallower profile than field soils, soil on a wall has to be watered more frequently than in the field. Even with careful engineering, repeated watering can break down the aggregates that give the soil its structure, and with the loss of structure, the channels that allow air to be delivered to roots are also lost. Anaerobic conditions are created and literally cause the roots to suffocate from the lack of oxygen. Anaerobic conditions also encourage a number of root pathogens which can also stress the roots. It is interesting to note that different plants have different tolerances to the anaerobic conditions associated with the flooding of the inter-particle spaces in the soil. We typically think of this as the tolerance of the plant to overwatering but it is actually the lack of oxygen in the soil, not the excess water, that damages the plants. When properly aerated, there is no such thing as too much water to the roots of almost all plants.

Another issue that arises from soil being a collection of particles is that these particles will eventually succumb to gravity and therefore cannot be applied to the vertical surface without some sort of containment system. Soil will only work if it is contained in some sort of "pot." Containment systems that are arranged so that their openings are not horizontal must also contend with the soil slouching out of the container. The soil frequently succumbs to gravity and sloths off the wall. This is also true for the entire plant; with the torque forces that the plant applies to the soil, the entire soil ball can be leveraged out of the container. Both of these issues are frequently addressed by covering the soil with a mesh, leaving only a small amount of soil around the base of the plant uncovered.

Containers used in living wall systems range in size from less than a quarter of a pint (100 ml) to many quarts (liters). But irrespective of their size, the containments offer a physical barrier to the expansion of the plants' root systems which in the long run will reduce the viability of the plants—i.e., they become pot bound. This is much more of an issue with small containers than large ones and will influence plant selection and longevity of the system. The containment of the soil also creates barriers to the flow of water through the system. Water cannot disperse freely horizontally because of the sides of the container.

Correcting the water flow is sometimes addressed by watering each container separately to avoid the requirement that water flow between vertical containers. This has some advantages but it is difficult to balance water delivery particularly to the entire wall. For example, the upper sections of the wall receive their water from the water supply system while the lower sections of the wall receive water from the water delivery system and drained from the container above. Frequently under these conditions, it is the bottom of the wall that appears to be "overwatered" and exhibits flood injury while the top appears to be under drought stress.

The last issue related to the use of soil-based plant walls is the longevity of the soil media. One way for a synthetic or engineered soil to withstand the intensive maintenance of the plant wall is the inclusion of organic material such as peat, fibers, or wood chips. This will help with the soil structure but being organic the material will decompose and the soil media will need to be replaced typically within a few years. This can be a very costly process.

HYDROPONIC-BASED LIVING PLANT WALL SYSTEMS

As mentioned previously, an alternative approach to soil-based planting is the use of hydroponic-based living plant walls. Hydroponics is increasingly used in agriculture for high-value crops where the reliability of production, and the quality and consistency of the end product are paramount. Hydroponics can be defined as a cultural method where the plants are grown in an inert rooting material. The hydroponic rooting material typically offers little water holding capacity and is simply a means to support the plant (keeping it upright). The hydroponic root substrate is also inert in terms of the plant's nutrition. All of the plant's essential nutrients must be supplied from the irrigation water.

Hydroponics has made great headway in the traditional greenhouse production systems for a number of reasons. Agricultural hydroponics are much more sophisticated production systems than traditional soil systems which means that they can be easily integrated in an automated control system, giving better control and monitoring of the plant's growth environment. While soil mixes tend to be inconsistent because of variability of the various components, the simpler (in terms of its composition) fabricated hydroponic media also streamlines the production of plants. The simple synthetic inert media used in hydroponics, such as rockwool or horticultural foam, gives the provider direct and immediate control over what is happening in the plant's root environment (the "rhizosphere"). Lastly, hydroponic designs facilitate the efficient use of resources. Although not impossible with soil culture, hydroponic irrigation systems lend themselves to be designed as a closed loop such that the water and its contained nutrients can be collected after use and circulated back through the system. This substantially reduces the amount of water and nutrients used by the system, fitting it better into sustainable design. All these benefits are directly applicable to the living wall venue.

Based on the above, it is clear that two critical components of a hydroponic system are the rooting or growing media and the irrigation system, both of which we will look at in more depth.

Photo courtesy of Nedlaw Living Walls, Inc.

Plants and rooting media need to be benign so as not to introduce anything detrimental into the space they serve, such as this restaurant where a healthy environment is particularly advantageous.

Hydroponic Rooting Media

The critical component of hydroponic living plant walls is the rooting media. This material must be inert and free from contaminants that could interfere with plant growth. The material must allow water to flow freely while maintaining good air spaces. The main advantage of the hydroponic media is that it retains its characteristics under the very intensive management seen on plant walls. Despite the very rapid and extensive flush of water down the wall, the internal structure of the hydroponic media will need to hold its structure for many years. A number of hydroponic living wall rooting media are now available. Most providers use either rockwool, felt, or a mat material as a rooting substrate.

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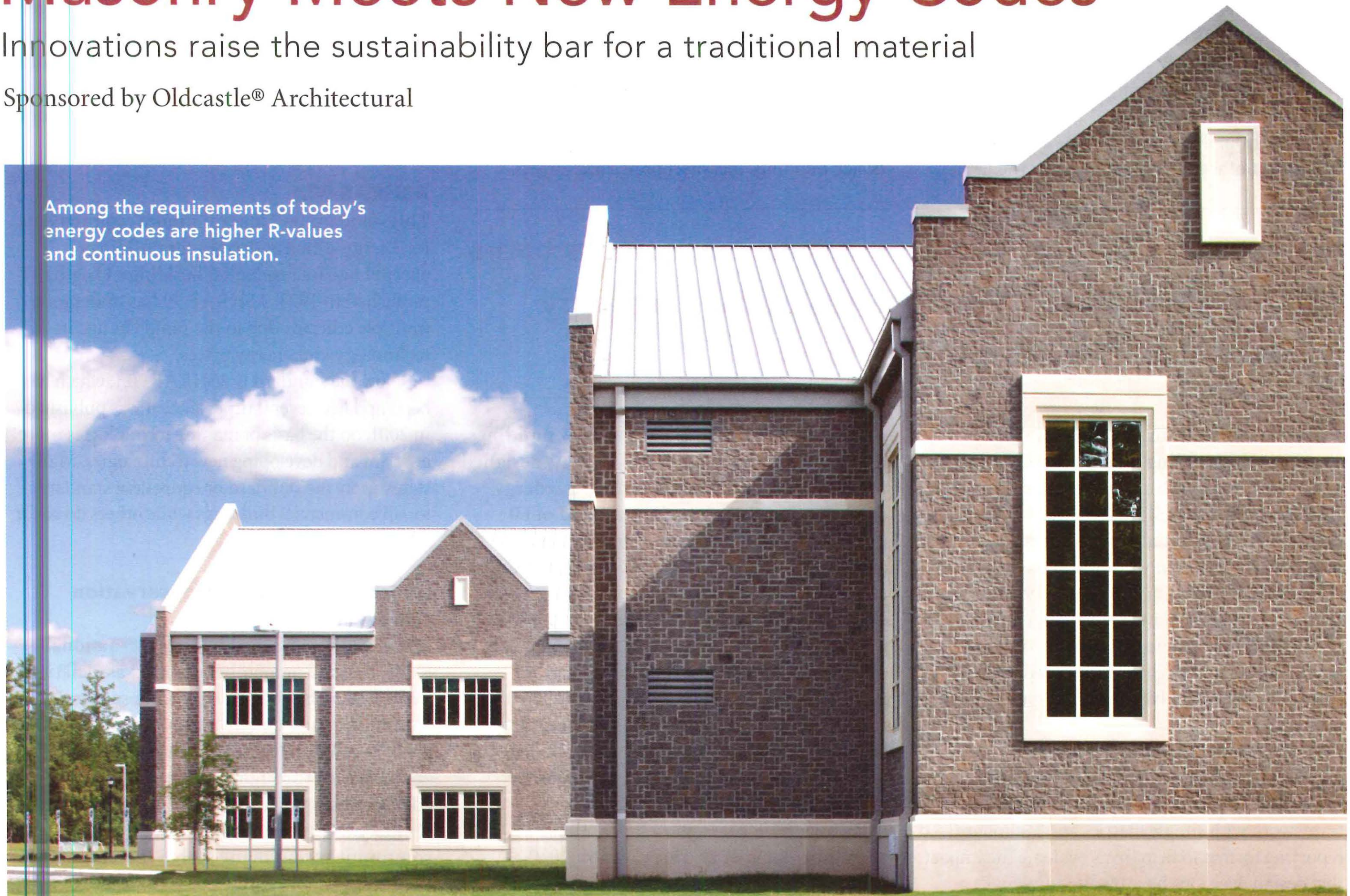
Alan Darlington, PhD, *is a researcher in addition to being the founder and director of Nedlaw Living Walls. www.linkedin.com/pub/alan-darlington/9/97a/a6*

Masonry Meets New Energy Codes

Innovations raise the sustainability bar for a traditional material

Sponsored by Oldcastle® Architectural



Among the requirements of today's energy codes are higher R-values and continuous insulation.

Photo courtesy of Oldcastle® Architectural

The term "masonry" refers to construction with stone, and it has been around for centuries, from the pyramids to the Coliseum to the magnificent cathedrals of Europe. Masonry by its very nature conveys permanence and quality, and its attributes are well recognized. Masonry is structurally sound, withstanding wind loads and gravity loads. It is fire resistant. Acoustically, it confers peace and quiet, and it provides good moisture control and thermal performance. In short, masonry endures.

Over the years, masonry has evolved as a result of better quality control, improved construction methods, enhanced design, and a deeper understanding of the material's fundamental properties, and in modern times, continues to be identified with longevity and low life-cycle cost. To today's buildings, masonry brings durability, value, and aesthetics. Many structures incorporate a wide spectrum of compatible masonry components from split face concrete masonry units (CMU) and cast-in-place concrete to pre-cast elements and concrete pavers.

To big box stores, masonry offers durability and value. In renovations, it provides an attractive and practical re-cladding material. And the designer's palette is not limited to exterior applications—many interiors incorporate the aesthetic and practical appeal of the material.

Now masonry is poised for another major evolutionary step—to meet changing energy codes. As society moves towards sustainable building, energy codes are becoming ever more demanding. Rising to the challenge of stricter regulations, manufacturers are working to develop new, more insulated masonry systems with better thermal performance. This article will discuss the changing green building picture, focusing on new requirements in the International Energy Conservation Code (IECC). Compliance options for masonry will be identified, with particular emphasis on foam wall panel systems.

CALLING FOR MORE ENERGY-EFFICIENT BUILDINGS

The statistics indicating that buildings have a significant impact on energy use and the environment have been widely publicized.

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Learning Objectives

After reading this article, you should be able to:

1. Discuss the exterior wall requirements and compliance options of the 2012 IECC.
2. Describe continuous insulation as a means of reducing energy costs.
3. Identify which masonry wall systems offer continuous insulation to meet the objectives of new legislation.
4. Compare the benefits and limitations of new and old masonry wall systems in terms of meeting today's codes and energy initiatives.

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

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According to the World Business Council for Sustainable Development (WBCSD), buildings account for 40 percent of the world's energy use. Besides using more energy than any other sector of the U.S. economy, buildings account for approximately 70 percent of electricity consumption, 40 percent of CO_2 emissions, and 14 percent of water consumption in the U.S.

Rising to the challenge of stricter regulations, manufacturers are working to develop new, more insulated masonry systems with better thermal performance.

Recognizing the implications of these numbers, the building industry has responded on several levels with calls to adopt sustainable, resource-efficient building practices that can play a major role in reducing the impacts of the built environment on the natural environment.

Professional organizations and governments are calling for greener targets; codes and regulations are evolving in support of that objective. Several of the building industry's sustainability initiatives are highlighted below.

The AIA Commitment

A growing national initiative, the AIA 2030 Commitment provides a consistent, national framework with simple metrics and a standardized reporting format to help firms evaluate the impact that design decisions have on an individual project's energy performance. The idea is that to truly rise to meet the energy reduction goals of 2030, architects have to apply the principles of sustainable design to every project from its inception and early design through project completion and ongoing building operations–not just those projects where clients wish to pursue third-party green building certification. The profession can't meet radical building energy use reduction targets one project at a time and architects are embracing the challenge at hand by thinking differently about sustainable design.

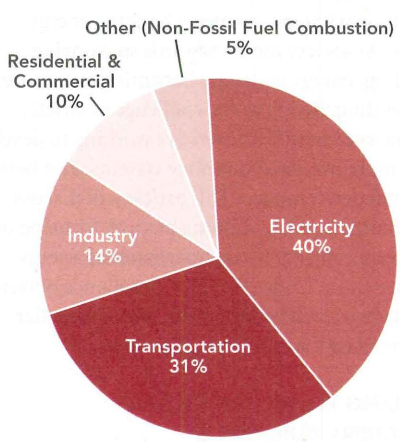
Vision 2030

Composed of several industry groups including the AIA, Vision 2030 asks the global architecture and building community to achieve a dramatic reduction in the climate-change-causing greenhouse gas (GHG) emissions of the building sector by changing the way buildings and developments are planned, designed, and constructed. Vision 2030 is specifically focused on lowering building energy consumption and greenhouse gas emissions. Although Vision 2030 is at the core of the AIA 2030 Commitment, it encompasses other issues as well, such as incorporating water and indoor air quality requirements in every design and outlining internal policies within the firm with regards to recycling, green product purchasing, and energy conservation, among others. While the AIA's commitment also asks for action plans and implementation steps to be documented and submitted, Vision 2030 is a stand-alone commitment, and encourages firms to design buildings that meet prescribed targets.

Vision 2030 seeks to have all new buildings, developments, and major renovations designed to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 60 percent below the regional (or country) average/median for that building type—and at a minimum, to have an equal amount of existing building area renovated annually to meet those goals. With the overall objective of carbon-neutral buildings by 2030, the following interim goals are targeted: The fossil fuel reduction standard for all new buildings and major renovations increased to 70 percent in 2015, 80 percent in 2020, and 90 percent in 2025.

While these goals go well past those of the current energy codes, Vision 2030 suggests that targets may be accomplished by implementing innovative sustainable design strategies, generating on-site renewable power, and/or purchasing (20 percent maximum) renewable energy. Of these three approaches, sustainable design strategies are by far the most important. While manufacturers can help with new and better products, the bigger burden falls on architects, who can employ such design strategies as building size—volume and floor space—orientation, air tightness, higher R-values, thermal mass, and continuous insulation to reduce energy costs.

GREENHOUSE GAS SOURCES



Total Carbon Dioxide Emissions from Energy Consumption by Sector (2008)

ASHRAE 90.1

This standard provides minimum requirements for energy-efficient designs for buildings except low-rise residential buildings. Originally published in 1975, ASHRAE 90 has undergone multiple editions due to the rapid change in technology and energy prices.

Now the standard is ASHRAE 90.1, which has been updated several times since it was published in 2001, on the basis of making technologies more efficient and developing new technologies. Many states apply the standard or equivalent standards for all commercial buildings while others do so for all government buildings.

International Energy Conservation Code (IECC)

The IECC is published by the International Code Council, a member-focused association dedicated to helping the building safety community and construction industry provide safe, sustainable, and affordable construction through the development of codes and standards used in the design, build, and compliance process. Most U.S. communities and many global markets choose the International Codes, or I-Codes. Providing minimum safeguards for people at home, at school and in the workplace, the I-Codes are a complete set of comprehensive, coordinated building safety and fire prevention codes.

The IECC, which references ASHRAE standards, is an I-code, a model code adopted by many state and municipal governments in the U.S. for the establishment of minimum design and construction requirements for energy efficiency. Introduced in 1998, the IECC addresses energy efficiency on several fronts including cost savings, reduced energy usage, conservation of natural resources and the impact of energy usage on the environment. IECC's precursor was called the Model Energy Code. IECC 2009 was recently updated by the IECC 2012.

It is generally considered that the adoption and enforcement of energy codes is one of the quickest, cheapest, and cleanest ways to reduce energy use in the built environment and help ensure a sustainable and prosperous future. Not only do energy codes reduce needless energy consumption and help protect the environment, they provide common benchmarks that drive new designs and technologies.

CURRENT BUILDING ENERGY CODE ADOPTION STATUS

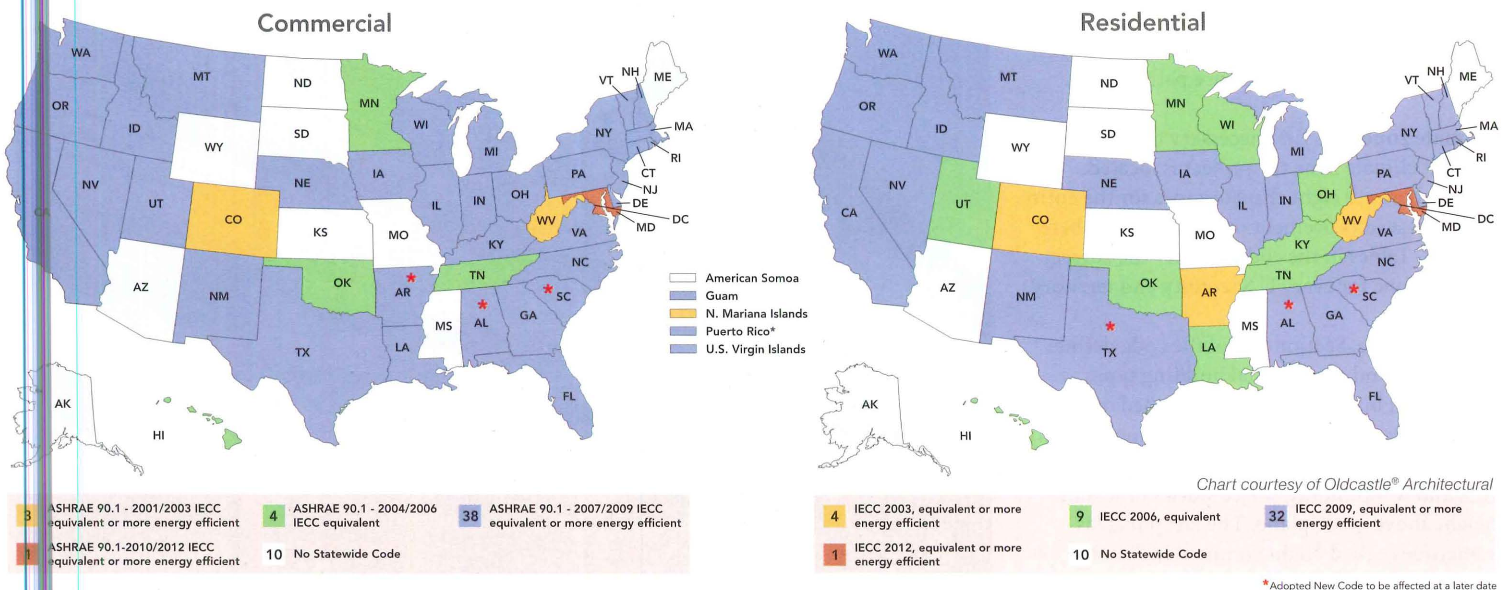


Chart courtesy of Oldcastle® Architectural

States marked with an asterisk have locally adopted residential energy codes that are above the state-mandated minimum.

The desirability of energy codes is a given, but the question becomes which code to follow. The answer lies in where the project is located. Rather than mandating across-the-board changes, IECC code changes are only enforceable when they are adopted at the state or local level. Many jurisdictions do not adopt new versions of the code immediately after publication. When states or municipalities do adopt updated codes, they generally incorporate changes to reflect regional building practices, or state-specific energy-efficiency goals, sometimes deleting, supplementing, or otherwise changing various sections of the code. As of August 2012, the commercial code status is as follows:

- Most states and U.S. territories—38 out of 56—require ASHRAE 90.1-2007 / IECC 2009 equivalent or less.
- One state has stricter requirements.
- The rest have less stringent requirements.
- Ten states have no statewide code at all.

The maps above illustrate the commercial and residential energy code situation by state.

The U.S. Department of Energy

To see that the U.S. government is motivated and involved in improving energy standards in the built environment, one has only to look at the U.S. Department of Energy (DOE), whose energy goals are either driven by policy or law. As spelled out in the DOE's Annual Report for 2011, the agency's goals include cost effectively increasing energy efficiency in all buildings by 50 percent through more efficient building codes by 2015. DOE, through its Building Energy Codes Program (BECP), is working to enable 70 percent of states to adopt either the 2009 IECC, or ASHRAE Standard 90.1-2007, or better by 2015, and 90 percent of states to adopt these codes or better by 2017.

A CLOSER LOOK AT THE IECC 2012

Each revision of the IECC ratchets up energy performance requirements, and the 2012 revision is no exception. The major changes in the latest version of the code center on creating buildings that use 30 percent less energy than that required by the 2006 IECC edition—and targets for the 2015 code are 20 percent above the 2012 edition. Essentially, the code is heading toward a pronounced emphasis on building insulation and building envelope construction, with changes that affect building insulation values, fenestration, and air leakage.

Of prime importance to designers of masonry systems are the air barrier requirements. Air barriers systems are comprised of a number of materials which are assembled together to provide a complete barrier to air leakage through the building enclosure. They control the unintended movement of air into and out of a building enclosure—an important consideration in reducing energy costs as air leakage from a building can result in an increased use in energy costs of up to 30-40 percent in heating climates and 10-15 percent in cooling costs. Still, according to the Air Barrier Association of America, only Florida, Georgia, Maryland, Massachusetts, Minnesota, New York, and Rhode Island have air barriers in their codes.

The IECC 2012 version requires air barriers in both commercial and residential energy codes. Air barriers are now required in zones 4 – 8, with a continuous air barrier for the opaque building envelope required to comply with Sections 402.4.1.2.1, C402.4.1.2.2, or C402.4.1.2.3. The commercial code definition for an air barrier is the same as the residential code, with the following additional requirements:

- Materials – Air Permeance < 0.004 CFM/SF
- Assemblies – Air Permeance < 0.04 CFM/SF
- Building – Air Permeance < 0.4 CFM/SF
- Mandatory Testing

RELEVANT WEB SITES

For further information on energy codes, architects will find the following links helpful.

U.S. Dept. of Energy
- www.energycodes.gov

Resource Guide for Architects
- www.energycodes.gov/resource-center/resource-guides

Responsible Energy Code Alliance
- www.reca-codes.org

Online Code Advocacy & Environment Network
- energycodesocean.org

Building Codes Assistance Project
- bcap-energy.org/

Getting Started in Compliance

R-value requirements for building envelope components are determined by climate zone and are also impacted by building occupancy types, wall types, and the compliance path chosen.

Climate zone. It is first necessary to determine in what climate zone the project is located. Today there are eight climate zones for the entire U.S., a vast improvement over 1989 when there were 38. Tables in the code identify the correct climate zone for every U.S. county and territory.

Building type. Section 502 of the code defines residential and commercial building types. Residential buildings include detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as Group R-2, R-3, and R-4 buildings three stories or less in height above grade plane. The last phrase is sometimes called "light commercial." In the energy code world, it is considered residential, primarily because the equipment and appliances used and exterior walls more closely match those used or found in a single-family house than in an office building. Commercial buildings refer to all buildings not included in the definition of "residential buildings."

Wall type. While the IECC has reduced the number of climate zones, R-value tables have become more complex. The commercial table lists multiple variations within each envelope component, except for walls below grade, where only one type is listed. Three types of roofs, for example, four types of above-grade walls, and two types of floors make for many permutations.

Compliance path. There are three paths to compliance: prescriptive, performance, and whole building analysis. In the prescriptive path, building design and components need to meet R-values listed in the tables. The prescriptive path is stringent and offers little flexibility, and does not take into account much individualized proposed building information, other than categories given in the tables. The performance path uses established software to measure compliance, providing less stringent requirements and more flexibility to trade off requirements. In the performance path, the designer is allowed to "build" a description of the structure, including specific information on project location, wall and window areas, orientation, the location of thermal mass relative to the exterior insulation layer, etc. If the envisioned envelope fails to meet the code requirements, it becomes a matter of adjusting the various components. To be sure, the performance path is more complex than the prescriptive path, which architects have traditionally followed. But with software becoming easier to use and the design flexibility it offers in meeting more stringent code requirements, the performance path may be more readily embraced in coming years. While not explicitly referenced in the IECC, the ASHRAE standard on which the IECC is based, specifically names two computer programs that are designed for use by the average architect.

Another path to compliance uses the whole building analysis. While this method requires even more complex software, tradeoffs are allowed among envelope components, HVAC systems, and lighting. For example, the whole building path may allow lower R-value wall material in exchange for pre-heating incoming "fresh" air. While not widely used today, the whole building path may be the main method in future years as it analyzes a building's total energy use, rather than compliance of individual components.

Photo courtesy of Oldcastle® Architectural

Continuous insulation helped a Wisconsin apartment rehab project win a government grant.

IECC and Continuous Insulation

National model energy codes are advancing the way designers approach commercial and residential exterior walls, some by focusing on continuous insulation (CI) systems, which provide an uninterrupted insulation layer over an entire wall, not just in the wall cavities. The 2012 code has created more opportunities for the use of CI on both new residential and commercial walls. Any time the insulating layer is interrupted, the effective R-value of the insulation is reduced. Increases in thermal performance have resulted in CI figuring more and more in meeting both prescriptive requirements and overall building R-value targets.

Continuous insulation is not currently defined specifically in the ICC family of International Building Codes, but it is defined in ASHRAE 90.1 as:

Continuous insulation (c.i.): Insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope.

Because CI combines rigid insulating foam and structural sheathing into an easily fabricated product that provides uninterrupted exterior insulation, air sealing, and a solid nailing surface for exterior finishes, many find it helps meet new code requirements in less time and with less incremental cost.

