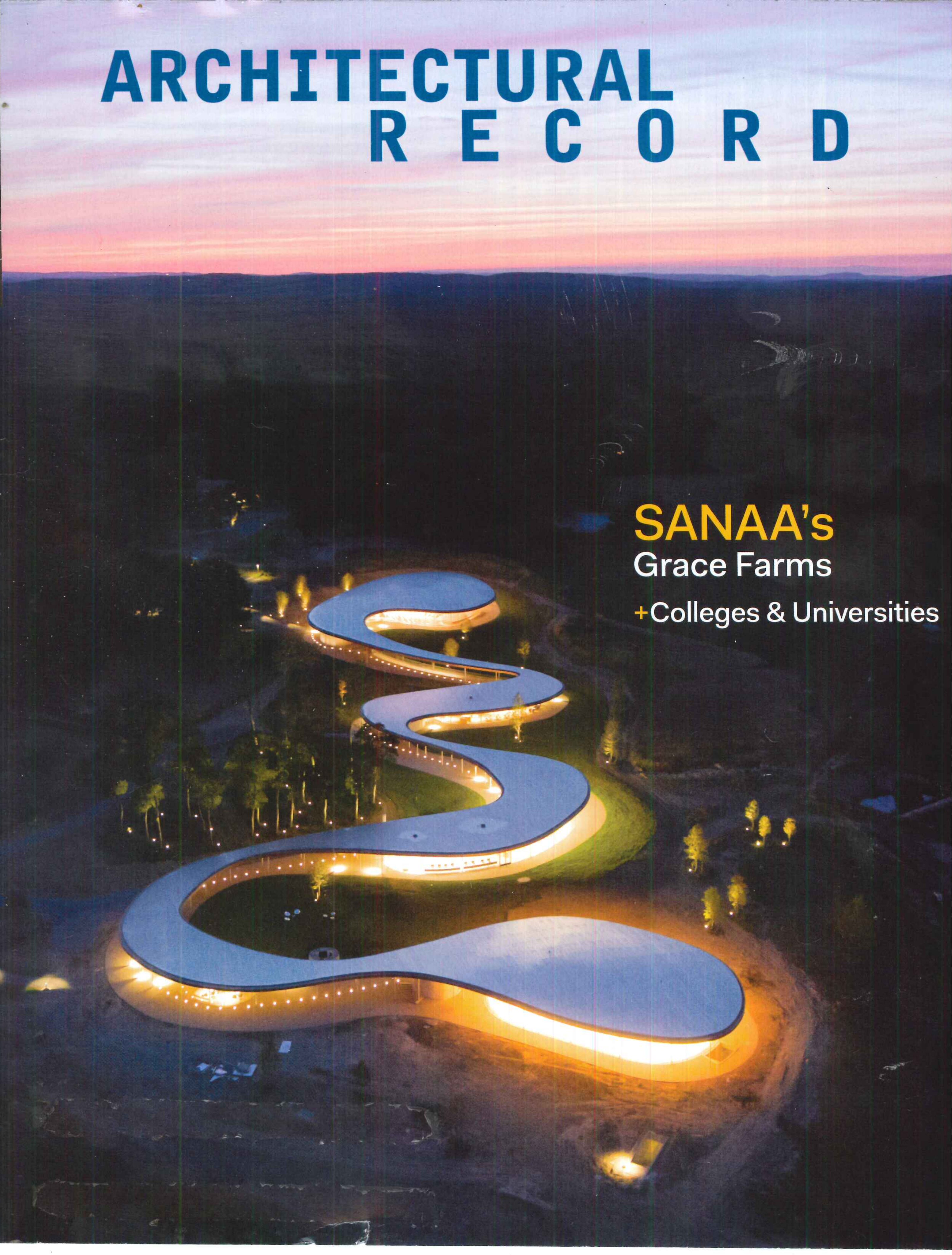
ARCHITECTURAL RECORD



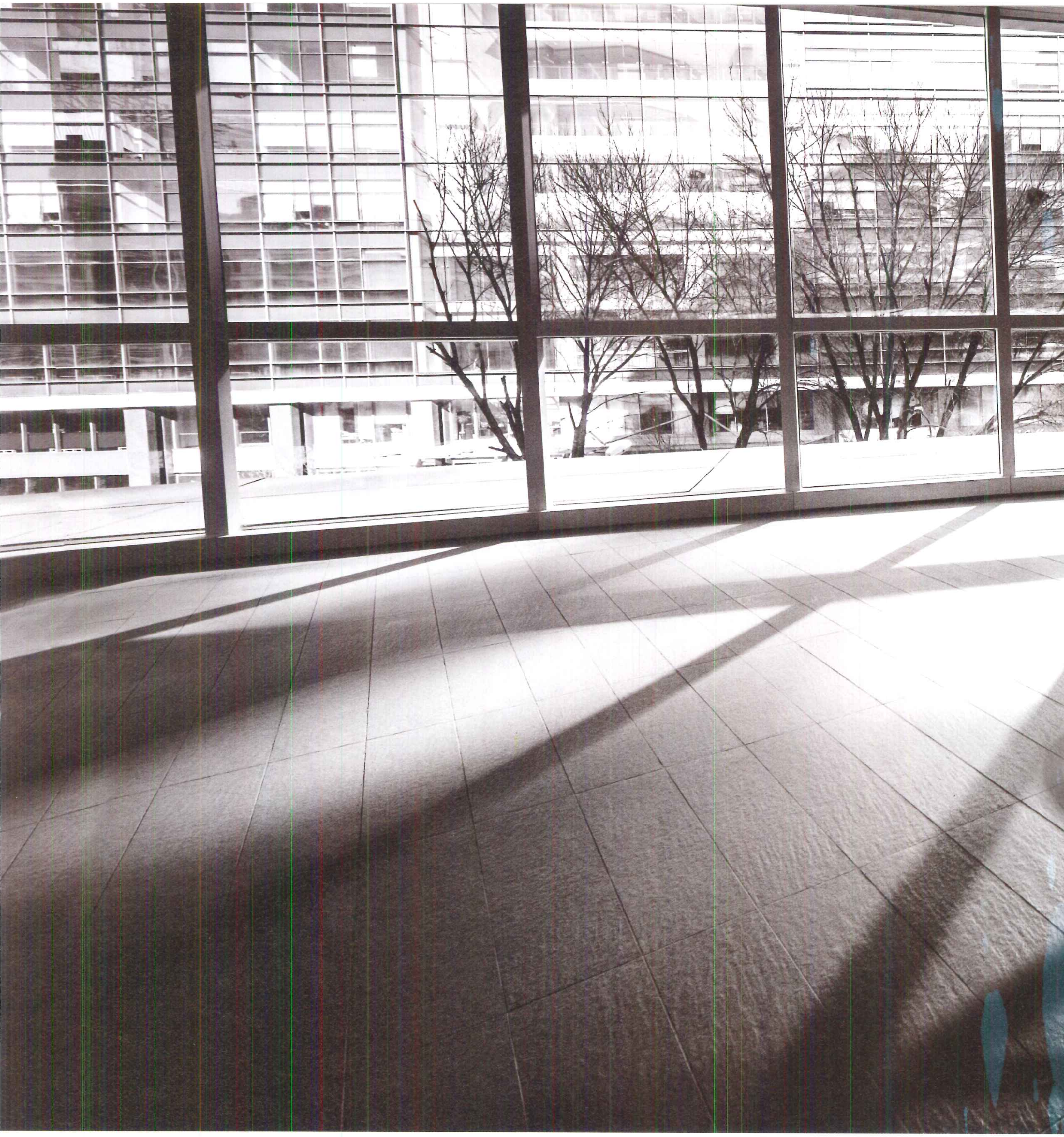
SANAA's
Grace Farms

+Colleges & Universities

bnp | 11 | 2015 $9.95 www.architecturalrecord.com

DISCOVER ULTRA HIGH PERFORMANCE CONCRETE
TAKTL® offers a full line of architectural elements—facade and wall panels, cast corners, screens, louvers, and fins—utilizing a proprietary Ultra High Performance Concrete (UHPC) that is over four times as strong as traditional precast concrete and performs exceptionally well in demanding conditions. Panels are cast in a tightly controlled and automated production process employing molds that yield intrinsic surface patterns and finishes. Uniting superior strength, durability and design possibilities—TAKTL will change the way you think about concrete.
1120 William Flynn Highway, Glenshaw, PA 15116 | 412.486.1600 | info@taktl-llc.com
SHOWN: TAKTL Panels | Rough 1+2 | Custom Tan
9 STANDARD TEXTURES + 12 STANDARD COLORS
ASTM C1186: Grade IV Certification
PROJECT: Wake Tech Community College Library
LOCATION: Raleigh, NC
OWNER: Trustees of Wake Tech Community College
ARCHITECT: Clark Nexsen Architecture (Raleigh)
INSTALLER: Sears Contract, Inc.
GC: Skanska (Durham)
CIRCLE 55
WWW.TAKTL-LLC.COM

TAKTL



Clearly Evolving

SOLARBAN® 90
Solar Control Low-E Glass

ARCHITECTURAL RECORD

PLEASE NOTE: EDITORS' EMAIL ADDRESSES HAVE CHANGED

EDITOR IN CHIEF	Cathleen McGuigan, *mcguiganc@bnp.com*
MANAGING EDITOR	Beth Broome, *broomeb@bnpmedia.com*
DEPUTY EDITORS	Clifford A. Pearson, *pearsonc@bnpmedia.com* Suzanne Stephens, *stephenss@bnpmedia.com*
SENIOR EDITORS	Joann Gonchar, AIA, LEED AP, *goncharj@bnpmedia.com* Linda C. Lentz, *lentzl@bnpmedia.com*
NEWS EDITOR	Anna Fixsen, *fixsena@bnpmedia.com*
WEB EDITOR	Miriam Sitz, *sitzm@bnpmedia.com*
EDITORIAL ASSISTANT	Rebecca Seidel, *areditor@bnpmedia.com*
COPY EDITOR	Anna Shapiro
ART DIRECTOR	Michael T. Powell, *powellm@bnpmedia.com*
ASSISTANT ART DIRECTOR	Kaylee Foster, *fosterk@bnpmedia.com*
CONTRIBUTING ILLUSTRATOR, PRESENTATION DRAWINGS	Peter Coe
CONTRIBUTING EDITORS	Sarah Amelar, Fred A. Bernstein, Robert Campbell, FAIA, C.J. Hughes, Blair Kamin, Jayne Merkel, Josephine Minutillo, David Sokol, Michael Sorkin, Sarah Williams Goldhagen
SPECIAL INTERNATIONAL CORRESPONDENT	Naomi R. Pollock, AIA
INTERNATIONAL CORRESPONDENTS	David Cohn, Tracy Metz, Aric Chen, Chris Foges
CONTRIBUTING PHOTOGRAPHERS	Iwan Baan, Roland Halbe

ARCHITECTURAL RECORD (ISSN: Print 0003-858X) November 2015, Vol. 203, No. 11 Published monthly, 12 time annually, by BNP Media II, LLC., 2401 W. Big Beaver Road, Suite 700, Troy, MI 48084-3333. Telephone: 248/362 3700, Fax: 248/362-0317.
ANNUAL RATE FOR SUBSCRIPTIONS TO INDIVIDUALS IN THE U.S.: $72.00 U.S. Annual rate for subscriptions to indi viduals in Canada and Mexico: $79.00 U.S. (includes GST & postage); outside North America: $199.00 (interna tional mail) payable in U.S. funds. Single-copy price: $9.95; foreign: $11.00.

Periodicals postage paid at Troy, MI, and at additional mailing offices.
POSTMASTER: Send address changes to: ARCHITECTURAL RECORD, P.O. Box 5732, Harlan, IA 51593.
CANADA POST: Publications Mail Agreement #40015472. GST account: 131263923. Send returns (Canada) t ASENDIA, Local Return Address P.O. Box 1051, Fort Erie, ON, L2A 6C7.
CHANGE OF ADDRESS: Send old address label along with new address to ARCHITECTURAL RECORD, P.O. Bo 5732, Harlan, IA 51593.
FOR SINGLE COPIES OR BACK ISSUES: contact Ann Kalb at 248/244-6499 or KalbR@bnpmedia.com.

EDITORIAL OFFICES: 212/904-6229. Editorial fax: 212/904-4256. Two Penn Plaza, New York, NY 10121-2298. **WEBSITE:** Architecturalrecord.com.

bnp media — BNP Media Helps People Succeed in Business with Superior Information

ABC MPA

PRINTED IN USA

ARCHITECTURAL RECORD

PUBLISHER
Alex Bachrach
bachracha@bnpmedia.com

ADVERTISING SALES
NEW ENGLAND AND PA: Joseph Sosnowski
(610) 278-7829 Fax: (610) 278-0936, *sosnowskij@bnpmedia.com*
SOUTHEAST/MID-ATLANTIC: Susan Shepherd
(859) 987-9913 Fax: (404) 252-4056, *shepherds@bnpmedia.com*
MIDWEST (IA, IL, MN, MO, WI): Elizabeth Tuke
224-216-7836, *tukee@bnpmedia.com*
MIDWEST (IN, MI, OH, EASTERN CANADA): Lisa Zurick
(513) 345-8210 Fax: (513) 345-8250, *zurickl@bnpmedia.com*
NORTHWEST: Bill Madden
(503) 260-9679, Fax: (503) 557-9002, bill@maddenandassociates.net
PACIFIC/TEXAS: Sherylen Yoak
(760) 568-0465 Fax: (720) 559-9818, *yoaks@bnpmedia.com*
KS, NE, ND, NY, SD: Risa Serin
(212) 904-6041 Fax: (212) 904-4652, *serinr@bnpmedia.com*

SPOTLIGHT SALES: Risa Serin
(212) 904-6041 Fax: (212) 904-4652, *serinr@bnpmedia.com*
WORKFORCE/ RECRUITMENT: Diane Soister
(212) 904-2021 Fax: (212) 904-2074, *soisterd@bnpmedia.com*

INTERNATIONAL

GERMANY: Uwe Riemeyer
(49) 202-27169-0 Fax: (49) 202-27169-20, *riemeyer@intermediapartners.de*
ITALY: Ferruccio Silvera
(39) 022-846716 Fax: (39) 022-893849, *ferruccio@silvera.it*
JAPAN: Katsuhiro Ishii
(03) 5691-3335 Fax: (03) 5691-3336, *amkatsu@dream.com*
KOREA: Young-Seoh Chin
(822) 481-3411/3 Fax: (822) 481-3414

CORPORATE DIRECTORS
PUBLISHING
John R. Schrei
CORPORATE STRATEGY DIRECTOR
Rita M. Foumia
CONTENT DEPLOYMENT
Michelle Hucal
INFORMATION TECHNOLOGY
Scott Krywko
PRODUCTION
Vincent M. Miconi
FINANCE
Lisa L. Paulus
CREATIVE
Michael T. Powell
HUMAN RESOURCES
Marlene J. Witthoft
EVENTS
Scott Wolters
CLEAR SEAS RESEARCH
Beth A. Surowiec

AUDIENCE DEVELOPMENT
SENIOR INTEGRATED MEDIA SPECIALIST
Magdalena Lee
CORPORATE AUDIENCE AUDIT MANAGER
Catherine M. Ronan
ONLINE DEVELOPMENT DIRECTOR
Nikki Smith
DIRECTORY DEVELOPMENT MANAGER
Erin Mygal

LIST RENTALS
SENIOR ACCOUNT MANAGER
Kevin Collopy
(402) 836-6265,
kevin.collopy@infogroup.com
SENIOR ACCOUNT MANAGER
Michael Costantino
(402) 836-6266,
michael.costantino@infogroup.com

BNP MEDIA: (248) 244-6400

WEBSITE: architecturalrecord.com. **SUBSCRIBER SERVICE:** 877/876-8093 (U.S. only); 515/237-3681 (outside the U.S.). Subscriber fax: 712/755-7423. E-mail: *arhcustserv@cdsfulfillment.com.* If the Post Office alerts us that your magazine is undeliverable, we have no further obligation unless we receive a corrected address within one year. **INQUIRIES AND SUBMISSIONS:** Letters, Beth Broome; Practice, Suzanne Stephens; Books, Clifford A. Pearson; Lighting and Interiors, Linda C. Lentz; Architectural Technology, Joann Gonchar; News, Anna Fixsen. **REPRINTS:** *architecturalrecord@theygsgroup.com* **BACK ISSUES:** Call 877/876-8093, or go to *architecturalrecord.com/backissues.*

BNP Media Helps People Succeed in Business with Superior Information

ABC MPA

PRINTED IN USA

HEALING GARDENS

THE ROLE OF FABRIC FOR SHADE & SEATING

The ancient concept of nature as healing diminished as technology propelled medical advances of the 20th century. Today, backed by extensive research, healthcare providers realize anew the important role nature can play in reducing patient stress, improving health outcomes and humanizing conditions for family members and medical staff.

Healing gardens are best designed to improve mental, physical and social well-being when they facilitate a sense of control and access to privacy, encourage social support and exercise and give users a means to spend time in nature. Performance fabric shade structures and seating offer many options in how gardens are used and the level of privacy they provide. Group interaction, private conversation or quiet observation can all be accommodated in comfort when appropriate fabric shade structures and seating are selected.

Coraline, an honorable mention winner in the 2015 Sunbrella Future of Shade competition, takes inspiration from sea coral and represents new thinking on shade designs for healing gardens and other public spaces.

Upon completion of this continuing education unit course, you will be able to:

- Recall the inception of healing gardens and the studies that led to their creation
- List benefits of a healing garden to patients, families, healthcare workers, and the environment
- Describe the goals of a successful healing garden and some of the garden elements that support these goals
- Summarize the considerations for designing shade and seating for a healing garden
- Identify the fabric selection considerations for both shade and seating elements

LEARNING UNITS

This course is worth 1 Learning Unit/Health Safety and Welfare Hour in the American Institute of Architects Continuing Education System. This course is worth:

- American Institute of Architects - 1 Learning Unit
- Interior Design Continuing Education Council - 0.1 Continuing Education Unit
- Landscape Architecture Continuing Education System - 1.0 Professional Development Hour

NATURE IS HEALING

The idea of nature as restorative is a concept that spans cultures and is more than a thousand years old. Contact with nature has long been seen as beneficial for health and well-being. The World Health Organization formalized a definition of health more than 65 years ago in the Preamble to its Constitution as, "a complete state of physical, mental and social well-being, and not merely the absence of disease or infirmity."

Defining health with this broad definition encompasses the understanding that there are many dimensions of wellness—and wellness is compromised when one or more dimensions is out of balance. The human connection with nature is a bond that can foster healing to restore the balance; early medical practitioners understood this.

In the Middle Ages in Europe, monastery infirmaries included gardens, often elaborate, to distract the ill. In the 1800s in both Europe and America, pavilion-style hospitals were commonly designed with gardens for the patients to use.

Florence Nightingale, nurse and public health reformer, wrote in 1898 that patients should be able to see out of windows from their beds, "to see sky and sunlight at least, if you can show them nothing else…I assert [this] to be, if not of the very first importance for recovery, at least something very near it." (Notes on Nursing: What It Is, and What It Is Not)

Those involved in caring for the sick intuitively understood that views and access to nature were therapeutic, even though they did not understand why.

20TH CENTURY THEORY & DESIGN

The 20th century leaps in medical knowledge and technology sidelined a connection with nature. The need to accommodate modern technologies in healthcare facilities, to improve efficiency and to prevent infection, overshadowed the importance of therapeutic elements such as gardens.

The result was starkly institutional hospitals that looked like office buildings, exteriors dominated by parking lots, and interiors closed off with air conditioning. This design, combined with an environment in which patients have little choice or control, led to a setting that did nothing to calm patients, reduce stress or meet the emotional needs of not only patients, but also families and staff.

PATIENT-CENTERED DESIGN

The patient-centered care movement of the early 1990s began a renewed awareness of the negative effects of institutional settings. Economic factors pushed this movement forward as competition between healthcare providers grew, and patients had more choices among hospitals and assisted living facilities. Healthcare organizations are now moving toward a holistic approach to treating the patient, taking the needs of family members and staff into consideration as well. The growing body of research on the benefits of nature to mental, physical and social well-being has meant that many healthcare facilities are returning to the concept of healing gardens, this time with scientific evidence and understanding of how and why they are therapeutic.

HEALING GARDEN RESEARCH

Mounting evidence shows that gardens are one way to measurably reduce stress for patients in healthcare settings and can benefit family members and healthcare staff.

In a 1984 study in Science, environmental psychologist Roger Ulrich was the first to use modern medical research standards (strict experimental controls, quantified health outcomes) to demonstrate that recovery times shortened with a view of nature. Gallbladder surgery patients with a view of trees healed on average a day faster, needed significantly less pain medication, and had fewer postsurgical complications than those with a view of a brick wall.

Even pictures of landscapes can soothe. Another study by Ulrich at Uppsala University Hospital in Sweden provided heart surgery patients with either a simulated window view showing a photo of a stream or a forest; abstract paintings; a white panel; or a blank wall. Patients who viewed the trees or stream photo needed fewer doses of strong pain medicine and were significantly less anxious during the post-operative period than the other patients.

Since these studies, many more have shown that exposure to healing gardens reduces patient levels of pain and stress. This may in turn boost the immune system and allow the body and other treatments to help. A well-designed healing garden can help to restore the balance of physical, mental and social well-being, and in this sense it can facilitate healing in anyone who uses it, not just patients.

HEALING GARDEN BENEFITS: MENTAL, PHYSICAL, SOCIAL

There are many ways to use a healing garden that will benefit a range of physical needs. Wide paths make room for a person in a wheelchair or walking with an aide. There can be space to conduct physical therapy or group exercise. Working in the garden itself is not only good exercise, but it can offer soothing reminders of home and make the unfamiliar surroundings seem less so.

Healing gardens promote social interaction in small or large groups. They can provide for the varying interests and abilities of family groups: children who may want to run and play while others sit and talk or simply observe. Coworkers can meet for lunch or retreat to the garden alone for a quiet break from the stresses of the job.

CIRCLE 44

2015 Sunbrella Future of Shade competition winner *The Mosque of Light in Dubai* uses fabric to create an ethereal experience and provide protection from the sun.

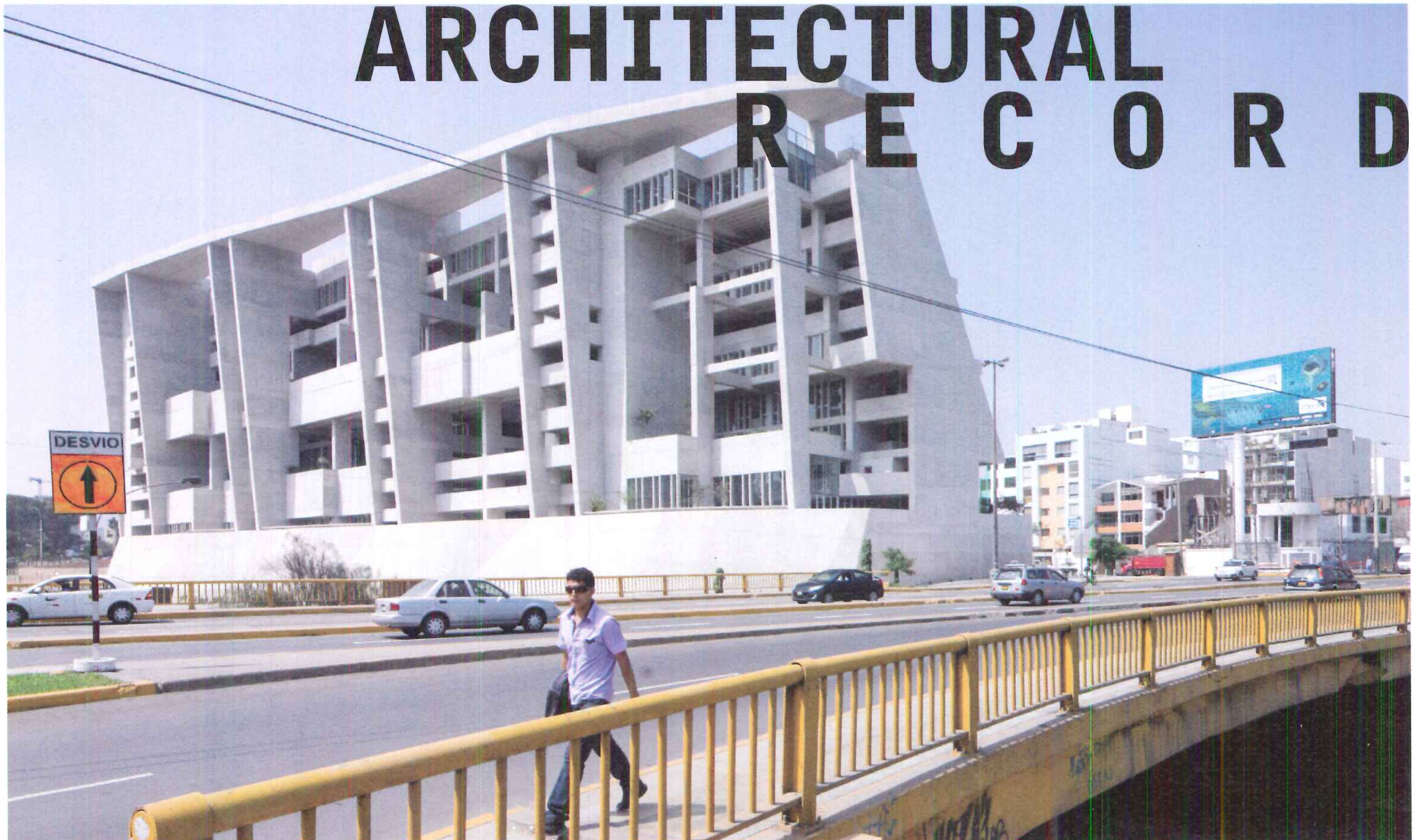
Complete this course, *Healing Gardens: The Role of Fabric for Shade & Seating,* at *sunbrella.com/ceu.*

Melody of Shadows, an honorable mention winner in the competition, transforms musical notation into shade forms.

Product Featured: Trenwyth Trendstone and Trendstone PLUS in Windermere, Manchester & Delmarva
Holy Cross Germantown Hospital; Germantown, Maryland
Architect: SmithGroup JJR


SIEGER SUAREZ ARCHITECTS
PORSCHE DESIGN TOWER
SUNNY ISLES, FLORIDA
OPENING IN 2016
2 HOUR FIRE RESISTIVE
GLASS ELEVATOR ENCLOSURE
WITH SUPERLITE II-XL 120
IN GPX CURTAIN WALL FRAMING
CIRCLE 15
Architect:
Sieger Suarez Architects
General Contractor:
Coastal Construction Group
of South Florida Inc.
Glazing Contractor:
Continental Glass Systems
RENDERING COURTESY OF METROSTUDIO.COM
WHEN THE BEST WANT THE BES
888.653.3333
WWW.SAFTI.COM
SAFTIFIRST
FIRE RATED GLAZING SOLUTIONS
Intertek
CLASSIFIED
UL
Made

ARCHITECTURAL RECORD



11 2015

ARCHITECTURE EDUCATION NOW

THIS PAGE: UTEC, BY GRAFTON ARCHITECTS. PHOTO BY IWAN BAAN.

COVER: GRACE FARMS, BY SANAA. PHOTO BY IWAN BAAN.

See expanded coverage of Projects and Building Type Studies as well as Web-only features at architecturalrecord.com.

This symbol denotes that enhanced content is available in our iPad edition.

Visit us at facebook.com/architecturalrecord

Follow us on Twitter at @archrecord


BEGA
LED shielded bollards.
Minimalist style optimized
for LED performance.
BEGA sets the standard
BEGA-US
www.bega-us.com
(805) 684-0533
No. 149
CIRCLE 104

 editor's letter

Work Around the Clock

As women push for equity in architecture, the culture of the workplace is under attack.

LAST MONTH, ARCHITECTURAL RECORD held its second annual Women in Architecture Forum and Awards in New York, with a packed crowd of architects (mostly women but some enthusiastic men) joining in the celebration. Chosen by an independent jury, they represent a broad and powerful range of contributions to the profession as designers, thinkers, explorers, and mentors. They are Billie Tsien, Design Leader; Meejin Yoon, New Generation Leader; Marilyn Jordan Taylor, Educator; Anna Dyson, Innovator; and Pat Sapinsley, Activist (RECORD, October, page 26).

RECORD's awards program not only honors these professionals' achievements, but also casts a strong light on the accomplishments of all women in architecture—for whom advancement in the field remains extremely tough. While women now make up 44 percent of enrollment in architecture schools, only 18 percent of licensed architects are women, and far fewer are principals in firms.

Not surprisingly, the design honorees run or co-run their own practices. In larger firms, promotion to leadership roles, especially in design, is far more difficult. As part of the awards celebration, RECORD held a panel discussion to look at strategies for women advancing in big practices. Sylvia Smith, a senior partner at FXFOWLE, described how she created and leads a 40-person studio within the firm, focused on cultural and educational projects (Smith was a project principal on the New York City school featured on RECORD's January 2014 cover). Hana Kassem, a director at Kohn, Pedersen, Fox, who led the design team on a new science center at the City University of New York (page 128), talked about the frequent travel and deadlines—as well as a key mentor—that have marked her career path, which also saw the birth of her two children. Also on the panel was Julia Murphy, an associate director at Skidmore, Owings & Merrill, who discussed her role in relaunching the firm's Women's Initiative and tracking the data of women entering and advancing in the firm—significant metrics that have raised awareness among SOM's senior leadership.

Of course, women face huge hurdles moving up in any profession—and increasingly, the culture of work is under attack as the reason why. In a recent essay in *The New York Times* called "A Toxic Work World," author and professor Anne-Marie Slaughter wrote, "Girls are outpacing boys in high schools, universities and graduate schools and are now entering the workforce at higher salaries. But the ranks of those women thin significantly as they rise toward the top, from more than 50 percent at entry level to 10 to 20 percent in senior management." Increased professional competitiveness and punishing schedules are not sustainable, she argues, for women who want to succeed professionally but are also caregivers.

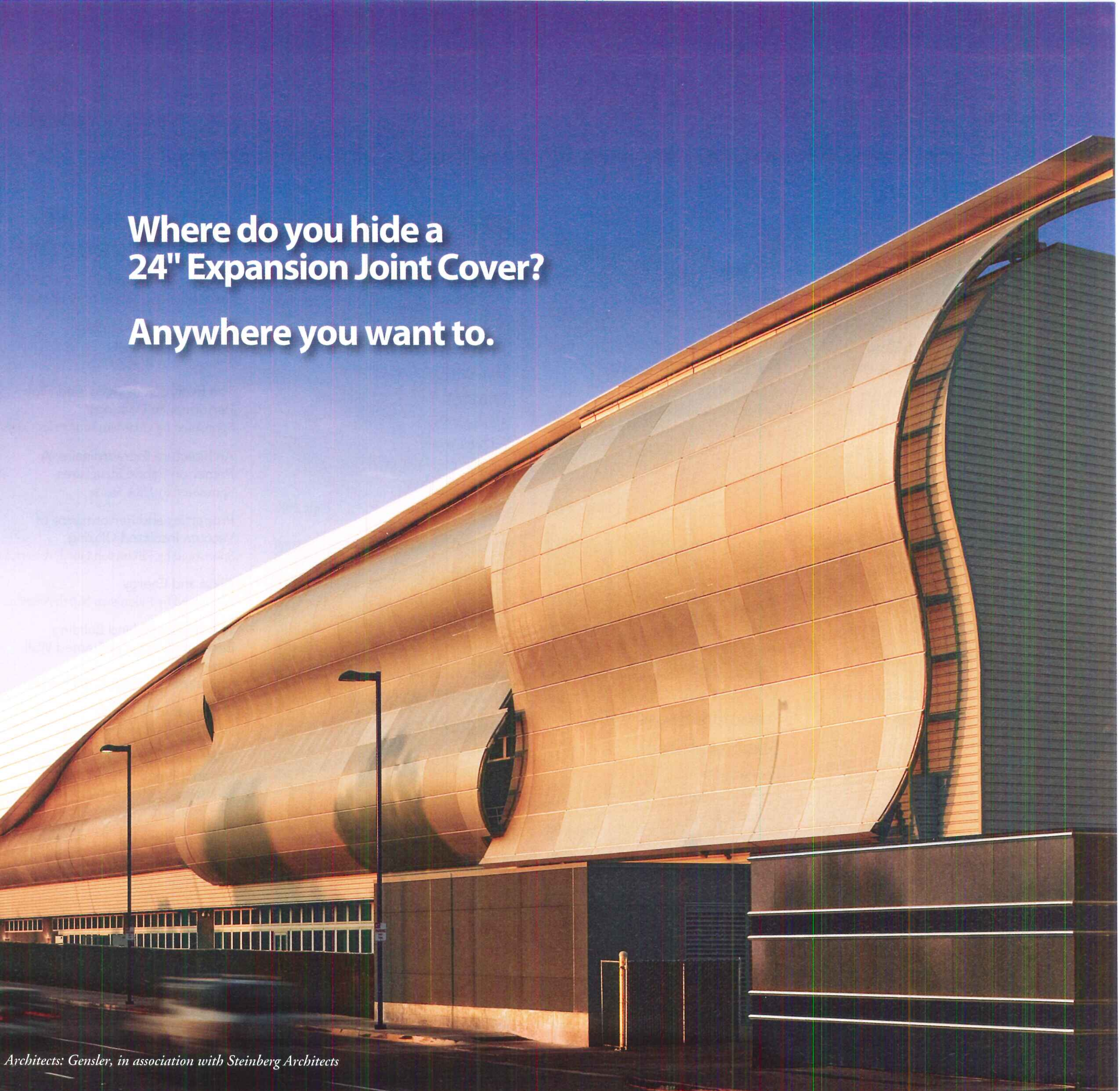
Work/family balance turned out to be a key theme at the biannual AIA Women's Leadership Summit, held in Seattle in September. A draft of a new AIA survey, "Diversity in the Profession of Architecture," was released that cited both women and men who said they struggle with these pressures. (The AIA will publish the final report in a few months.) Among the action items that emerged from the summit: institute a top 10 family-friendly firms list and develop a plan to transform the "culture of hours" in the architectural profession.

One real change in the culture at large is that the tech world has made work around the clock seem essential for success. But aside from occasional unavoidable deadlines, it's fair to ask if the continuous drive to work insane hours actually produces superior work. As Julie Snow, founder of Snow Kreilich Architects in Minneapolis, said in RECORD's special issue, Women in Architecture Now (June 2013): "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."

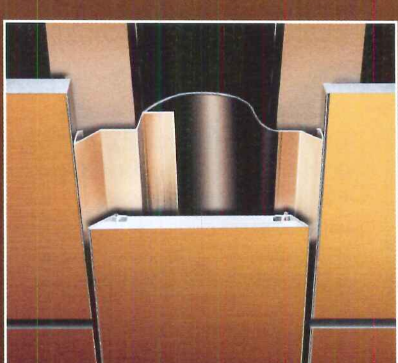
That business perspective is likely to gain traction as more women (and men) demand it. According to James Cramer, editor in chief of *DesignIntelligence*, whose annual rankings of the top architecture schools is featured in this issue (page 97), we're facing a shortage of architects. The best of the next generation already has more clout—with multiple job offers from top firms, often at salaries higher than in the past. They know the urgent need for a profession that reflects the diversity (not only in gender) of the world that architecture serves. And they will have the power to push for change.

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief



Architects: Gensler, in association with Steinberg Architects



LEARN & EARN

Earn your continuing education credits free online or with Architectural Record's Continuing Education App!*

IN THIS ISSUE


Photo courtesy of reThink Wood

Disruptive–and Green

Sponsored by
Mitsubishi Electric Cooling & Heating, MP Global Products, LLC, PIMA – Polyisocyanurate Insulation Manufacturers Association, reThink Wood, and Simonton Windows & Doors
Credit: 1 HSW, 1 GBCI CE Hour
Page 192


Image courtesy of Sefaira

Performance Matters!

Sponsored by
Sefaira, Inc. and SketchUp
Credit:1 HSW, 1 GBCI CE Hour
Page 201


Photo: ©Mark Herboth Photography LLC

Building Materials Matter

Sponsored by
reThink Wood
Credit: 1 HSW, 1 PDH, 1 GBCI CE Hour
Page 208


Photo courtesy of Garaventa Lift

Accessibility, Safety, and Platform Lifts and Elevators

Sponsored by
Garaventa Lift
Credit: 1 HSW
Page 213


Photo courtesy of MKA

Weight Watching: Adaptive Reuse with Structural Steel

Sponsored by
the Steel Institute of New York
Credit: 1 HSW
Page 214

Photo courtesy of Oldcastle® Architectural

Controlling Moisture in Masonry

Sponsored by
Oldcastle® Architectural
Credit: 1 HSW
Page 218


Photo courtesy of Guardian/Greg Benson Photography

Daylighting Design Update

Sponsored by
Guardian Industries Corp.
Credit: 1 HSW, 1 GBCI CE Hour
Page 222

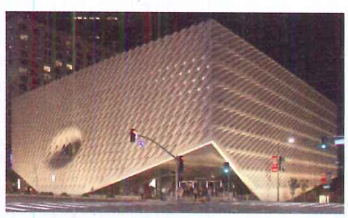


Photo courtesy of Willis Construction

High-Performance Aesthetics in Precast Concrete

Sponsored by
Precast/Prestressed Concrete Institute
Credit: 1 AIA LU
Page 226

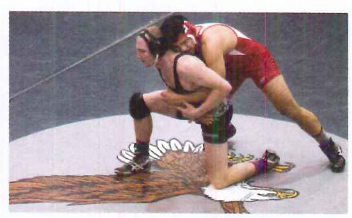


Photo courtesy of Draper, Inc.

Safety in the Gym: Specifying Equipment to Protect Users and Spectators

Sponsored by
Draper, Inc.
Credit: 1 AIA LU
Page 230


Photo courtesy of Lutron Electronics Co., Inc.

A New Methodology for Successful Daylighting Design

Sponsored by
Lutron Electronics Co., Inc.
Credit: 1 HSW, 1 GBCI CE Hour, 1 IDCEC CE Hour
Page 234

ALSO ONLINE AT ARCHRECORD.COM

Elevators, Sustainability, and LEED
Sponsored by ThyssenKrupp Elevator

The Value of Stone Wool Acoustical Ceilings
Sponsored by ROCKFON

The Evolution of Glass And High Performance Coatings
Sponsored by Guardian Industries Corp

Architecture Extraordinaire: A Primer on Fabric Structures
Sponsored by USA Shade

Properties and Performance of Vacuum Insulated Glazing
Sponsored by Pilkington North America

Glass and Energy
Sponsored by Pilkington North America

The Science Behind Building Envelope Design in Framed Wall Assemblies
Sponsored by CertainTeed Insulation

Finding the Fit
Sponsored by Bespoke Careers

Windows & Door Standards and Material Types
Sponsored by Milgard Windows & Doors

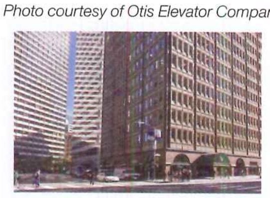
NEW ONLINE AT ARCHRECORD.COM

Photo courtesy of Smart Vent Products, Inc.

Floodplain Design, Construction, and Impacts on Flood Insurance

Sponsored by
Smart Vent Products, Inc.
Credit: 1 HSW

Photo courtesy of Otis Elevator Company

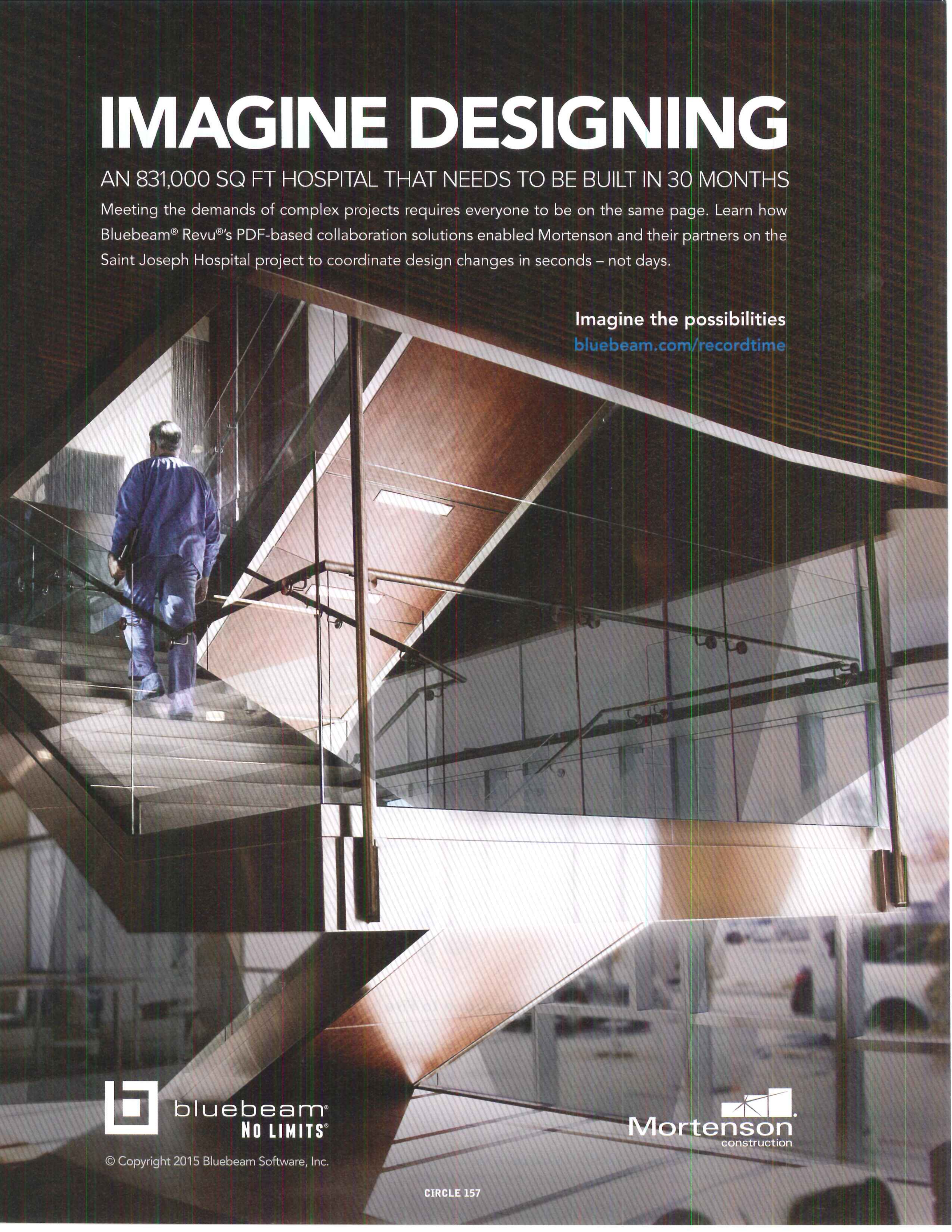


Destination Dispatch Elevator Systems Benefit Passengers, Building Owners, and Design Professionals

Sponsored by
Otis Elevator Company
Credit: 1 HSW, 1 GBCI CE Hour

Earn Free Health Safety Welfare (HSW), Green Building Certification Institute (GBCI), and Interior Design Continuing Education Council (IDCEC) credits with Architectural Record.

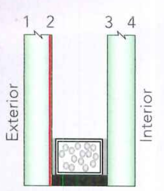
*All Architectural Record articles and presentations count toward the annual AIA continuing education requirement. All sponsored exams are available at no charge and are instantly processed.