▶ Continues at ce.architecturalrecord.com

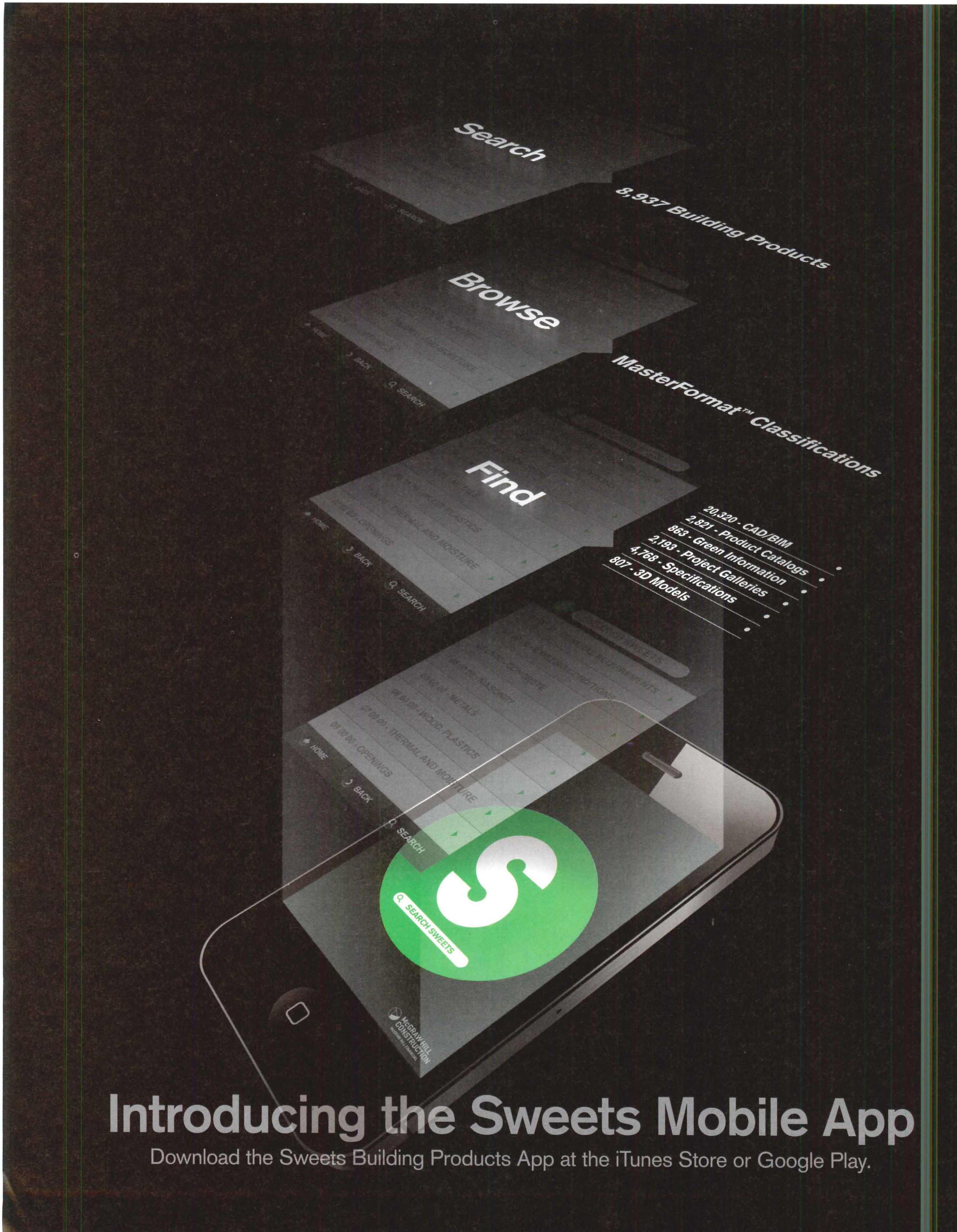


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Photo by Parallel Photography, courtesy of Dull Olson Weekes-IBI Group Architects Inc.

A wooden "bird's nest" created in the bent glulam wood trusses supports the library's roof structure, bringing the forest into the heart of Trillium Creek Primary School in West Linn, Oregon.

The Human Response to Wood

Measures of performance for building occupants

Sponsored by reThink Wood, American Wood Council, and US WoodWorks | *By Layne Evans*

The objectives of sustainable design are broader than just environmental effects, having come to embrace issues of human health and performance. As sedentary and service-related work becomes more prevalent in our society, the amount of time people spend inside buildings increases—the average North American spends 90 percent of his or her time indoors, another 5 percent in cars and only 5 percent outside. This not only makes the design of building interiors ever more important, but calls for the buildings themselves to provide a connection to nature that will only get harder to come by.

Many factors influence whether a building has a positive or negative impact on its occupants. This course highlights remarkable buildings where the use of wood as a structural or finish material has made a unique contribution, with a focus on indoor air quality, acoustics, physical health, and a natural, positive human response to wood that has always been intuitive, but is increasingly being proven by research and experience.

"This is one of the most overlooked aspects of sustainability. It's not about the points. It's about designing places where people want to be," says Marc L'Italien of EHDD, discussing the David and Lucile Packard Foundation Headquarters, one of the innovative projects featured in this course (see the online version of this article). Wood has been extensively researched and shown to be sustainable by measures that include renewability, embodied energy, air and water pollution, and carbon footprint. But it also performs well in areas that are essential to occupant comfort and performance, resulting in spaces where people feel good and do well over long periods of time.

INDOOR AIR QUALITY

For example, indoor air quality is a basic requirement for humans in any space. Wood itself is considered to be hypoallergenic; its smooth surfaces are easy to clean and prevent the buildup of particles that are common in soft finishes like carpet. Solid wood products, particularly flooring, are often specified in environments where the occupants are known to have allergies to dust or other particulates. Glues and adhesives, which were once based on formaldehyde, have been reformulated in many certified products and now contain urethane-type resins without measurable off-gassing.

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

EARN ONE GBCI CE HOUR FOR LEED CREDENTIAL MAINTENANCE

Learning Objectives

After reading this article, you should be able to:

1. Define the relationship between a building's sustainability and the health and performance of the building's occupants.
2. Explore how wood was used to enhance the experience of building occupants in projects from around the country.
3. Recognize how wood used as a structural and finish material contributes to key elements of occupant environment including indoor air quality, acoustic performance, and physical health.
4. Examine evidence confirming the positive human response to wood for its aesthetic qualities and connection to nature.

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

AIA/CES COURSE #K1306D
GBCI COURSE #0090009829

The use of wood products can also improve indoor air quality by moderating humidity. Acting like a sponge, the wood absorbs or releases moisture in order to maintain equilibrium with the adjacent air. This has the effect of raising humidity when the air is dry, and lowering it when the air is moist—the humidity equivalent of the thermal flywheel effect.

SOUND OF WOOD

For centuries, wood has been the material of choice for architects and designers intent on delivering the highest quality acoustic performance. From a violin to a concert hall, wood plays a role in delivering memorable acoustic experiences. Wood produces sound by direct striking and it amplifies or absorbs sound waves that originate from other bodies. For these reasons, wood is an ideal material for musical instruments and other acoustic applications, including architectural ones.

Wood is not as "acoustically lively" (translation: noisy) as other surfaces. Post-occupancy evaluations of buildings have revealed that poor acoustic performance is a common problem in buildings with large areas of hard, acoustically reflective surfaces. Ironically, such surfaces are frequently found in buildings designed to be sustainable, where the use of absorbent materials is minimized due to indoor air quality concerns.

In large buildings with hundreds or even thousands of occupants—for example, apartment buildings, condominiums, hotels or dormitories—every acoustic detail has a positive or negative effect on the quality of daily life. Wood-frame construction is efficient in buildings where sound insulation is required. In particular, wood doesn't present the impact noise transmission issues commonly associated with concrete construction.

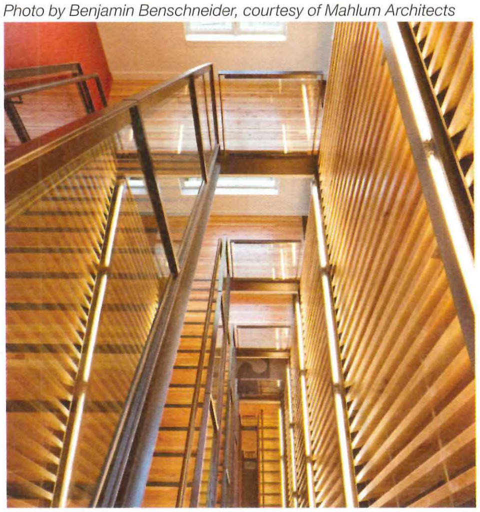
University of Washington

In 2012, the University of Washington in Seattle added nearly 1,700 student housing beds by constructing three residential halls and two apartment buildings, all of which include five stories of wood-frame construction over two stories of concrete. Designed by Mahlum Architects and winner of a recent WoodWorks Wood Design Award, the 668,800-square-foot project is the first of four phases planned to add much-needed student housing to the urban campus.

"Acoustics are important for any multifamily housing project, but especially for student housing," says Anne Schopf, FAIA, a design partner with Mahlum. "Mitigation measures must be weighed against budget, which is why we brought in experts from Seattle-based SSA Acoustics for the design of this project."

Because they knew single stud walls would not provide adequate performance, SSA recommended staggered stud walls between residential units. Since there is no rigid connection between the gypsum board on each side (except at the plate), a

Photo by Benjamin Benschneider, courtesy of Mahlum Architects



One of the many innovative uses of wood on the exterior and interior of new student housing at the University of Washington in Seattle.

staggered stud wall performs better than a single stud wall. Double stud walls perform better than a staggered stud design because plates are separated by an air space, so they used double stud walls between residential units and common spaces (e.g., lounges, staircases, and elevators) and service areas.

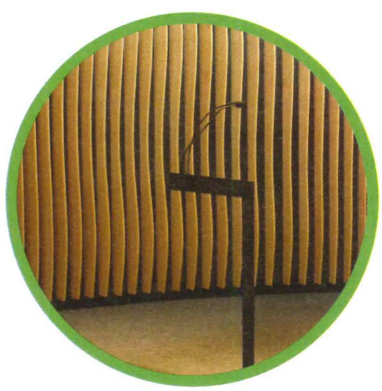
In the floor/ceiling assembly, they paid careful attention to the installation of resilient channels, which are often one of the main causes of failed floor/ceiling assemblies from an acoustical standpoint. In fact, there is a difference of 8 to 10 IIC and STC points between assemblies with resilient channels versus those without. Channel installation has fairly straightforward requirements; for example, screws for the gypsum board should never touch the framing behind the resilient channel.

"We used enhanced acoustical walls between rooms in the same unit," says Mohamed Ait Allaoua, managing partner of SSA Acoustics. "Although not a typical approach in multifamily buildings, this is important in student housing projects where people within a relatively small space have different needs—if one student wants to watch TV in the living room, for example, while another is studying in the bedroom."

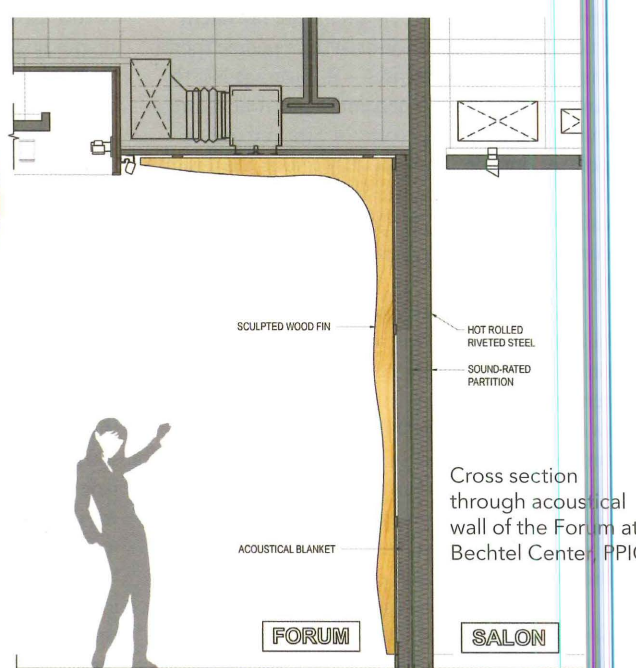
Bechtel Conference Center at the Public Policy Institute of California (PPIC)

Architect Marcy Wong articulates the connection between acoustics and sustainability in the Bechtel Conference Center at the Public Policy Institute of California (PPIC) in San Francisco this way: "In addition to the usual sustainable advantages of wood—renewability, nontoxic, carbon storing—this project had an additional sustainable aspect, that being acoustics. Sustainability is more than being responsible about the impact of a project on the earth's resources and climate, but also on the quality of environment for the users. The client's programmatic brief for this conference center space is best met by a round room, which happens to be the shape most difficult to acoustically resolve."

One of the foremost policy organizations in the state, the PPIC is dedicated to impartial and nonpartisan research to inform public policy decisions; it was important that their new conference space communicate these ideals of openness and calm discussion, as well as presenting a forward-thinking image appropriate for an institution focused on issues of the future. To meet the acoustical challenge of the non-hierarchical circular plan, architects Wong, Donn Logan and Tai-Ran Tseng collaborated with acoustical engineer David Schwind of Charles M. Salter



Sculptural wall fins fabricated from wood elements create an undulating 3D form while dispersing sound waves to enhance acoustic performance in the circular Bechtel Conference Center at the Public Policy Institute of California.



Cross section through acoustical wall of the Forum at Bechtel Center, PPIC

Inset photo by Billy Hustace; illustration by Justin Tang; both courtesy of Marcy Wong Donn Logan Architects, Inc.

Photo by Sharon Risedorph, courtesy of Marcy Wong Donn Logan Architects, Inc.

The seating riser central to the Pearson Theater at Meyer Sound Laboratories rests on a 1-inch subfloor of 12-ply birch. The design of the riser and floor are among many acoustic innovations.

Associates to design a series of sculptural wall fins. Fabricated from wood elements, the fins disperse sound waves for enhanced acoustical distribution while creating the 3D undulating form that defines the architecture.

Wood best served this purpose for two basic reasons, says Wong: the molecular quality of the wood itself, and the ease with which complex geometric forms can be created.

The excellent machinability and edge appearance of the wood elements also proved essential to the project's feasibility and overall aesthetic impact. Virtually each of the CNC milled wood fins is unique in shape to augment the scattering of sound waves that would otherwise be unduly focused in the round room.

Pearson Theater at Meyer Sound Laboratories

In some projects, acoustical performance is not only a contributor to the building's mission, it is at the heart of its purpose. The Pearson Theater at Meyer Sound Laboratories in Berkeley, California, for example, was designed to showcase the products of a renowned company that develops and manufactures state-of-the-art sound system and integrative technologies including hardware, software, and audio analysis tools. Clients range from opera houses and concert halls, to London and Broadway productions, to rock and roll bands around the world. The theater, also designed by Marcy Wong Donn Logan Architects, needed to deliver the clearest sense possible of how the equipment would perform in a client's own specific context. Thus the design had to feature extreme flexibility in order to configure it for different sound systems in all parts of the theater, which is also used for other purposes including seminars, in-house training, and film screenings.

The design team, which benefited from the considerable acoustical expertise and resources of Meyer Sound, faced the fundamental issue of sound isolation, particularly from truck traffic on the busy street adjacent to the theater's wall. The solution was the creation of a floating room-within-a-room where the interior structure has no contact with the outer shell.

Physically, the central feature of the room is the seating riser, which rests on a 1-inch subfloor of 12-ply birch (the same wood used to make the company's loudspeaker cabinets). Areas of the floor not covered by the riser are topped with a tough 1-inch-thick floor of end-grain Douglas-fir, bonded to the birch with fiberglass and urethane. The seating riser is constructed from wood rather than concrete, allowing it to couple with the wood floor and transmit structure-borne low frequencies to the seats from two stacks of four studio subwoofers positioned in the room's front corners. The result is a visceral experience of low-end sound achieved by transmitting bass through both the riser and the air.

To allow for meticulous acoustical adjustments throughout construction, a system of Douglas-fir slats and exposed black sound absorption insulation creates a wall pattern which can be manipulated to satisfy the acoustician's objectives. The theater also features an innovative sub-floor made by sandwiching sound absorption sheeting manufactured from recycled tire rubber between layers of plywood. In addition to providing excellent isolation from external noise, the system helps low-frequency sound couple into the wooden floor and bleacher structure so sounds can be felt as well as heard.

According to the client's artistic/technical director, "The completed theater is even more successful than we dreamed possible. The facility has drawn rave reviews from visiting artists, potential and current clients, and company staff for the aesthetic, acoustical, and technical experience."

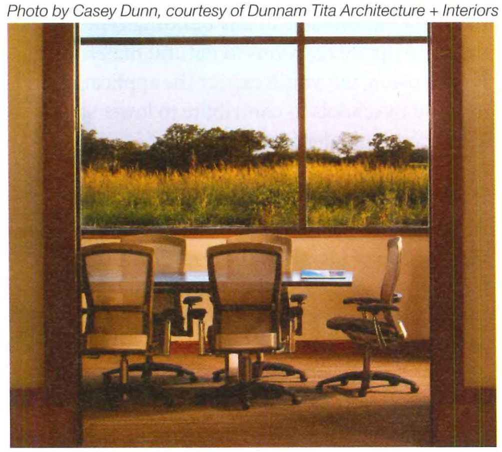
HEALTH IN NATURE

The definition of sustainable building continues to deepen as we understand more about the impact of buildings on the environment and on people. One of the most promising areas of focus is "evidence-based design," which involves using information gained from the rigorous analysis of past buildings to build better new ones. Healthcare architects have been at the forefront of this effort, exploring the physiological benefits of good design on patient recovery and the well-being of staff and visitors. Among the results, an increasing number of healthcare facilities are making use of natural daylight, views of nature, and exposed wood to create a warm, natural aesthetic that supports their healing objectives. These same techniques are also being used in schools and offices to improve performance, productivity, and occupant well-being.

Humans have a natural affinity for nature. Being in a natural environment—a forest, park or simply a garden—can make us feel more relaxed. The term "biophilia' has been coined to refer to this phenomenon. Although most of us understand the connection intuitively, the stress-reducing effects of outdoor nature are also well documented from a scientific perspective. Exposure to nature has been shown to lower blood pressure, heart rate, and aggression. Nature also increases the ability to focus attention and perform concentration and creative tasks. One landmark study of hospital patients recovering from abdominal surgery found that patients in rooms with a view to nature had shorter post-operative hospital stays and required fewer analgesics than patients with a view of another building from their window.[1]

But what about the "average North American" spending 90 percent of the time indoors? In addition to views of nature itself, there is growing evidence that a positive relationship exists between humans and natural materials.

Photo by Casey Dunn, courtesy of Dunnam Tita Architecture + Interiors



Research is confirming that interiors with natural materials and views, exemplified here in the Greater Texas Foundation in Bryan, Texas, can lower stress and promote relaxation.

For example, one study at the University of British Columbia and FPInnovations demonstrated that the presence of visual wood surfaces in a room lowered sympathetic nervous system (SNS) activation. The SNS is responsible for physiological stress responses in humans.

In the study, four office environments were created to examine the effects of natural materials on autonomic nervous system responses. The effects of both plants and wood materials were studied on a sample of 119 university students, in four simulated office spaces, identical except for either wood finishes (birch veneer) or white finishes, and the placement of either plants or non-natural objects. Students were assigned to one of the four conditions, but were told only that they were participating in an office performance task.

Heart rate (EKG) and skin conductivity (GSR) were monitored throughout the experiment to measure SNS response. Moderate to high stress activation was monitored through periods of waiting alone for instructions, performing math tests, and recovery.

Stress as measured by SNS activation was lower in the wood room in all periods of the study. Temporary spikes in skin conductivity (SCRs, associated with stressful thoughts or stimuli) were also measured. Once again, the subjects in the wood room had statistically fewer of these responses, interpreted as fewer stressful thoughts.

SNS activation in the body is the familiar "fight or flight" preparation of the body to deal with perceived threats. It has numerous physical effects, for example increased blood pressure and heart rate, and inhibited digestion and repair functions in the body. But when these stress reactions are prolonged, both psychological and physical damage can occur.

According to study author David Fell, the results of the office study could apply to any interior environment. "The stress-reducing effects we found for wood in office environments are in theory transferable to any building type as these are innate reactions to natural materials. By extension, we would expect the application of wood in schools to contribute to lower stress activation in students and teachers."

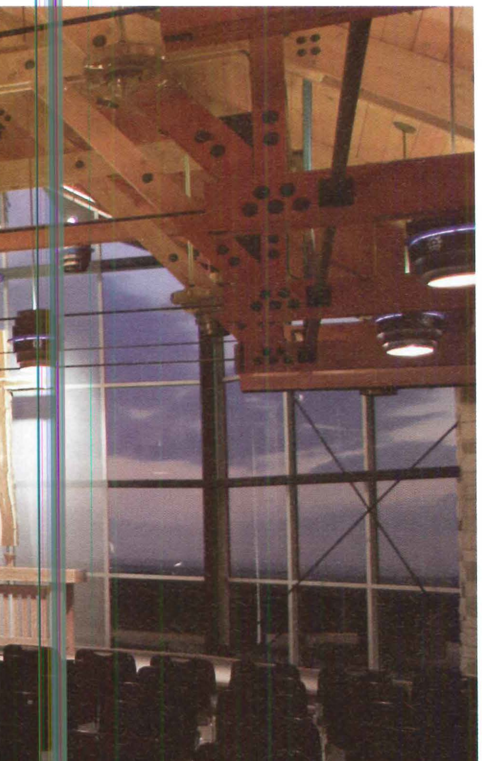
HUMANS LOVE WOOD

Although not the most scientific of statements, the reaction of people to the projects featured in this course can only lead to the conclusion that "humans love wood." Acoustic performance can be carefully measured and calibrated, and so can blood pressure and skin conductance. But the deep positive connection between humans and wood materials is just as powerful, though harder to measure. Reasons given by clients and architects for choosing wood often include references to beauty and warmth, connection to both the local landscape and larger nature,

Photo by Michael Ortega Architectural Photography, courtesy of Roesler Associates, Inc./Architects

Another view of the "forest" in the center of the library at Trillium Creek Primary School, connecting students to the natural Douglas-fir forest environment around them in West Linn, Oregon.

Photo by Parallel Photography, courtesy of Dull Olson Weekes-IBI Group Architects Inc.



Different species of wood were used as structural and interior elements of the Carby Chapel, including the custom designed cross, altar, lectern, baptismal font, and double entry doors made of cedar milled from trees grown on the site.

"upscale" connotations, and the expression of an organization's core values and mission.

For example, there are many reasons why a school district might opt for wood construction—including lower cost, speed of construction, sustainability, and the flexibility to address changing needs. Schools get a lot of abuse, so durability is also important. And good acoustics, as discussed, are an essential condition for student learning.

But as we have seen, there is a deeper, if less measurable, reason why wood is chosen as a central design element for many schools. Architects, not to mention students, teachers, and parents, often believe that exposed wood enhances learning by providing an inviting and enriching environment—a belief that is not unique to North America.

In Japan, for example, officials at the Ministry of Education believe wood has numerous qualities that promote the learning process. In a three-year study of 700 schools, Japanese researchers studied how the educational environment is shaped by the type of materials used for school buildings. Data found reduced flu outbreaks in wood-framed schools compared to concrete facilities. A second Japanese study surveyed teachers and students to measure their impression of wood versus reinforced concrete—and both groups had similar, favorable impressions of wood schools. Results also showed that teachers and students in wood buildings felt less fatigue, and that students perceived schools with larger areas of wooden interiors to be brighter than reinforced concrete structures.[2]

Another study, this time in Austria, found that interior wood use in classrooms reduced pupils' stress levels, as indicated by criteria that included heart rate and perceived stress from interaction with teachers.[3]

Trillium Creek Primary School

Closer to home, Dull Olson Weekes-IBI Group Architects Inc. chose glued laminated timber (glulam) for the 68,000-square-foot Trillium Creek Primary School in Oregon, noting that wood is the only major building material that comes from a renewable resource. According to Karina Ruiz, DOWA-IBI Group associate principal and project manager for the school, "The driving influence behind our decision to celebrate the wood structure was our desire to connect students and building occupants directly to their site environment."

The school is nestled in a heavily forested wetland site, surrounded by mature Douglas-fir trees. "The bent glulam wood trusses used to support the library roof structure allowed us the opportunity to replicate this forest experience in the heart of the school," explains Ruiz. "We were able to create a wooden 'bird's nest' in the center tree that offers the students a personalized learning environment where they can overlook the rest of the library." Warm, natural wood finishes were used throughout the school to help create varied niches and cubbies in the building where students can be "captains of their own learning." The wealth of natural wood finishes also provides a warm canvas upon which student work can be displayed and helps further connect the building to the surrounding natural, forested environment.

The exposed wood had to meet other stringent requirements beyond its beauty and warmth. Finishes had to be easy to clean to reduce reliance on regular and intensive maintenance, and low-VOC finishes helped to provide a healthy indoor environment.

One student recently commented that the library embodies sustainability because "there is so much nature."

Carby Chapel Center

The natural environment was consciously integrated into the design of the Carby Chapel Center near Houston, Texas, through the use of different wood species and a blend of native limestone. Designed and constructed by Roesler Associates, Inc./Architects, it is used for adult retreats and conferences as well as summer camps for children. It functions as a multipurpose chapel and conference center, and also features classrooms and spaces for other camp programs.