IMAGINE DESIGNING
AN 831,000 SQ FT HOSPITAL THAT NEEDS TO BE BUILT IN 30 MONTHS
Meeting the demands of complex projects requires everyone to be on the same page. Learn how Bluebeam® Revu®'s PDF-based collaboration solutions enabled Mortenson and their partners on the Saint Joseph Hospital project to coordinate design changes in seconds – not days.
Imagine the possibilities
bluebeam.com/recordtime
bluebeam®
NO LIMITS®
© Copyright 2015 Bluebeam Software, Inc.
Mortenson
construction
CIRCLE 157

GUARDIAN SUNGUARD® SNX 51/23

No other glass delivers this much light with so little heat.

SunGuard SNX 51/23 glass from Guardian is an industry first — the first product on the market with visible light transmission above 50% and a solar heat gain coefficient below 0.25. Along with a neutral blue reflected color, it represents a breakthrough combination of light transmission, appearance and solar control that meets increasingly strict energy codes. For complete performance data — and other ways to Build With Light — visit Guardian.com/commercial. Or call 1-866-GuardSG (482-7374).



SNX 51/23 on #2

GUARDIAN SUNGUARD®
ADVANCED ARCHITECTURAL GLASS

BUILD WITH LIGHT®

ARCHITECTURAL RECORD
Record Products 2014
EDITORS' CHOICE

GUARDIAN®

CIRCLE 176

perspective

Don't let me go too crazy. The boat has to work.

–Frank Gehry, before designing Foggy, *the architect's first-ever yacht,* Town and Country *reports.*

São Paulo Implements New City Plan

BY TOM HENNIGAN

AFTER DECADES spent in thrall to the car, which brought it epic traffic jams across an ever-expanding urban sprawl, the Brazilian city of São Paulo has finally decided to try something different.

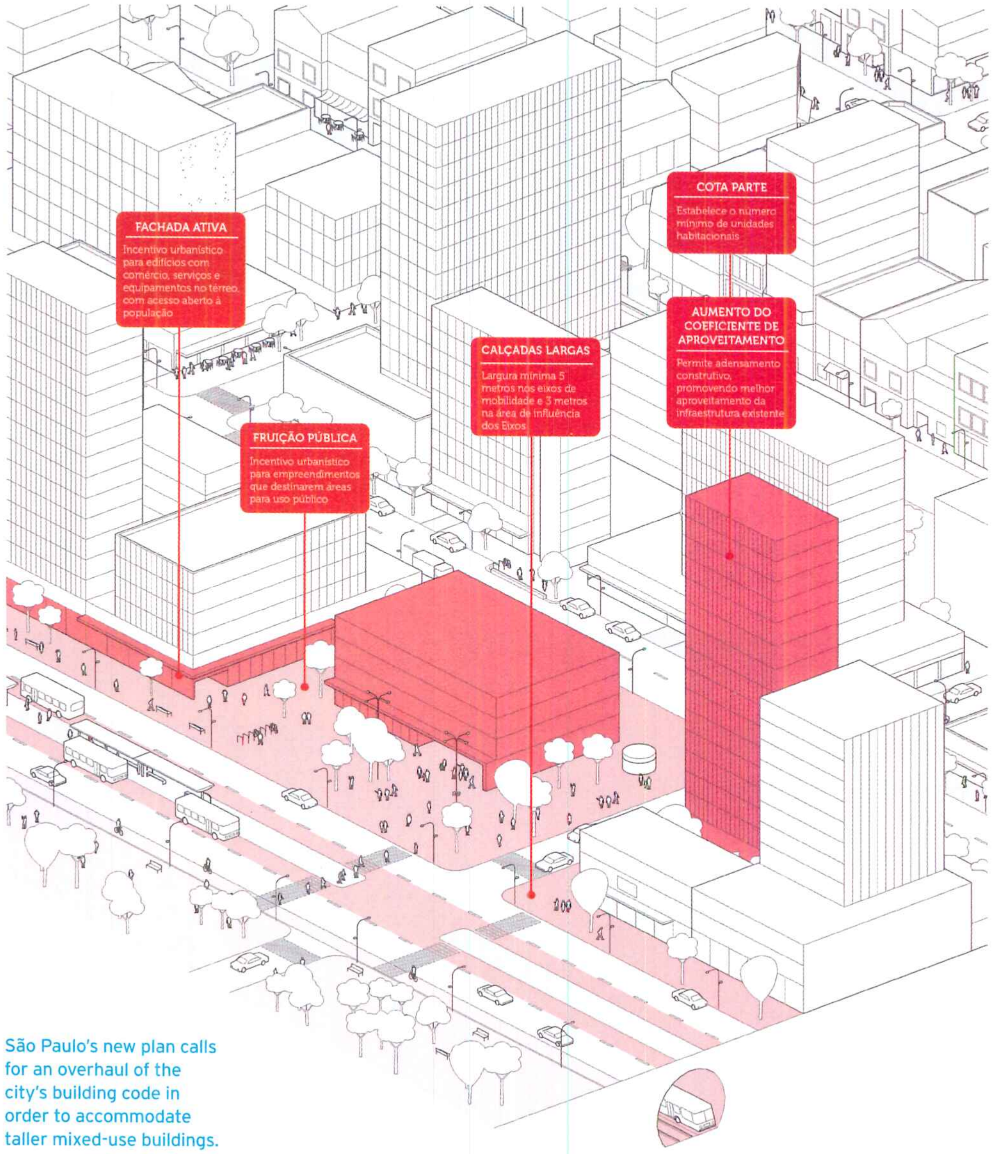
Fernando Haddad, the mayor of this metropolis of nearly 12 million people, is undertaking sweeping reform of the city's approach to planning with the goal of increasing urban density along metro, train, and bus corridors. This objective is at the heart of São Paulo's most radical strategic master plan in decades, with a bold prioritization of public over private transport in the citadel of Brazil's powerful motor industry.

Passed by the city's municipal assembly last year, Haddad's "Plano Diretor" is being implemented in a series of changes to planning laws to give legal form to the city's new direction.

"We are establishing a long-term plan that the city has not had since Prestes Maia [mayor during World War II], who had a 'freeway' conception of the city," Haddad points out in an interview with RECORD. "We have never had such a modernizing vision of the city as we have now."

At a recent conference in São Paulo organized by the Brazilian Association of Architectural Practices (AsBEA), there was enthusiasm for the possibilities opening up, thanks to the new direction.

Codes for building along public-transport corridors are being altered to allow for taller buildings and smaller unit sizes. To encourage the use of public transport, codes that demanded a minimum number of parking spaces in buildings are being rewritten to include a cap. To try and cut Paulistanos deep-seated car dependency (even for humble tasks like picking up a carton of milk), the long-lamented, decades-old law that banned mixed-use occupancy is being relaxed in regions earmarked for densification, meaning buildings can once again have ground-



São Paulo's new plan calls for an overhaul of the city's building code in order to accommodate taller mixed-use buildings.

floor commercial spaces with residents above.

But among some conference participants, doubts were raised. The city's main business association has warned that, in light of Brazil's ongoing recession, developers might struggle to find buyers for a flood of new commercial spaces. Meanwhile, SECOVI, the main lobby group of the city's real-estate sector, has warned that smaller housing units with limited parking space might be a tough sell to the city's middle class, the main impetus of the local housing market.

So great is São Paulo's car addiction that some of the mayor's most visible initial changes have run into stiff resistance among a significant portion of the city's population. Already Haddad's administration has put nearly 250 miles of new bus corridors in place and is on the way to a similarly sized network of bike lanes. Creating the space for these has squeezed the car fleet on what were already heavily congested streets, further irritating commuters.

Some experts have warned that there is a disconnect in the plan between more inten-

Visit our online section, architecturalrecord.com/news.

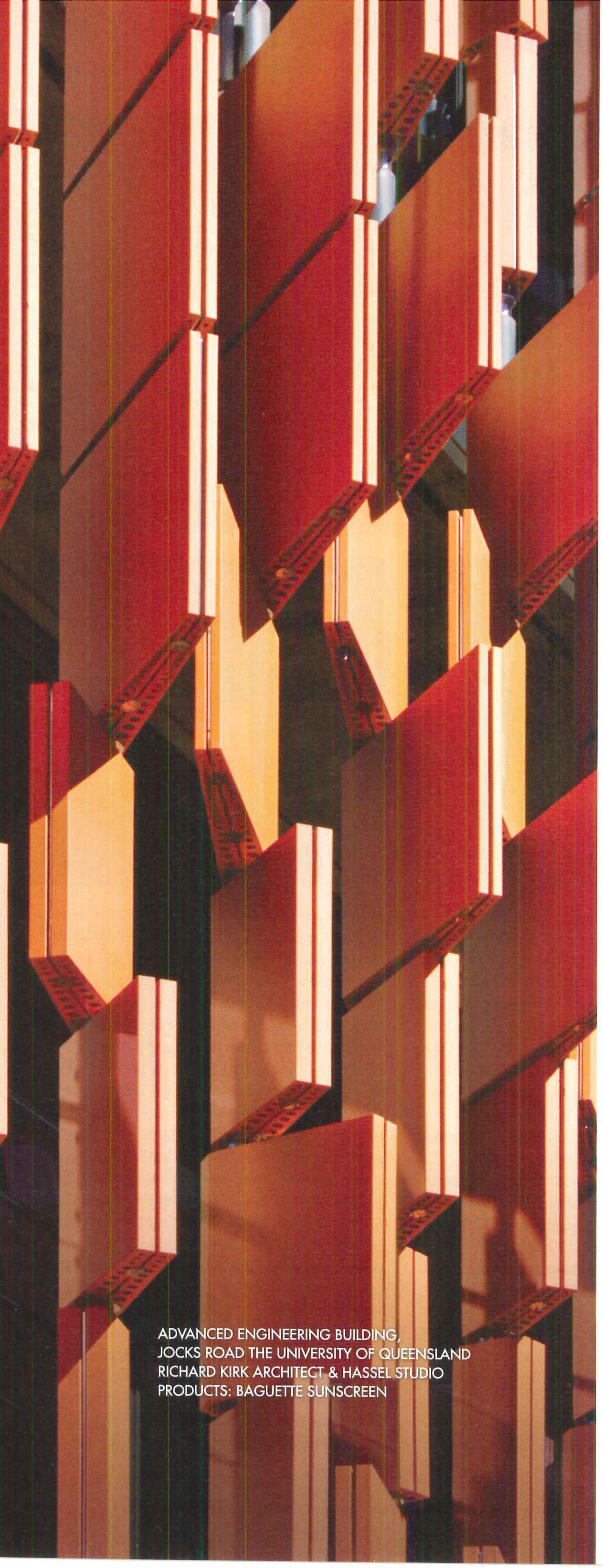
An objective of São Paulo's new city plan is to increase urban density along major transportation corridors and to alleviate traffic congestion by encouraging the city's 12 million residents to utilize public transportation rather than cars. Critics say the plan doesn't address the future added stress on the city's existing transit infrastructure.

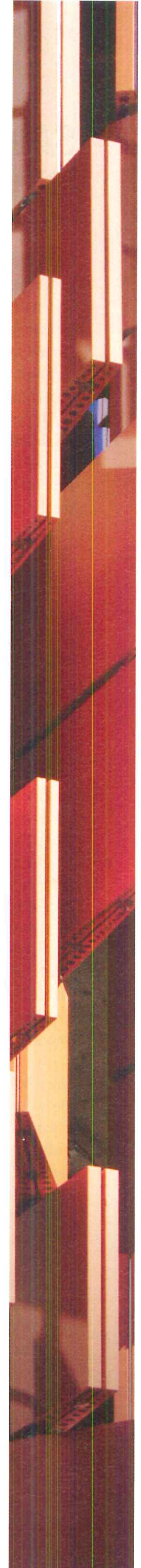
sive use of land and transport infrastructure. "The new plan will increase density without adequate transport planning. The obvious solution is more metro lines rather than bus corridors, but the state government struggles to deliver these to the city. This risks even greater congestion in the future," warns Cândido Malta Campos Filho, the city's former planning secretary and professor emeritus of the architecture and urbanism faculty at the University of São Paulo (USP-FAU).

But Fernando de Mello Franco, the city's secretary for urban development, says "triggers" are in place to avoid this happening. "If the expected investment in public transport along a corridor does not take place, then permission to build will not be granted," he says.

Implementation of the plan via changes to the city's planning codes is currently under way. Its critics have accused city hall of mismanaging the process, sowing confusion.

But most of the city's urbanists have broadly welcomed the new outlook. Says Alexandre Delijaicov, professor at USP-FAU, "Despite its contradictions, this plan is a great step forward." ■


ADVANCED ENGINEERING BUILDING,
JOCKS ROAD THE UNIVERSITY OF QUEENSLAND
RICHARD KIRK ARCHITECT & HASSEL STUDIO
PRODUCTS: BAGUETTE SUNSCREEN



SANAA, SHoP, and Others Present at RECORD's Innovation Conference

BY FRED A. BERNSTEIN

Kazuyo Sejima and Ryue Nishizawa, cofounders of SANAA (right) delivered the afternoon's keynote lecture, while architects Nicolas Moreau and Hiroko Kusunoki discussed their award-winning Guggenheim Helsinki design (bottom, right) and Gensler co-CEO Diane Hoskins and Ed Feiner of Perkins+Will discussed working at a supersize firm (below).

FOR RYUE NISHIZAWA and Kazuyo Sejima, principals of the Pritzker Prize–winning firm SANAA, innovation can occur long before a building is designed. The program for Grace Farms (which opened last month in New Canaan, Connecticut) required just such creativity.

"It's got a large place for eating, but it's not a restaurant," Sejima said. "It's got a gym, but it's not a sports center. It's got rooms for reading, but it's not a library. It's a new kind of public space."

Sejima and Nishizawa spoke at ARCHITECTURAL RECORD's Innovation Conference, "Expanding Architecture: Creativity + Design + Technology," which was held in Manhattan's Time & Life Building. Sejima told the 400 architects in attendance that an earlier SANAA project, the Rolex Learning Center in Lausanne, Switzerland, "doesn't do enough to communicate with its surroundings." So, before designing Grace Farms, she and Nishizawa spent many days walking the site, trying to make sure the building would "communicate with nature."

Other architects have found innovative ways to present designs to clients. Chad Oppenheim, a Miami-based architect, described his use of video game technology to create hyper-realistic renderings, which the viewer can control in real time like the most sophisticated games (and which won over his client Michael Bay, the director of action films like *Armageddon*). "I think you'll see a fusion of architecture and gaming in the next five years," Oppenheim said.

By contrast, Nicolas Moreau and Hiroko Kusunoki, of Paris-based Moreau Kusunoki, showed a series of hand-drawn renderings, disarming in their apparent simplicity, that helped the couple win the competition to design the proposed Guggenheim Museum Helsinki. Both just 36 years old, they have also won competitions for a courthouse in Paris, a museum of culture in Guyana, and an engineering school in the French Alps. If Oppenheim is constrained by computing power, Kusunoki is limited only by the thinness of the point on her Sakura Micron pen.

The conference opened with Gregg Pasquarelli, a principal of SHoP Architects, describing uses of technology that have helped his firm speed the transition from design to construction. When its Barclays Center in Brooklyn was rising, he said, "our guys were up in the steel, with iPads. The steelworkers didn't want drawings; they wanted to see the models, which our guys could spin around for them onscreen." The firm is also proud of its inventive forms. Its supertall condo building at 111 West 57th Street in Manhattan will culminate in a 200-foot spire that Pasquarelli said has no function other than to be "a piece of beauty in the air." And its east and west facades will be covered in sinuous terra-cotta panels that hint of tradition, even at dizzying heights.

Deborah Berke, who was recently named dean of the Yale School of Architecture, showed some work of her Manhattan practice, Deborah Berke Partners. "The alchemy of architecture is making common things precious," said Berke, describing a series of adaptive-reuse projects that brought "magic" to formerly workaday buildings. Architecture, she said, "is not problem-solving. What it is really about is making something that expresses your beliefs."

Senior leaders of Perkins + Will, Kohn Pedersen Fox Associates, and Gensler talked about ways very large firms can foster innovation and creativity. Ed Feiner, director of the Design Leadership Council at Perkins + Will, described initiatives meant to engage the youngest members of the 26-office practice, including an internal competition that recently attracted 62 teams. "Senior people are not necessarily seeing all the perspectives," he said. Diane Hoskins, co-CEO of Gensler, said that the route to innovation is harnessing diversity, having "people who are different from each other come together."

James von Klemperer, president and design principal of KPF, said that, compared to their Silicon Valley counterparts, architects tend to innovate incrementally. Michael Bierut, the preeminent graphic designer, recommended saving innovation for where it's really needed. He told the crowd: "Show up; pay attention: if you look hard and listen hard, the answer will be waiting." One audience member suggested that innovation shouldn't be an end in itself. But Cathleen McGuigan, RECORD's editor in chief, had a simple answer. "Innovation," she said, "is embedded in good work." ■

UAE to Introduce Labor Reforms

BY ANNA FIXSEN

THE UNITED ARAB EMIRATES (UAE) is taking steps to reform its labor laws, local authorities say. At a press conference in the UAE capital, Abu Dhabi, September 29, officials outlined three significant reforms, effective next year, that are meant to protect the rights of some 5 million migrant laborers, many of whom are building major cultural, institutional, and infrastructure projects there, and who have been subjected to wage theft, inadequate housing, and passport confiscation.

"The issue isn't about the legal system itself, but some of the practices that have been associated with it," said Labor Minister Saqr Ghobash.

The new provisions outlined by UAE officials would prevent employers from changing the terms of already agreed worker contracts, allow workers to terminate their contracts at will, and enable them to leave their employer for other job opportunities. The second and third reforms target the gulf region's much-criticized migrant sponsorship system, called kafala, a policy that binds employees to the companies that sponsor them.

"We wanted to ensure that the labor relation is entered into voluntarily and freely," said Ghobash.

Many of the UAE's laborers have left their homes—chiefly in Southeast Asia and the Philippines—to lay the groundwork for Abu Dhabi's Saadiyat Island project, home to ambitious works by Rafael Viñoly, Norman Foster, Jean Nouvel, Frank Gehry, and Tadao Ando. Viñoly's New York University project came under fire after reports in *The New York Times* and elsewhere showed that, in spite of persistent promises from the university, workers were not given fair wages, reasonable working hours, or adequate living quarters.

Migrant laborers make up 80 percent of the United Arab Emirate's population, according to a 2013 report by the United Nations. New reforms could help prevent workers from being abused by employers.

In spite of the changes' positive tenor, the reforms are facing scrutiny from human-rights groups, especially regarding how the country plans to monitor and enforce such laws.

Nicholas McGeehan, a researcher for Human Rights Watch, points out that the two kafala-focused reforms echo similar changes promised in 2010 by the Ministry of Labor. McGeehan, who was banned from the country last year, says that a lack of institutional transparency makes it difficult to determine whether changes are being implemented.

"Paper reforms are all well and good to provide the framework for a better labor system," he says, "but until these countries stop banning investigations, people will never fully trust them." ■

The New York Times Building pursued a Window-Management® System with energy efficiency and cost savings in mind. MechoSystems' state-of-the-art SolarTrac® System—paired with the electrical lighting—is saving up to 25% in energy costs.

Start spreading the news.

SolarTrac®
Ultimate in WindowManagement®

MechoSystems
Design with light.®

T: +1 (718) 729-2020
F: +1 (718) 729-2941
E: info@mechosystems.com
W: mechosystems.com/newyorktimes
@mechosystems

Offer views to the outside.

Provide daylight harvesting.

Control the sun's glare.

Limit solar radiation.

Manage contrast ratios.

CIRCLE 180

[NEWSMAKER]

Rural Urban Framework

BY REBECCA SEIDEL

AS PART of the Chicago Architecture Biennial's kickoff last month, Rural Urban Framework (RUF), a Hong Kong–based nonprofit design lab run by architects Joshua Bolchover and John Lin, was awarded the 2015 Curry Stone Design Prize. The annual award, which honors socially engaged design, celebrates RUF's commitment to reinvigorating Chinese villages that have been destabilized by unprecedented rural-to-urban migration; more than half of China's population now lives in cities.

Servicing charities and NGOs, RUF works on projects that vary widely in scale: in some cases they design new housing, and in others they plan entire villages working collaboratively with local residents. Recent projects include Angdong Hospital in Hunan Province, which sought to develop a model structure for rural health care, and an expansion of the Mulan Primary School in Guangdong Province.

RECORD caught up with the 2013 Design Vanguard firm's two founders about their latest endeavors.

You've said that the rural is actually at the front line of urbanization. Can you explain?

Joshua Bolchover: When we started RUF, we realized that we weren't dealing with purely rural areas but a very volatile landscape that had many types of pressures exerted on it, from economic changes, land-use policies, regulations, and how people were utilizing their land. We came to the realization that we weren't really working in the rural but on this front line in the urbanization process itself.

John Lin: We're not rural architects. We're urbanists. We're interested in this drive to build and to urbanize.

Your current project in the Sichuan Province's Jintai Village aims to create a prototype for earthquake reconstruction. Tell me more about it.

JL: We are designing and rebuilding the entire village. We've never really done that before; it's always been an insertion into a larger context. It's both exciting and kind of frightening.

After the 2008 Sichuan earthquake, the village was in the process of rebuilding its houses. But right before they moved in, there were aftershocks and the houses collapsed again. With the responsibility to build these homes, there's also an opportunity to improve them and to think about what it means to be a village, what it means to have a shared economy and a shared social engagement.

You've recently expanded your research and design work to Mongolia.

JB: The Mongolian project is very different from our work in China. In China, you can say it's about the process of urbanizing the rural, whereas in Mongolia, it's really about the effect the rural citizens are having on the city. Rural citizens who migrate into the city are beginning to form informal settlements, which are expanding at the periphery of Ulaanbaatar. We're coming up with design prototypes for new infrastructure, community services, and housing. We've already completed two projects in these communities, a waste-recycling center and collection facility.

Since you work pro bono, you're responding to a lot of different agendas and needs. How do you make sure everyone's interests are met?

JL: The difficulty and the magic happens when you unify a lot of different agendas; I think the architect's desire is to put all of this into a single form. A project satisfies lots of agendas, but it comes together as a monument to that process. We very much think of ourselves as architects, instead of getting overinvolved in the social, political, or economic issues. It's still very much about form—solving things through space.

You are both associate professors at Hong Kong University. How do you apply RUF's goals to your teaching?

JB: We operate as a lab within the university, and we employ people to be our research and architectural design assistants. This year, I'm doing a master's studio on Mongolia, so the students will participate in the project. John is working on a Chinese village project with his students.

JL: There's been a lot of currency given to the idea of the research studio, but I think that if you have a parallel goal, which is to actually make a project at the end of the day, it gives that studio more drive—more sharpness and purpose. ■

noted

Deborah Berke Named Dean of Yale Architecture School

The Yale School of Architecture announced that New York–based architect Deborah Berke will be stepping up as dean next July, the first woman to lead the school in its 100-year history. Berke succeeds Robert A. M. Stern, who has headed the architecture school since 1998.

Calatrava Awarded European Prize for Architecture

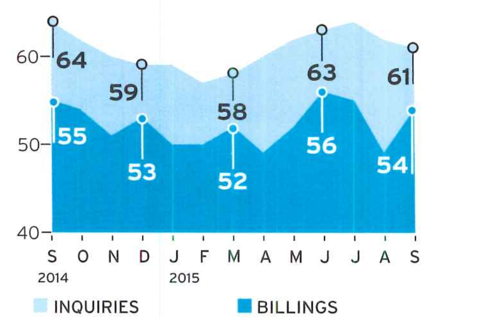
The Chicago Athenaeum Museum of Architecture and Design and the European Centre for Architecture, Art, Design and Urban Studies named Spanish architect Santiago Calatrava winner of the 2015 European Prize for Architecture, recogonizing work that promotes humanism. Calatrava will receive the award at a ceremony in New York on November 17.

Van Alen Institute Announces National Park Competition Winner

The Van Alen Institute and the National Park Service announced the winners of the National Parks Now design competition, which aims to connect parks and communities. The winning proposal, led by graphic designer Manuel Miranda, will connect New Jersey's Paterson Great Falls National Historical Park with residents through local food culture.

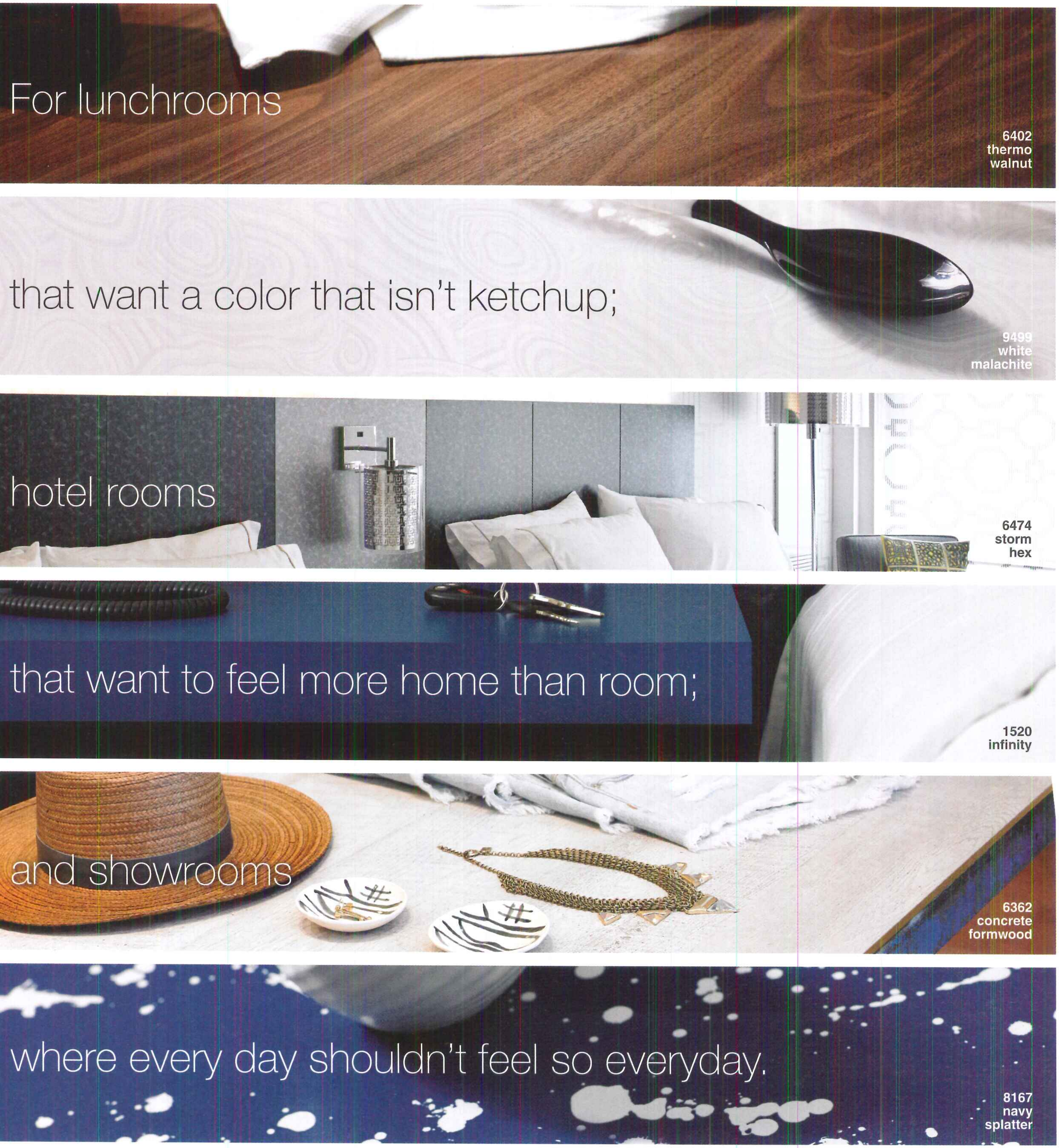
Chicago Biennial Attracts 31,000 Visitors on Opening Weekend

Chicago's inaugural architecture biennial brought in more than 31,000 visitors for its opening festivities October 1–4, according to the event's organizers. More than 80 percent of attendees went to venues managed by the City of Chicago, including the Biennial's main hub at the Chicago Cultural Center.



ABI Upswing in September

After a slide in August, the Architectural Billings Index (ABI) rallied in September. The AIA reports a score of 53.7 that month, up 4.6 points from August's mark. (Scores above 50 indicate an increase in billings.) The project inquiries index clocked in at 61.8. "Aside from uneven demand for design services in the Northeast, all regions and project sectors are in good shape," said AIA economist Kermit Baker.



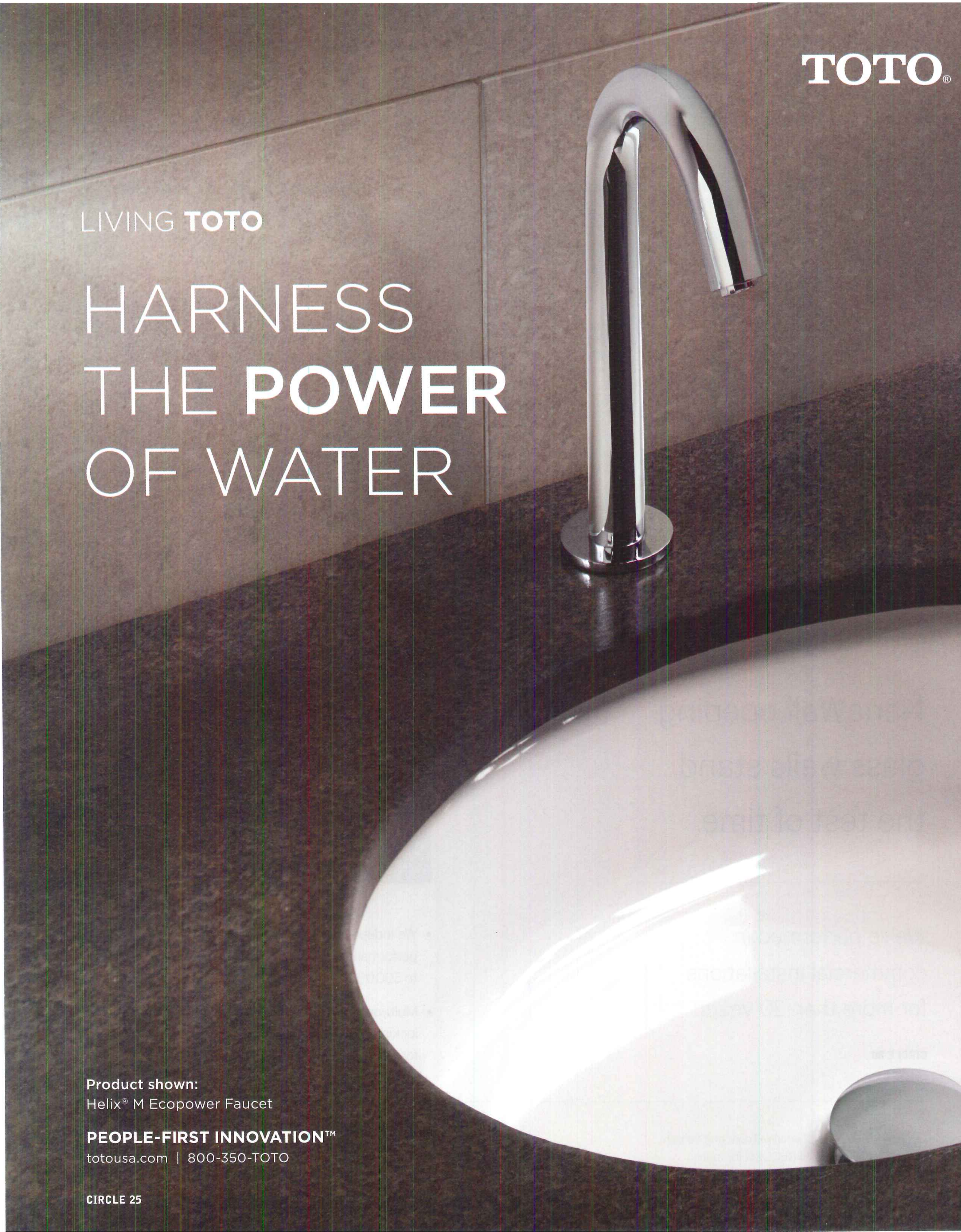
Formica® Surfaces. **FOR REAL.**™

Introducing **SurfaceSet™ 2016** by Formica Corporation. Our most versatile collection yet features three unique palettes inspired by nature. Designed to make every room beautiful, durable and enjoyable.

Download the Formica® SurfaceSet™ 2016 lookbook at formica.com/lookbook. CIRCLE 43


YOUR VISION.
OUR EXPERIENCE.


Best in Class Winner
2015 BRICK IN ARCHITECTURE AWARDS
Choate Rosemary Hall, Lanphier Center – Wallingford, CT
Manufacturer: Glen-Gery Brick – Aspen White (W804)
Architect: Pelli Clarke Pelli Architects
Landscape Architect: Ryan Associates
Distributor: Mack Brick Company
Builder: Newfield Construction, Inc.
Mason Contractor: F. Monarca Masonry, Inc.
CIRCLE 3
125 YEARS
Glen-Gery
610.374.4011 • glengery.com


TOTO®
LIVING TOTO
HARNESS THE POWER OF WATER
Product shown:
Helix® M Ecopower Faucet
PEOPLE-FIRST INNOVATION™
totousa.com | 800-350-TOTO
CIRCLE 25

house of the month

UNSTUDIO HAS DESIGNED THE W.I.N.D. HOUSE IN THE NETHERLANDS TO NESTLE INTO ITS NATURAL SETTING WHILE ADMITTING LIGHT AND VIEWS TO THE INTERIOR. BY SUZANNE STEPHENS

The living spaces on the main level look toward the polders (above); underneath are the garage and main entrance (top). The curvilinear dining and living spaces wrap around a podium (right).

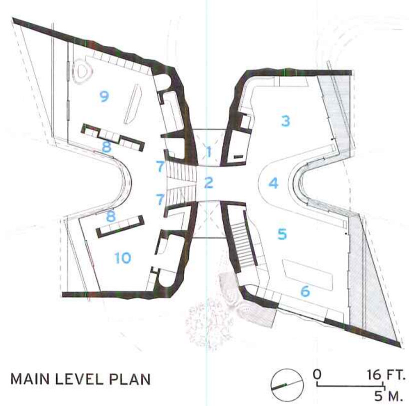
A HOUSE by architect Ben van Berkel rarely could be described as a glass box. Instead the principal of the Amsterdam-based UNStudio avoids the rectilinear modernist approach for a more organic direction. Curves and swerves take charge of the parti as seen in the W.I.N.D. House, a 4,370-square-foot structure in the northwestern part of the Netherlands.

To accommodate the programmatic needs of a family living there full-time, van Berkel pinched the house into two biomorphic volumes, one for public living spaces, the other for private. Then he gouged out each of the two wings with U-shaped voids.

In plan, the result looks a bit like a carnivorous plant with four distended petals. There a family of four can find many places to retreat and enjoy the views and cross breezes. (The name of the house, W.I.N.D., actually is formed from the family's initials.) While the living and dining areas look south to polders—reclaimed low-level land protected by dikes—the sleeping and work spaces on the north half face the woods. Because of changes in grade, the house loosely follows a split-level pattern, connected by an open steel stair.

To protect the interiors from glare, van Berkel tinted the glass and pushed back the expanses within the volume of the house to create sheltering canopies, terraces, and blinders at the sides. He also wrapped the masonry load-bearing walls in Fraké—hardwood—slats that bulge out with blob-like growths. "The shapes play off the land forms," says van Berkel, noting that they filter light to the spaces within.

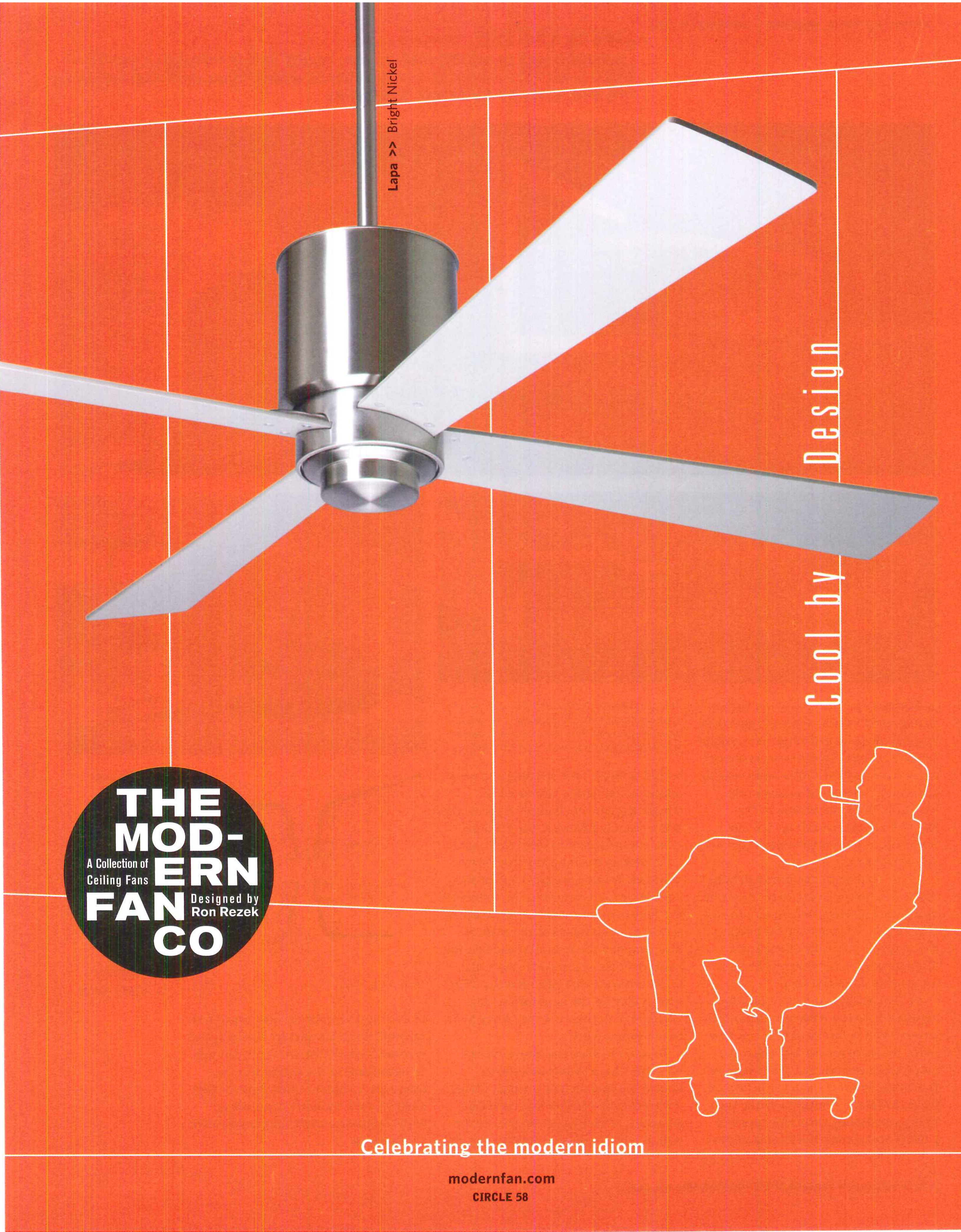
In order to keep the house energy-efficient, the architect installed a system to regulate power usage, along with a battery of other sustainability elements, including pvs on part of the roof, a central air/water heat pump, and mechanical ventilation with waste-heat recovery. Such advantages matter greatly to both client and architect. But just as significant to the design was the desire for a residence that dynamically embraced the natural surroundings while being discreetly immersed in the landscape. ■



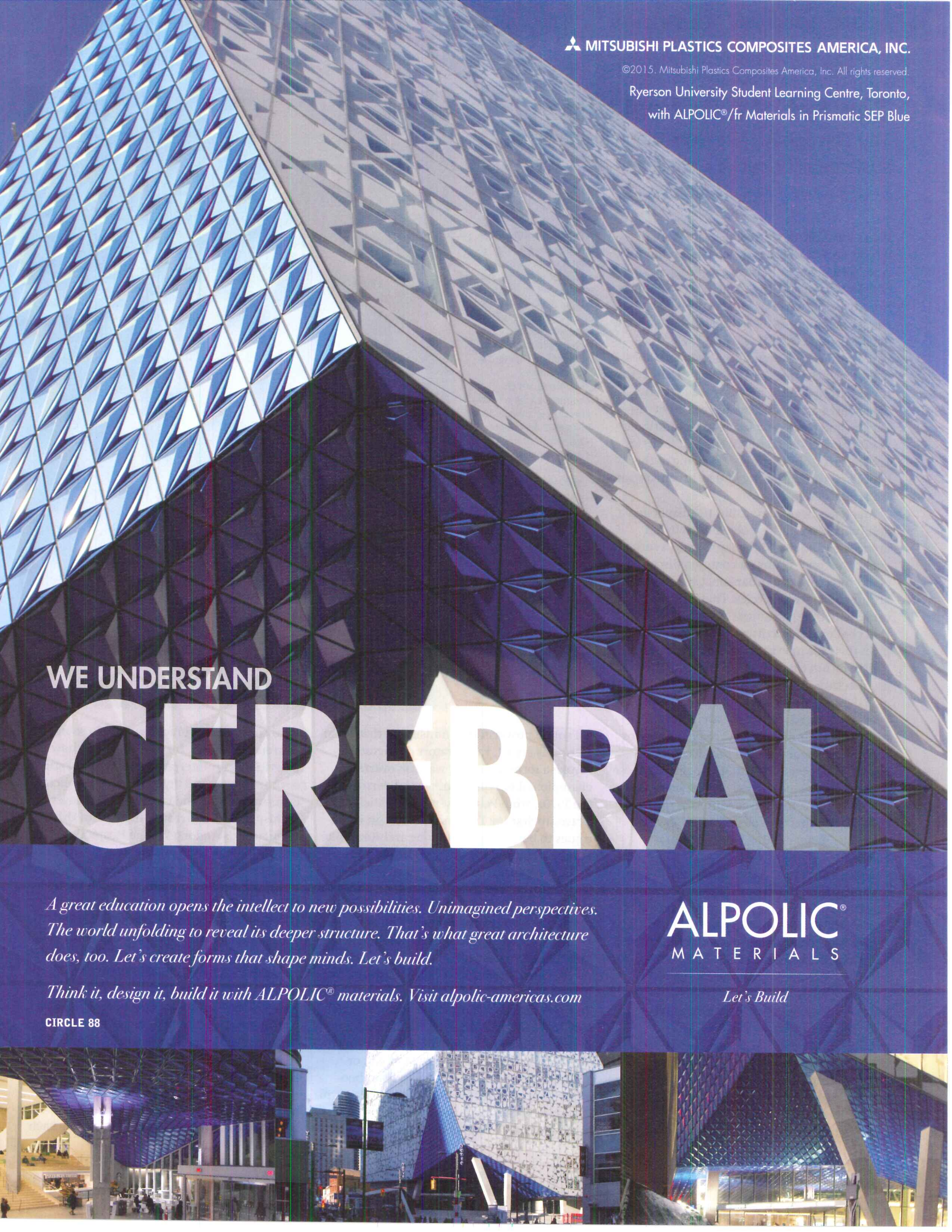
MAIN LEVEL PLAN

1 ENTRANCE (BELOW)
2 HALL
3 LIVING ROOM
4 PODIUM
5 DINING
6 KITCHEN
7 CENTRAL STAIR
8 GALLERY
9 MASTER BEDROOM
10 GUEST ROOM

View additional content at architecturalrecord.com.