Wood used in the chapel was stained and sealed to enhance its natural beauty and provide contrast and visual interest. Custom wood trusses, interior woodwork and trim are Douglas-fir. The exposed structural roof deck is Southern Yellow Pine. The custom designed and built cross, altar, lectern, baptismal font, stair rail, banister, and double entry doors were all made of cedar milled from trees grown on the site.

According to Matt Roesler, AIA, wood was chosen for the interior and exterior because of its aesthetic value, although its acoustic value and natural sound absorption were also important. The orientation of the building and use of extensive daylighting enhance the natural beauty of interior finishes and provide spectacular natural displays at dawn and dusk. "Musicians in string quartets performing at weddings have said the natural acoustics provided by the wood finishes as well as the baffle effect of the open wood trusses are perfect for wood stringed instruments."

See endnotes in the online version of this article.

Continues at ce.architecturalrecord.com

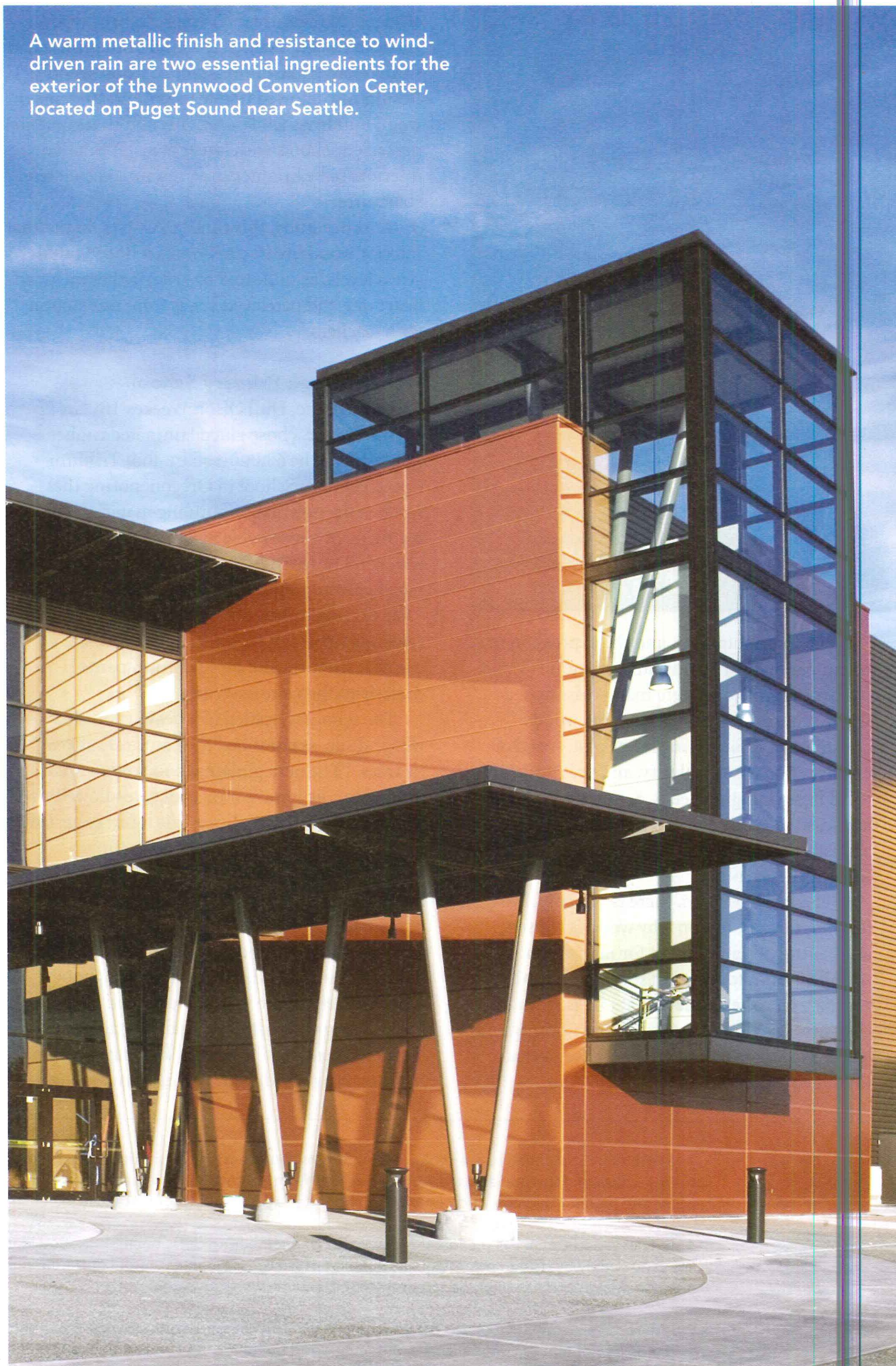
Barrier vs. Rainscreen Exteriors

Choosing a design approach to create a rain-proof façade

Sponsored by Laminators Incorporated | *By Clayton DeKorne*

A building's exterior façade is, as the name implies, its face, and great design effort goes into the arrangement, color, and texture of this outermost skin. In large part, the exterior layer defines what the building will be, but its function goes way beyond aesthetics. "The façade is of paramount importance in terms of building performance," says Dr. Mikkel Kragh, an associate at Arup and chairman of the Society of Façade Engineering. "The façade is the number one filter between the climate outside and the conditioned space inside... and its performance relies on appropriate specification, design, and delivery of a multitude of components and systems."

In the complex world of integrated building design, the term façade has taken on a larger role than just the front-facing side of a building. More apt these days is the term "skin." For façade designers, this includes the whole wall assembly—the entire envelope that separates indoors from outdoors. This article zeroes in on one critical aspect of the façade's performance—moisture control—looking primarily at composite architectural panels. Composite metal panel systems can provide an effective "first defense" against wind-driven rain—the most unruly and damaging class of moisture that buildings must repel—provided the system is appropriately detailed and is installed precisely as detailed.



A warm metallic finish and resistance to wind-driven rain are two essential ingredients for the exterior of the Lynnwood Convention Center, located on Puget Sound near Seattle.

Photo courtesy of Laminators Inc.

THE DYNAMICS OF RAIN

Over the life span of a building, no other force acting on the building proves more insidious, more destructive over time, than wind-driven rain. It comes at a building with erratic force. It is predictable but irregular, and this variability lowers the tolerance for error.

Rain does not simply fall straight down. If it did, and all one had to contend with was gravity to keep water out of walls, creating a moisture-resistant exterior would be much simpler. Not fool-proof exactly; there are plenty of errors with flashing and weep systems to be made that can always make gravity-driven water a concern on any building project. But from a design perspective, drip moldings, through-flashings, and weep channels are straightforward, easily managed solutions.

Similarly, capillary action—the movement of water caused by the surface tension between water drops—can be solved relatively easily with good design. The surface tension of water allows droplets to move together, or cohere. In porous materials, such as masonry, capillarity is usually the dominant force that causes wetting. Commonly known as "wicking," water moves though masonry from one tiny pore to the next. The result is that the masonry stores this moisture, and, if enough mass is used, will have the capacity to hold enough water to prevent leaks through the wall. When the drying potential reverses (as happens when the sun comes out and warms the side of the building), the flow of water vapor reverses, explains Dr. John Straube of Building Science Corp. Masonry exteriors can be relatively forgiving, provided the mass is appropriate to the expected wetting conditions.

However, metal or glass panels are another matter altogether. Metal and glass don't absorb any water, but capillarity remains a concern at joints, where very small crevices create channels that can move large amounts of water against gravity. The droplets, in an effort to cohere, will literally push themselves upward through crevices in the cladding, and if they move far enough along a crevice, water can penetrate the interior of the structure.

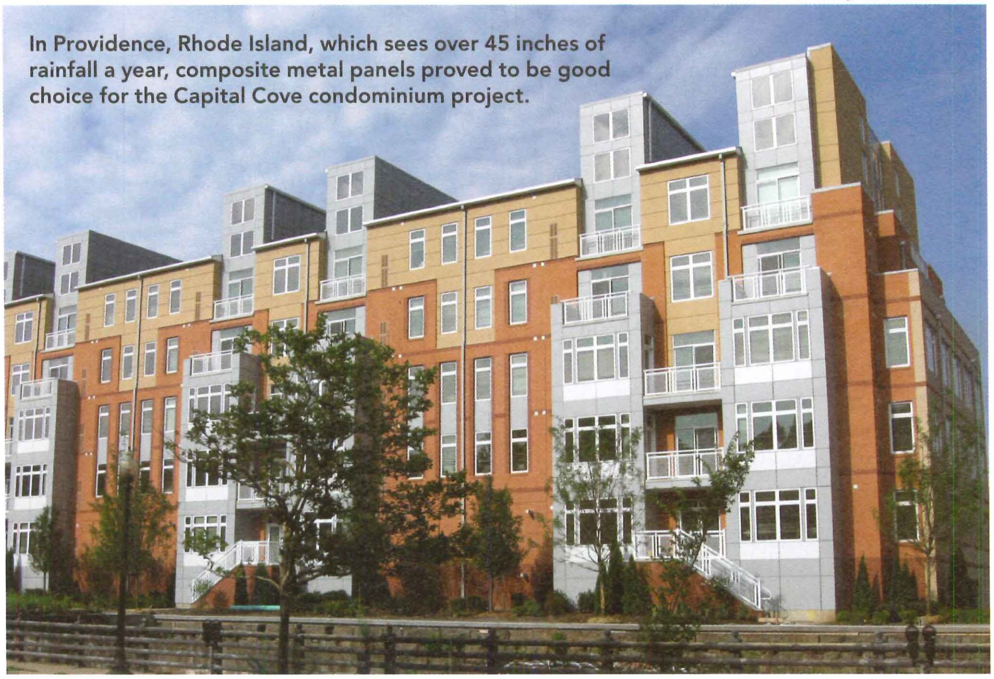
One effective solution, that is often employed in some "dry seal" panel systems, is to create a capillary trap in the cladding joint—a gap that's large enough to break the surface tension so the water droplets no longer cohere. This gap needs to be drained so that when the surface tension is broken, the free-flowing water can drain away.

A capillary trap, however, is ineffective when the penetrating water is driven by air pressures that forcibly push and pull water and air through crevices in the façade. Whenever you have a difference in pressure—known as a pressure gradient—across a surface, you have an engine that forcibly moves liquid, be it air or water (or both, in the case of a rain storm). This force always moves from a region of higher pressure to a region of lower pressure.

Pressure gradients occur frequently and come from many sources. Wind pressure is the dominant source. It is considered a dynamic pressure, because it is constantly changing in intensity and direction as it flows around objects. But there are also static pressures that can have an effect on air and moisture flow. These include:

- **Mechanical pressure.** HVAC equipment inside the building can create positive and negative air pressures that act against the walls, pushing and pulling air through crevices that can draw water inwards or expel it to the exterior.
- **Stack pressure.** The pressure flow caused by the buoyancy of heated air turns a tall building into a chimney. Air flows from the bottom to the top. At the top, positive pressure pushes air out of the lid. Near the bottom of the building, negative pressure pulls outdoor air inside. This same principle can occur in a narrow chamber, like the gap between a cladding material and inner wall assembly. Imagine a 1-inch gap behind a veneer cladding. If this gap rises unobstructed for the height of a tall building, stack effect would create a determined flow of air. It would have a powerful drying effect, but might also tend to pull rain and moist air in behind the cladding down low, and push it out at the top.

Photo courtesy of Laminators Inc.



In Providence, Rhode Island, which sees over 45 inches of rainfall a year, composite metal panels proved to be good choice for the Capital Cove condominium project.

Mechanical and stack pressures occur at fairly consistent and sustained levels, with only subtle variability in pressure. While these "static pressures" can move a lot of air through a building envelope when there are enough air leaks, the air pressures are relatively steady and can be effectively managed. Using impervious materials carefully installed to maintain air seals between layers of a wall assembly, the effect of static pressures on building airflow can be reduced to tolerable levels. Much more difficult to manage are the cyclic pressures induced by the wind.

Wind pressure on a large building exerts pressure that flows in two directions. When wind is blowing—pushing at a building assembly—it is considered a positive pressure; when wind draws air away from an assembly, it is referred to as a negative pressure.

Now add water. In a rain storm, water is both pushed and pulled by the wind. On a large building, some areas are more vulnerable than others, due to the prevailing pressures created by air flowing around the geometry of the building: As wind flows around corners, it accelerates, and eddies of air create a high degree of pressure fluctuation. Around the sides and top edges of the building, the air is moving faster, driving rain at a greater velocity against these parts of the wall. At the center of the building, the pressure will be fairly constant, resulting in a "cushion" of high-pressure air. This pressure will be positive (pushing against the building) on the windward side, and negative (drawing air away from the building) on the leeward side. Not as much rain reaches the building in this "dead spot" near the center as compared to the top and corners.

On a tall building, 20 to 50 percent more rain wets the building at the top and corners than at the center area. However, some variability

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Learning Objectives

After reading this article, you should be able to:

1. Differentiate between a rainscreen and a barrier façade.
2. Choose a panel installation system appropriate for the application, budget, and local climate.
3. Describe the benefits of using a composite metal panel system.
4. Explain how pressure equalization reduces water penetration.

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DESIGNING A GREENER BUILDING

While the all-glass façade may garner the praises of architectural critics and urban planners hoping for the next architectural splash on the city's skyline, building performance can suffer. When glazing is overused, the thermal characteristics of glass, which is highly conductive and offers almost no resistance to heat flow, often result in a poor-performing building envelope. "From an energy standpoint, I have my doubts whether a building with floor-to-ceiling glazing on every floor can be a green building," says building scientist John Straube. "Numerous studies have shown there are no daylighting or energy benefits with exteriors that have very high window-to-wall ratios."

A truly green building reduces energy loads while effectively managing exterior moisture, the bulk of which comes from wind-driven rain. Both energy and daylight performance benefit from a ratio of window-to-wall area between 25 and 40 percent, explains Straube. From a performance standpoint, a façade that combines opaque claddings with glazing will result in a greener building. Today's design challenge is to make an architectural splash without resorting to simple aesthetics that compromise performance.

in wetting patterns will occur on multistory buildings. The taller and narrower the building, the more intense the potential for wetting will be. The more corners, bump-outs, parapets, and other differentiations in the building shape, the greater the chances of creating negative pressure flows that are capable of drawing water laterally and even upward through crevices in the façade.

The type of cladding material used on the building has a big impact as well. Porous masonry exteriors will absorb and hold a high percentage of the water that the building sees, and will release this moisture slowly over time by diffusion (the movement of moisture vapor through a building material by evaporation). On the other hand, with a non-porous cladding such as a glass curtain wall or composite metal panel system, most of the water striking the building will run down the face, and the chances for the wind to drive this water into joints will increase. This suggests that the joints in non-porous claddings will require extra attention, especially near building corners and near the top of the building. Detailing in these wetting areas will be critical to the building's ability to manage wind-driven rain. In most real-world cases, some degree of leakage is inevitable, and even the best, and most carefully installed cladding systems should have some capacity to manage water that penetrates the exterior skin.

GENERAL APPROACHES TO KEEPING WATER OUT

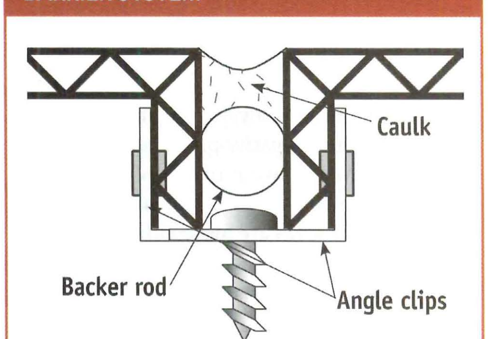
There are several approaches to keeping wind-driven rain out of walls:

- **Barrier systems** attempt to stop all water at a single plane. Typically this plane is the outermost layer of the building envelope—the cladding, sometimes referred to as the outer "leaf." To stop the water at a single plane, the joints between cladding members must be resistant to the penetration of driven rain over time. Barrier systems are sometimes referred to as "perfect systems" or "perfect walls" or "zero-tolerance wall systems" because the exterior layer must be a perfectly sealed plane. There is no forgiveness in the system, and if that plane leaks, there is typically no accommodation for the water that gets past it. These systems are also sometimes referred to as "face seal" systems. However, the term "face seal" should refer to the seal on the outer surface of a cladding joint. A face seal contrasts with a "drained seal," "a concealed seal" or a "two-stage seal," all of which refer to more durable methods of sealing a barrier system.
- **Drainable assemblies**, often referred to as a "drained cavity wall" or "drained/back-ventilated (D/BV)" system, take into account that some moisture will be driven past the outer skin and allow this moisture to drain harmlessly away. The system consists of two layers separated by an air space. The outer layer is the cladding that sheds the majority of rain water. The inner layer is usually the exterior surface of the structure, and this surface must be protected by a weather barrier to shed any water that does get past the cladding. The air space between the two layers serves as a place for water to drain down to the appropriate base flashings. It also allows air to circulate behind the cladding. This "back ventilation" helps dry the wall by promoting evaporation. Note that a D/BV wall is sometimes called a "rainscreen," particularly in residential applications. However, it's important to be precise with the term "rainscreen." Here the use of "rainscreen" is reserved for a pressure-equalized rainscreen (PER).
- **Pressure-equalized rainscreens** don't rely on sealants at joints to keep water out. Instead the wall is designed with a series of pressurized compartments. These compartments usually consist of a drainage plane that is vented at the top and bottom and closed on the sides. When wind blows against the wall, the compartments fill with air. But because the sides are closed, and the airflow through the vents is limited, the compartments can only fill up until the air pressure matches the pressure of the incoming wind. At this point, the air inside the compartment essentially pushes back. When the wind subsides, the pressurized air in the compartments will flow out the vent until the pressure inside the compartment again matches the outside pressure. As long as the pressure on each side of the cladding is the same, there is no driving force for air and water to penetrate the cladding.

Which approach is best for any given project largely depends on the type of materials chosen for the façade. In addition, this critical design decision will also be affected by other factors, not least of which are the project budget and the climate. To understand all the issues at stake, let's explore each system further.

Illustration courtesy of Laminators Inc.

BARRIER SYSTEM



In a barrier system, caulk and backer rod form the seal between two composite metal panels.

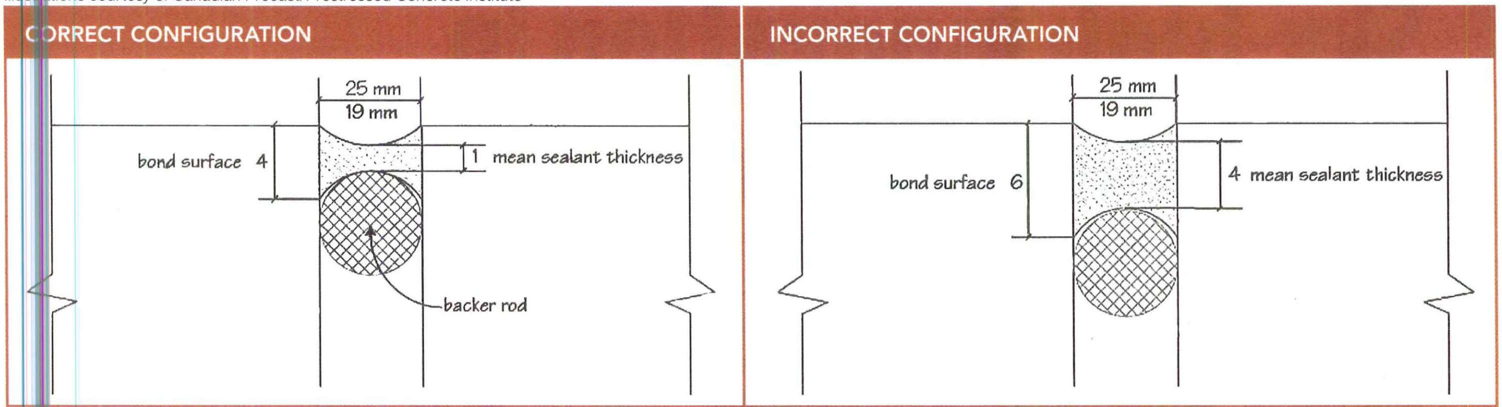
BARRIER SYSTEMS

In order for a barrier system to work, it's critical that the cladding material be impervious to moisture. If the cladding absorbs moisture, that moisture must be managed. A single-plane approach will not be feasible.

In addition, the joints between cladding members must be sealed, and that seal must be maintained over time. Any joint exposed to the elements will be more likely to shrink and crack over time, primarily due to the damaging effects of ultraviolet radiation from sunlight.

Installation is critical. Face seals, in particular, must be executed with exacting care. Caulk beads need to conform closely to the profile, as depicted in the illustration on the following page. Just using backer rod is not

Illustrations courtesy of Canadian Precast/Prestressed Concrete Institute



Left: The correct shape for caulk is hour glass with a ratio of bond surface to mean thickness of about 4:1.
Right: If the backer rod is placed too deep, the caulk will be too thick, as shown in this illustration of incorrect caulk configuration.

enough. A misapplication as simple as too thick a bead of caulk, as shown in the illustration above, can result in premature failure of the seal. Also, to ensure a strong bond between the sealant and the cladding materials, surfaces and edges should be clean, dry, and free of all contaminants such as protective coatings, oils, grease, soap or detergent films, water, and dust. This doesn't happen on jobsites unless the installer takes great care.

Thermal Expansion

In regions with greater variability in climate conditions (cold or extremely cold winters and hot summers), the façade will see much greater variability in thermal movement, and sealants will tend to fail more quickly. When the temperature is cold, all of the materials on the façade contract and pull away from each other. When they heat up, they expand. With all façade materials, but especially metal panels that readily conduct heat, dimensions change as the material expands and contracts with fluctuations in temperature. This thermal movement must be taken into consideration.

The amount of thermal movement needs to be calculated at the design phase, and the panel dimensions sized to limit the cumulative movement. Otherwise, when panels expand, they will push into each other, causing them to buckle and deform. As panels contract, the joints between panels will open up beyond what the sealant can tolerate.

Thermal expansion is one factor that must be clearly understood when selecting an approach to keep water out of a wall system. In a harsh climate—either very cold or very wet—a barrier system may not be appropriate, regardless of the material. In less severe climates, thermal expansion still needs to be understood and carefully calculated when using metal panel systems. But as long as it is addressed at the design phase, it is completely manageable.

Ultraviolet Radiation

Even when panels are sized correctly to eliminate extreme dimensional changes that would cause these immediate failures, the panels still move back and forth. That's why sealants are flexible. But over time, the sealant dries out and hardens. Ultraviolet light breaks down the sealant chemicals, reducing its ability to absorb thermal movement, causing the sealant to crack and the bond to fail. All caulks, gaskets, and foam tapes are vulnerable to this eventual failure. Some last longer than others but eventually, if the sealant is directly exposed to sunlight, it will deteriorate.

Concealed Joints

With many manufactured systems, the joints are not simple face seals. With many composite metal panel systems, for example, many of the caulk joints are protected from direct exposure to the sun, making the system much more durable over time.

Photo courtesy of Laminators Inc.

As a government project, the Fort Knox Human Resource Center had to work within a limited budget and meet a minimum LEED Silver design certification.

Typically, panels fit into extrusions or are covered by trim molding. This protects the sealant from exposure to ultraviolet light. This is a key feature. Because the metal panel itself is impervious to moisture, the joint is the only site for water entry. And because this joint is less vulnerable to installation error and the sealants are protected, a metal panel exterior can be a feasible barrier system.

Indeed, it is possible that a barrier system may be the most appropriate option for a given project. There is a widespread belief that barrier systems are inferior in all cases. While it may be less forgiving to installation errors and climate extremes, in many situations a barrier system is the best option. The crucial elements are the cladding material and the seal between cladding members. Manufactured systems, in which the joints between cladding members are better controlled, have the best chances of performing well over time.

Cost effectiveness is a primary reason for choosing a barrier approach. Since a single-plane barrier approach does not require installation of a separate weather barrier or detailing required to create an air space between the cladding and the structure, a barrier system is typically less costly to install. Assuming the project location is not in a severely cold or wet climate, and an impermeable material, such as a composite metal panel system is used, a barrier system may be a very practical solution.

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Continuous Insulation Systems for Exterior Walls

High performance through sprayed-in-place foam insulation

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

Continuous spray foam insulation is suitable for use in commercial buildings to create superior thermal performance, air sealing, and moisture control.

Photo courtesy of ICYNENE, Inc.

Techniques for insulating exterior walls in commercial buildings have received considerable attention in recent years for many good reasons. Energy codes are requiring higher thermal performance values in walls. Green building standards and energy efficiency programs seek to exceed the minimums called for in the codes. Building owners are seeking to control energy consumption and associated expenses while still controlling construction costs. All of this has architects and other building professionals seeking solutions for proven and effective exterior wall assemblies that provide the thermal performance needed. Among the emergent and popular choices, spray foam insulation is being used to address a number of thermal performance needs in different types of wall assemblies.

SPRAY FOAM INSULATION OVERVIEW

When selecting building insulation, architects have a broad range of products to choose from. Foam insulation products, whether used in board products or sprayed in place, have typically and rather consistently been shown to provide equal or greater insulation performance per inch than other products such as batt or loose fill insulation. While foam board products are common and widely used in wall and roof assemblies, foam that is sprayed in place in the field is becoming more widespread for a variety of performance and construction ease reasons. In particular, wall assemblies in commercial buildings that use spray foam insulation have evolved to be a very attractive and pervasive technology with greater flexibility in regard to both design and installation.