Lapa >> Bright Nickel
Cool by Design
THE MOD-ERN FAN CO
A Collection of Ceiling Fans
Designed by Ron Rezek
Celebrating the modern idiom
modernfan.com
CIRCLE 58


ENERGY Select 23
More Light. Less Heat. Stunning Visual.
Introducing NEW Energy Select 23. Featuring a neutral blue reflected color, 50% visible light transmittance and 0.23 solar heat gain coefficient, this high-performing low-e glass lets natural light in, while keeping more heat out—for maximum energy savings and indoor comfort. AGC provides just the right solutions. For Every Code. For Every Region.
Visit us.agc.com to learn more, or email us at info@us.agc.com to request a sample.
CIRCLE 100
Architectural | Interior | Residential
AGC
BEYOND GLAS


MITSUBISHI PLASTICS COMPOSITES AMERICA, INC.
©2015. Mitsubishi Plastics Composites America, Inc. All rights reserved.
Ryerson University Student Learning Centre, Toronto, with ALPOLIC®/fr Materials in Prismatic SEP Blue
WE UNDERSTAND
CEREBRAL
A great education opens the intellect to new possibilities. Unimagined perspectives. The world unfolding to reveal its deeper structure. That's what great architecture does, too. Let's create forms that shape minds. Let's build.
Think it, design it, build it with ALPOLIC® materials. Visit alpolic-americas.com
CIRCLE 88
ALPOLIC®
MATERIALS
Let's Build

The Art of a Critical Vision

The Chicago Architecture Biennial speaks to sustainability, social justice, and the public realm.

BY SARAH WILLIAMS GOLDHAGEN

A FITTING BACKDROP The Chicago Cultural Center (right) is the epicenter of the Biennial. Projects within its doors include SO-IL's *Passage*, which emboldens a narrow ramp with pointed metal archways (opposite, top left) and Sou Fujimoto's *Architecture is Everywhere*, which recontextualizes ordinary objects. The same room hosts MOS Architects' *House No. 11 (Corridor House)* (opposite, bottom). Turning to the need for sustainable low-cost housing in Mexico City, Tatiana Bilbao designed a simple pitched-roof dwelling (opposite, right).

FROM ARCHDAILY to Treehugger, a virtual wonderland of websites devoted to architecture, design, and urbanism are piling gigabytes of information atop that generated by publications like ARCHITECTURAL RECORD, which also command a significant online presence. Much good has come from this World Wide Web–based cornucopia, even if its abundance does feel overwhelming. Contemporary architecture is vibrant. Globalization has, paradoxically, engendered an unprecedented sensitivity to locality and place, a widespread commitment to buttressing the distinctiveness of societies and cultures, and a salutary blurring of the boundaries among architecture, urbanism, and landscape design.

Much has been gained. But the dispersion and immensity of this polyphonic virtual arena has vanquished the large-scale, synthetic essays that once framed a common discourse on architecture and urbanism. Critical visions are an endangered species. That matters because only they galvanize the kind of debate that challenges practitioners to sharpen or push their ideas, even to change their minds.

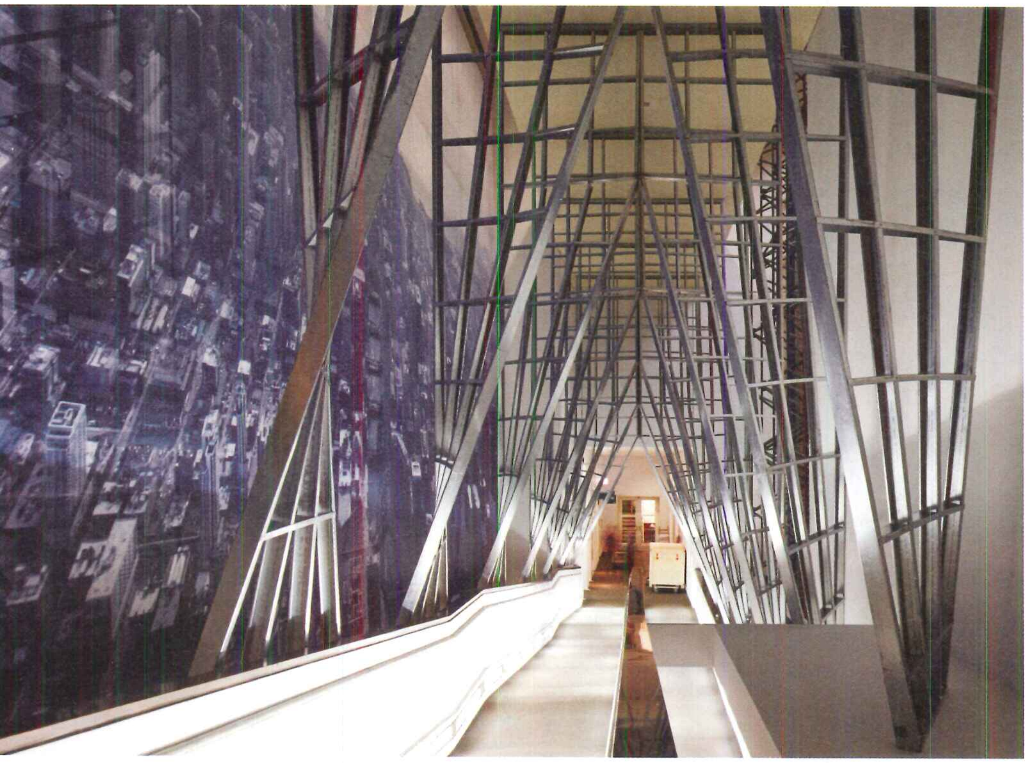
One forum that might fill this void is the architecture exposition, where shape-shifting global practitioners congregate. Such events, if properly curated, can nudge architects into reflecting their own ideas through the prism of their colleagues' visions and accomplishments. Few recent expositions (including those in Venice) have made good on that potential. This makes the inaugural edition of the Chicago Architecture Biennial (CAB), which runs until January 2016, that much more exciting.

Kudos to curators Sarah Herda and Joseph Grima for orchestrating the most focused, substantive exhibition on contemporary architecture in years, perhaps a generation. From nearly 500 submissions, they culled 120 firms, many run by designers of the under-50 generation. Most exhibits are staged in Chicago's Cultural Center, the city's original public library, itself an extraordinary Beaux Arts monument, completed in 1883.

Grima and Herda insist that they adopted a big-tent approach that pushes no aesthetic or critical agenda. Luckily for us, that's not so: Chicago's biennial is anything but a neutral survey. Even its title, The State of the Art of Architecture, smuggles in a curatorial polemic via subtle provocation. In insisting that architecture is an art, the curators deliberately invoke a formalism that was last overtly championed by American postmodernists in the 1970s, from Peter Eisenman to Michael Graves to Stanley Tigerman, although it continues to be practiced today by architects like Frank Gehry and Zaha Hadid. Herda and Grima purport to continue this tradition by framing architecture as above all an aesthetic practice. Traditionally, that would entail relegating social agendas to the realm of building rather than the form-dominated "art" of architecture.

Not here. Dozens of works exhibited at the Biennial would not, by any conventional standard, be considered art. Certainly not URBZ's tiny "homegrown" brick residence, though it is dramatically more healthful than its immediate neighbors in the slums of Mumbai, or Yasmeen Lari's elevated, lime-and-bamboo yurt-like structures for flood-prone villages in Pakistan. These and many other projects exhibited rely on traditional materials, employ local construction practices, and do so in often conventional ways. Innovation lies in how practitioners reinterpret existing typologies to optimize space and light, abide by the dictates of sustainability, and create ordered oases amidst destitute surroundings. Rural Urban Framework's Andong Village Hospital and Jindai Housing, for example, which earned the Hong Kong firm this year's Curry Stone Design Prize (page 36), are notable as much for the humanitarian issues they address—the millions of Chinese citizens who stay behind in the country's vast, impoverished countryside – as for the formal excellence of their designs.

Many of the projects here bespeak a definition of architecture so elastic that we cannot but wonder what the curators are up to. RUA Arquitetos' large wooden model reveals the Maré favela in Rio de Janiero not as the undifferentiated mass of shanties it superficially resembles but, instead, a self-organizing constellation of 16 distinct neighborhoods that sometimes abut and sometimes bleed into one another. RUA's contribution? Identifying each



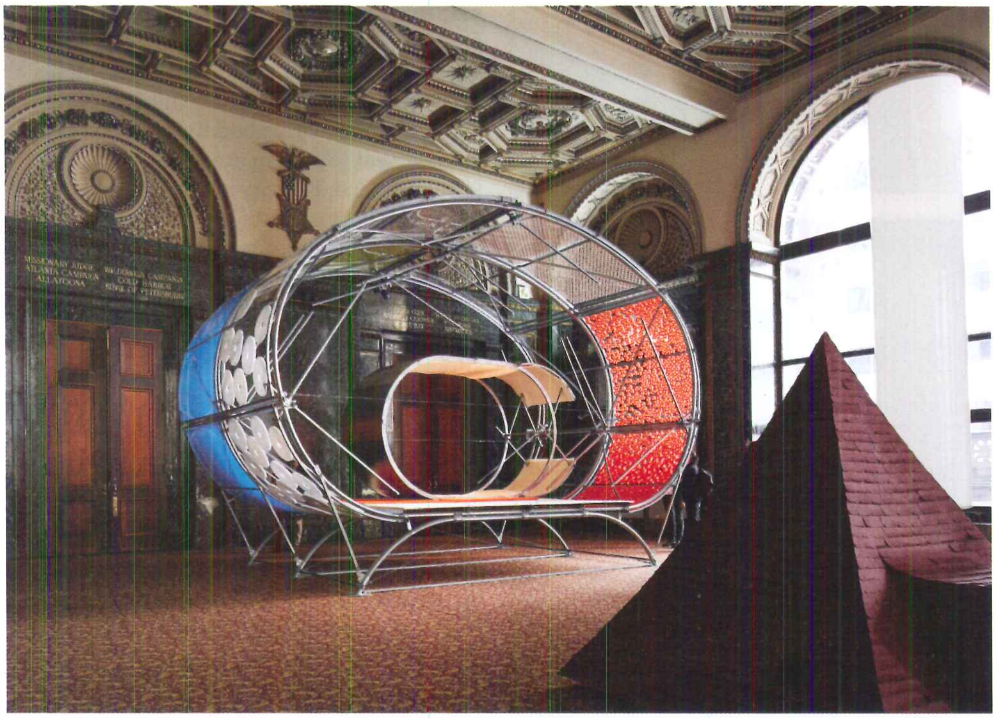
community, which they propose marking with some minimally iconic structure, like the open steel-frame Observation Tower that they present for one neighborhood. Another exquisitely creative project, by otherothers, a firm from Sydney, dismantles buildings rather than constructing them: their Offset House remediates the anodyne wastefulness and social isolation of Australia's suburbs by stripping parts of developer-built houses down to their balloon frames and repurposing the latticed areas into light wells and semi-enclosed terraces and patios. The land between these slenderized houses would be common playgrounds and gardens. Otherothers's scheme would bring moments of urbanity to the deserts of suburbia by blurring the transition between the public realm of the street and private realm of home, generating the in-between spaces that urbanist Jan Gehl has demonstrated foster communal life.

The curators present a powerful, if implicit, case that, in contemporary architecture, these are the trends that merit our attention. Put another way, as Sou Fujimoto declares in his poetic but hardly profound exhibit of ordinary objects reimagined as buildings, Architecture is *everywhere*. Design matters, to be sure, but formalism and iconicity are out. Design can be art while addressing the world's travails.

Today, climate change necessitates sustainable buildings and practices. Ever-expanding poverty and social anomie demand that our public realms be invigorated, that housing be affordable, and that every community be anchored with inspiring schools and flourishing cultural and social institutions. In developed countries beleaguered by commercial blight, we should design with nature and forge art from the detritus of everyday life. Kéré Architecture's *A Place for Gathering* is the most prominently featured installation to advance these interlocking agendas. Locally sourced wooden logs form crude amphitheater-like seating where people can commune in groups, read by themselves, people-watch, rest.

Two of the best-represented, and overlapping themes in the Biennial concern affordable housing, on the one hand, and innovating with the tropes and materials of mass production on the other. More speculative projects include the *Light House for Bangkok*, in which the Thai firm All(zone) envisions ethereally translucent shelters for civilized squatting. MOS's Corridor House, one of CAB's four full-scale mock-ups, quietly advances an incisive critique of the American building industry by demonstrating a McMansion's wastefulness: a light-filled, small but serviceable home occupies only the area that a typical developer-built home devotes to transitional spaces.

Star billing goes to two more low-cost housing prototypes. From interviews with potential residents, Tatiana Bilbao of Mexico City



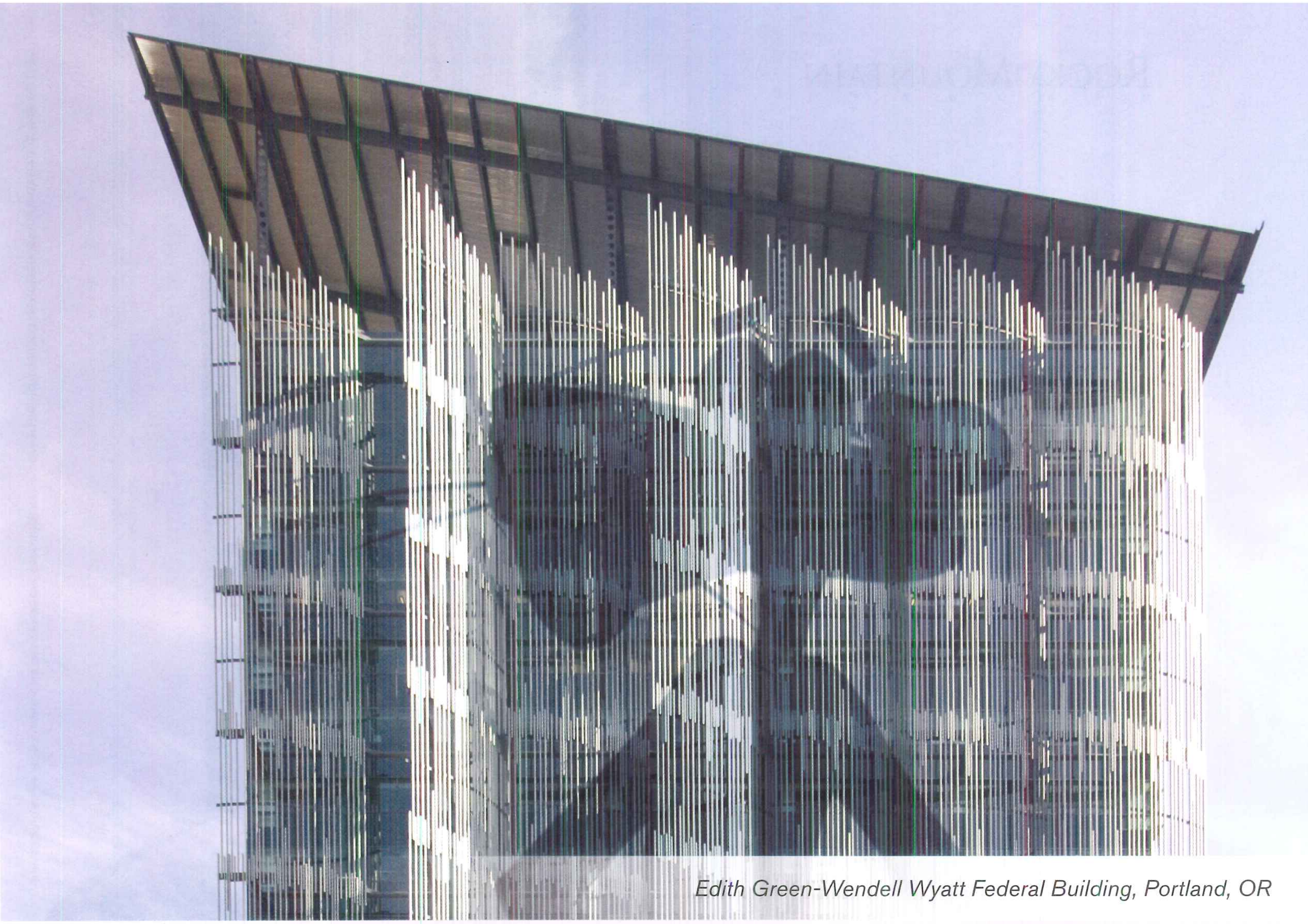
ADAPTABLE DESIGN MIT's Self-Assembly Lab, Gramazio Kohler Research, and ETH Zurich designed an algorithm to guide a robotic arm through a 3-D "rock-printing" process (top, left). Vo Trong Nghia built a transportable house supported by steel beams for residents of Vietnam's Mekong Delta (above). Selgascano and Helloeverything designed Casa A (left), whose bold interchangeable panels can adapt to a range of climatic conditions.

learned that slum dwellers feel stigmatized by the unfinished state of their poured-in-place concrete residences; she concluded that any Mexican affordable home should above all look finished. A simple concrete-block core anchors her "sustainable" house, where wooden pallets and plywood sheets are arranged into a tidy pitched-roof dwelling that looks at once complete yet can be inexpensively reconfigured. Vo Trong Nghia's full-scale prototype for residents of Vietnam's impoverished Mekong Delta focuses on transportability and ease of construction. The frame of his spacious one-room S House is comprised of prefabricated galvanized-steel beams that are dimensioned to be light enough for one person to carry and small enough to be shipped on an ordinary truck. A dry-joint system of construction ensures that the entire frame of a small home can be erected by mainly unskilled labor in just hours. Walls, fabricated from whatever material is least expensive locally, affix to this durable frame; at the CAB, the wall panels featured were of dried reeds.

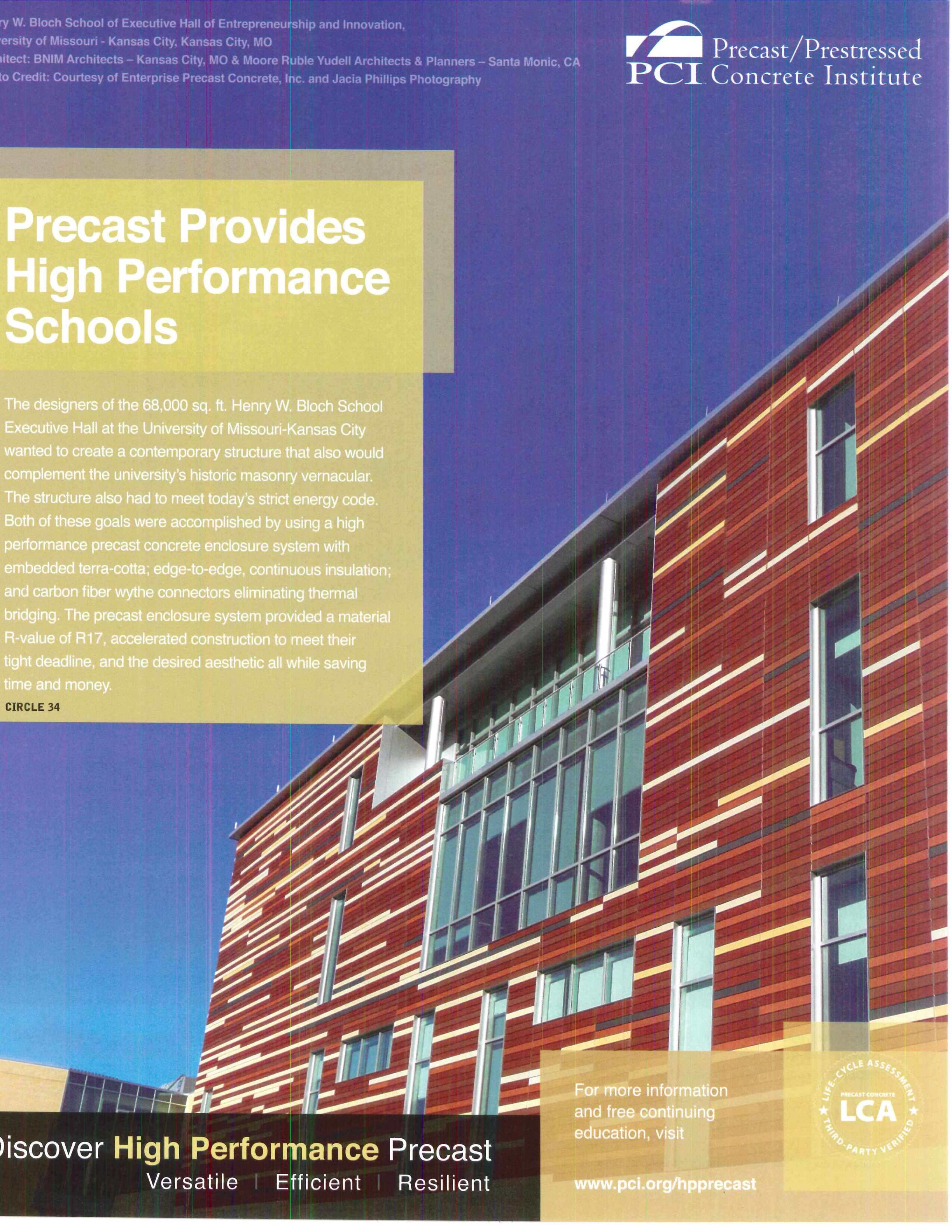
In first-world settings, affordable housing seems less urgent than figuring out how to employ ordinary construction methods and materials without straitjacketing a design. Both Besler & Sons + ATLV and SO-IL creatively feature off-the-shelf metal studs: pavilions by the former replace the usual sloppy joinery of studs to sheetrock with careful, clean details; an astonishingly affecting installation by the latter ennobles an ordinary, ADA-compliant ramp by configuring metal studs as a soaring, quasi-gothic arcade.

Even the CAB's high-art projects touch upon the curators' core themes, especially climate change and the public realm. Herda and Grima feature the work of practitioners who are captivated by nature and the dynamics of organic growth. Very likely, this generational pivot toward biomorphism is owing to the twin specters of environmental degradation and climate change. Kindred explorations drive the MIT Media Lab's Self-Assembly project and Thomás Saraceno's installation. Saraceno, an artist from Berlin, contributes the CAB's most theatrical piece: in a blackened room, pedestals present spotlit, glass-encased spiders, spinning their architecture of webs and cocoons.

The exclusion of starchitects and many other kinds of talented practitioners is the least of the CAB's impressively polemical commission-by-omission. This exhibition is a piercing clarion call: *Look at all that architecture can do!* By presenting the work of a generation driven to make design a socially relevant practice, the CAB presents a welcome vision of a society in which people, no matter how poor, reside in life-affirming, place-specific homes, and those homes congregate into sustainable communities. Beauty cannot be a commodity just for people who already have bought everything else they need. It's an art, and it brings order and meaning to a chaotic, often tragic world. ■



Edith Green-Wendell Wyatt Federal Building, Portland, OR


ry W. Bloch School of Executive Hall of Entrepreneurship and Innovation,
ersity of Missouri - Kansas City, Kansas City, MO
itect: BNIM Architects – Kansas City, MO & Moore Ruble Yudell Architects & Planners – Santa Monic, CA
o Credit: Courtesy of Enterprise Precast Concrete, Inc. and Jacia Phillips Photography
PCI Precast/Prestressed Concrete Institute
Precast Provides High Performance Schools
The designers of the 68,000 sq. ft. Henry W. Bloch School Executive Hall at the University of Missouri-Kansas City wanted to create a contemporary structure that also would complement the university's historic masonry vernacular. The structure also had to meet today's strict energy code. Both of these goals were accomplished by using a high performance precast concrete enclosure system with embedded terra-cotta; edge-to-edge, continuous insulation; and carbon fiber wythe connectors eliminating thermal bridging. The precast enclosure system provided a material R-value of R17, accelerated construction to meet their tight deadline, and the desired aesthetic all while saving time and money.
CIRCLE 34
Discover High Performance Precast
Versatile | Efficient | Resilient
For more information and free continuing education, visit
www.pci.org/hpprecast
LIFE-CYCLE ASSESSMENT
PRECAST CONCRETE
LCA
THIRD-PARTY VERIFIED

YOUR ONE VISION.
OUR INFINITE CHOICES.
CREATE.
Your inspired vision.
COLLABORATE.
The Unilock team brings customer service and technical expertise to fully develop your creative paving designs.
CUSTOMIZE.
Optimizing color, finish, texture and size, we'll make your unique designs a reality.


We create chemistry that lets rainstorms love rooftops.
BASF's spray polyurethane foam roofing system delivers the strength your commercial projects need to survive in heavy rains and high winds. SPF roofing creates a monolithic surface capable of advanced weather resistance and reduced air leakage, so indoor environments stay safe fromoutdoor elements—all while facilitating higher R-values for enhanced energy efficiency. Upgrade the performance and protection in your commercial construction with spray polyurethane foam from BASF.
Learn more about how BASF is taking high-performance to new heights at www.spf.basf.com
CIRCLE 42
BASF
We create chemistry

Lightening Up

Thomas Moran investigates architecture through collaboration and humor.

BY REBECCA SEIDEL

WHETHER HE is hijacking plastic or determining the "tectonics of blanketness," Thomas Moran spends a lot of time in a fabrication lab. But there is nothing fabricated about this Ann Arbor–based architect's interest in materiality or his commitment to collaboration—or his belief that architecture should have a funny side. "Architects often wear many hats: urban designer, bureaucrat, philosopher," he says. "So why not comedian? Why not use architecture as a medium to lighten things up?"

Moran's profile is on the rise this year. Last May, he won the Architectural League Prize for Young Architects + Designers, and, along with the other winners, installed his work at the New School in New York. In August, Moran and a team of colleagues—literally called T+E+A+M, an acronym created from their names—were selected to participate in the U.S. Pavilion at the 2016 Venice Architecture Biennale.

On top of preparing for the Biennale, Moran, who is an assistant professor at the University of Michigan's Taubman College of Architecture and Urban Planning, joins with colleagues for a slew of other design projects.

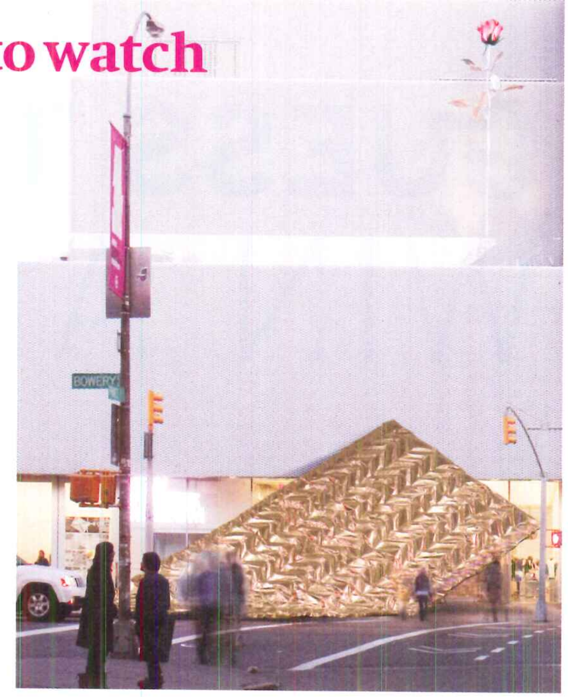
Visual irony and what he calls "cognitive slapstick" are at the center of Moran's work. A prime example is *Between You and Me*, the basis for his League Prize exhibition. For this project, Moran and Taubman College colleague Meredith Miller constructed caryatids with human characteristics out of aluminum foil and foam. Seeking to blur the line between humans and inanimate objects, they merged deadpan wit with an element of surprise.

Moran and Miller also submitted a bold proposition this year to the IDEAS CITY competition, sponsored by the New Museum in New York: a big "blanket fort," made of aluminum, to lean against the museum's facade. They envisioned a playful structure that would incite conversation. Though they didn't win, they got deeply involved in the fabrication process, exploring materials that could best reflect the "tectonics of blanketness."

Collaboration also guides Moran's work at THING THING, a Detroit-based studio established in 2012. THING THING experiments with fabrication methods to engineer new materials, often working with post-consumer recycled polyethylene plastic. The whimsical results—eye-popping urban sculptures or stools whose seats are molded from frying pans—reflect a Dadaist sensibility that capitalizes on the incongruity between materials and the resulting objects.

Building on such incongruity, THING THING is now researching how pollutants might be architecturally useful. According to a 2013 report from the Geological Society of America, plastic pollutants in the Pacific are fusing with natural materials to form a rock called plastiglomerate. "Whether we like it or not," Moran notes, "plastic is making it into the geological record. So, instead of wringing our hands, we're assessing the question, What can we do with that new material?" In their studio, Moran and his team are trying to recreate the natural processes that produce this conglomerate as grounds for further experimentation.

Moran grew up helping in his family's construction business in the Chicago area—which may explain his affinity for getting his hands dirty in the building process. He got a B.S. in Architectural Studies from the University of Illinois Urbana-Champaign and a Master in Architecture from Yale. He joined Taubman College's tight-knit studio as a Muschenheim Fellow in 2009, which led to his teaching appointment.



For the 2015 IDEAS CITY competition, Thomas Moran and colleague Meredith Miller proposed a giant "blanket fort" draped against the New Museum (rendering above). On a more utilitarian note, Moran built a shelf/staircase hybrid (bottom) in 2010 that he and four colleagues bought for $500 in Detroit at a foreclosure auction.

Moran's work with T+E+A+M for the Venice Architecture Biennale will be a major step toward potential international visibility. T+E+A+M—the group includes Moran, Ellie Abrons, and Adam Fure, and Miller—is one of a dozen groups commissioned by curators Cynthia Davidson and Monica Ponce de Leon to produce work for the U.S. Pavilion, whose title this year is The Architectural Imagination. Each group will generate a project specific to Detroit. Collectively, the pavilion will examine architecture's role in catalyzing change in a postindustrial city.

T+E+A+M is studying the Packard Automotive Plant, an Albert Kahn–designed factory that opened in 1903, the first car factory built using reinforced concrete. The hulking complex has long been abandoned. Moran emphasizes that while the plant is often seen as an emblem of ruin, it was an innovative prototype for 20th-century industrial architecture—still a symbol not just of decay but of potential. The group is scrutinizing the building's physicality and testing materials to discuss larger questions about urban development. "We are more interested in the forward-looking possibilities of material," Moran says, "in contrast to approaches that glamorize decay." ■

The Runtal Family of Products

For Hydronic, Electric, and Steam Heating Systems

From baseboard to wall panels, to fancy curves and dramatic room dividers, Runtal manufactures the perfect welded steel radiator for every application. Runtal manufactures an almost unlimited selection of sizes, colors, and heat outputs that afford the architect and engineer choices. The inventor of the panel radiator in 1953 in Switzerland and operating a factory in Massachusetts for over 25 years to serve the US and Canadian markets, Runtal has had millions of installations worldwide in schools, government buildings, hospitals, corporate offices, libraries, museums and homes.

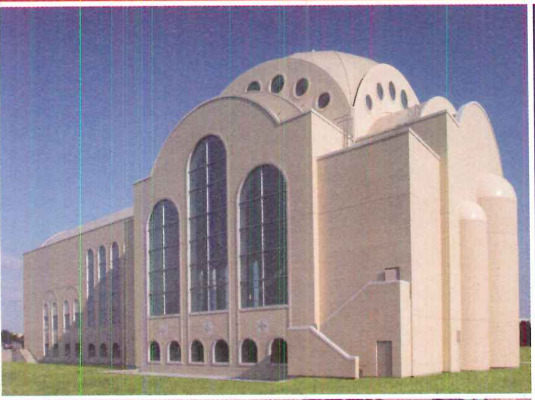
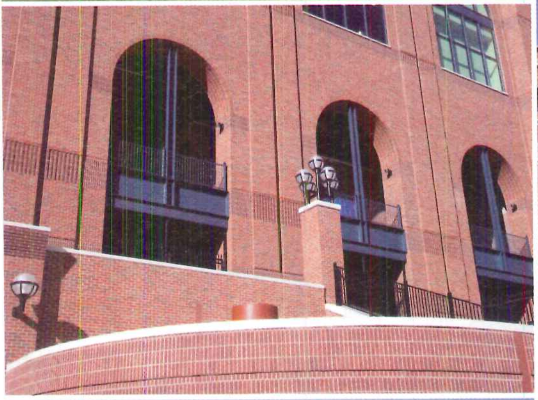
Imagine the possibilities, confident that the final design will be comfortable and stylish.

CIRCLE 63

For more information or your nearest representative, please call 1-800-526-2621 or online at **www.runtalnorthamerica.com**.

ARCHITECTURAL RECORD
2014
ADVERTISING EXCELLENCE AWARDS
FINALIST

runtal RADIATORS
Warmth by Design


Hilton
Hilton

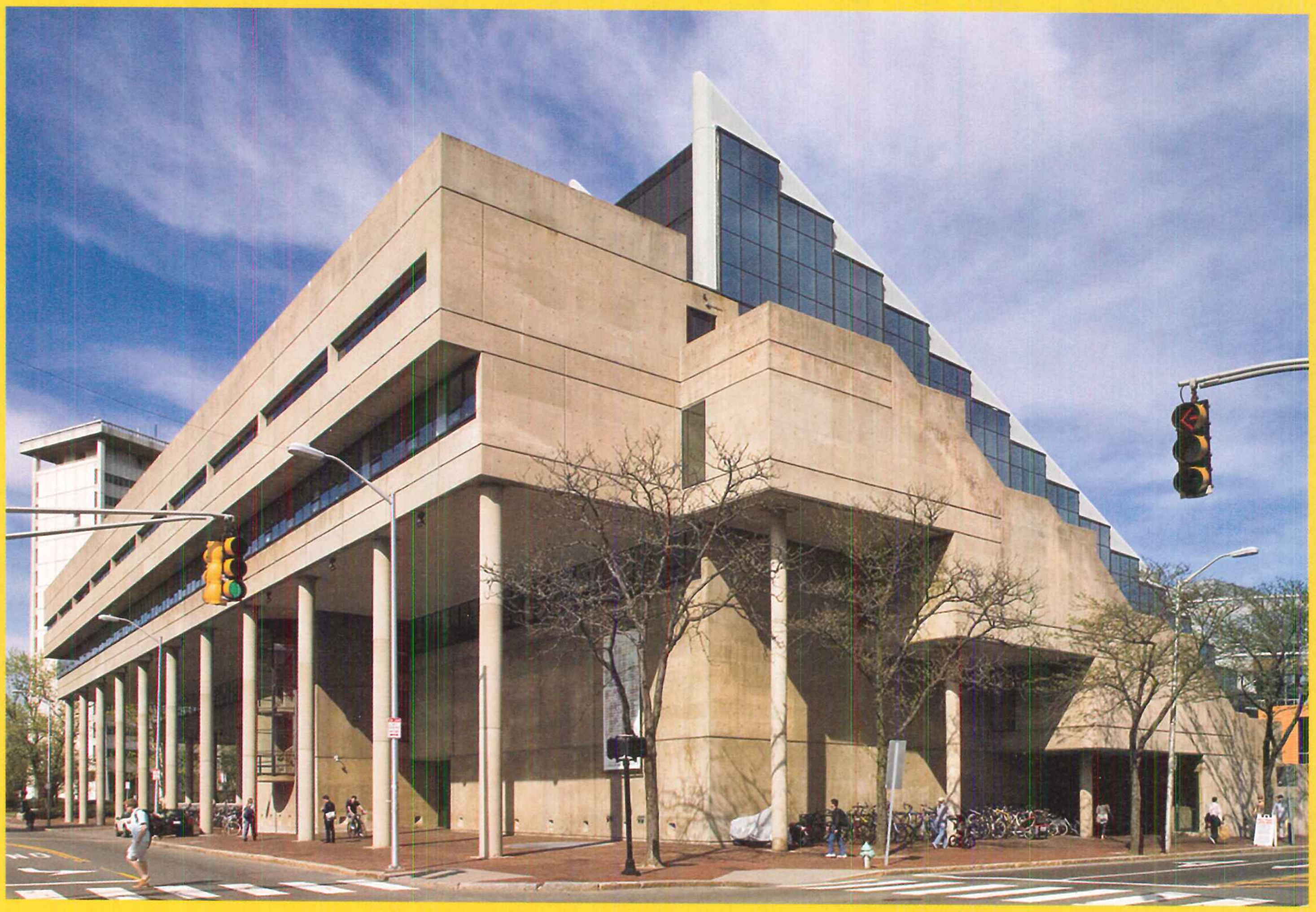

AS HANGING DISPLAY SYSTEMS
INTELLECTUALLY ENLARGING
EDUCATING FOR ETERNITY
CHARACTER BUILDING
LIFELONG LEARNING & SERVICE
WE'RE OBSESSED BY DETAILS NO ONE WILL EVER NOTICE. YOU UNDERSTAND.
Discrete. Stylish. We've created a multitude of state-of-the-art ways to showcase your interior displays. Visit us online or call us to get samples, CSI specs and more. It'll be the start of something beautiful.
ASHanging.com 1 866 935 6949
CIRCLE 76
© 2014 AS Hanging Systems

SageGlass
LOOK AGAIN
at SageGlass
It's time.
Time to look again at how we approach design, and manage the effects of the sun.
Time to look again at removing the blinds and shades that block out the world, so we can improve the human experience of everyone who inhabits the buildings we create.
It's time to look again at SageGlass.
CIRCLE 90
THE REVOLUTION BEGINS AT GREENBUILD 2015
sageglass.com/greenbuild
SAINT-GOBAIN

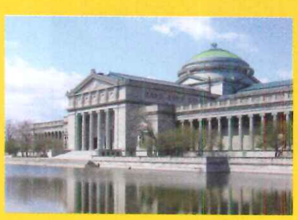
ARCHITECTURAL RECORD

Guess the Architect Contest

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



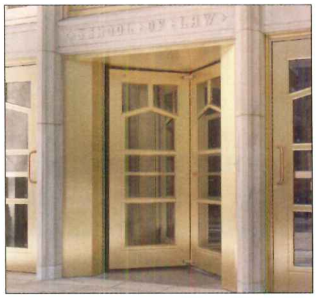
CLUE: ALTHOUGH THIS MUCH-PUBLICIZED DESIGN SCHOOL MADE ITS ARCHITECT, A FORMER STUDENT, FAMOUS, THE YOUNG TALENT WAS TO FIND MORE OPPORTUNITIES TO BUILD IN OTHER COUNTRIES.



The answer to the October issue's Guess the Architect is **CHARLES B. ATWOOD**, who, working for D.H. Burnham and Company, designed numerous temporary structures for the world's Columbian Exposition of 1893 in Chicago. His Palace of Fine Arts, a Greco-Roman-style pavilion, was rebuilt from 1933 to 1940 as the permanent home of the Museum of Science and Industry.

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

Opening & Closing



Securing

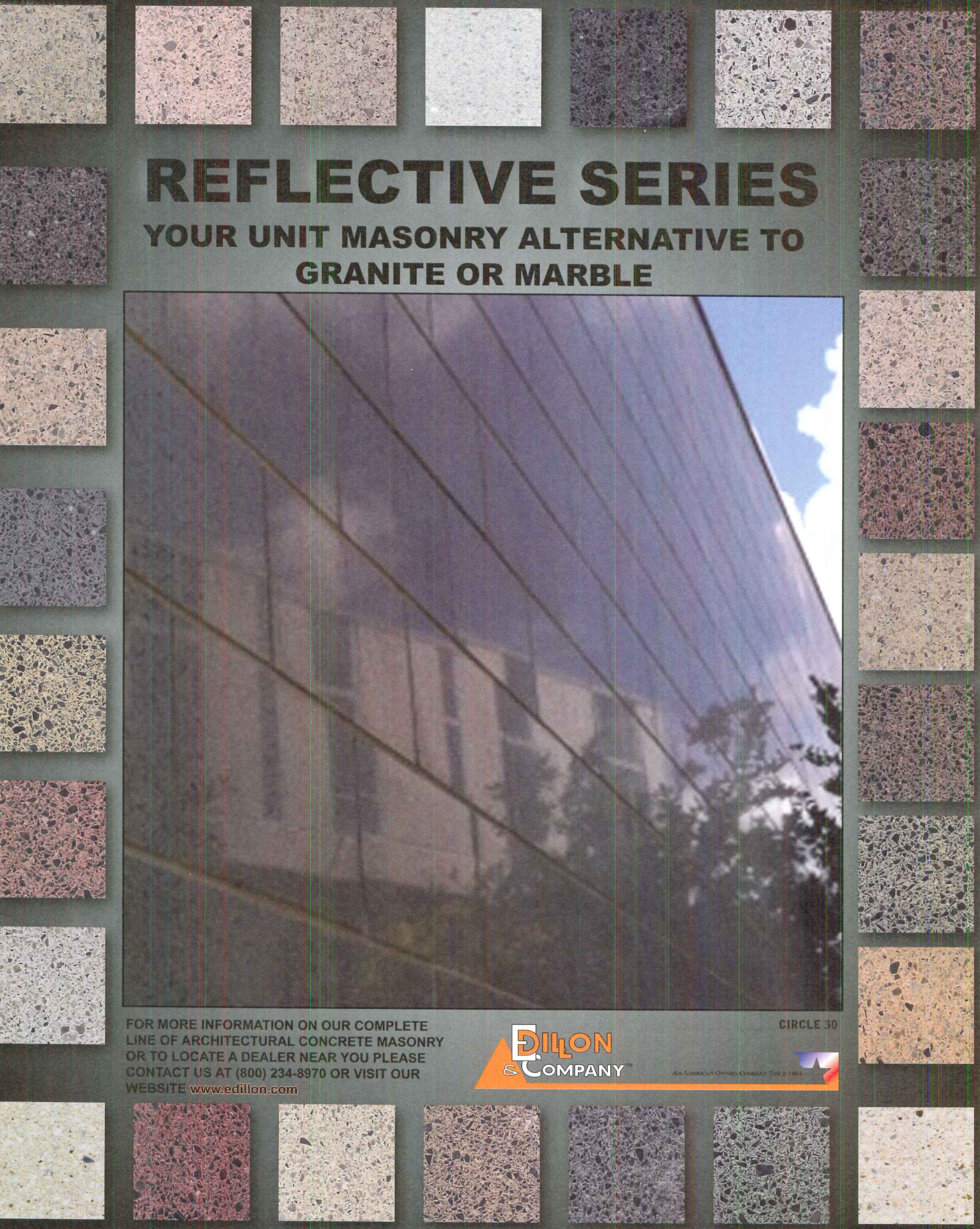
Dividing

Service

Premium Access Solutions and Services

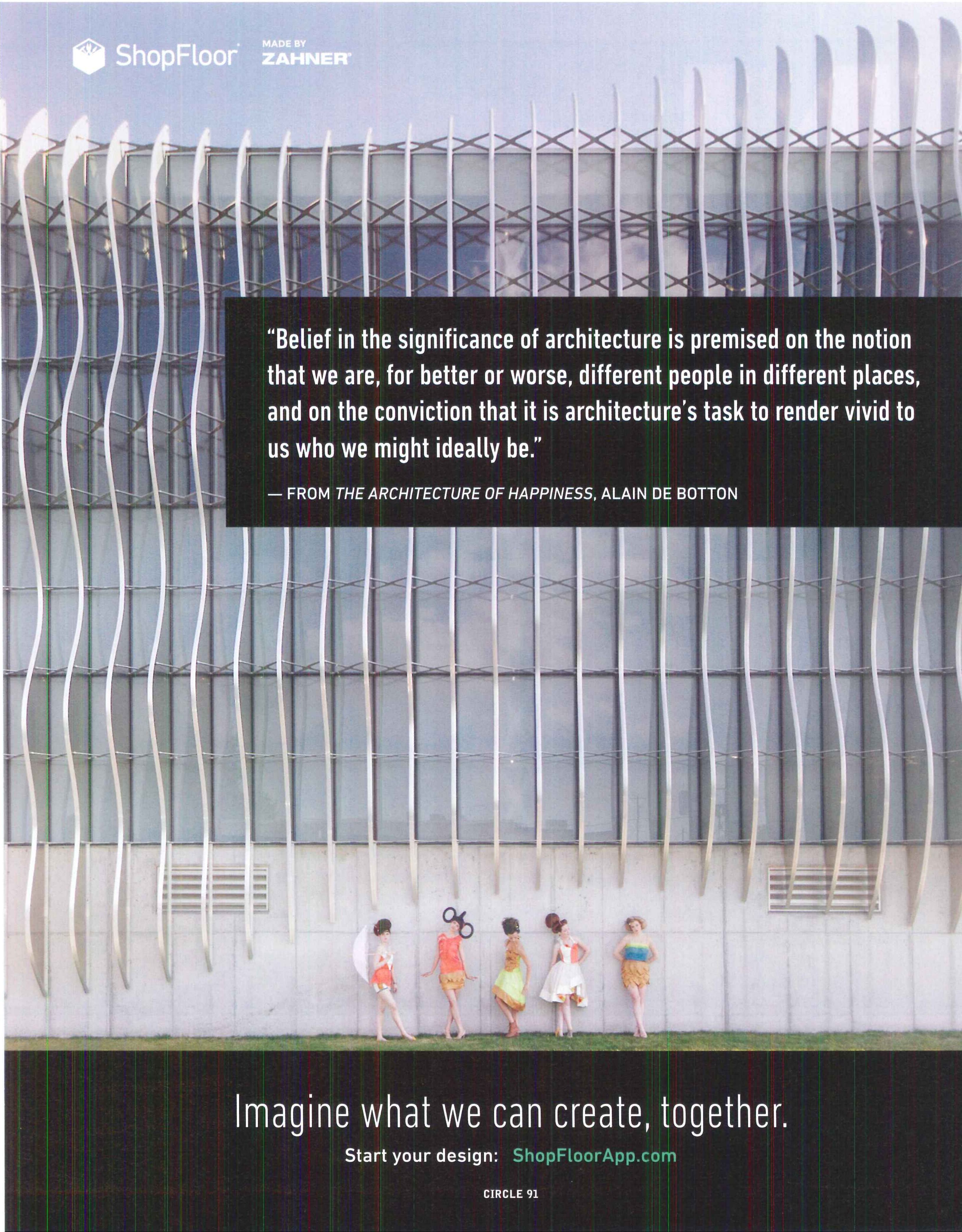
Educational environments need door openings and applications that function seamlessly and also stand up to high traffic and abuse. DORMA is the trusted global partner for stakeholders of any building. **Find your solution at go.dorma.com/edusolutions or 844-SPECNOW.**