Right up front, it should be noted that unlike traditional insulation products, spray foam insulation is mixed and formed in the field. Most of these systems require two distinct ingredients that are combined on site using specific equipment associated with a manufactured foam product. Typically, equipment is mounted in a trailer or truck with flexible hoses carrying the needed ingredients from there to a handheld gun that both mixes and sprays the combined product onto the surfaces being insulated. As soon as the two parts are mixed, a chemical reaction begins causing the liquid mixture to foam, expand, and eventually harden. This customized on-site

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Learning Objectives

After reading this article, you should be able to:

1. Identify the characteristics of high-performance spray foam continuously insulated exterior wall assemblies.
2. Investigate the numerous opportunities to use spray foam insulation to achieve thermal performance goals.
3. Assess the ability of spray foam insulation to act as an effective air sealing barrier that prevents unwanted air infiltration.
4. Recognize the ways that thermal bridging can be thwarted in wall assemblies using continuous spray foam insulation.

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Photos courtesy of ICYNENE, Inc.

Spray foam insulation is mixed on site and applied using spray gun equipment appropriate to a particular manufacturer.

application means that the sprayed insulation readily conforms to the shape and geometry of the surfaces it is being applied to while its chemical make-up provides the needed properties for it to adhere to those surfaces.

Because of this full custom on-site application, spray foam insulation is generally found to be effective at boosting the energy performance of wall assemblies in multiple ways. First, it fills completely the spaces being insulated. In typical stud wall cavities, that means that irregularities from framing can be filled around rather than restricting or compromising the amount of insulation installed. This complete filling is thus unhindered by unusual conditions that can be a significant challenge for other insulation products that are pre-cut or pre-formed in shapes that differ from field conditions. Second, spray foam has been shown to hold its shape over time such that sagging, settling, and other potential incomplete insulation installations that cause gaps or voids can be readily overcome with spray foam insulation. Third, it significantly reduces air leakage, thus reducing unwanted air infiltration. In fact, spray foam insulation has been used in many buildings specifically to seal openings, penetrations, and around doors and windows. Because of this air sealing quality, it can also be an effective barrier that minimizes airborne moisture transfer. Keeping unwanted moisture out of wall assemblies has long been a goal of successful design, thus these properties are significant indeed. Overall, the use of spray foam insulation, then, goes beyond just R-values and truly addresses a comprehensive way to optimize energy efficiency.

Within the industry, there are two common types of spray foam insulation that are in use today. We will look at each one in detail.

Low-Density Open Cell Insulation

With a common density of about 1/2 pound per cubic foot, open cell spray foam insulation is relatively light in weight and comes with an R-value of approximately 3.5 to 3.7 per inch. It is suitable for use in cavity wall installations covered by sheathing on both sides.

Low-density open cell spray foam has a comparatively softer make-up which means that it will effectively air seal around the edges and perimeter of stud cavities and any penetrations. It also means that it can flex and adjust to continue to provide an effective air seal even as the building may settle, expand, or contract. However, while open cell insulation is an effective air sealant, it does allow water vapor to permeate through it. Hence, in cold climates a warm side vapor retarder (e.g., vapor retardant paint) will be needed to control vapor diffusion in an exterior wall assembly. Some approved vapor retarders can be painted directly onto the insulation. There is, however, a wider range of vapor retarder coatings available for painting on the sheathing or gypsum board which the open cell insulation is applied against. And in cases where the wall assembly is exposed to water penetration, open cell insulation may reject bulk water depending on the specific brand. This point should be verified with the specific product manufacturer since this trait varies between products.

Some of the other benefits of open cell insulation are tied to its lighter, softer, and more flexible make-up. Acoustic control, for example, is enhanced in wall assemblies due to its absorptive properties, more so than with rigid insulation. Should water infiltrate the assembly for any reason, its vapor permeability means that the material can dry both toward the interior and the exterior as may be preferred. As a material it does not provide a food source for mold meaning it won't grow in the insulation in a wall assembly. Finally, the cost of open cell spray foam insulation is generally very attractive and competitive when compared to labor and materials for other types of insulations.

Medium-Density Closed Cell Insulation

As the name implies, medium-density spray foam insulation is heavier than low-density spray foam, coming in at about 2 pounds per cubic foot, or roughly four times heavier than low-density material. Its other defining characteristic is the closed cell nature of the insulation when mixed. Since it becomes a series

Photo courtesy of ICYNENE, Inc.

Low-density open cell spray foam insulation has been installed to fill and seal stud cavities of this prefabricated wall panel and shipped to the site for final installation.

Photo courtesy of ICYNENE, Inc.

Medium-density closed cell insulation can be spray applied to the outside of the sheathing on a stud cavity wall assembly and remain durable and water resistant during the construction period.

of small bubbles (cells) of trapped insulating gas (a blowing agent), the thermal performance is directly enhanced, resulting in an over 70 percent increase in R-value compared to open cell insulation. R-values are possible up to R-6.9 per inch for closed cell spray foam compared to 3.7 per inch for open cell. The closed cell make-up of this insulation also means that it serves as a full air barrier eliminating the need for a separate product to perform that function. In fact, according to the Air Barrier Association of America (ABAA), many medium-density spray foam insulation are classified as air barrier materials and are the key component in tested air barrier assemblies. And in terms of vapor permeance it tests as a class II vapor retarder meaning it has very low permeance, much more so than open cell low-density spray foam.

Because of the variety of desirable physical properties in medium-density closed cell insulation, it is suitable for a variety of locations in wall assemblies. When used in stud wall cavities, it will provide higher R-values, excellent air sealing, and add some rigidity to the framing by virtue of its denser make-up. And because it already qualifies as a vapor retarder, no additional paint, membrane, or other material is needed beyond this insulation. Closed cell spray foam insulation is also rigid and durable enough to be installed outside of a stud cavity such as between masonry wythes or behind a masonry veneer. This means that the insulation can be spray applied continuously without interruptions by studs or other building components. This is quite significant since energy codes and standards such as ASHRAE 90.1 have recognized the performance boost achieved from continuous insulation (ci) in wall assemblies.

In terms of wall and façade design, closed cell insulation has the benefit of achieving higher R-values in thinner wall assemblies. From a construction standpoint, the combination of thermal, air barrier, and vapor retarding characteristics means that one product provides all three of these functions. That helps control material and labor costs. High-density foam also provides a stronger, more impact-resistant, rigid insulation material in cases where those are desired characteristics. Because of its cell structure it is water resistant and is approved by FEMA as a flood-resistant material. And, like open cell insulation, closed cell insulation is not a food source for mold to grow on the foam, even in the presence of water or vapor.

Closed cell insulation has the benefit of achieving higher R-values in thinner wall assemblies.

SPRAY FOAM INSULATION DESIGN CONSIDERATIONS

Regardless of the choice of the type of spray foam insulation being used, there are several general considerations to take into account when deciding how best to incorporate it into a building design including the following:

Fire Resistance and NFPA Testing of Assemblies

Building codes address foam insulation directly and typically require that it is covered or separated from the interior of the building by a 15-minute thermal barrier such as gypsum board or other approved material. When used in an exterior wall assembly, the concern becomes the control or prevention of fire within the wall assembly itself or between floors within that assembly. To receive appropriate fire code approvals, the entire assembly needs to be tested and evaluated, not just the component materials. Hence for a project being built according to the International Building Code an exterior wall assembly with spray foam insulation typically requires testing in accordance with ASTM E119 (timed fire resistance rating of assemblies) or NFPA 285 (evaluation of combustible components in a non-combustible assembly) standards in order to meet the safety and fire code demands of most jurisdictions. At a minimum, compliance with NFPA 285 is needed for most wall assemblies. Note that the details of NFPA 285- and ASTM E119-compliant wall assemblies vary according to the spray foam manufacturer and extra fireproofing attention may be necessary for some designs, particularly when detailing openings around windows and doors.

Environmental Considerations

Spray foam insulations require blowing agents to work and some of those agents are better for the environment than others. Materials used as blowing agents can be rated based on their Global Warming Potential (GWP) by comparing it to other materials. The most basic greenhouse gas is carbon dioxide with a GWP rating of 1. Hence, a spray foam insulation that is specified which uses only water and carbon dioxide as the blowing agents will similarly have a GWP rating of 1. Currently, there are several low-density spray foams with this very low environmental impact rating and at least one medium-density spray foam product has it as well. By contrast, all rigid foam insulation and most medium-density closed cell spray foam insulation need to rely on other blowing agents beside water and carbon dioxide to produce the desired results. Depending on the blowing agent used, the GWP rating can be very high up to around 1,430 due to its hydro-fluorocarbon (HFC) make-up. That means that the insulation has a greenhouse gas within it that is 1,430 times more potent than carbon dioxide. Of course there is only an environmental impact if it actually gets released from the insulation and into the air, which may not happen during installation. Nonetheless, if using closed cell spray foam insulation, it becomes important to seek out and specify a product with the lowest possible HFC content and the lowest possible GWP.

Construction Considerations

The nature of any field-applied building product is such that the quality and the effectiveness of the final installation are directly dependent on the experience and qualifications of the installer. Variable field conditions such as air temperature and the condition of the substrates being sprayed upon can directly impact the final results. An installer that understands and adjusts to those field conditions can make all the difference between an excellent installation and one that could be compromised. Further, the nature of spraying the insulation is such that there will likely be some overspray or airborne spray that needs to be contained. Properly protecting the surrounding surfaces and coordinating with the work of other trades to be sure that mishaps are avoided can be very important aspects to the installation. With all of this in mind, it is worth a little investigation ahead of time to be sure that the spray foam insulation being specified has qualified and reputable installers are available to do the work in the building location.

With a basic understanding of the attributes, characteristics, and product variables of spray foam insulation, let's turn our attention to its critical function—energy performance.

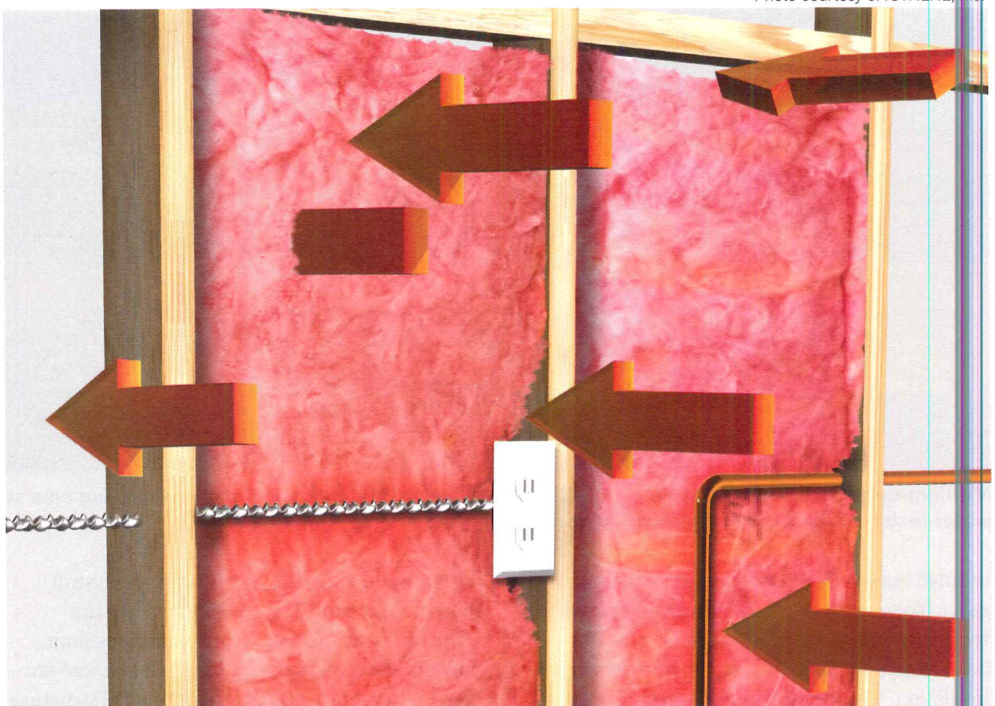
THERMAL RESISTANCE WITH SPRAY FOAM INSULATION

There are two fundamental ways to use spray foam insulation in exterior wall assemblies—as a way to insulate in stud cavities and as a way to provide exterior continuous insulation.

Stud Cavity Insulation

The primary method of insulating a stud wall system whether framed in wood or metal has not changed notably over the past 40 years. The traditional approach has been for batt type insulation to be placed between the framing members. In this approach, the insulation is routinely compromised due to compression by mechanical, plumbing, or electrical components embedded within the same stud cavity. Also not to be overlooked is the sag potential of many batt insulation products which can result in loose fits that don't end up completely filling the stud cavities over time, resulting in less than stated thermal performance.

Photo courtesy of ICYNENE, Inc.



Traditional fibrous batt insulation is prone to incomplete filling of the stud space cavities, allowing greater heat transfer than desired.

Spray foam insulation overcomes many of these thermal performance issues in stud cavities. Low-density open cell insulation is most commonly used for this application since its physical characteristics are well suited to form to the conditions of the cavities and the cost is economical. By field applying it against the interior face of exposed sheathing, it can fill the cavity space completely, thus assuring the full thermal value of the wall is realized. If all of the mechanical and electrical work is roughed into the wall, then the insulation can appropriately fill around all of those irregularities as well creating a thorough installation. The end result is an insulated wall with a much more effective full R-value from the spray foam than a potentially compromised R-value for batt type insulation.

It should be noted that while stud cavity insulation systems have the benefit of economizing on wall thickness, they do not provide continuous insulation across the wall due to the recurring thermal bridges associated with the studs. Energy codes and green building standards have recently recognized that exterior walls with insulation installed between studs, particularly steel studs, have real performance limitations due to these thermal bridges. Most take into account the overall calculated U-factor of the total assembly and do one of two things. Either they set the required R-values of a typical assembly higher to take into account the lower performance due to thermal bridging, or they require that a maximum U-factor of the total assembly be achieved.

ASHRAE 90.1 which is appended to many energy codes and standards includes some very clear correction factors for this calculation. For example, a metal stud wall using 6-inch nominal studs at 16-inch o.c. may include insulation that carries a manufacturer's rating of approximately R-3.5 per inch for a total of approximately R-21. However, the frequency of the metal studs including the head and track pieces create a typical stud wall area that is on the order of 20 percent stud and track faces and only 80 percent solid insulation. This ratio compromises the overall effective wall R-value by as much as 65 percent. Therefore AHSRAE 90.1 assigns a total working value for this typical assembly of only R-7.4 (U-factor of 0.135) which is little more than a third of the insulation R-value.

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Aesthetically Designed Architectural Door Openings

Making deliberate design decisions without compromising quality or function

Sponsored by ASSA ABLOY | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

Photo courtesy of ASSA ABLOY

Truly aesthetic door openings result from coordination of all door assembly components and deliberately integrating them with the overall design of the spaces they serve

Virtually every building project, new construction, or renovation requires attention to door openings. Properly located, they direct flow and movement through spaces for functional and safety purposes. The nature of door openings, however, is that they are made up of many individual components including wood, metal or glass doors, door frames, hardware, trim, closers, etc. Architects can sometimes view selecting and specifying all of these components on multiple doors as a bit of a chore, particularly if the focus is only on meeting life safety codes and other basic requirements. However, when coordinated and integrated door openings are recognized as truly significant design elements in interior spaces, they become real opportunities to move beyond the basics and enhance the overall building design and the indoor environment.

THE AESTHETICS OF DOOR OPENINGS

At a purely human level, door openings are the usual point where we actually touch the building and pass through one space to another. That

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Learning Objectives

After reading this article, you should be able to:

1. Write clear, correct, and concise specifications for aesthetically designed architectural openings that are also code compliant.
2. Explore the benefits and understand the challenges of utilizing aesthetic doors and hardware.
3. Recognize the various codes as related to doors and hardware, which affect the product selection.
4. Describe various designs and color/finishes available to create an aesthetically pleasing opening.

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Photos courtesy of ASSA ABLOY

Some common wood doors in both flush and stile and rail types.

experience can help us interact with the rest of the building when the door opening elements create unity with and reinforce the dominant design concept of the building. Conversely, when the door opening details are loosely coordinated, or worse, left to chance selection by others, then the experience of interacting with a door opening is less than positive. Since a lot of time and energy is usually expended to ensure harmony between all of the other functional and visual aspects of an interior space, it clearly follows that the design and integration of door openings significantly contributes to the success of any interior design.

Many successful architects have understood this concept of design integration based on using a strong unifying concept. Eero Saarinen for example produced designs that were indisputably invigorated by his passion for harmonious detail. He believed that good design respects context such that a lever on a door relates to a door in a frame which relates to a frame on a wall which in turn relates to a wall in a room while the room is connected to a building, and so on. He and other successful designers wouldn't delegate these important design elements to contractors or suppliers nor would they rely only on submittals to make product selections or determinations. Rather, they have given us the example of starting early in the programming, planning, or schematic design phases to identify their overall design concept and assure that door openings are considered as a consistent and integrated part of it. They are such strong contributors of the experience of the space, that to wait until later project phases overlooks the design impact of integrating door openings into the design at the earliest stages.

When designing and specifying door openings and each of their component pieces, other criteria certainly come into play and must be accounted for as well. Appropriate fire ratings of doors and frames need to be provided in all fire-rated walls. In many settings, the issue of appropriate isolation for security or access control is important. Increasingly, sound control is an issue in interior spaces either for privacy or to meet green building standards. And the materials used for door opening components should of course contribute to energy efficiency, sustainable design, and good construction practices.

The good news in thinking about all of these other criteria is that none of them need to be a cause for design compromise. The marketplace has provided a full array of door opening components that can readily meet the various performance criteria and still be consistent with the overall aesthetic and building design. That means it is often very easy to start with the design concept and aesthetic of door openings first, and then readily be able to specify products that can meet the other code and functional requirements.

With all of the above in mind, let's turn our attention to each of the individual components of door openings and look at how the balance between design aesthetic and technical performance is readily achieved in each.

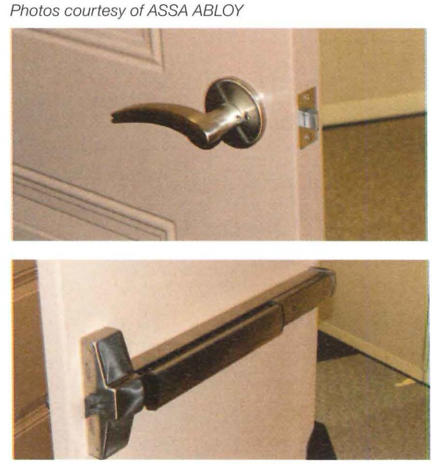
DOOR FRAMES—DEFINING THE OPENING

Once a door opening is designed into a space and located in a wall, that opening needs to be framed in some manner to serve several purposes. First, the frame closes off and trims the wall construction. Second, the door frame supports the door itself and provides the means for assuring a plumb and level condition. And in cases where it is needed, the door frame contributes to the integrity of a fire rating. Beyond providing these basic functions, however, there are actually many choices of door frames available to work with many different design conditions.

Hollow Metal Frames

Hollow metal frames are the default door frame for many commercial and institutional building designs. They are proven, durable, economical, and suitable for a wide variety of settings. Beyond that, hollow metal door frame profiles are available in a wide variety of shapes and sizes that can make them less visible or more prominent to suit an overall design scheme. This means that beginning with the wall opening itself, the

Photos courtesy of ASSA ABLOY



Hollow metal doors can be finished with exposed edge seams (top) or filled seams that are ground smooth (bottom).

Photos courtesy of ASSA ABLOY

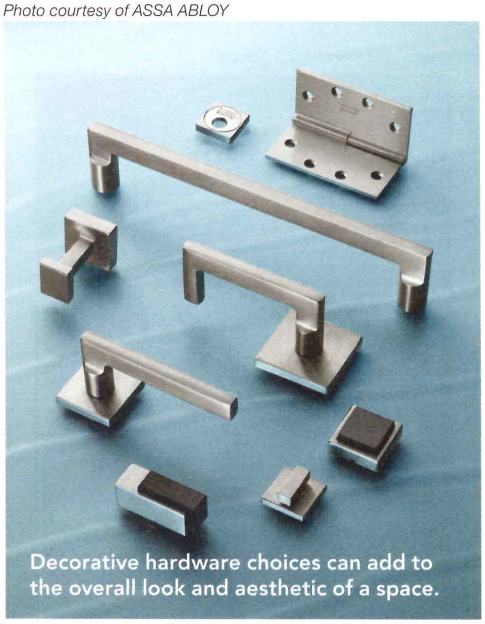
Some available types of door hinges include (left to right) two-knuckle hinge with decorative tips, three-knuckle hinge with decorative tips, five-knuckle hinge, olive-knuckle hinge, and a square barrel hinge.

visual framed appearance of that opening can be controlled in terms of how much or how little of the frame to make visible and in terms of what three-dimensional form that frame takes.

In some cases doors and frames are part of a wall that is performing a thermal separation as between indoors and outdoors or between two rooms that have very different normal operating temperatures. In that case, energy-efficient hollow metal frames are the most appropriate to use. There are two common types:

Thermally broken frames are fabricated to interrupt direct heat transfer through the metal frame by fabricating them in two parts with a less conductive material in between. They work the same way that thermal breaks in metal windows work and in that regard they are suitable to reduce heat loss anywhere that thermally broken windows are used. These door frames are ideal for openings directly exposed to cold or hot temperature differences between the two sides. In the case of exposure to cold, they can be an effective deterrent to frost and condensation that might otherwise form on the metal frame.

Photo courtesy of ASSA ABLOY



Decorative hardware choices can add to the overall look and aesthetic of a space.

Kerf frames are not typically thermally broken, but they do address another concern—air sealing the door using weather-stripping. Now, in reality, most door frames can receive weather stripping; it's just that a kerf frame makes it easier by virtue of an integral groove manufactured into the profile of the entire frame. This groove means that the installation of the weather stripping is simplified and that no additional fasteners are required to hold it in place.

Aluminum Frames

Aluminum frames are usually part of a system designed for both doors and windows and might, in fact, form the entire wall. They are suitable for interior situations where the intent is to maximize the penetration of daylight into rooms. They can integrate into standard drywall partitions but can also be adapted to accommodate varying wall conditions such as angled, segmented, and radiused frame configurations. It is possible to choose standard or custom anodized finishes, or electrostatically applied painted finishes as may suit the design intent of the rooms.

In terms of the actual aluminum frame elements, there are two types. A classic system frame—the original frame system in the industry—screws into a gypsum board partition and requires taping and floating to finish. Classic systems can accommodate 1/4-inch and 3/8-inch single glazing. By contrast, a trim-style system frame is a modular system that was developed for greater versatility and strength, and easier installation. It uses snap-on trim that conceals the fasteners and provides clean design lines. Trim-style frames are installed after the walls are finished and painted, which removes it from critical path scheduling and makes it very appropriate for design-build or fast-track fit-out projects. Trim-style systems can accommodate 1/4-inch, 3/8-inch, and 1/2-inch single glazing.

Wood Casings

In design situations where wood is the preferred frame material, wood casings form the door frames and are installed around the exposed faces of the door opening. The junction of the wood casing and the wall may or may not then be covered with separate pieces of wood trim in whatever profile is desired. In many cases, the use of wood is the most appropriate to be consistent with an overall design scheme. There is a misperception that they can only be used in cases where a fire rating is not required. However, since both non-rated and fire-rated frames and jambs are in fact readily available, their use does not need to be restricted because of fire rating concerns. Frames and jambs are available with 20-minute, 45-minute, 60-minute, and 90-minute ratings. Full frames are rated under positive or neutral pressure and in the case of using jambs only, they need to meet or exceed the rating of the door.

DOORS—FILLING THE VOID

With the frame appropriately integrated into the wall, the door itself needs to be selected next. Here, a deliberate choice can be made based on the overall design criteria and it is very likely that all code and functional requirements can be met within that selection. Of course, different door types and styles will appeal to different design situations, but some of the common choices and characteristics are explained as follows:

Hollow Metal Doors

As with frames, metal is a common material choice. The door faces are available in primed or pre-painted metal while unfinished stainless steel is also an option. The faces can be smooth or patterned of course, and for situations where the durability of steel is needed but a wood-like appearance is preferred, then it is even possible to specify an embossed wood-grain pattern on a metal door.

Inside the door, a core material needs to be inserted to provide integrity to the metal panels which can be specified to meet the specific performance requirements of the door. The common core choices include an open honeycomb fiberboard, solid polystyrene foam, polyurethane foam, solid mineral fiberboard, or a steel stiffened core. The choice of the core material will likely be the determinant of how the door performs in terms of fire rating, energy efficiency, sound transmission, overall strength, and even blast resistance. Since the core is then covered over by the selected metal faces, making it completely concealed, the design aesthetic is maintained regardless of the core selection made.

One important aesthetic detail on hollow metal doors is the manner in which the edges of the door are treated. This is the area where the front and back panels come together and meet at or near the center of the door thickness. The specification choices include exposed seams, which produce a visible line or ridge at the side, top, and bottom of the door. The alternative is to specify that the edges be filled and ground smooth to eliminate the seams and create a more refined appearance.

Aluminum Doors

When aluminum doors are used, they are typically mostly or fully glazed, assembled, and packaged at the factory, complete with the frame. They also typically include accommodations for any special hardware preparation, thus making installation easier on site. Aluminum door types in particular are not limited to swinging doors but can be selected in a sliding barn door type or a pocket door type. Aluminum doors are commonly available in narrow (2-1/8 inches), medium (4-1/4 inches), and wide stiles (5-1/2 inches).

Wood Doors

There are many choices and aesthetic options when the overall design calls for wood doors. The first and most basic choice is whether to use smooth flush doors or to incorporate a more three-dimensional stile and rail pattern into the doors. Stiles are the vertical support portions of the door on the sides. The rails are horizontal supports appropriately referred to by their location on the door such as top rails, bottom rails, and cross rails for intermediate locations. Either door type can create traditional or contemporary solutions, so an understanding of the possibilities becomes important in order to create door openings that truly work with the rest of the interior design.