CIRCLE 18



REFLECTIVE SERIES
YOUR UNIT MASONRY ALTERNATIVE TO GRANITE OR MARBLE
FOR MORE INFORMATION ON OUR COMPLETE LINE OF ARCHITECTURAL CONCRETE MASONRY OR TO LOCATE A DEALER NEAR YOU PLEASE CONTACT US AT (800) 234-8970 OR VISIT OUR WEBSITE www.edillon.com
E. DILLON & COMPANY™
AN AMERICAN OWNED COMPANY SINCE 1868
CIRCLE 30

CASTCONNEX
Universal Pin Connectors
& Architectural Tapers
Specify independently or together
CAST CONNEX
UNIVERSAL PIN
CONNECTOR
CAST CONNEX
ARCHITECTURAL
TAPER
HSS XXX Ø
CASTCONNEX
www.castconnex.com
CIRCLE 31
Woods Hole Oceanographic Institute
Architect - Ellenzweig
Structural Engineer - LeMessurier
Photographer - Ellenzweig

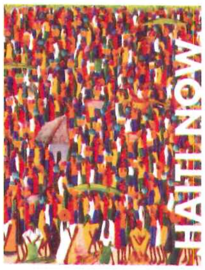

ShopFloor
MADE BY ZAHNER
"Belief in the significance of architecture is premised on the notion that we are, for better or worse, different people in different places, and on the conviction that it is architecture's task to render vivid to us who we might ideally be."
— FROM THE ARCHITECTURE OF HAPPINESS, ALAIN DE BOTTON
Imagine what we can create, together.
Start your design: ShopFloorApp.com
CIRCLE 91

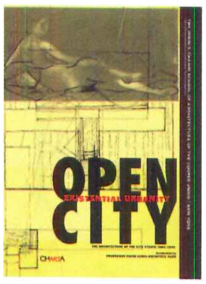
Haiti Now, *edited by Thom Mayne and Eui-Sung Yi. The Now Institute, 2014, 732 pages, $40 (paper).*

Open City: Existential Urbanity: The Architecture of the City Studio 2001-2014, *by Diane Lewis. Charta, June 2015, 368 pages, $75 .*

Reviewed by Fred A. Bernstein

IF YOU'VE ever felt like a slacker, neither of these books will help. You'll know even before you open them—one weighs 4.4 pounds; the other, more than 7—that they represent thousands of hours of painstaking effort. Among their creators are the dynamos Thom Mayne (of Morphosis) and Diane Lewis (of Diane Lewis Architect), and students at the architecture schools where these practitioners somehow find time to teach.

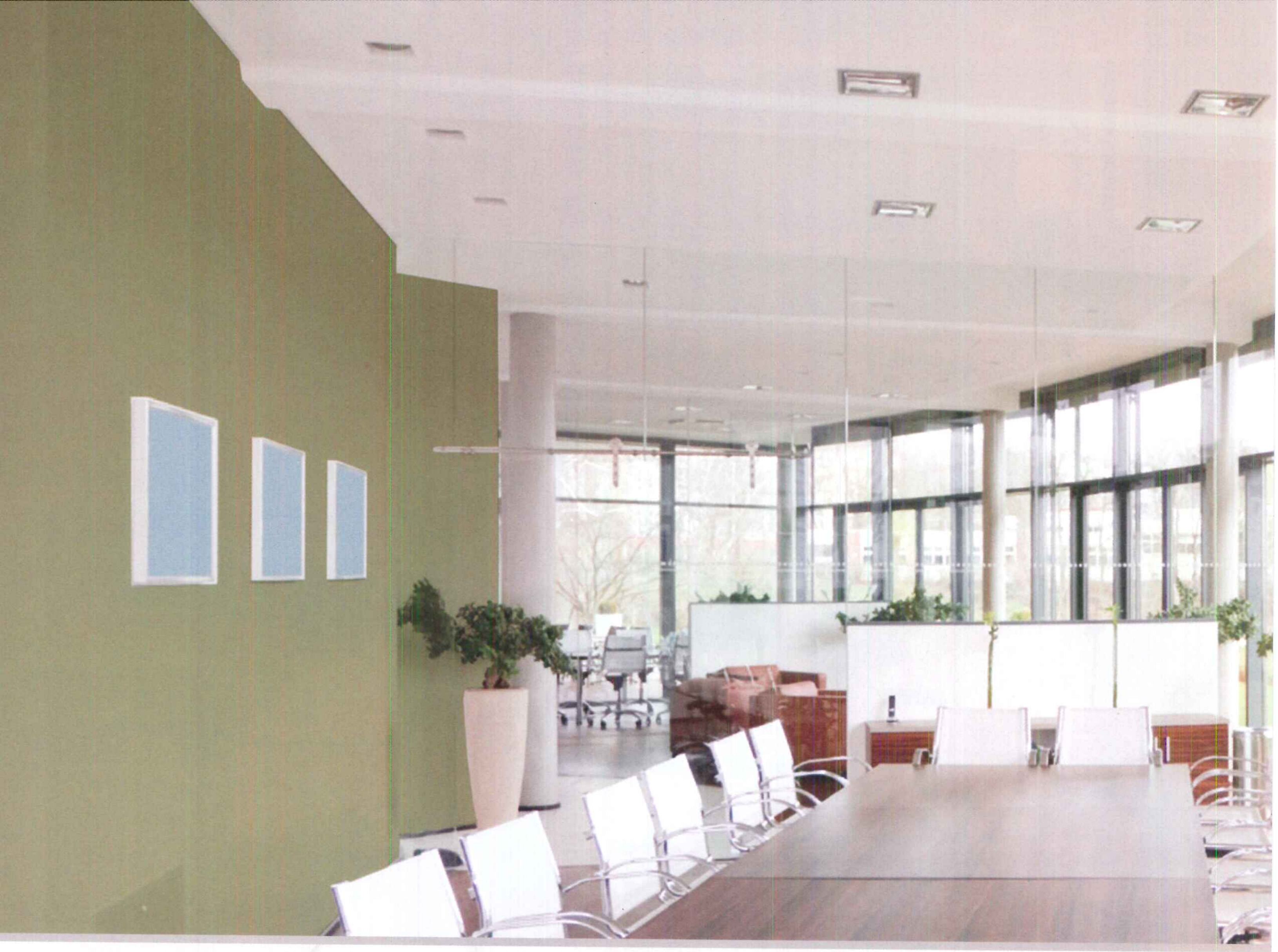




Mayne's book is the more accessible of the two, and deliberately so. In 2012, he assigned the members of his Suprastudio (a one-year master's program at UCLA) to examine the problems of Haiti. Then, the Now Institute, a think tank headed by Morphosis principal Eui-Sung Yi, began compiling the students' findings (and data from sources like the CIA's *World Factbook*) into a 732-page "visual almanac." Hundreds of terrific photos present a composite picture of Haiti, and the graphics (by James Janke and others) make statistical comparisons with other Caribbean countries compelling. But the book stops short of architectural solutions, focusing instead on problems—architectural, infrastructural, social, medical, technological, and environmental. "You have to understand the people and the culture before you can come in and recommend X, Y and Z," says Yi, whose institute has several building projects planned for Haiti.

By contrast, Lewis's book is all about solutions. For 35 years, she has been teaching the fourth-year Architecture of the City studio at Cooper Union in New York. Her goal is to give her students a chance to dream. "It's the first time anyone asks them what they want to do as architects," she says. Though specifics vary from year to year, the basic assignment is the same: design a meaningful civic institution, in a location that deepens that meaning. Among the projects her students came up with are a maternity hospital on the site of the World Trade Center (with large earthen breasts) and an institute melding science and religion in Rome, at the site where Galileo recanted. Most of the book consists of students' drawings, texts, and models photographed in black-and-white from the last 13 studios. Interspersed are essays by Lewis, Cooper Union colleagues such as Peter Schubert and Dan Sherer, and outside critics Calvin Tsao and Roger Duffy. Barry Bergdoll, Richard Meier, and Lewis's friend the humorist Fran Lebowitz also weigh in.

In fact, both books demonstrate the appeal—and limitations—of print. The Mayne volume begins and ends with timelines of Haitian politics, economics, and culture, displayed over multiple pages. In the Lewis book, architectural drawings as large as 6 feet by 6 feet are shrunk to fit. But to Lewis, it was essential not just to have a physical book, but one with the same dimensions (nearly 11 by 15 inches) as Mario Moroni's *Atlas of Urban History*, published in Italy in 1963. She calls the result "a sensuous and gorgeous thing." It is, but a digital version, not an option for Moroni, would let users zoom in on the drawings and models Lewis wants the world to admire. ■



Benjamin Moore®

ULTRA SPEC® 500

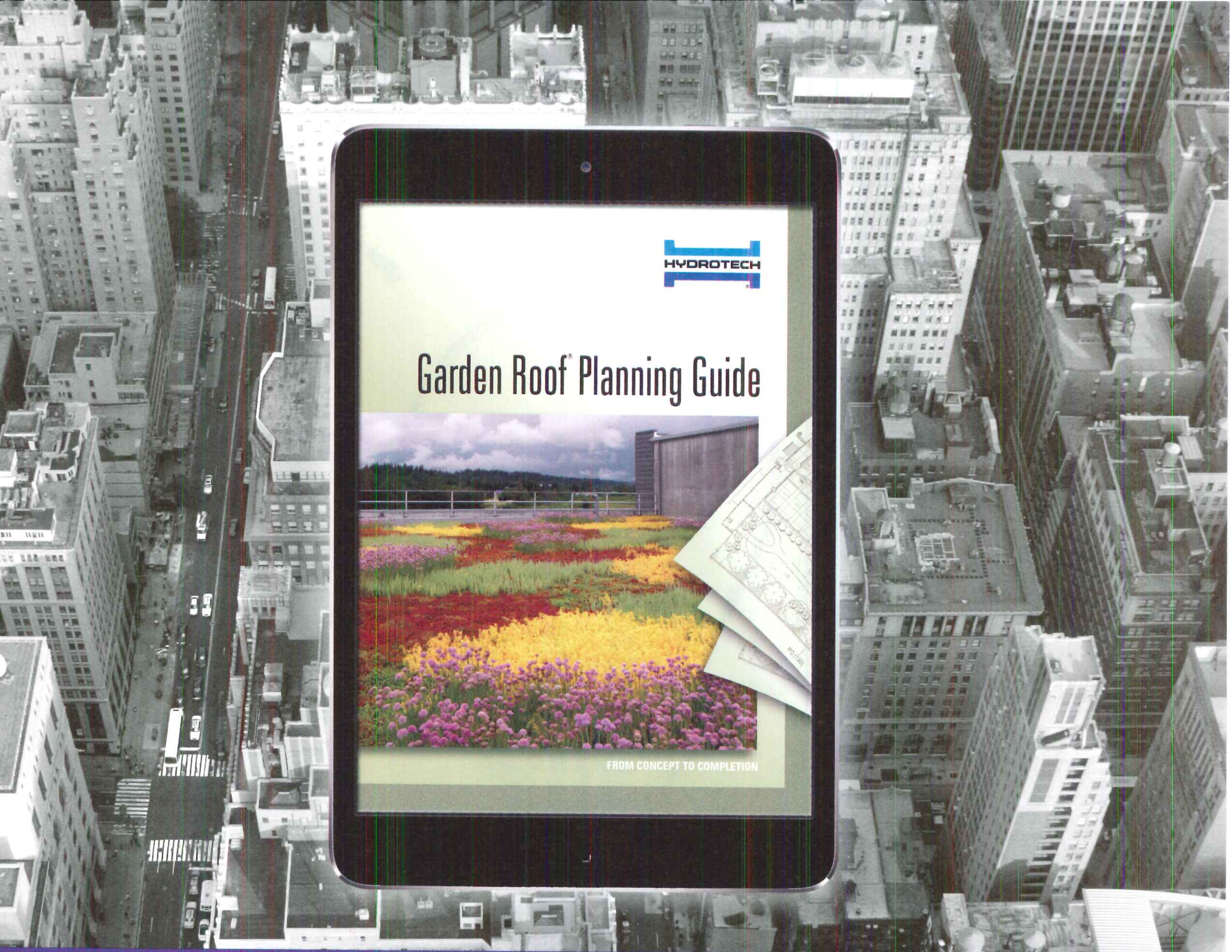
FOR THE PROS.

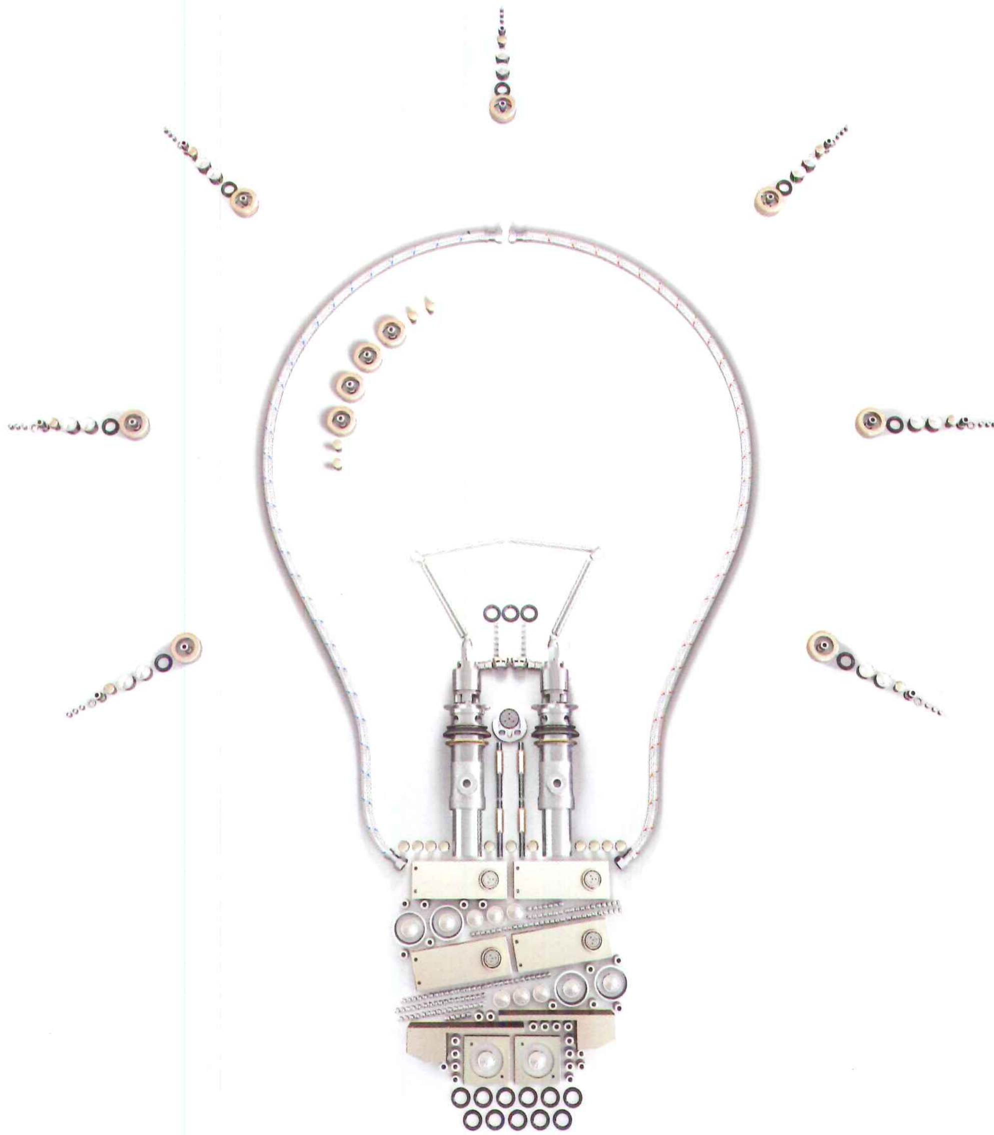
SMOOTH APPLICATION FOR FASTER RESULTS.

Ultra Spec® 500 is formulated for the professional. With smooth application and a fast dry time, Ultra Spec® 500 helps your interior commercial projects move quicker, while delivering the quality finish and color expected from a professional job.

- Exceptional application properties
- Quick dry and re-coat time
- Excellent hide and easy touch-ups
- MPI approved
- Qualifies for LEED® and LEED® v4 credit

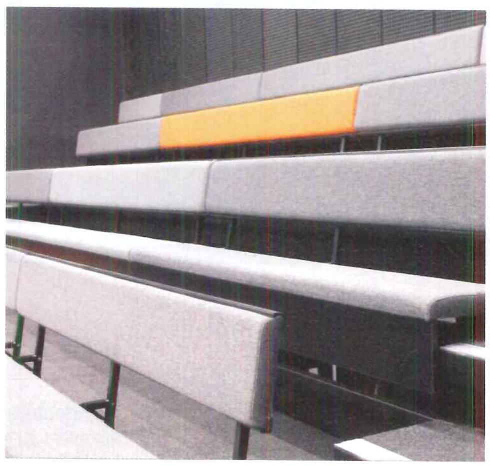
CIRCLE 12


HYDROTECH
Garden Roof® Planning Guide
FROM CONCEPT TO COMPLETION



products **head of the class**

EDUCATIONAL PRODUCTS THAT MUFFLE SOUND, POWER ELECTRONIC DEVICES, AND ADAPT AS NEEDED. BY JULIE TARASKA



Touchdown Charging Locker

Slyde slydedrawer.com

Aside from providing secure storage for students and faculty, each of these units can charge up to four electronic devices that use USB ports and/or AC outlets. Locking options include four-digit codes for timed access and private codes for repeated use. A single outlet can charge up to eight wall-mounted or stacked lockers. CIRCLE 150

SixE Learn Chair

PearsonLloyd for Howe howe.com

Ideal for educational settings that emphasize flexible learning and collaboration, this movable all-in-one desk features a storage compartment, integrated bag hook, and cupholder. The tablet arm rotates 360° and the seat, available in six colors, comes in stacking and armchair models.

CIRCLE 151

Sonovent Acoustical Flap

Renson renson.com

This passive ventilation and sound-abatement system promotes fresh-air intake while reducing ambient noise by up to 56 dB. The unit may be glazed in or installed at transom. Suitable for residential and commercial projects, Sonovent comes in four sizes (10mm to 25mm) and four configurations (small to extra-large).

CIRCLE 152

Zintra Acoustic Panels

Baresque baresque.us

These ½"-thick polyester panels deliver a noise-reduction coefficient of 0.35 to 0.90, depending on installation and distance from the surface to which they are affixed. They may be used for walls, ceilings, screens, and joint-free floor-to-ceiling installations. Class-A fire-rated, they also may be customized with digitally printed designs. CIRCLE 153

Folding Benches

Hussey Seatway husseyseatway.com

This system of telescopic bleachers, available in a variety of widths, row rises, and row depths, can maximize floor space in assembly halls and gymnasiums. The units are available with a motorized or manual retracting mechanism, as well as mobile or freestanding platforms.

CIRCLE 154

Lyra High CAC Ceiling Panels

Armstrong Armstrong.com

Offering an NRC of 0.95 and Ceiling Attenuation Class of 42, Lyra provides outstanding sound blocking and absorption. The 24" square panels, which feature a fiberglass face and mineral fiber backing, contain 59% recycled content. They have a drywall-like appearance and are scratch-, soil-, and sag-resistant. CIRCLE 155

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

PPG IdeaScapes™
Glass • Coatings • Paint

Premier Products. Premier Partners. Proven History.

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

PPG CAP
CERTIFIED APPLICATOR℠ PROGRAM

Traditionally for Metal. Now for Hardwood.

For decades, architects have trusted DURANAR® fluoropolymer coatings, expertly applied by members of the PPG CAP CERTIFIED APPLICATOR℠ PROGRAM, to protect and beautify aluminum building components on landmark building projects. Now they can do the same with hardwood floors finished by the first PPG CAP program member certified to apply DURETHANE® wood coatings.

For the first time, architects can specify custom-colored, prefinished hardwood floors for office buildings, restaurants, hotels and retail stores with the same confidence they reserve for *Duranar* metal coatings applied by traditional PPG CAP program members.