For flush doors, the door face is obviously the most visible element with the biggest design impact. The face is typically a wood veneer over a substrate or crossband layer. That veneer can be any of a wide variety of species of wood, from almost any type of tree. When the wood is cut from the log, it can be done in a variety of ways that produce different wood grain appearances and different sizes of veneer pieces. The size of those pieces will determine whether the door appears with a single wood grain pattern or if several pieces are matched together to create other aesthetics. Hence the commonly used book-match or slip-match patterns of veneer can be selected instead of a full veneer piece. Custom or standard decorative patterns are possible that use multiple pieces of veneer, sometimes with multiple wood species, to create free form or geometric pattern to produce very artistically inspired results.

When it comes to flush door construction, the common manufacturing process is to create a five-ply product—a central core is one of the plies that is then covered on each side with two other plies—a crossband substrate layer and then the selected wood veneer. All four exposed edges of the core are covered with an internal set of supportive stiles that can have a smooth edge treatment that can be specified to match the door. Similar to hollow metal doors, the core material in wood doors can be selected on the basis of performance and code criteria. The five common choices are open honeycomb fiberboard, solid mineral material, composite of block and stave, particle board, and even a rapidly renewable agrifiber.

Moving on to stile and rail doors, the basic construction results in an appearance that is quite different. Solid pieces of wood are formed and used as the basic frame of a door with the stiles running vertically and the top and bottom rails running horizontally. Inside of this basic frame, many options exist.

Photo courtesy of ASSA ABLOY

A fully integrated door opening blends seamlessly with the rest of the interior design while still meeting the functional, safety, and code requirements of the space.

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Peter J. Arsenault, FAIA, NCARB, LEED AP *practices, consults, and writes about sustainable design and practice solutions nationwide. www.linkedin.com/in/pjaarch*

Sustainable Building with SFI Certified Wood

Using responsible sources for a new wave of green building

Sponsored by Sustainable Forestry Initiative, Inc. (SFI Inc.)

Hands-On Children's Museum of Olympia, Washington, demonstrates exceptional commitment to sustainability and achieved Green Globes certification.

Photo courtesy of The Miller Hull Partnership, LLP

All architects know that when designing a project, materials used in the construction are critical to address sustainability objectives. The American Institute of Architects (AIA) 2030 commitment, which is aimed "to apply the principles of sustainable design to every project from its inception and early design through project completion and ongoing building operations—not just those projects where our clients wish to pursue third-party green building certification," demonstrates this importance.

This article addresses why architects and their clients should ask for certified wood products, which drives the growth of healthy forests and healthy communities. The article also examines the growing interest in green building legislation and government action to recognize the value of all forest certification programs. These government actions are aimed to provide incentives to local products used in green building projects while providing a market incentive for landowners to adopt or maintain sustainable forest practices.

WHY MATERIALS MATTER

According to 2011 statistics from the U.S. Department of Energy, buildings account for 41 percent of total U.S. energy consumption and 38 percent of U.S. carbon dioxide (CO_2) emissions—figures that have spurred the architecture and construction industries to find ways to reduce the environmental footprint of new structures. That is why sourcing materials that have a low impact on carbon emissions is critical to any building construction.

Wood has been used as a building material for thousands of years due to its desirable aesthetic, superior environmental characteristics, and ease of construction. "Wood was chosen initially because of economic considerations, and it's turned out to be a good decision," says Drew Phillips, a construction executive with Berschauer Phillips Construction, describing a recent project. "It's much less energy-intensive to manufacture wood products than steel."

Wood's inherent environmental benefits are clear, but because wood comes from forests, it's important that those forests are managed in a responsible way. Forest certification programs are one way to help promote responsible management of forestland. Voluntary third-party forest certification began in the 1990s partly in response to market concerns about forest

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Learning Objectives

After reading this article, you should be able to:

1. Describe the benefits of SFI certification and the references or endorsements of the SFI program in major green-building standards and forestry programs.
2. List the main elements of the SFI certification, and explain how they differ from other forestry product standards.
3. Explain how the SFI standard impacts conservation and economic development efforts by groups including family forest landowners, indigenous peoples, and state and local governments.
4. Discuss the impact of the SFI standard on green building projects and research into forestry and related topics.

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management and illegal logging. Today, forest certification programs promote sustainable forest management, considering environmental, social, and economic factors.

According to a 2012 continuing education article in *GreenSource* sponsored by SFI, forest certification programs display leadership within the broad environmental community. "Forest certification can be a proof point that wood products are from well-managed forests where the perpetual growing of trees is integrated with protection of wildlife, plants, soil and water quality," according to the article.

Among the forest certification standards is the Sustainable Forestry Initiative (SFI) program, described in detail in this article. Other forest certification programs include the American Tree Farm System (ATFS), the Canadian Standards Association (CSA), the Forest Stewardship Council (FSC), and the Program for Endorsement of Forest Certification Systems (PEFC). SFI, ATFS, and CSA are all endorsed by PEFC, an umbrella organization that endorses national and regional certification standards. Globally, only 10 percent of the world's forests are certified to any forest certification standard.

Forest-certification experts note that while the programs may take different approaches, forest certification initiatives typically focus on:

- Protection of biodiversity
- Care for species at risk
- Preservation of wildlife habitats
- Safeguarding of water quality
- Sustainable harvest levels
- Prompt regeneration
- Third-party independent audits

Certification programs provide a market incentive that will keep managed forests as forests, which can provide economic return and at the same time support environmental values.

Architects, designers, and others within the building community have an opportunity to demonstrate their support for responsibly managed forests in North America by specifying forest certification standards in new construction or renovation projects.

GREEN BUILDING AND SUSTAINABLE FORESTRY

The major market driver for forest certification in the solid wood sector over the last decade has been the green building movement. There are many credible green building rating systems that recognize the value of multiple forest certification standards, and offer credits for products certified to these forest certification standards.

While the chart (see the online version of this course) details many of these standards, three programs worth noting include *ANSI/GBI 01-2010 Green Building Assessment Protocol for Commercial Buildings, ANSI/ICC 700-2008 National Green Building Standard,* and the *International Green Construction Code* (IgCC).

- **ANSI/GBI 01-2010 Green Building Assessment Protocol for Commercial Buildings**, formerly known as Green Globes, is a standard and rating system that promotes building practices that result in energy-efficient, healthier, and environmentally sustainable buildings. One of the points available under Green Globes is awarded for the "proportion of solid lumber, engineered wood, and other wood-based products [which] originate from sustainable sources that are a third-party certified sustainable forestry program including SFI, CSA, FSC, and ATFS."
- **ANSI/ICC 700-2012 National Green Building Standard**, developed for residential construction by the National Association of Home Builders and the International Code Council under the ANSI standards process, is for new construction and remodeling for all residential building types including single-family, multifamily, and residential portions of mixed-use buildings. Three to four points are available for use of "wood-based products certified to the requirements of one of the following recognized product programs: ATFS, CSA, FSC, PEFC, SFI, other product programs recognized by PEFC."
- **International Green Construction Code (IgCC)**, developed by the ICC, with support from the American Institute of Architects and ASTM International, recognizes wood and wood products labeled in accordance with "the SFI Standard, FSC Indicators of Sustainable Forestry, PEFC Technical Document or equivalent fiber procurement system."

There are a plethora of tools that exist in the green building community that recognize the value of multiple forest certification standards. However, a major driver in the green building community is the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating tools. Since USGBC's inception, the LEED rating tools have only recognized FSC's certification standard.

More market leaders are supporting all forest certification standards. Both federal and state

Photo courtesy of Tom Haxby – Manistee River in Maine

The SFI 2010-2014 standard is the most widely used forest certification standard in North America, and was developed specifically for U.S. and Canadian forests.

governments have taken notice with their own actions aimed to provide incentives for using local wood products in green building projects while providing a market incentive for landowners to adopt or maintain sustainable forest practices. Furthermore, green building plays an important role in government policy, as government agencies strive for energy efficiency, greenhouse gas reductions, and other sustainability goals. In fact, 30 percent of all U.S. acres certified to the SFI standard are publicly owned.

By way of example, the U.S. Department of Agriculture in a September 2011 news release announcing their program to promote wood in green building stated, "Sustainability of forest products can be verified using any credible third-party rating system, such as Sustainable Forestry Initiative, Forest Stewardship Council or American Tree Farm System certification." Agriculture Secretary Tom Vilsack urged U.S. builders to prioritize wood in green buildings, stating that the review of scientific literature found that using wood yields fewer greenhouse gases than the application of other common materials.

Elected officials in several states, including Alabama, Georgia, Maine, and Mississippi, have taken direct action through Governor executive orders or legislation to prohibit the use of a green building rating system that does not give equal credit to SFI, FSC, and ATFS.

THE SFI 2010-2014 STANDARD: MAKING A DIFFERENCE IN FORESTS AND COMMUNITIES

Understanding SFI helps architects and building owners make better choices in their projects. SFI is an independent, nonprofit organization that advocates sustainable forest management and facilitates responsible forestry globally. The SFI program is based on the premise that responsible environmental behavior and sound business decisions can coexist to the benefit of communities, landowners, manufacturers, shareholders, customers, and the environment, today and for future generations.

SFI was launched in 1994 as one of the forest sector's contributions to the vision of sustainable development established by the 1992 United Nations Conference on Environment and Development (UNCED). The SFI program is governed by a multidisciplinary, 18-member board equally represented by environmental, social, and economic sectors. Representatives include individuals from conservation organizations, forest product companies, aboriginal groups, small family forest landowners, government agencies, academics, and labor organizations. Across North America, more than 200 million acres are certified to the SFI Standard.

Sustainability of forest products can be verified using any credible third-party rating system, such as Sustainable Forestry Initiative, Forest Stewardship Council or American Tree Farm System certification.

Mississippi's legislation directs that, "any new or expanded state buildings shall incorporate 'Green Building' standards that give certification credits equally to forest products grown, manufactured, and certified under the Sustainable Forestry initiative, the American Tree Farm System, and the Forest Stewardship Council."

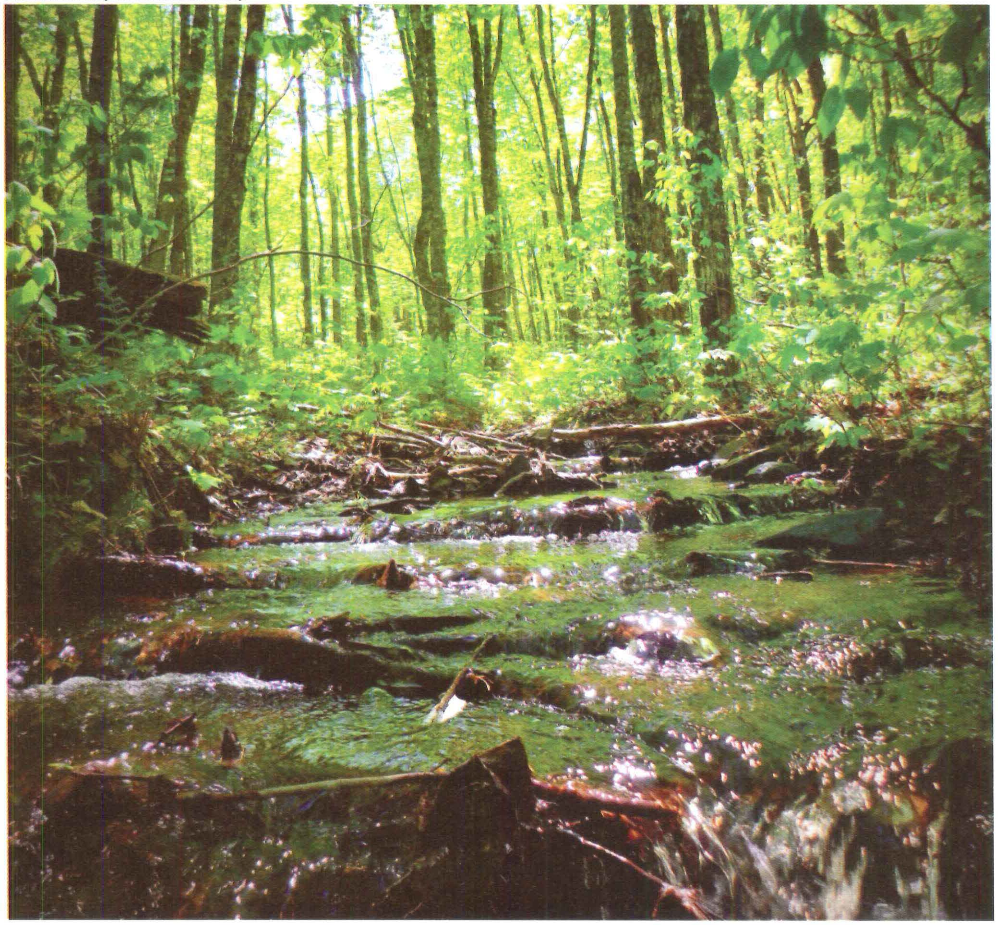
Government action from international markets is also apparent. The United Kingdom's Central Point of Expertise on Timber views forest certification as a proof point to ensure the products meet both legality and sustainability requirements. This is increasingly important as a 2012 report by the United Nations Environment Program and Interpol estimates that illegal logging activity accounts for 50-90 percent of all logging in certain tropical countries of Central Africa, South America, and Southeast Asia, and that this criminal trade is worth $30-100 billion annually worldwide. All forest certification standards assess and address the risk of illegal logging.

At the core of the SFI program is the SFI 2010-2014 Standard, which guides organizations as to how they manage their forestland and source fiber from noncertified lands. The SFI 2010-2014 standard is comprised of 14 core principles, 20 objectives, 38 performance measures, and 115 indicators. It is the most widely used forest certification standard in North America, and was developed specifically for U.S. and Canadian forests.

The standard was developed through an open, transparent process that included professional foresters, conservationists, scientists, and others key stakeholders. The standard addresses environmental, social, and economic forest values—from water quality and biodiversity to harvesting and regeneration. SFI also manages a Chain-of-Custody Standard that tracks fiber throughout the supply chain.

SFI does not certify organizations as conforming to these standards—that is done by

Photo courtesy of Jonathan Kelley



Streamside management zone shows an example of the protection of water bodies and riparian zones in Maine.

independently accredited certification bodies. All certification bodies that wish to perform certification to the SFI Standard must be accredited by ANSI-ASQ National Accreditation Board (ANAB) or the American National Standards Institute (ANSI) or the Standards Council of Canada (SCC).

SFI 2010-2014: PRINCIPLES FOR SUSTAINABLE FORESTRY

SFI Program Participants believe forest landowners have an important stewardship responsibility and a commitment to society, and they recognize the importance of maintaining viable commercial, family forest, and conservation forest land bases. They support sustainable forestry practices on forestland they manage, and promote it on other lands. They also support efforts to protect private property rights, and to help all private landowners manage their forestland sustainably.

SFI Program Participants are third-party certified to demonstrate their conformance with 20 objectives, 38 performance measures, and 115 indicators, which support 14 overarching principles of sustainable forestry which follow:

1. Sustainable forestry. To practice sustainable forestry to meet the needs of the present without compromising the ability of future generations to meet their own needs by practicing a land stewardship ethic that integrates reforestation and the managing, growing, nurturing, and harvesting of trees for useful products and ecosystem services such as the conservation of soil, air and water quality, carbon, biological diversity, wildlife and aquatic habitats, recreation, and aesthetics.

2. Forest productivity and health. To provide for regeneration after harvest and maintain the productive capacity of the forest land base, and to protect and maintain long-term forest and soil productivity. In addition, to protect forests from economically or environmentally undesirable levels of wildfire, pests, diseases, invasive exotic plants and animals, and other damaging agents and thus maintain and improve long-term forest health and productivity.

3. Protection of water resources. To protect water bodies and riparian zones, and to conform with best management practices to protect water quality.

4. Protection of biological diversity. To manage forests in ways that protect and promote biological diversity, including animal and plant species, wildlife habitats, and ecological or natural community types.

5. Aesthetics and recreation. To manage the visual impacts of forest operations, and to provide recreational opportunities for the public.

6. Protection of special sites. To manage forests and lands of special significance (ecologically, geologically or culturally important) in a manner that protects their integrity and takes into account their unique qualities.

7. Responsible fiber sourcing practices in North America. To use and promote among other forest landowners sustainable forestry practices that are both scientifically credible and economically, environmentally, and socially responsible.

8. Avoidance of controversial sources including illegal logging in offshore fiber sourcing. To avoid wood fiber from illegally logged forests when procuring fiber outside of North America, and to avoid sourcing fiber from countries without effective social laws.

9. Legal compliance. To comply with applicable federal, provincial, state, and local forestry and related environmental laws, statutes, and regulations.

10. Research. To support advances in sustainable forest management through forestry research, science, and technology.

11. Training and education. To improve the practice of sustainable forestry through training and education programs.

12. Public involvement. To broaden the practice of sustainable forestry on public lands through community involvement.

13. Transparency. To broaden the understanding of forest certification to the SFI 2010-2014 Standard by documenting certification audits and making the findings publicly available.

14. Continual improvement. To continually improve the practice of forest management, and to monitor, measure, and report performance in achieving the commitment to sustainable forestry.

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Photo by Eduard Huebersuch, courtesy of the Steel Institute of New York

Steel framing is used to create open airy interiors such as this expansive connecting corridor at the John Jay Center for Criminal Justice.*

Design Flexibility Using Structural Steel

Architects address challenging urban site conditions through innovative structural design

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

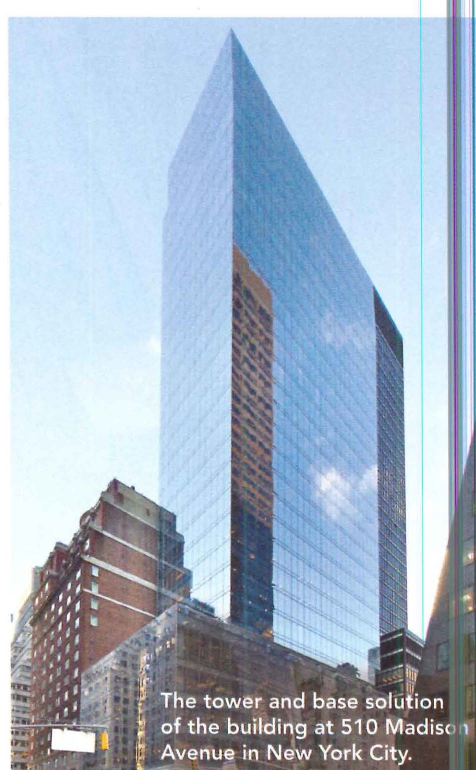
When constructing new buildings, urban sites can present significant space challenges. The existing surroundings often impose limitations on the size of the site and its buildable area. Zoning requirements can restrict the building footprint and square footage plus dictate setbacks at different height levels. Pulling together the collaborative efforts of architects, structural engineers, fabricators, and installers, these challenges can be overcome in innovative and very effective ways. The teams of professionals that worked on four recent buildings in New York did just that by overcoming some real site limitations and meeting the building owner's goals in ways that achieved impressive results. We will explore in detail and review each of these four buildings.

1 510 MADISON AVENUE
DESIGNING FOR OPEN INTERIORS

A significant challenge that projects in urban environments face is meeting relevant zoning requirements. Through an innovative structural steel design, 510 Madison was able to maximize the floor area ratio within the constraints of its required setback to create a new, high-end high-rise tower on Madison Avenue in New York City.

Design Problem—Work Within Zoning Setbacks

Completed in 2011 at the corner of Madison Avenue and East 53rd Street, 510 Madison certainly falls under the constraints of New York City zoning requirements that govern setbacks and floor area ratio. The usual response is to create a base and podium style structure with a profile that maximizes the amount of usable floor space. Originally planned as a residential tower, the recession shifted the priorities of owner and developer Macklowe Properties toward a 350,000-square-foot office building for the so-called Plaza District in Midtown Manhattan. Dan Shannon, the design architect in charge of the project for Moed de Armas & Shannon Architects, says the focus of the building was to create column-free tenancies of between 11,000 and 45,000 square feet. Zoning restrictions meant the street wall on the site perimeter could only go up to 85 feet before needing to step the building back for the tower above. "This created a structural challenge of



The tower and base solution of the building at 510 Madison Avenue in New York City.

Photo by Moed de Armas & Shannon, courtesy of the Steel Institute of New York

* **NOTE:** *See John Jay case study in the online version of this course.*

driving the tower superstructure through the base without impinging on the quality of the base floor plate," says Shannon. The owner had also purchased the air rights on the adjacent lot which would have allowed the building to go higher, but instead the team saw the value of protruding into the adjacent air space by approximately 8 feet to allow for larger floor plates.

Design Approach—Collaboration for an Innovative Structure

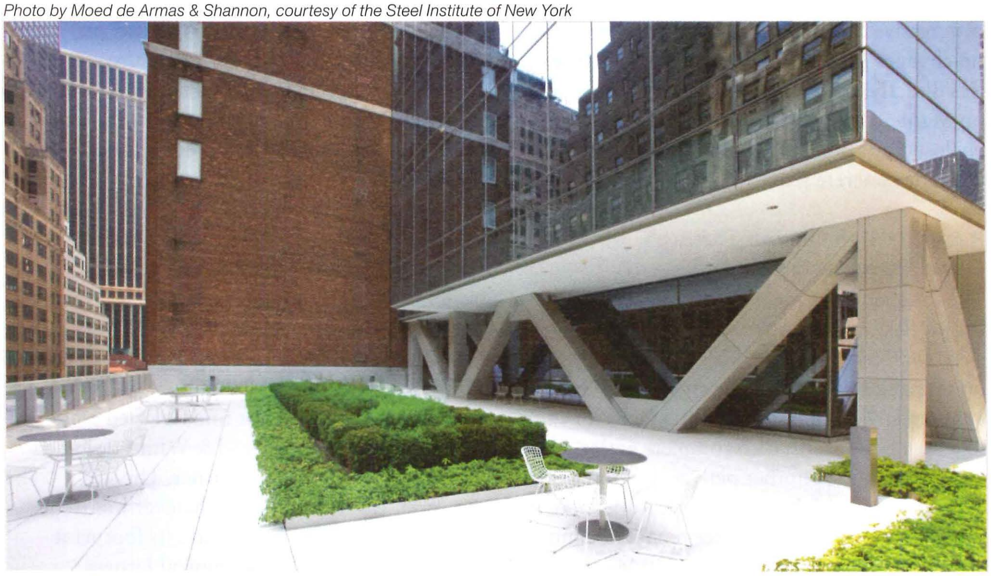
The design team of 510 Madison rose to the challenges of this situation and went beyond.

Through a carefully conceived structural design, they were able to minimize the space lost to interior columns and the stair core. The building was kept to only 30 stories (429 feet) in height meaning that the engineers at Gilsanz Murray Steficek (GMS) were able to use just two bands of large wide-flange outrigger trusses, one each at the bottom and top of the tower, to control drift. Most high-rise designs of this type include at least three such bands. This simpler system allowed the engineers to shrink the floor space needed for the braced structural frame within the tower section to the point of it being imperceptible, and added a full story of seemingly column-free office space. A 55-foot interior span ties the relatively small south-side core (only three elevators) to perimeter columns that are set back 1 foot, 10 inches from the aluminum glazed curtain wall. "There are 2 feet, 6 inches from the glass to the column line, so you really get this feeling of disconnection between the facade and columns," says Karl Rubenacker, the GMS partner in charge.

In order to tie the tower to the base, an outrigger truss was used on the sixth floor to transition between the columns along the perimeter of the five-story base and the 25-story tower above, transferring the truss loads in the fifth floor ceiling with large 6-foot-wide by 9-inch-thick built-up plate girders. "The necessity of this truss gave the building a distinct architectural look of having the tower floating on the base," says Shannon, the architect. "We couldn't just solve these problems with more steel, it had to be efficient and cost-effective." The engineers addressed the imposed loads by adding more perimeter columns, which meant they could keep the scale of individual components smaller.

The engineers used W18s for the interior spans, which allowed them to compress the ceiling plenum down to deliver those high ceilings within an overall 13-foot, 6-inch floor-to-floor height. Shannon also says that the design team focused on coordinating the mechanical system with the structure, designing penetrations in the beams to anticipate future ductwork. "Doing that after the fact is not that effective, but if you plan for this, it could happen efficiently," he says. "Tenants understand how that affects ceiling height so they are happy to coordinate around the openings." In the structural bays at the building corners, engineers removed the columns to provide an unencumbered corner office view that is a prized perk for high-end tenants.

Photo by Moed de Armas & Shannon, courtesy of the Steel Institute of New York



The story-tall transfer girders above the fifth floor help create a roof garden at 510 Madison Ave.

The building envelope was designed to intensify the apparent lightness of the structure with floor-to-ceiling glazing that floods the interior with views and daylight, both of which are enhanced by 10-foot ceiling heights. Achim Hermes, a structural engineer and the building's facade consultant from GMS, says the goal for the exterior was a monolithic, uniform building. The unitized glass-and-aluminum curtain wall consists of nominal 5-foot-wide, one-story-high panels that are clipped onto anchors at the end of the floor plates. Tower floor slabs are 2-1/2 inches of concrete over a 3-inch, 18-gauge metal deck. The building slightly chamfers with a 2 percent slope through the top three floors, though the curtain wall was easily sloped without special requirements. The curtain wall panels have treated glass in the vision zone, which couples a low-emissivity coating with a relatively high 43 percent visible light transmittance. The glazed shadow box spandrel, which is hidden from the interior, barely reads from the exterior. "None of the facade units contain reinforcing steel; they were all within the limits to handle the wind loads," says Hermes. The only departure from the curtain wall is the storefront system used along the ground-floor retail area.

Both the construction manager and the steel fabricator were brought on board during the design process, which helped to smooth over coordination and constructability issues in connections and steel quantities. Structural analysis was performed using a variety of software packages while the engineers at GMS used internal analysis spreadsheets to design all of the connections. A wind tunnel analysis had been performed for the original residential building, which was planned to be 700 feet tall, so the wind consultants performed a simpler desktop analysis based on that outcome. "The torsional velocity of the highest rented floor's corner office was used to set the controlling wind criteria for drift and stiffness" says engineer Rubenacker. GMS also carried out a

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Learning Objectives

After reading this article, you should be able to:

1. Identify and recognize the unique characteristics of structural steel systems that make them suitable for a variety of urban building sites.
2. Investigate the design potential for alternative design approaches that allow for maximizing usable space within a restrictive urban site.
3. Assess the functional contributions of structural steel systems in the creation of well-designed buildings.
4. Design buildings that consider innovative construction approaches suitable to both new and renovated buildings.

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progressive collapse study, which resulted in no changes to the design. The steel structure ties directly into concrete footings below grade on Manhattan's rock, with the sub-grade level enclosed by a concrete foundation wall with an at-grade concrete slab.

Result—High Design Through Good Engineering

The finished building, now owned by Boston Properties, was recently certified LEED Gold for Core and Shell, which in part relied on recycled steel used in the structure. An exposed structural steel stair also leads down to a basement health club complete with a swimming pool, another perk geared toward the expectations of high-end tenants. Added in with the high ceilings, column-free tenancies, and elegant outrigger truss transfer, 510 Madison has proven successful in attracting tenants, even in a challenging market.

2 COLUMBIA UNIVERSITY NORTHWEST CORNER BUILDING

BUILDING AROUND EXISTING STRUCTURES

Another project forcing collaborators to get creative because of existing site conditions, Columbia's Northwest Corner Building used an engineered steel frame to span over an existing gym. This structure was designed to eliminate vibrations in interior lab spaces and provide long-span spaces for a cafe, library, and labs.

Photo by Arup, courtesy of the Steel Institute of New York

The Northwest Corner Building at Columbia University in New York City needed to span over an existing gymnasium to create the needed space in the upper floors.

Design Problem—Build Around an Existing, Operating Gymnasium

Columbia University, like most universities, uses peer schools as a way to benchmark their own performance and facilities. Back in 2002, the administration determined that the university was in danger of falling behind in one key area—it had no cutting-edge, 21st-century laboratory facility that could match what peer schools like Harvard or Princeton were erecting.

To close the gap, Columbia hired the well-known Spanish architect José Rafael Moneo to design a contemporary laboratory building on the last remaining major undeveloped plot of the original McKim, Mead & White-designed campus—the northwest corner. The site, however, came at a price. Whatever was to be built there would have to share its footprint with the existing Dodge Physical Fitness Center—notably its basketball facility, home to Columbia's Division One Lions.

"The basic challenge was to come up with a structure that would span 120 feet over the existing gym, and to facilitate construction while the gym was closed," explains Dan Brodkin of Arup, whose firm collaborated with Moneo on the design. "We experimented with many possibilities, and decided to create a building like a bridge." While this addressed the structural issue, the occupancy issue was complicated since the New York City Department of Buildings requires that two floors be completed before a space below can be occupied. Columbia wanted the gym to be open in time for the Lions to begin daily practices so construction had to move at a rapid pace. With long spans and a narrow timeline, the choice of structural material came easily: The building would be framed out of structural steel to cover the long span and keep the building light in weight.

Design Solution—Bridge Over the Existing Space with Long-Span Steel Structure

At 14 stories and 188,000 gross square feet, the Northwest Corner Building, as it is now known, packs a lot onto its 65-foot-wide site. To keep all of this space stable and immune to live loading—lab buildings are adverse to vibration and sway—Arup decided to use the whole height of the building as the truss. In other words, the engineers allowed for filling each of the perimeter framing bays with diagonal bracing elements, and put one giant chevron—a big V—through the center of the elevation. "There's a pay-off to this approach," continues Brodkin. "There are more bits and pieces, but it's deeper and stronger."

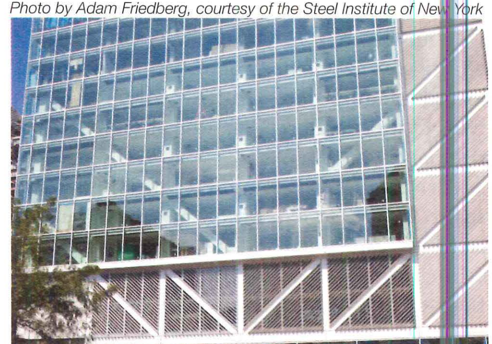
The internal system runs longitudinally north-south through the building, sandwiched between the corridor and offices of the east side and the laboratories of the west side. Framed with mid-range W14 wide flange sections fabricated from Grade 50 A992 steel, the big V cuts the span of the truss in half, while its easily understood, rational load pattern makes it simpler to thread mechanical systems through the building.

The expected loads actually did not call for bracing elements in every perimeter bay, so the engineers had the freedom to decide which would be braced and which wouldn't. Arup came up with a computerized force weighted random structure generator that began by assuming mathematically that every space between column and beams would have an X brace. This model was then analyzed and the engineers deleted every bracing element in compression while maintaining every element in tension. Then they analyzed it again, grouping the diagonal members based on their force level—600 to 900 kips were grouped as high force, 300 to 600 kips as medium force, and 50 to 300 kips as low force.

With these groupings in place, the team set up an algorithm that they applied to each group, allowing the computer to randomly delete 70 percent of low-force members, 40 percent of moderate-force members, and 10 percent of high-force members. Arup then began to play with its numbers, sometimes deleting hard-working members, sometimes lighter-working members. Each time, a different load pattern emerged. When hardworking members were deleted, the pattern became weird and unexpected, but when lighter-working members were deleted the pattern was more rational.

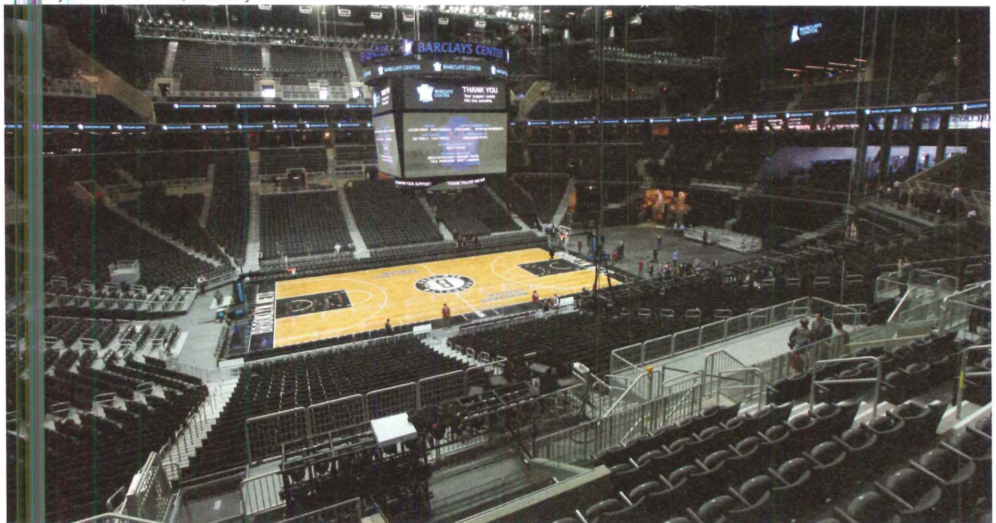
This process became an integral part of the final look of the exterior and Moneo was a willing collaborator. He gravitated more toward the rational expressions generated by deleting the low-force members, and Arup ran the program playing with the numbers until they found one that he determined was consistent with the overall design intent. In the final assembly, the bays and diagonals are framed with a variety of mid-range W14 wide flange sections fabricated from Grade 50 structural steel.

Photo by Adam Friedberg, courtesy of the Steel Institute of New York



To accomplish the building's engineering feat, the entire building was designed as a truss with the structure incorporated as an exposed design element.

Photo by Bruce Damonte, courtesy of the Steel Institute of New York



The wide open space of the Barclays Center was achieved through structural steel design.

Construction—Innovation in Process

While mathematically this building-as-truss system functioned fine as a means to carry the structure over the 120-foot span of the gymnasium without bearing on it, the design assumed that the entire assembly appeared magically in place and did not take into account the step-by-step, bottom-up nature of the construction process. To manage this essential procedure, a system would have to be developed to shoulder the building's massive dead loads while it was being built.

In answer, Arup devised a system of three, full-floor-height jumbo trusses that would span across the gym and serve as a launch pad for the rest of the structure. It would handle dead loads during construction, and help to manage live loads once the erection was complete. These trusses, approximately 400 to 500 tons each, were constructed from massive W14x730 wide flange sections reinforced with 4-inch-thick steel plates welded across the webs. The trusses tie into eight similarly hefty columns—W14x730 wide flange sections reinforced with 4-inch-thick steel plates—five on the north side of the building, three on the south, that transfer the gravity load down to bedrock.

However, these jumbo trusses were too large to fabricate off site and then truck in. They were also too heavy to lift into place with a crane, or to assemble while bearing on the roof of the gym. Working out a plan with erector DCM, Turner Construction assembled the components on a heavy construction shed above the sidewalk on Broadway, connecting them with complete joint penetration welds. Because the location of the tower crane would have interfered with the area needed for this work, its base was bumped out from the building to provide room for assembly of the trusses. Once assembled, they set up temporary steel beams spanning the roof of the gym, greased them liberally with lubricant, and slid the trusses into place with hydraulic rams.

The remainder of the steel structure is relatively straightforward, excepting the laboratory bays with their 40-foot clear spans and 18-foot floor-to-floor heights. Moneo and executive architect Davis Brody Bond Aedas set up these wide-open spaces to create greater flexibility within the facility, allowing for different scientific disciplines to augment any floor to its needs—a move that will keep the building relevant well into the future. Castellated beams frame these bays, allowing mechanical systems to be run through the web openings. The double-height floors allowed mezzanine levels to be set up on the east side of the building, a literal beehive of faculty offices and student breakout space.

Without structural steel—some 4,000 tons of which were used in the project—few if any of these innovative design decisions would have been possible.

3 THE BARCLAYS CENTER SPORTS GEOMETRY

Brooklyn's new multipurpose indoor arena relies on a structural steel geometry that provides unobstructed views to keep visitors coming back often. The use of structural steel allowed the Barclays design team to make several grand gestures, including a bowl-shaped arena with steep seating slopes to create a unique viewing experience for sports fans and concertgoers.

Design Problem—Create a Positive Viewing Experience for Sports Fans and Concertgoers on a Tight Urban Site

When ticketholders arrived for the series of Jay-Z concerts that officially opened Brooklyn's new Barclays Center on September 28, 2012, they were treated to a dramatic view of the lighting cluster above the stage from the moment they walked onto the center's main entrance plaza. The design team intentionally planned this experience so visitors could visually connect with the massive arena's interior while still outside at the corner of Atlantic and Flatbush Avenues. Not only would this help them find their way into the building, but glimpses of the three-story, 70,000-pound central scoreboard would pump up fans on game days.

This seemingly simple gesture, which creates a quintessential only-in-New York street scene, relies in large part on several structural engineering maneuvers that nestled the 675,000-square-foot arena into its site on the northwest corner of the 22-acre Atlantic Yards development. As a result, unlike several new arenas developed in the last decades in other American cities, the scale of the Barclays Center does not appear to overwhelm its site. This was a critical gesture for Forest City Ratner Companies (FCRC), the Barclays Center's developer that had famously struggled to win community support for the overall development.

Design Approach—Structural Steel Creating a Steep Bowl Shape Spanned by Truss System

The seating bowl of the arena, which rises from approximately 30 feet below street grade and makes these visual connections possible, has similar sightlines to those of Indianapolis's Bankers Life Fieldhouse. That project, which relied on a concrete superstructure and steel roof trusses, was designed by Ellerbe Becket Architects and Engineers (now AECOM), who adapted the configuration for Barclays' superstructure while SHoP Architects designed the exterior, as well as some interior architecture components.

For the fourth case study and complete project details, see the online version of this article.

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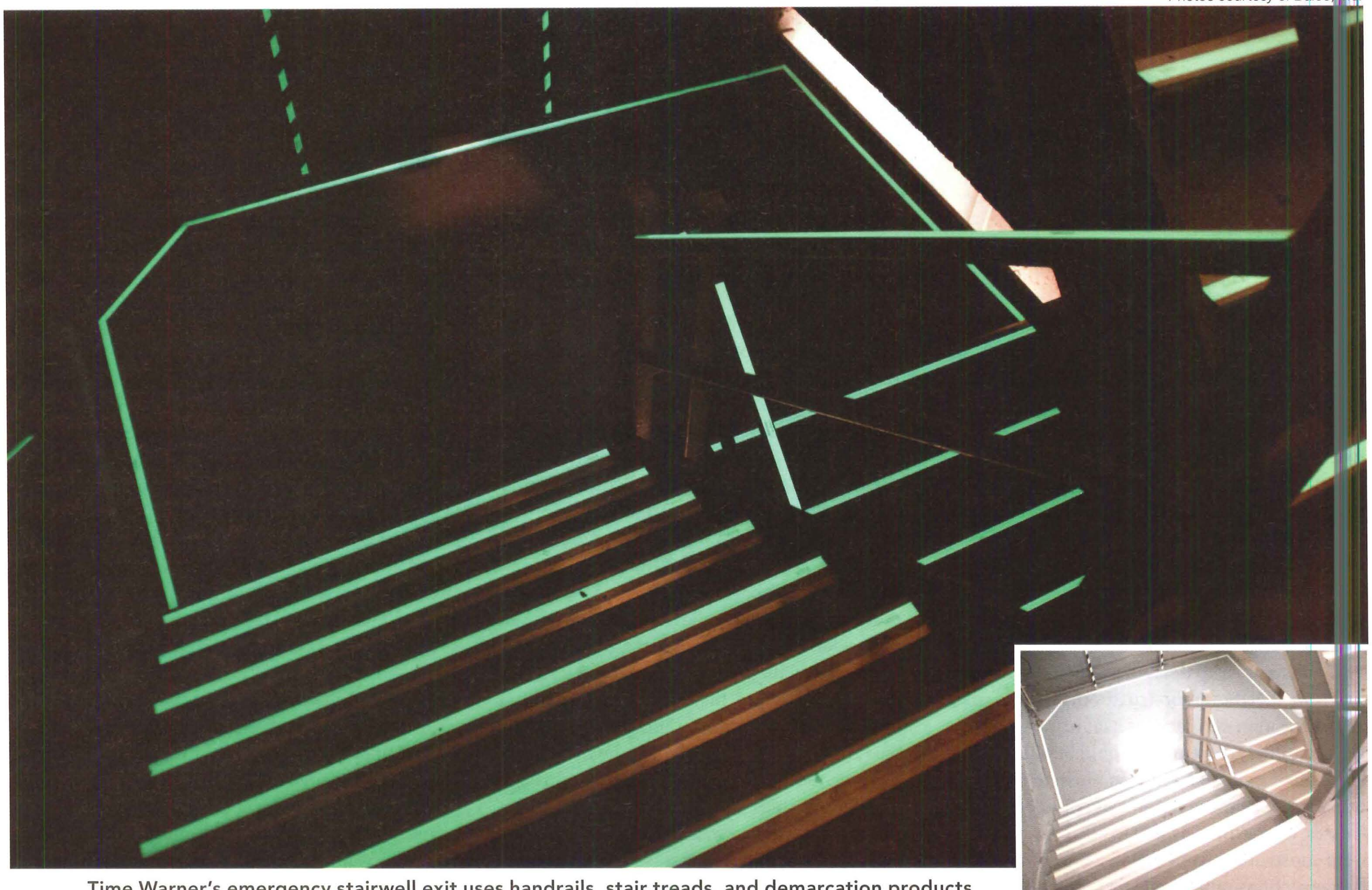
Peter J. Arsenault, FAIA, NCARB, LEED AP, practices, consults, and writes about sustainable design and practice solutions nationwide. www.linkedin.com/in/pjaarch

Illuminated Stairway Identification

Glowing pathways aid building occupants and first responders

Sponsored by Balco, Inc. | *By Steve Cooper*

Photos courtesy of Balco, Inc.



Time Warner's emergency stairwell exit uses handrails, stair treads, and demarcation products.

Photoluminescent (PL) technology saves lives by lighting a glowing path for a critical duration of time to evacuate occupants and navigate stairways during extreme circumstances like total darkness due to loss of power in a multistory building. PL glows through darkness and smoke-filled stairways, allowing first responders to get in and find their way to alleviate the threat and evacuate building occupants in a manner that is safer for everyone.

INTRODUCTION TO PHOTOLUMINESCENT EGRESS MARKINGS

PL egress markings are designed to create an intuitive path throughout the full height of an emergency stairwell or set of steps used for emergency egress in many types of buildings, such as high-rise office buildings, stadiums, arenas, hospitals, educational facilities, and many others.

The benefits of photoluminescent markings in these areas include:

- A luminous path that is intuitive to follow, guiding both occupants and first responders through an otherwise dark enclosure or series of steps to be navigated during an emergency evacuation.
- A fail-safe glow-in-the-dark source that is dependable even when backup generators or other electrical light sources are out of service.
- A strategically laid-out egress path that is intended to reduce or eliminate trips and falls on steps, collision with objects that protrude into stairwells, or potentially entering or exiting a doorway that is unsafe or heading in the wrong direction for emergency egress.
- An illuminated visual identifier that evacuees and first responders can use to quickly identify their current location and direction for egress, exit level location, and availability to roof access for rescue.

Manufacturers and installers of egress components for multistory buildings developed the technologies and methods for applications that benefit a wide range of communities. Such benefits begin with the building occupants and first responders mentioned above and extend to the architectural and technical communities that now have enhanced life safety products to reduce life safety risks with choices that require very little energy and are primarily made of reusable resource materials.

Building codes refer to the photoluminescent markings in stairwells as "luminous" markings. You will see the terms "luminous," "photoluminescent," and "PL" throughout this article, all with the same meaning, which is a glow-in-the-dark marking that is charged by a light source and discharging a glow without the requirement of electricity.

HISTORY OF EMERGENCY PATHWAY MARKINGS

Emergency pathway markers have been used in commercial applications in the U.S. and other countries for decades. Many pathway marking systems are charged electrically. Items such as exit signs above doorways and pathway lighting used in hallways of buildings as well as on transportation vehicles like ships, trains, and aircraft are now commonplace.

Photoluminescent pathway markings and signage are a tested and proven evolution from electrical technology to a chemically charged material applied to a solid surface. PL is a fast-reacting source of illumination and is reliable even when power failures occur coupled with failures of backup batteries and generators. Some slow-to-recover lighting sources like metal halide used in stadiums, arenas, and gymnasiums leave occupants in the dark for long periods of time that could be crucial to evacuation and first responder efficiency.

Photoluminescent illumination requires a minimal light source to charge the particles imbedded in the PL material. Discharging is constant and immediately apparent when the lights go out. Think of it like a cell phone connected to an electrical charger. The phone works while it is plugged in and it also works when it is unplugged but only for a particular duration. Then the phone slowly loses its charge over time. PL works in a similar fashion. It charges when lights are on and it glows all of the time. You only notice the glow when the lights are dimmed or completely out. The photoluminescent material glows bright enough to allow sufficient egress through the pathway for at least 90 minutes and then becomes less bright over time until the charge runs completely out or it is recharged by a light source.

The Science Behind PL

The most common materials used for commercial-grade luminous markings are referred to as either "self-luminous" or "photoluminescent." Self-luminous materials are radioactive particles that do not require a light source for charging. This technology has been used in exit signs but not in emergency egress markings like the ones stated in this article. Self-luminous materials typically require regulation for tracking and disposal and are regulated by governmental agencies.

Photoluminescent materials are safe, non-toxic, and non-radioactive materials that require a light source for charging. The most common material used in commercial-grade photoluminescent products is strontium aluminate activated with a suitable dopant like europium.

Strontium aluminate is a solid, odorless, nonflammable, pale yellow powder, heavier than water. It is chemically and biologically inert. When activated with a suitable dopant (e.g. europium), it acts as a photoluminescent phosphor with long persistence of phosphorescence.[1]

Photo courtesy of SUMA Industries

New York City's Barclays Center emergency stairwell exit door with markings

The required levels of phosphorescence are described in detail in the 2009 and 2012 version of the IBC/IFC 1024 building codes. They both reference UL1994 as the standard measure of acceptable glow requirements measured in terms of foot candles and Lux for charging and millicandelas for discharging of the glow materials. All measures are related to periods of time for charging and discharging.

The current UL 1994 standard states that the required charging source to illuminate and fully charge a photoluminescent path marking has a minimum of 1 foot candle (11 lux) capacity for a minimum of 60 minutes prior to terminating the light source in an egress stairwell. The required glow capacity for a photoluminescent material is a level of 30 millicandelas visible for at least 10 minutes and 5 millicandelas for a period of at least 90 minutes.

Minimal lighting is required at least 60 minutes prior to building occupancy, according to IBC/IFC 1024, to ensure that the PL materials are adequately charged and functional in the case of an emergency. The minimal source of lighting is less than the current requirement for lighting an existing egress stairwell in a high-rise building. Typical light sources include sunlight, fluorescent, incandescent, halogen, metal halide, and many others.

BUILDING TYPES THAT BENEFIT FROM LUMINOUS MARKINGS

There are many building types that benefit from luminous markings for means of egress as well as practical function in an often darkened venue like a stadium or arena. There are other types of buildings that do not have adequate lighting to maintain the proper charge required for a commercial-grade PL material. Buildings such as high-rise structures, multistory office buildings, hospitals, K-12 schools, and universities are excellent examples of structures that have obvious benefits related to PL markings for means of egress. Stadiums and arenas are excellent examples of venues that benefit not only from emergency egress when lighting is lost unexpectedly but also when lights are dimmed for periods of time during performances. This is an example of the practical use of PL markings, allowing fans to make their way to concession stands and restrooms during darkened periods of the performance.

One great benefit of photoluminescent markings is that they are only visible when looked at from above. Performers on stage cannot see the glow from the stands on steps in an arena because they are not in the proper line of sight. This is not possible with electrical lighting. For this reason a vertical strip on the face of a stair nosing is not desirable.

Movie theaters and performing arts theaters are often dark for long periods of time. These venues are not usually good choices for photoluminescent markings unless proper light sources are pre-planned to create a suitable charging source.

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

1. Explain the concept of intuitive stairwell emergency egress using photoluminescent illuminated egress markings.
2. Identify the six distinctive elements of multistory building stairwell photoluminescent egress markings.
3. Determine the proper building codes to apply to the use and application of photoluminescent egress markings in egress stairways.
4. Locate and identify the performance characteristics of building code-compliant photoluminescent egress markings based on standards established by UL, ASTM, and NFPA.

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The most common and practical building type that benefits from PL markings are high-rise buildings. The 2009 and 2012 International Building Code and International Fire Codes have specific and very detailed requirements for these types of structures.

High-Rise Building Egress

The dust has finally settled in the building code debates regarding high-rise building egress requirements. Now we can get on with the business of educating everyone who participates and benefits from the related code adoptions of 2009 and 2012 for the International Building Code (IBC) and International Fire Code (IFC). The list of beneficiaries begins with high-rise building occupants. The intended effect of the new codes was primarily to save lives of people escaping from any emergency that requires evacuation of a high-rise structure.

High-Rise Building Evacuation Philosophy

High-rise buildings are defined as any building with occupants at a level 75 feet or higher above fire department access, according to the NFPA 101 Life Safety Code. Manufacturers and installers have the responsibility to educate the public, first responders, code enforcement agencies, and architectural communities about high-rise building safety. Building occupant egress for high-rise buildings has changed strategy in recent years. The primary change is the philosophy of evacuation. The strategy used prior to the collapse of the World Trade Center towers on Sept. 11, 2001 was to evacuate occupants using a floor-by-floor method based on location of the danger. The current strategy is total building evacuation with measures taken as rapidly as possible.

Benefits Obvious to First Responders

The benefits quickly became obvious to first responders as well. First responders like firefighters, medical personnel, and law enforcement are now able to navigate a structure in the dark 30 percent more efficiently than

PRACTICAL USE OF PHOTOLUMINESCENT EGRESS COMPONENTS

The 2012 versions of IBC and IFC Chapter 10 both have sections 1022 and 1024 that require six distinctive components of PL pathway markings for high-rise building egress. The six distinctive markings are:

Per IBC/IFC Chapter 10 Section 1022 for version 2012 Stairway Identification Signage:

1. Stairway identification signage. A 12-inch-wide x 18-inch-tall sign is located 5 feet 0 inch above the floor in an egress stairway. The sign must be located in a place that is always visible, even when the door is open. (See figure 4.)

The stairway identification sign must contain the following data:

- Identification of stair or ramp
- Availability of roof access or no access
- Floor level
- Braille floor number–tactile characters
- Terminus top and bottom
- Story and direction of exit discharge

Per IBC/IFC Chapter 10 Section 1024 for version 2012 Pathway Markings.

2. Stair nosings must be an integral part of the stair edge and have PL markings up to 1 inch wide within ½ inch of the leading edge of the step. The nosing must extend the full width of the steps. (See figure 1.)

3. Handrail markings must be placed on the top of the handrails for the continuous length of the handrails except for a 4-inch gap allowed at directional changes in the handrail. (See figure 1.)

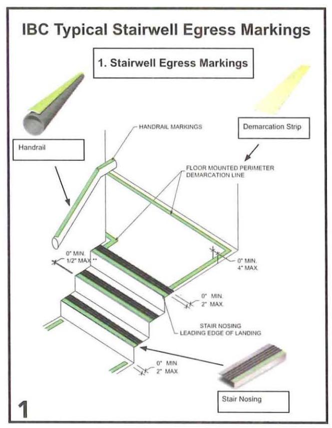
4. Demarcation strips are required at stair landings to guide occupants in a path that is intuitive from one level to the next. Demarcation is also required to direct any pathway that leads to a final exit door. (See figure 1.)

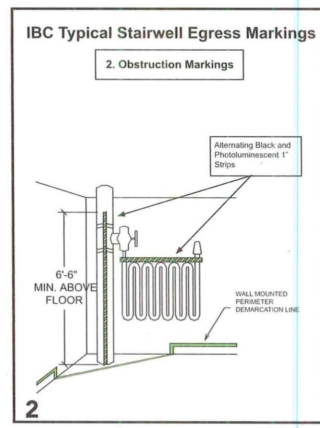
5. Obstruction markings are alternately striped black and PL yellow to provide warnings of objects that protrude 4 inches or more into a defined egress path. Common obstructions inches from the landings or steps. (See figure 2.)

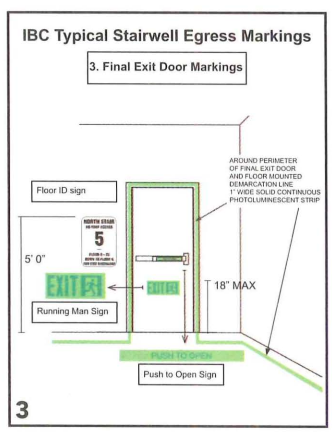
6. Final door markings are required only at the door leading directly to an approved building exit or for doors that must be passed through in order to reach a final exit door. (See figure 3.)

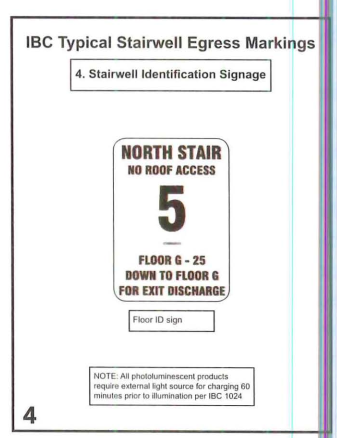
Final exit door markings are:

- Demarcation strip around the doorframe including the head and jambs only but not across the base of the doorframe.
- Door handle markings must be a minimum 16 square inches of material either in the form of a strip on or above a push bar or in a square or rectangle adjacent to a door handle or knob.
- A running man sign must be located 18 inches above the floor in the center of the final exit door.









EXCERPT FROM 2009 IFC 4064.23 EGRESS PATH MARKINGS

"Historically, code requirements for high-rise buildings were written under the assumption that buildings would be evacuated floor-by-floor... Acts of terrorism and accidental incidents, such as power failures, have made it necessary to consider design for full building evacuation."

before the codes were adopted.[2] Both occupants and first responders gain a measure of safety due to the advances in product technology that lead to the adoption of new building codes in IBC and IFC for Chapter 10 Sections 1022 and 1024 "Means of egress."

First responders are key to high-rise building safety because they bring order to very stressful and often chaotic emergencies. Their mission is to save lives. The advancements in PL technologies have increased the potential lives saved beyond building occupants and extended the life-saving benefits to first responders as well. They risk their lives as a routine part of their job. In Pennsylvania, three firefighters lost their lives because they were disoriented and did not know which level of the building they were on. This confusion is believed to have lead to them being trapped in a dangerous location with tragic results.[3]

IBC/IFC Chapter 10 Section 1022 was revised for the 2012 version of the code to require the addition of stairway identification signage with distinctive markings. These markings are intended to provide information for evacuees and first responders alike. Stairwell identification signage is required to be photoluminescent in high-rise buildings because PL is known to function for an extended period in complete darkness even when backup generators fail to operate.

After complete power is cut off or lost in a structure, PL egress markings light the way through darkness and smoke providing a 30 percent increase in rescue efficiency according to tests conducted at the firefighter training center in Anaheim, California, in 2011.[4] PL egress markings were also proven to be as effective as standard lighting in a stairwell evacuation according to tests ran by a Canadian laboratory after the World Trade Center evacuations.[5]

Luminous stairway identification signage must be located in an area of the landing on the floor entrance level. The signs are not required at intermediate landing levels. The intent of stairway identification signs is multipurpose. Occupants in the process of evacuation can determine what level they are currently on and how many floors they must descend or ascend in order to reach an exit level. Persons who are visually impaired have two methods of determining the level they are currently on. The floor level can be written as numbers or letters and is affixed in a raised tactile character or characters in a 5-inch height. There is also a Braille insert just below the number notating the current floor level.

First responders and rescuers can also use the signage to determine the level they are on so they can identify how many floors must be ascended or descended in order to locate occupants, fellow rescuers, and the location level of a fire or emergency area. They can also determine if roof access is available when air rescue may be useful to evacuate occupants or rescuers needing medical attention.

The location of the sign is 5 feet above the floor and located in a place that is always visible, even when the door entering the stairway is opened.

Luminous stair nosings are intended to provide a stable, firm, slip-resistant component to the leading edge of egress stairs. This is according to the International Code Council (ICC) A117.1 Sections 504 and 302. Section 302 specifically addresses treads and risers, which are the horizontal and vertical components of steps respectively. Due to the absence of a specific requirement for slip resistance in the ICC, IBC, and IFC, the most commonly applied standard is the ADA recommendation of a Static Coefficient of Friction (SCOF) of 0.6 or higher for slip resistance. The standard test method outlined in ASTM C 1028-96 is commonly used to determine the SCOF for stair nosings. Most commercially available stair nosings exceed that standard and typically have a SCOF rating of 0.75 to greater than 1.0 when tested in either wet or dry applications.

The 2012 IBC/IFC sections 1009 identify the required tread and riser dimensions in order to create safe movement up and down steps. Treads must be a minimum of 11 inches deep and a maximum of 7 inches high when measured from the edge of one step to the edge of another above or below that step. It is important to note that the addition of stair nosings to existing stairs does not change the height from the edge of one step to the edge of another step. The measurement is taken from the top edge of one stair nosing to the top edge of the nosing of the next step.

2012 IBC/IFC section 1009.7.4 states, "Stair treads and risers shall be of uniform size and shape. The tolerance between the largest and smallest riser height or between the largest and smallest tread depth shall not exceed 3/8 inch in any flight of stairs."

The luminous markings of a stair nosing are stated in the 2012 version of IBC/IFC 1024.2.1 "Steps." The luminous marking is required to be placed within ½ inch of the leading edge of the step. It is restricted to a maximum of ½ inch wrapped around the vertical face of the step. The intent of this restriction is to reduce or preferably eliminate a vertical luminous marking on the face of a step. When ascending steps, the vertical face is more visible than when descending steps. Any luminous marking would reduce the delineation between the horizontal and vertical planes of a step. This could lead to trips and falls due to misplaced foot placement when ascending steps. A vertical luminous marking wider than ½ inch could result in a completely disoriented view of the steps causing them to look more like a ramp than a set of steps.

The depth of the luminous marking that is located at the leading edge of the stair nosing is stated to be a minimum 1 inch wide and maximum 2 inches, according to IBC/IFC 1024. There is an exception immediately noted that states the luminous stripe can be less than 1 inch if it meets UL1994 requirements, which were previously illustrated in the section "The Science Behind PL."

See endnotes in the online version of this article.

Continues at ce.architecturalrecord.com

***Steve Cooper** is vice president of sales and marketing for Balco, Inc. He is a graduate of the school of engineering at Oklahoma State University and has over 25 years of product design, field installation training, and executive management experience in the construction and life safety industry.*

Cutting-Edge Elevator Technology

Elevating architecture with destination dispatch controls

Sponsored by Schindler Elevator Corporation | *By C.C. Sullivan*

Photo courtesy of Schindler Elevator Corporation

Elevator layouts traditionally are dictated by efficiency of core area and ADA rules, but destination-based systems remove this design constraint, allowing more freedom in planning a lobby layout.

Over the last decade, new techniques in controlling elevators have radically changed thinking about how building mobility is organized and operated. For architects, these advances are essential knowledge for designing and renovating any buildings that rely on elevators for moving their occupants and visitors. The most important advancement in recent years is *destination control.* About 20 years ago, *destination control* systems were commercialized based on this approach. Not only did the controls reduce wait times and traveling times by up to 30 percent, but they also allowed for new techniques in core layouts, elevator stacking, and overall building designs.

From the 1940s to today, elevator call systems have operated on a single, uniform principle, the up-and-down hall push-button. These systems are known today as conventional technology. Used to guide elevators and tell them which floor to visit next, this approach is familiar to anyone who regularly rides an elevator. The essential logic is:

- A car will continue traveling in the current direction as long as there are remaining requests in that direction.
- If there are no requests in that direction, the car should wait and idle.
- The car should change direction if there are requests in the opposite direction.

Decidedly simple, yes—but elevator operations could be optimized for even greater efficiency. In the 1980s, microprocessor technology introduced programs with more complex commands. These include heuristics—experience-based problem solving—which attempts to approximate reasonable if not optimal solutions to handling requests. These more recent algorithms are typically applied to elevator banks through a lift-group control system (LGCS), using microprocessor logic to send off the most appropriate car among the group to answer a given request.

Yet older conventional technology systems can be outdated and inefficient. These systems represent unnecessary costs and losses to both building owners and tenants. Simple and heuristic algorithms often waste time, energy, money, and space in a large number of typologies and applications. For architects and their clients, there are big implications for adopting cutting-edge controls instead—creating "smart elevators" that benefit everyone.

DESTINATION DISPATCH

Being an amenity for building convenience, elevators are more than just vertical transportation. Its performance is a real factor in setting rental prices and attracting and retaining tenants for office buildings or buyers of condominiums. They are a memorable part of our visits to hotels and conventions. Although elevators are inherently energy efficient due to their counterbalancing, elevator systems do use significant energy during operation, and this can be bad for the triple bottom line of social, economic and environmental sustainability. Additionally, elevators consume floor area for each story served—square footage that can't be used for any other purpose.

With the goal of making elevators more efficient in each of these respects, designers are frequently looking to a computer-based system of destination control, a smart elevator technology often called *destination dispatch.*

The essence of destination dispatch is the premise that the user of a multi-elevator installation alerts the system to his or her intended destination *before* entering the car. This feature alone improves on the heuristic algorithms, by enabling the LGCS to group riders together who are traveling to the same destination. But the potential is great for destination dispatch to improve the building mobility experience—reaching beyond performance improvements alone.

User Experience

For example, user convenience and experience can be enhanced, making destination dispatch an amenity in its own right. It is less likely to strain the user's wait-time tolerance. Each input device is *position knowledgeable*, so devices can be placed throughout the path of travel to allow the user's walk time to the elevator to become part of the waiting time, for example. Some destination dispatch systems have the capacity for personalizing aspects of the ride to the individual user through use of RFID or pin code technology.

Building Performance

Performance improvements also benefit bottom-line property financials. Fewer trips and fewer stops can translate to reduced energy requirements, which translate directly to savings on power consumption and reduced carbon emissions. Destination dispatch systems can provide heightened security and access control. This is especially true for security programs and building automation system (BAS) devices engaged in data collection and analysis, which can provide a level of access control that elevators equipped with keyed access systems cannot.

Personalized for Occupants

Such *personalizing* dispatch systems are poised to significantly alter the elevator control paradigm over the next decade. Stored user data can also be shared with other BAS networks, creating opportunities for "smarter buildings" that demonstrate improved performance in myriad ways. This is true for new construction projects and existing systems in need of modernization, in both high-rise and mid-rise settings across a wide range of typologies.

Photo courtesy of Schindler Elevator Corporation

Computer-based elevator destination control systems allow users to indicate their destination before entering the car.

EVOLVING ELEVATOR CONTROLS

Old-fashioned car-switch levers recall uniformed lift attendants and movies of a certain period. A few vestiges remain in big American cities, but not by design. Such controls are antiquated, but perhaps no more so than conventional up-and-down push-button controls will seem to be in the near future.

One of the first collective push-button control systems introduced into the marketplace dates back to 1909. The first automatic *signal control* in 1924 introduced electrical relay logic boards into the pantheon of lift control technology.

Microprocessor-based controls emerged in the late 1970s in Germany, Japan, and the United States, with systems that monitored every aspect of elevator operation. Most noteworthy was their ability—now standard—to gather and analyze data from sensors indicating car positions, moving directions, loads, and door status, as well as summaries of hall and car calls, runs per car, alarms, and more. Systems used a single, computer-based system and gave rise to remote elevator monitoring.

Next came *destination-dispatch* technology, introduced in 1992. "Back in those days it was relatively a hard sell," says Bill Lippman, vice president, modernization sales and destination technology, for Schindler Elevator Corporation. "The first system was the only one on the market, and it was relegated to high-rise commercial office environments almost exclusively." User controls for the product consisted of a numbered keypad, which the rider employed to input the destination floor.

The LGCS, using a destination-dispatch algorithm, directed riders travelling to the same floor (or to floors near to one another) to enter a particular car.

Today there is a robust, competitive marketplace for elevator systems incorporating some form of destination-dispatch technology, with seven or more manufacturers and as many proprietary products. Applications are seen in universities, hotels, apartment buildings, and corporate headquarters, among others. The surge in research and development and market positioning largely reflects the measurable return on investment (ROI) associated with application of destination dispatch. Leading property managers and owners say it's likely to be the next paradigm in urban mobility solutions.

More recent developments in the control technology include *second-generation destination dispatch* control algorithms, introduced around 2004, that improve performance in all traffic modes, further reducing wait times and destination times. The addition of *access-card readers* to the user control panel further builds on the ideas of personalization and customized service. With a simple swipe, the controls recognize the user and floors available. The added level of security using access cards has also expanded interest among end-users. Visitors or contractors to a facility, for example, are issued cards in lobby or reception areas.

These and other emerging *personalization features,* we will discuss in detail, are among the most intriguing and beneficial advances for

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Learning Objectives

After reading this article, you should be able to:

1. Discuss the context for developments in elevator technology, with particular emphasis on controls.
2. Describe new destination-based dispatching technology, and how it is installed and implemented in both new construction and modernization projects.
3. List the energy-efficiency implications and other operation and efficiency benefits of destination-dispatch elevator controls and similar optimization techniques.
4. Explain how destination dispatch benefits specific building typologies, citing case studies.

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elevator end-users and owners who invest in destination-based elevator controls. Overall, the ROI is being studied by interested owner groups. One market report by CoStar, a commercial real estate information clearinghouse, found that buildings with destination-based elevator controls earn an average of $3.50 more per square foot than comparable properties without the advanced controls. Far from being relegated to only high-rise office, today destination-dispatch systems are making inroads into:

- Class A office
- Hotels
- Healthcare
- High-rise residential
- Government
- Academic

Photo courtesy of Schindler Elevator Corporation

The addition of access-card readers to the user control panel allows customized service.

Midrise structures benefit from the technology also, as do unexpected typologies such as senior living facilities. As the technology becomes more widely available, more building owners and facility managers will be learning about destination controls to stay competitive.

That means that project teams need to learn how to design for it. This will require familiarity with the system's effect on building traffic patterns and floor layouts and areas of use, as well as the particulars of the elevator and controls technologies.

NEW CONSTRUCTION, RESIDENTIAL

For the 45-story, 500-unit luxury rental tower at 516 North Lake Shore Drive in Chicago, real estate development company Related Midwest opted for a fully integrated destination-dispatch system to upgrade the elevator systems. The developer wanted more than a hall-call system; in order to attract top-dollar tenants, it sought a system that would provide high-level command and communication features.

Designed by Solomon Cordwell Buenz, the building is on track to achieve LEED Silver certification. Adding to the energy-efficient building elements is a combination of permanent magnet elevator motors combined with destination-based controls. The system also gives building management tools to develop applications for meeting target efficiency goals, updating security protocols, and adapting to tenants' specialized needs. This destination dispatch system, equipped with the full range of personalization features, not only optimizes operational performance and energy efficiency but adds a high level of customization.

Related's president Curt Bailey says, "The convenience and luxury this new system will offer our residents are fundamental to the high standard of living we provide."

The developer and architect employed destination-based controls to help meet customization, security, and efficiency goals.

Photo courtesy of Schindler Elevator Corporation

IMPLICATIONS FOR NEW CONSTRUCTION

Beyond these benefits for building occupants and owners, there are new trends in architectural design that leverage and exploit the technology. In project pre-planning and schematic design, studies of intended elevator usage and user behaviors should be considered in developing the core design and circulation scheme. User data can be analyzed and weighed against factors such as building code limits on elevator car speed; the results will inform such choices as core and bank layouts, number of elevator shafts and cars, as well as shaft heights, express and skip-stop options, as well as dedicated elevators for specific uses or occupants.

Incorporating destination-dispatch models into project planning can alter the potential design results. Alterations both subtle and radical represent increased architectural flexibility to improve upon delivery of project goals, including the following areas:

Traffic patterns. Typical elevator designs are based on *up peak roundtrip time* calculations, which describe the volume handled during a peak in trips up the elevators—for example, a morning rush-hour or post-lunchtime maximum in an office building. These trip times usually do not include the time end-users spend waiting alone or in clusters for the next car.

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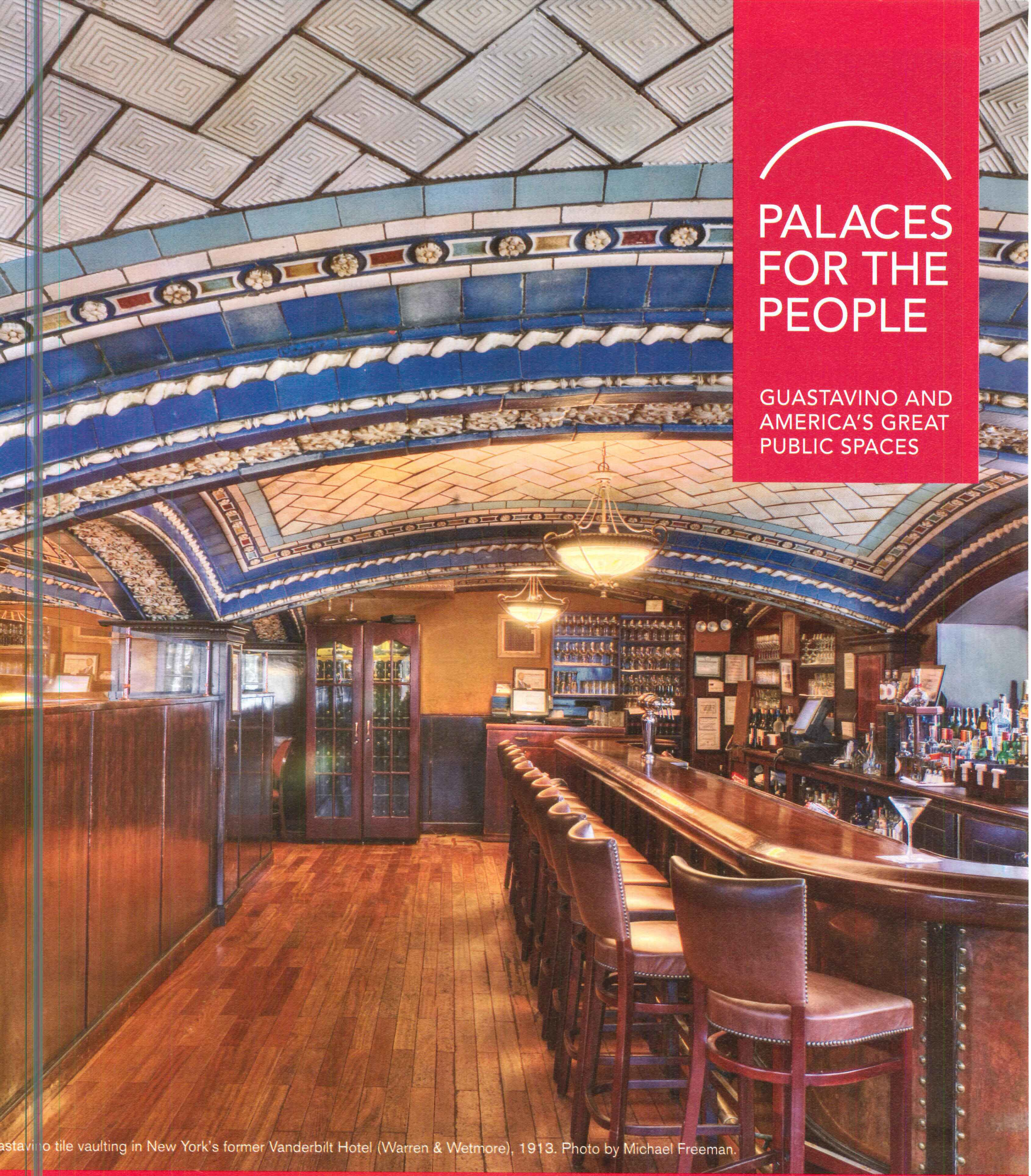
C.C. ***Sullivan*** *is a marketing communications consultant specializing in architecture and construction.*



astavi o tile vaulting in New York's former Vanderbilt Hotel (Warren & Wetmore), 1913. Photo by Michael Freeman.

New and Upcoming Exhibitions

A New Sculpturalism: Contemporary Architecture from Southern California
Los Angeles
June 2–September 2, 2013
The Museum of Contemporary Art, Los Angeles presents the first extensive scholarly examination of the radical forms that have become prolific in Southern California architecture during the past 25 years. The exhibition aims to rethink how museums display architecture, allowing visitors to experience it primarily in three-dimensional form with models, full-scale maquettes, and full-size built structures. For more information, visit moca.org.

Eastern Promises: Contemporary Architecture and Spatial Practices in East Asia
Vienna
June 5–October 6, 2013
One of the most dynamic and multifaceted building sites in the world, Asia is attracting the interest of architectural practitioners on a global scale. Bearing in mind the manifold cultural and regional references, this MAK exhibition presents as its theme the promise of a future-oriented trend in architecture specifically associated with countries such as China, Taiwan, South Korea, and Japan. For more information, visit mak.at.

Reimagining Lincoln Center and the High Line
Long Island City, New York
June 7, 2013
Directed by Muffie Dunn and Tom Piper, this film explores the renovation of the High Line Park and the revitalization and expansion of Lincoln Center for the Performing Arts, both of which were completed in New York City almost simultaneously by the design firm Diller Scofidio + Renfro. Founded in 1979, the firm is celebrated for its integration of architecture with both the performing and visual arts. Showing at the Noguchi Museum. For more information, visit noguchi.org.

James Turrell: The Light Inside
Houston, Texas
June 9–September 22, 2013
Concentrating on the extraordinary collection at the Museum of Fine Arts, Houston, of work by American artist James Turrell, this presentation makes many of the artist's installations accessible to the public for the first time. At the conceptual core of the exhibition is *The Light Inside*, which is a permanent work at the MFAH in the underground Wilson Tunnel. Also included is *Vertical Vintage*, a grouping of a dozen light-based installations that allow visitors to test the limits of their perception, study the play of illusion, and witness how light shapes space. For more information, visit mfah.org/exhibitions.

Nomadic Furniture 3.0 New Liberated Living
Vienna
June 12–October 6, 2013
In today's world, DIY culture is practically omnipresent: whether fashion, furniture, cooking, or communication, hardly a single area of everyday life and material culture has not been swept up in the revolution. With its emphasis on the field of furniture design, this is the first exhibition to examine the movement situated on the threshold between the subcultural and the mainstream and take a look into its historical context. For more information, visit mak.at.

James Turrell
New York City
June 21–September 25, 2013
James Turrell's first exhibition in a New York museum since 1980 focuses on the artist's explorations of perception, light, color, and space, with a special focus on the role of site-specificity in his practice. At its core is *Aten Reign* (2013), a major new project that recasts the Guggenheim rotunda as a volume filled with shifting artificial and natural light. The installation reimagines Frank Lloyd Wright's iconic architecture—its openness to nature, curves, and magnificent sense of space—as one of Turrell's Skyspaces, referencing in particular his magnum opus, the *Roden Crater* project. For more information, visit guggenheim.org.

Composite Landscapes: Photomontage and Landscape Architecture
Boston
June 27–September 2, 2013
The Isabella Stewart Gardner Museum debuts the first landscape-architecture-focused exhibition in the Hostetter gallery of the museum's new wing, designed by Renzo Piano. This exhibition will gather works from influential contemporary artists and a dozen leading landscape architects to examine one of landscape architecture's most recognizable representational forms: the montage view. For more information, visit gardnermuseum.org.

Coast Modern
Long Island City, New York
August 2, 2013
An independent documentary by directors Mike Bernard and Gavin Froome, this film explores

West Coast Modernist architecture along the Pacific Northwest coastline. *Coast Modern* takes viewers through some of the region's most expressive homes, designed with the convergence of the interior and exterior world in mind. Featured are interviews with several Modernist architects, including James Steele, Barbara Lamprecht, Ray Kappe, Henrik Bull, Pierluigi Serraino, Michael Folonis, Dion Neutra, Douglas Coupland, John Cava, and Barbara Bestor. Showing at the Noguchi Museum. For more information, visit noguchi.org.

Ongoing Exhibitions

Jim Olson: Art in Architecture
Bellingham, Washington
Through June 9, 2013
This retrospective at the Whatcom Museum is devoted to the career of Jim Olson, one of the Northwest's most significant architects and founder of the Seattle-based firm Olson Kundig Architects. The exhibition spans Olson's first 50 years in architecture, exploring his built work as well as his artistic, cultural, natural, and personal influences. For more information, visit whatcommuseum.org.

Loos: Our Contemporary
Vienna
Through June 23, 2013
The continuous influence of Adolf Loos (1870–1933) on the building culture of the past 100 years is the focus of the exhibition *Loos: Our Contemporary* at the Austrian Museum of Applied Arts (MAK). Loos's minimalist-aesthetic paradigms and concept of ethical architecture influenced the oeuvres of numerous modern-era architects. For more information, visit mak.at.

Low Rise High Density
New York City
Through June 29, 2013
This exhibition at the New York chapter of the AIA's Center for Architecture examines a housing type celebrated in the 1960s and '70s, and what it means in the United States today. Presenting global case studies from the last 50 years through architectural drawings, photographs, and oral histories with project architects, *Low Rise High Density* traces the typology over time. The consideration of environmental and social ideas embedded in low-rise, high-density housing is as urgent now as it was when it was first developed. Today we can look at it as an alternative to suburban sprawl. For more information, visit cfa.aiany.org.

Future of the City
New York City
Through June 29, 2013
Also presented by the New York chapter of the American Institute of Architects, *Future of the City* documents AIA New York's thinking on significant issues facing the city's built environment. The first section, "A Platform for the Future of the City," is the result of an inclusive process that involved AIA New York members, committee chairs, board leaders, and others. This policy platform provides recommendations addressing the issues the city faces today. "Post-Sandy Strategic Initiative," the second section, responds immediately to the extraordinary challenges following the devastation of Hurricane Sandy. Presented as part of NYCxDESIGN—New York City's design week—this exhibition demonstrates the values, expertise, and practical knowledge of the architect, associate, and affiliate members of AIA's New York chapter. For more information, visit cfa.aiany.org.

Motion Matters
Berlin
Through July 4, 2013
UNStudio has been investigating the potential

of temporary installations as an experimental testing ground for architectural concerns, and it is these investigations that form the basis of *Motion Matters*. The exhibition presents 10 of UNStudio's milestone projects, in addition to conveying its perspective on 25 years of architectural production, its current approach to practice, and the wider discourse that determines design challenges today. For more information, visit aedes-arc.de.

The Woolworth Building @ 100
New York City
Through July 14, 2013
A masterpiece of early-20th-century art and technology, the Woolworth Building celebrates its centennial year in the process of conversion, with office space remaining below and luxury residences planned for the upper tower. Still radiant on the Lower Manhattan skyline, the landmark heralds both the past and future of New York. For more information, visit skyscraper.org.

Folly 2013
Queens, New York
Through August 5, 2013
Folly is a competition cosponsored by the Architectural League and Socrates Sculpture Park that invites emerging architects and designers to propose contemporary interpretations of the architectural folly, traditionally a fanciful, small-scale building or pavilion sited in a garden or landscape to frame a view or serve as a conversation piece. The 2013 Folly winner is *Tree Wood,* designed by Toshihiro Oki, Jen Wood, and Jared Diganci. For more information, visit archleague.org.

Spontaneous Interventions: Design Actions for the Common Good
Chicago
Through September 1, 2013
Held at the Chicago Cultural Center, this exhibition is devoted to the growing movement of architects, designers, artists, and everyday citizens acting on their own initiative to bring improvements to the urban realm, creating new opportunities and amenities for the public. The Chicago installation will re-create the lively exhibition design of pull-down banners created by Brooklyn design studio Freecell and Berkeley-based communication-design firm M-A-D. For more information, visit spontaneousinterventions.org.

Ricciotti, Architect
Paris
Through September 8, 2013
The first solo exhibit dedicated to Rudy Ricciotti—the Bandol artist who received the

Grand Prix National de l'Architecture in 2006—this exhibition highlights a series of experiments in concrete, his favorite material. At the Cité de l'Architcture et du Patrimoine. For more information, visit citechaillotfr/en.

Energy: Oil and Post-oil Architecture and Grids
Rome
Through September 29, 2013
More than 80 drawings and projects, three photographers and seven international architects demonstrate the relationship between architecture and energy at this MAXXI exhibition. *Energy* explores new architectural ideas and an impressive depth of research in the field of spaces and grids that are linked to the distribution of energy for more efficient movement and tasks. For more information, visit fondazionemaxxi.it.

Theaster Gates: 13th Ballad
Chicago
Through October 6, 2013
Chicago-based artist Theaster Gates has designed a new large-scale installation at the Museum of Contemporary Art Chicago. The installation consists of objects and materials from the Huguenot House, a public-architecture project in Chicago and Germany, a set of repurposed pews from the University of Chicago's campus church, and a monumental double-cross sculpture. Gates created an ecclesiastical ambience to suggest that art museums, like churches, are sites of pilgrimage and thoughtful contemplation. *13th Ballad* is accompanied by a series of collaborative performances. For more information, visit mcachicago.org.

Archaeology of the Digital
Montreal
Through October 13, 2013
This exhibition at the Canadian Centre for Architecture delves into the genesis and establishment of digital tools for design conceptualization, visualization, and production at the end of the 1980s and beginning of the 1990s. Featuring the work of Frank Gehry, Peter Eisenman, Shoei Yoh, and Chuck Hoberman, *Archaeology of the Digital* highlights the dialogue between computer sciences, architecture, and engineering, which is at the core of the early experiments performed by the featured artists. For more information, visit cca.qc.ca.

Green Schools
Washington, D.C.
Through January 5, 2014
The National Building Museum is hosting the first-ever museum exhibition dedicated to the greening of American schools. Featuring more than 40 exemplary projects, from new construction to rehabs to modular classrooms, the exhibition will survey the breadth of green school design in the United States through sample building materials, photographs, video, and green products. For more information, visit nbm.org.

Palaces for the People: Guastavino and America's Great Public Spaces
Washington, D.C.
Through January 20, 2014
Palaces for the People sheds lights on the story of Rafael Guastavino Sr. (1842–1908), arguably the most influential architectural craftsman working in late-19th- and early-20th-century America. An established master builder in Barcelona, Guastavino patented a tiling system—based on a centuries-old Spanish building method—enabling the construction of self-supporting arches that were simultaneously lightweight, virtually indestructible, fireproof, and attractive. At the National Building Museum. For more information, visit nbm.org.

dates&events

James Turrell: A Retrospective
Los Angeles
Through April 6, 2014
This Los Angeles County Museum of Art retrospective explores nearly 50 years in the career of James Turrell, a key artist in the Southern California Light and Space movement of the 1960s and '70s. The exhibition includes early geometric light projections, prints and drawings, installations exploring sensory deprivation and seemingly unmodulated fields of colored light, and recent two-dimensional work with holograms. One section is devoted to the Turrell masterwork-in-process *Roden Crater*, a site-specific intervention into the landscape just outside Flagstaff, Arizona, which will be presented through models, plans, photographs, and films. The exhibition includes a separately ticketed experience, *Light Reignfall*, from the artist's *Perceptual Cell* series, with a limited number of tickets available. For more information, visit lacma.org.

Lectures, Conferences, and Symposia

Michigan Modern: Design That Shaped America
Bloomfield Hills, Michigan
June 13–16, 2013
This four-day symposium at the Cranbrook Educational Community brings together architects, critics, designers, historians, business leaders, and others to discuss Michigan's central role in the development of American Modernism, which created the foundation for Michigan's strong design and engineering industry today. This symposium and the companion exhibition celebrate Michigan's contributions to modern design and the stories of the people who made it happen. For more information, visit michiganmodern.org.

CityAge: The Global Metropolis
New York City
June 18–19, 2013
CityAge is a platform for dialogue, designed to amplify new ideas in business, government, and society. It holds events across North America to explore and develop the partnerships between businesses, decision makers, and thought leaders who are building the 21st century's urban future. Prior CityAge events have been organized in partnership with Mayor Sly James and his team in Kansas City, Missouri (Summit on the New American City), the Vancouver Economic Commission (Vancouver Cities Summit), and the MaRS Discovery District in Toronto (The Innovation City). RECORD is a media sponsor of the event, which includes speakers Bjarke Ingels of BIG and Jill Lerner of KPF. For more information, visit cityage.tv/nyc/.

AIA National Convention
Denver
June 20–22, 2013
The American Institute of Architects' national convention is the industry's leading annual event. The theme of this year's gathering, Building Leaders, underscores the importance of celebrating leadership while sharpening skills to engage clients, the government, and the public. With over 300 convention programs, including seminars, workshops, exhibitions, tours, and networking opportunities, the event, to be held at the Colorado Convention Center, will give attendees the

opportunity to stay abreast of developments in the field, as well as strengthen connections with professional and political colleagues.

2014 International Roofing Expo
Las Vegas
February 26–28, 2014
The International Roofing Expo brings all segments of the roofing construction and maintenance industry together for three days of face-to-face interaction, product review, education, and networking. The show will feature 450 exhibiting companies in 1,000 booths and draw 9,000 people in total attendance. Show highlights include 44 educational sessions, the Product Showcase, the Technology & Business Services Pavilion, the Metal Marketplace, and Exhibitor Product Clinics. At the Mandalay Bay Convention Center. For more information, visit theroofingexpo.com.

Competitions

7th International Cosentino Design Challenge
Submission Deadline: June 1, 2013
Cosentino, a producer and distributor of quartz, natural stone, and recycled surfacing, invites submissions for its annual design and architecture competition. Submissions must use Cosentino materials for a conceptual office space or outdoor kitchen space. The competition is open to current college and university students studying architecture or design. The submissions will be evaluated by a jury based on a number of criteria, including innovation, research, product adaptation, feasibility, conceptual and technical quality, and presentation. For more information, visit cosentinodesignchallenge.org.

Ground/Work
Submission Deadline: June 13, 2013
The Van Alen Institute is seeking submissions from designers who are up to 10 years out of school for ways to reinvent its ground-floor retail space in Manhattan. After evaluation by a jury composed of Van Alen trustees and design professionals, as many as three individual designers or firms will be selected to compete in the second phase of the competition. These finalists will be offered a modest stipend and will have three weeks to develop their designs. Following the jury's final selection, the winning team will have four months to complete design work and develop construction documents. Construction is expected to begin in winter 2013. For the full list of guidelines and other information, visit vanalen.org/groundwork.

East-West Dialogues Symposium Call for Papers
Abstract Deadline: July 8, 2013
The East-West Dialogues Symposium intends to explore the ideas and practices involved in the development of modern schools. Contributors are invited to propose papers—preferably dealing with archival and primary material and interdisciplinary approaches. A series of session themes/topics has been identified, but the organizers encourage paper presenters to explore outside the bounds of these topics. For more information and a list of defined topics, visit eastwestdialogues.com.

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

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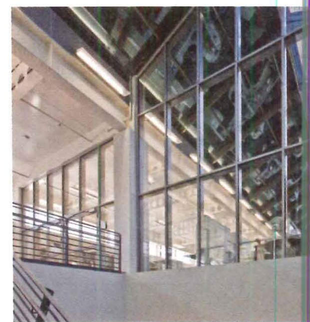

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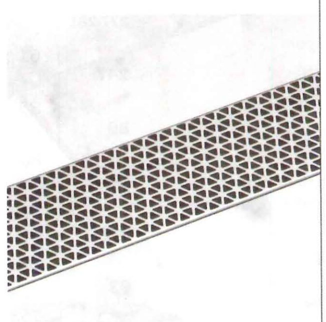

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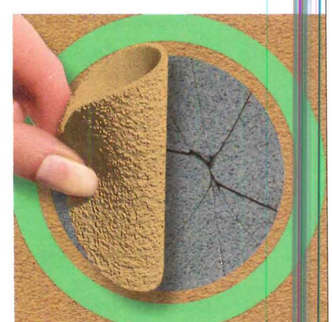

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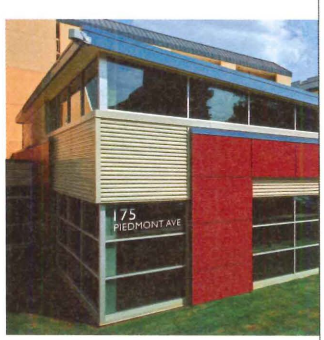

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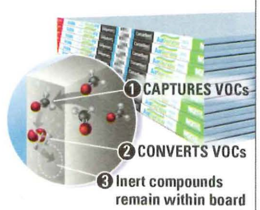

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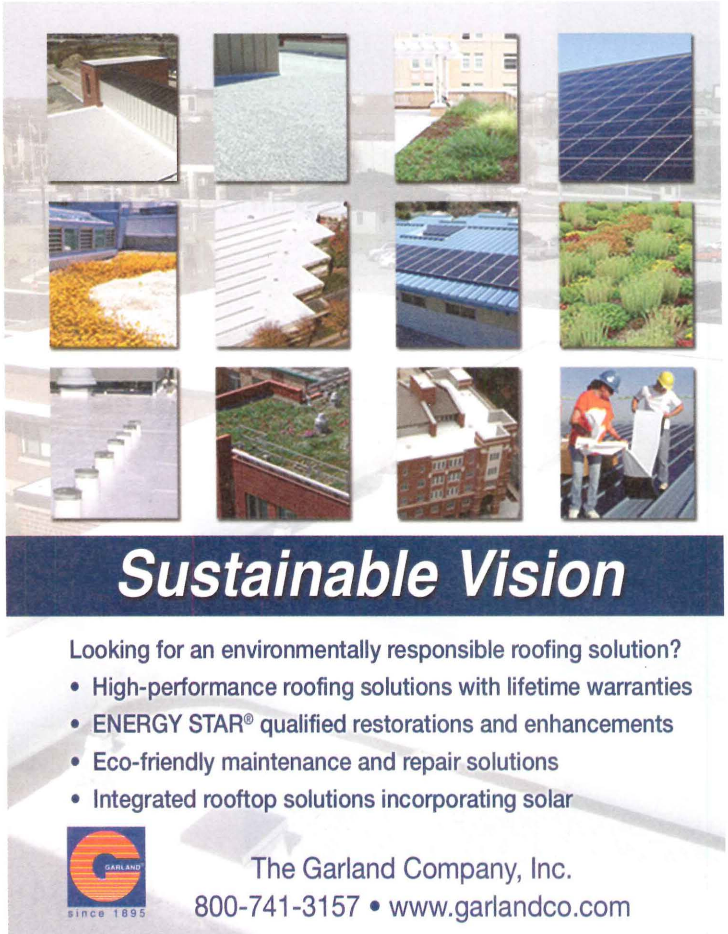

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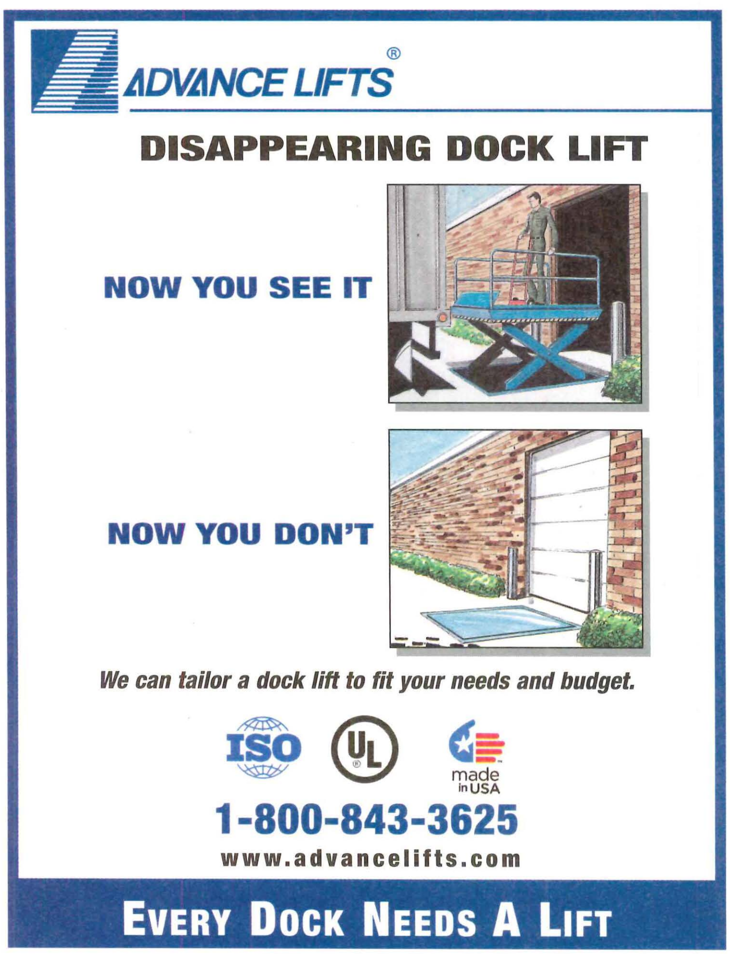

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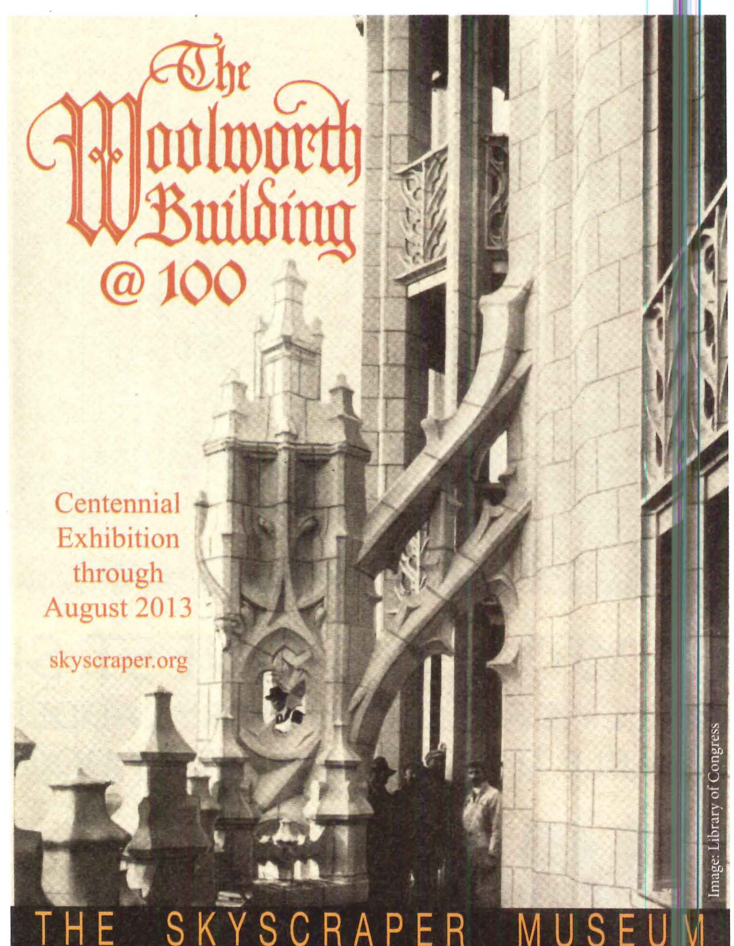
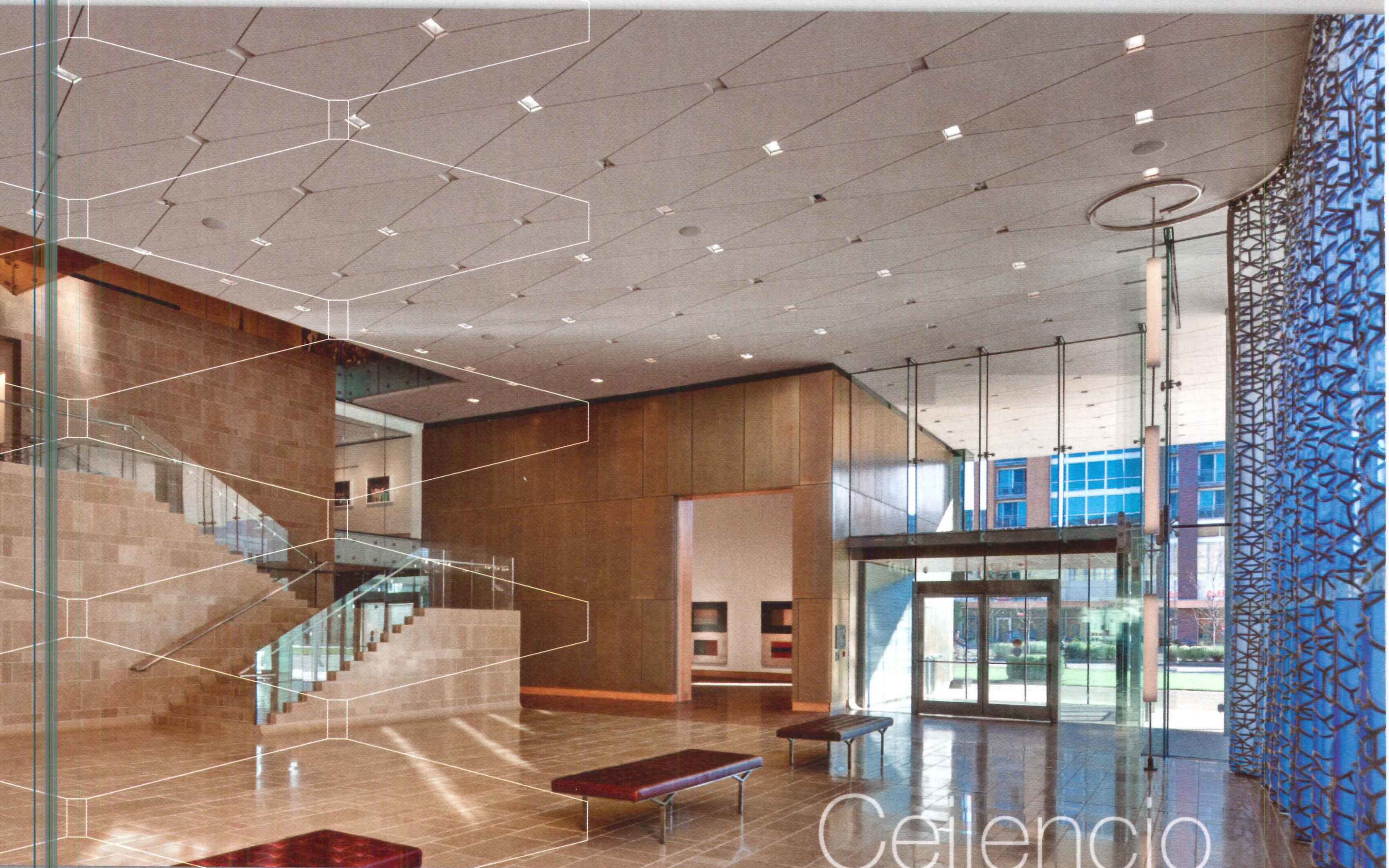


snapshot

PROJECT CMA CGM HEADQUARTERS
LOCATION MARSEILLES, FRANCE
DESIGNER ZAHA HADID ARCHITECTS

Zaha Hadid's first tower, completed in September 2011 for container-shipping company CMA CGM, is visible beyond low-rise buildings in Marseilles's Grands-Carmes district.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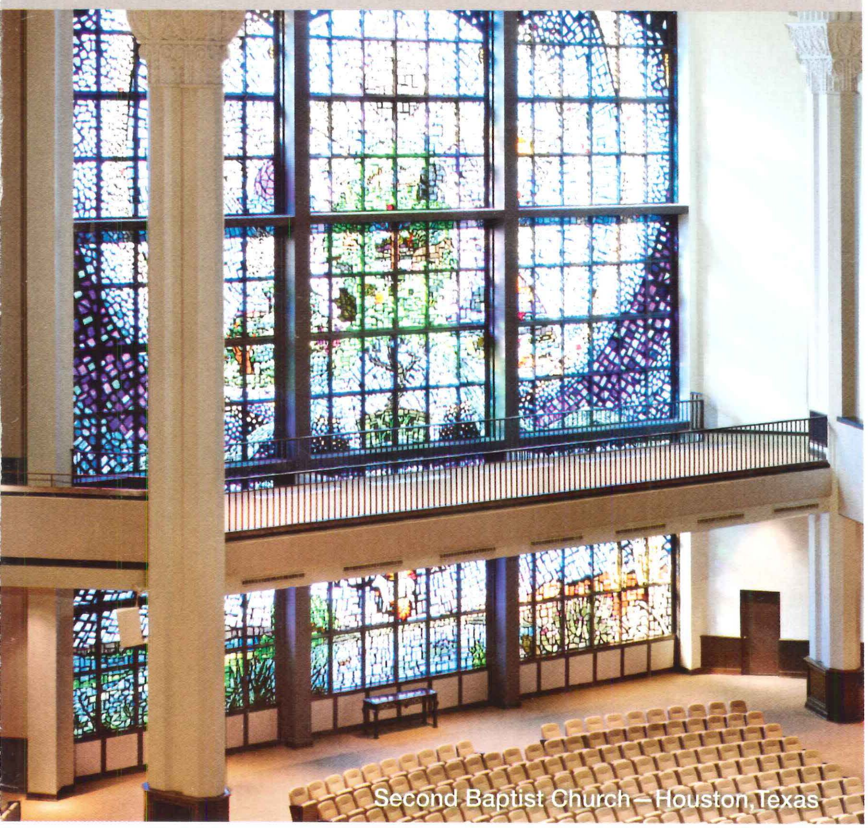

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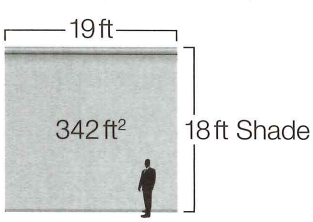

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