Whether your goal is to add warmth and color to a building's interior or exterior, PPG can connect you with a certified applicator trained and audited to deliver the world-class customer service, industry-leading technical expertise and accelerated product delivery your project demands.

To learn more, visit **ppgideascapes.com** or call **1-888-PPG-IDEA**.

CIRCLE 50

METAL COATINGS

Architectural Window
Rutherford, NJ • (201) 939-2200
architecturalwindow.com

Astro Shapes
Struthers, OH • (330) 755-1414
astroshapes.com

Durapaint Industries, Ltd.
Scarborough, ON • (416) 754-3664
durapaint.net

Kawneer Co., Inc.
Bloomsburg, PA • (570) 784-8000
Cranberry Twp., PA • (724) 776-7000
Lethbridge, AB • (403) 320-7755
Springdale, AR • (479) 756-2740
Visalia, CA • (559) 651-4000
kawneer.com

Keymark Corporation
Fonda, NY • (518) 853-3421
Lakeland, FL • (863) 858-5500
keymarkcorp.com

Sapa Extrusions Americas
Gainesville, GA • (770) 355-1560
Mississauga, ON • (905) 890-8821
Pointe Claire, QC • (514) 697-5120
Portland, OR • (503) 285-0404
Yankton, SD • (605) 665-6063
sapagroup.com

Spectrum Metal Finishing, Inc
Youngstown, OH • (330) 758-8358
spectrummetal.com

Trojan Architectural Coaters
Pompano Beach, FL • (954) 366-5319
trojanpowder.com

Tecnoglass S.A.
Barranquilla, Colombia • 57-5-373-400
tecnoglass.com

Windsor Metal Finishing, Inc.
Kissimmee, FL • (407) 932-0008
1stchoicewindsor.com

YKK AP America Inc.
Austell, GA • (678) 838-6000
ykkap.com

HARDWOOD COATINGS

Somerset Hardwood Flooring
Somerset, KY • (877) 404-9663
somersetfloors.com

Total Flood Protection Nozzles

OPTIMIZE

Your Design Solutions for Light-Framed Multi-Story Construction

Seismic and wind events pose serious threats to the structural integrity and safety of structures. Building structures with a continuous load path can mean the difference between withstanding these types of natural disasters – or not.

All wood-framed buildings need to be designed to resist shearwall overturning and roof-uplift forces. For one- and two-story structures, structural connectors (straps, hurricane ties and holdowns) have been the traditional answer. With the growth in light-frame, multi-story wood structures, however, rod systems have become an increasingly popular load-restraint solution.

Simpson Strong-Tie Strong-Rod™ continuous rod tiedown systems are designed to restrain both lateral and uplift loads, while maintaining reasonable costs on material and labor. Our continuous rod tiedown systems include the Anchor Tiedown System for shearwall overturning restraint (Strong-Rod™ ATS) and the Uplift Restraint System for roofs (Strong-Rod™ URS).

Strong-Rod ATS for Overturning

Strong-Rod ATS solutions address the many design factors that need to be considered to ensure proper performance against shearwall overturning, such as rod elongation, wood shrinkage, construction settling, shrinkage compensating device deflection, incremental loads, cumulative tension loads, and anchorage.

Strong-Rod URS for Uplift

Strong-Rod URS solutions address the many design factors that need to be considered to ensure proper performance against roof uplift, such as rod elongation, wood shrinkage, rod-run spacing, wood top-plate design (connection to roof framing, reinforcement at splices, bending and rotation restraint), and anchorage.

Strong-Rod Systems have been extensively tested by engineers at our state-of-the-art, accredited labs. Our testing and expertise are crucial in providing customers with code-listed solutions. The Strong-Rod URS solution is code-listed in evaluation report ICC-ES ESR-1161 in accordance with AC391, while the take-up devices used in both the ATS and URS solutions are code-listed in evaluation report ICC-ES ESR-2320 in accordance with AC316.

Because no two buildings are alike, Simpson Strong-Tie offers many design methods using code-listed components and systems to help you meet your complex design challenges.

Let us help you optimize your designs. For more information about our Strong-Rod™ systems continuous rod tiedown solutions or traditional connector solutions, call (800) 999-5099 and download our new Strong-Rod™ Systems Design Guide at **strongtie.com/srs**.

SIMPSON Strong-Tie®

CIRCLE 196

A RIVER RUNS THROUGH IT

SANAA floats a ribbon of glass, steel, and wood across a hilly landscape for the Grace Farms Foundation.

BY NAOMI R. POLLOCK, AIA
PHOTOGRAPHY BY IWAN BAAN

View additional content at architecturalrecord.com.

Some buildings are sympathetic to nature. Others are open to nature. But the River, the latest project from SANAA, is practically a part of nature. As the name suggests, the building's organic shape resembles a stream meandering peacefully through its idyllic setting. Conversely, the experience of this bucolic place, 80 acres of Connecticut countryside, is enhanced by the River's calming presence. Viewed through SANAA's curved glass walls, the sky looks somehow bluer, the trees somehow greener, and the landscape all the more magnificent.

Located in New Canaan, the River belongs to the Grace Farms Foundation, a nonprofit organization established in 2009 that asked the Pritzker Prize–winning firm from Tokyo to create a building that embodies its mission, bringing people together to "experience nature, encounter the arts, pursue justice, foster community, and explore faith." The foundation aimed to preserve this unspoiled parcel in perpetuity and share it with the public. Originally a patchwork of small farms, the property had fallen into the clutches of a developer who had it rezoned for a 10-lot subdivision. After saving the land from that fate, the foundation began the international search for a designer that led them to SANAA.

What the client wanted was a building that would disappear into nature. This description piqued the interest of SANAA principals Kazuyo Sejima and Ryue Nishizawa,

STRETCHED OUT At 83,000 square feet, the River contains a series of glass-enclosed spaces and covered areas in between. The building leads to a pair of horse barns renovated for use by Grace Community Church members and the public.

whose works can be so light and ethereal that they barely seem like buildings at all. In response, the duo began searching for a strategy to fit the project on the site. Though the land was largely open, it was saddled with a number of restrictions, such as areas occupied by woodlands, wetlands, and horse paddocks that the client wanted to keep. "The landscape is just as much a part of the program as the building," explains Sharon Prince, president of the Grace Farms Foundation. The architects also had to wrestle with the needs of a complicated set of users, including select community and nonprofit groups and the Grace Community Church. Plus they had to integrate commissioned installations by five artists: Olafur Eliasson, Susan Philipsz, Thomas Demand, Teresita Fernandez, and Beatriz Milhazes.

SANAA answered this complexity with simplicity. The firm proposed a long, snaking roof and placed each programmatic piece in its own glass-enclosed volume underneath. Between and around these indoor elements, the canopy-like structure yields covered but essentially outdoor spaces, an ambiguity deeply rooted in Japanese architecture.

Making the roof work, though, was anything but simple. Low and sloping, it follows the lay of the land, switching back and forth for approximately 1,400 feet as it flows down the hilly site. At the same time, its width expands to a maximum of 150 feet and contracts to a minimum of 25 feet as it incorporates the glazed spaces: a 700-seat sanctuary-cum-amphitheater at the highest point of the property, followed by a library, a generous dining and living room called the Commons, a pavilion for welcoming visitors, and a sunken gymnasium. The only opaque elements are small volumes holding washrooms and offices and support rooms tucked underground. Hugging the ground, a sloped and stepped exterior walkway mirrors the roof and negotiates the site's 44-foot drop. Additional studio space for art and dance, plus the church's administrative functions, occupy a separate SANAA-renovated horse barn and paddock. At the barn compound, SANAA removed the building's central portion to create an outdoor courtyard, and reworked rows of stalls on either side for use by the public and church members.

In contrast, the 83,000-square-foot River neither looks nor behaves like a conventional building. Though incorporated into the overall form, each volume acts as an autonomous mini-building, with its own entrances. "We asked for no front door," says Prince. Since the various spaces are connected externally, it is necessary to go outside to get from place to place—an acceptable condition in Japan, where the climate is relatively forgiving. Within each volume, a geothermal HVAC system keeps the temperature comfortable. Double-paned window walls help too.

Unsurprisingly, the main purpose of the glass is to open the interior visually to the outdoors. To maximize transparency, SANAA specified low-iron glass, thin stainless-steel sash, and silicon joints for the project's 203 mostly curved panes, custom made in Spain. The floor-to-ceiling panes are 7 to 8 feet wide and trapezoidal in shape, to accommodate the sloping roof. Working

FLOOR PLAN

0 100 FT. 30 M.

1 SANCTUARY
2 LIBRARY
3 OFFICE
4 COMMONS/DINING
5 PAVILION
6 GYMNASIUM
7 HALL
8 MEETING ROOM
9 OFFICES
10 LOUNGE
11 PLAZA
12 ATHLETIC FIELD

COMPLEX GEOMETRY The building winds its way 44 feet down a hillside. The roof curves in three dimensions but is made of two-dimensional elements, such as sheets of anodized aluminum and cedar fascia.

IN THE LOOP For the first time, SANAA designed a hybrid structural system of steel columns and timber beams. The underside of the roof is clad with 3-inch-wide strips of Douglas fir.

with the topography, each see-through volume is shaped and oriented to offer panoramic views in various directions. "We wanted to make diverse experiences between people and nature," explains Sejima, who collaborated with landscape architects OLIN on the site work and Larry Weaner Landscape Associates on restoring mowed areas as meadows. While a few trees had to be felled, some of them were reborn as communal dining tables designed by SANAA.

Though SANAA buildings tend to favor glass and steel, wood plays a starring role in the River. A first for the firm, the building is supported by a hybrid structure made of steel columns and timber beams. While glulam beams and steel trusses support wood ceilings above individual volumes, some 200 portals composed of vertical columns and sloping beams, each one different, hold up the roof. Though the roof curves in three dimensions, it is made of two-dimensional elements: anodized aluminum sheets measuring 2 by 20 feet on top, cedar fascia, and 3-inch-wide strips of Douglas fir for the underside. Following SANAA's direction, the contractors diligently laid out the planks, aligning their joints at matching angles as the roof turns and cascades downhill. "The carpenters were very patient," remarks Sejima with a smile.

Although it stretches out for more than a ¼ mile, the River makes no attempt at monumentality or grandeur. But, in the elegant way the building coexists with nature, SANAA achieves something far more sublime—a project that seems destined to become one of its iconic works. ■

credits

ARCHITECT: Kazuyo Sejima+Ryue Nishizawa/SANAA – Kazuyo Sejima, Ryue Nishizawa, principals; Shohei Yoshida, project architect

ARCHITECT OF RECORD: Handel Architects – Frank Fusaro, principal; Peter Miller, senior associate

ENGINEERS: SAPS/Sasaki and Partners and Robert Silman Associates (structural); McChord Engineering (civil); BuroHappold Engineering (m/e/p)

CONSULTANTS: OLIN (landscape); Larry Weaner Landscape Associates (meadows); Transsolar (sustainability); Front (building envelope)

CONSTRUCTION MANAGER: Sciame

OWNER'S REPRESENTATIVE: Paratus Group – Andrew Klemmer, principal; Pamela Torres, project director

CLIENT: Grace Farms Foundation

SIZE: 83,000 square feet (the River); 17,000 square feet (barns)

CONSTRUCTION COST: $67 million

COMPLETION DATE: October 2015

SOURCES

STEEL: QSR Steel

CURVED BEAMS: Chicago Metal Rolled Products

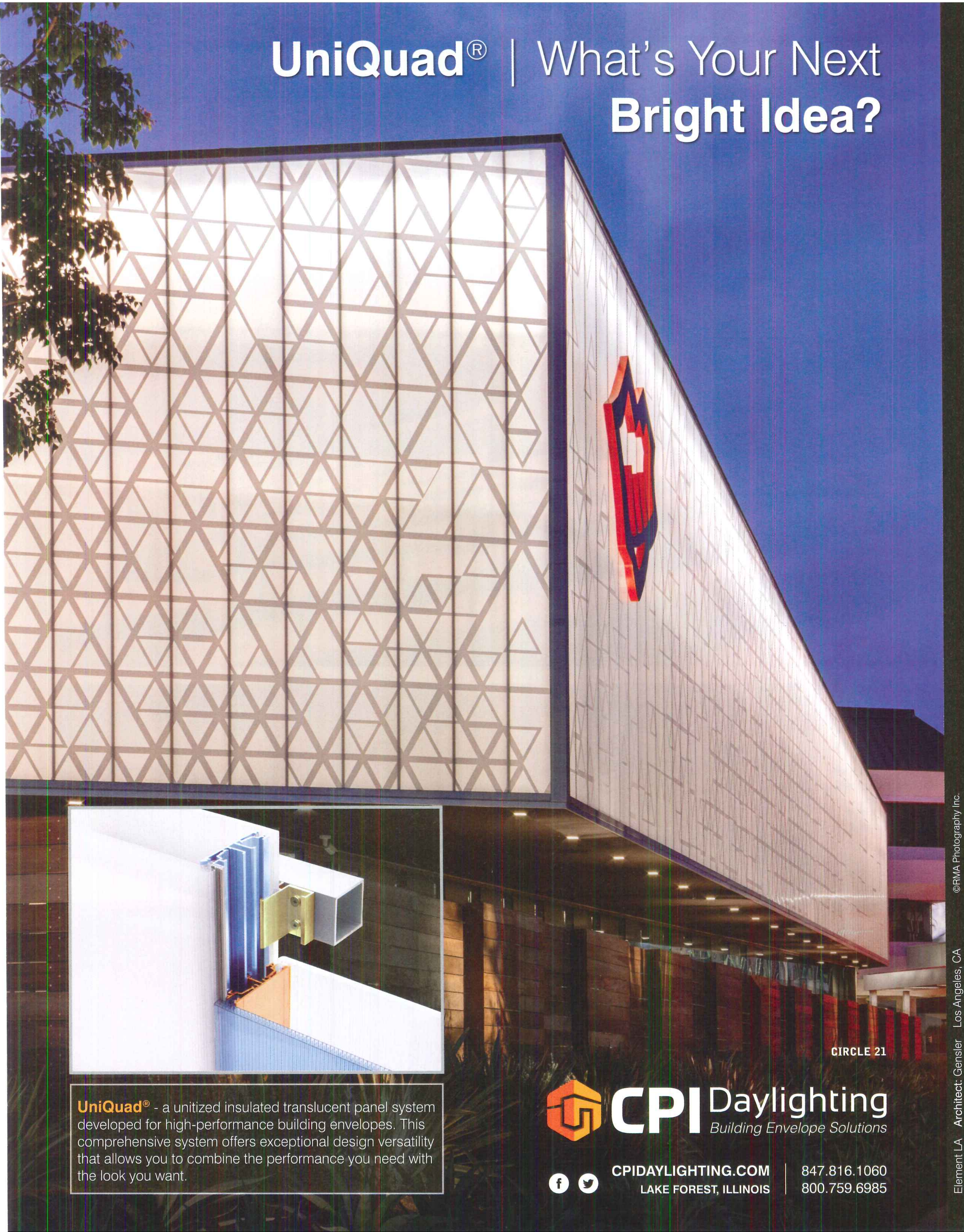
GLUE-LAMINATED BEAMS AND TRUSSES: Structurlam Wood Products; Tripyramid Structures

METAL AND WOOD DOORS: Curries Company

SANCTUARY CHAIRS: Moser

HARVESTED-WOOD TABLES: Troy City Wood Work

VIEWING ROOMS
The area known as the Commons offers indoor and outdoor places to dine (opposite). At the top of the site, the sanctuary (above) can seat 700 people, while the gym (right) occupies the lowest portion of the land.


UniQuad® | What's Your Next
Bright Idea?
CIRCLE 21
UniQuad® - a unitized insulated translucent panel system developed for high-performance building envelopes. This comprehensive system offers exceptional design versatility that allows you to combine the performance you need with the look you want.
CPI Daylighting
Building Envelope Solutions
CPIDAYLIGHTING.COM
LAKE FOREST, ILLINOIS
847.816.1060
800.759.6985
©RMA Photography Inc.
Element LA Architect: Gensler Los Angeles, CA

OUR VERSATILITY IS IDEAL FOR ALL BUILDING TYPES.

Ecospan's Composite Floor System is an integration of steel components with open web design for low, mid, and high-rise structures. Using a unique configuration of components with high strength-to-weight ratios, our innovative system allows for longer spans, shallow floor depths, greater rigidity and enhanced performance – without sacrificing aesthetics.

Made with 99% recycled steel joists and 70% recycled steel decking, Ecospan provides open web structural components with a lighter weight composite design for elevated floor construction.

ECOSPAN®
COMPOSITE FLOOR SYSTEM

www.ecospan-usa.com

NUCOR
VULCRAFT/VERCO GROUP

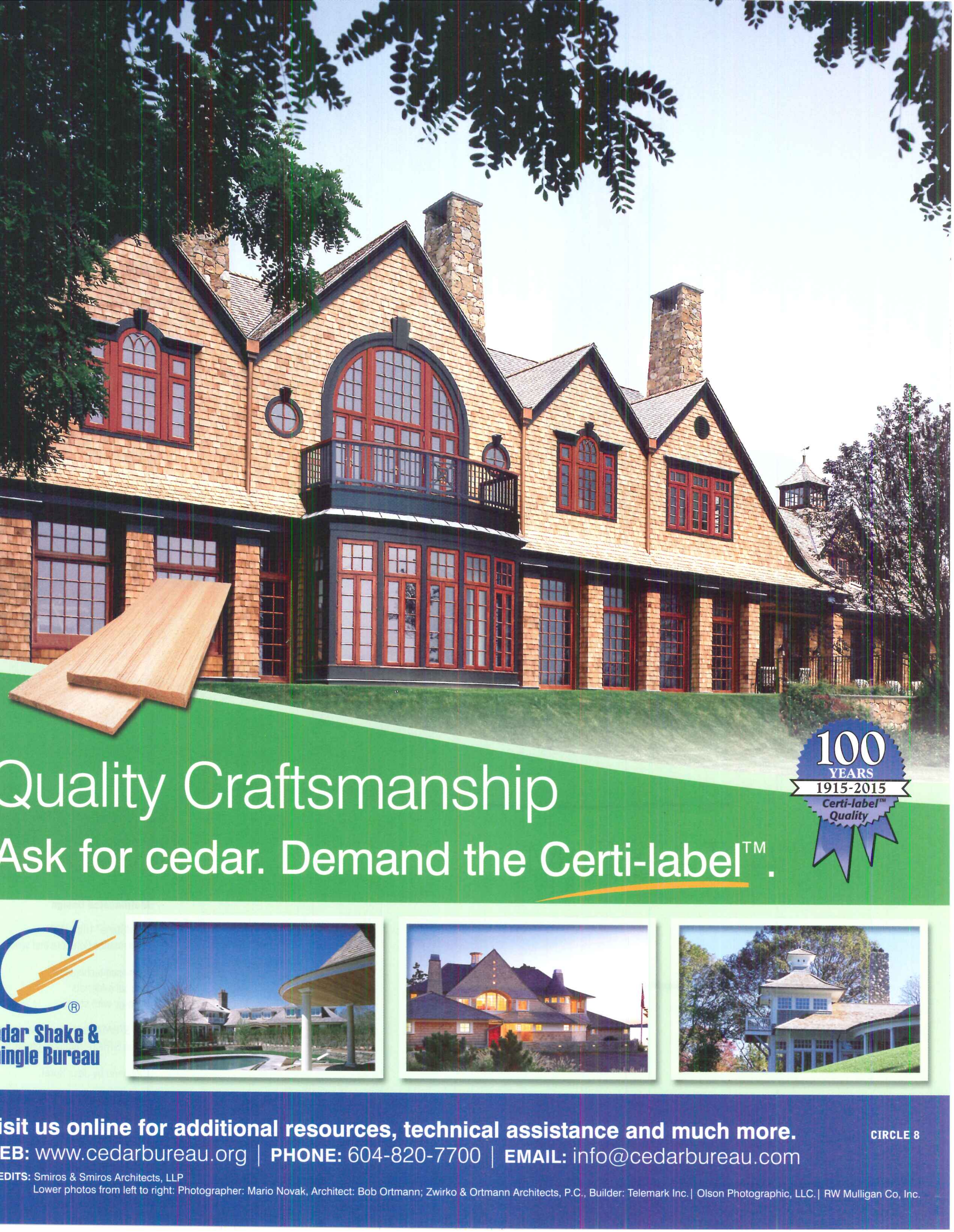
Ecospan Composite Floor System
Nucor Vulcraft National Accounts
6230 Shiloh Road, Suite 140
Alpharetta, GA 30005
(678) 965-6667
888-375-9787

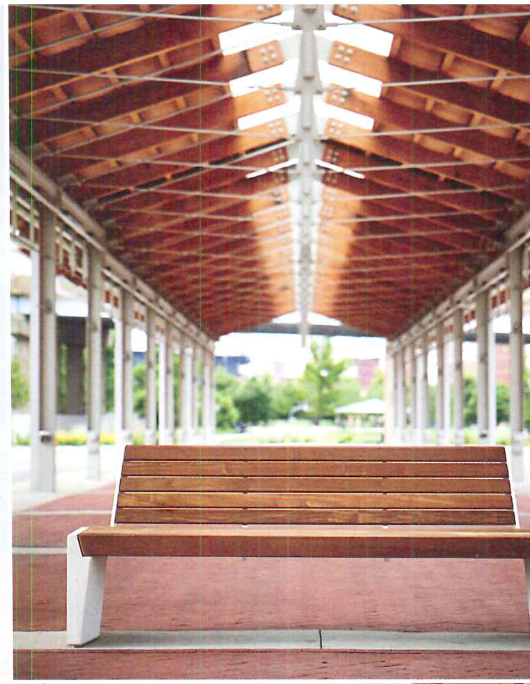
THE VULCRAFT BIM EVOLUTION

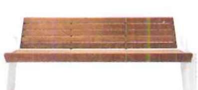
UL
FIRE RATED
1,2,&3 HOURS

STC
57

CIRCLE 29


100 YEARS 1915-2015 Certi-label™ Quality
Quality Craftsmanship
Ask for cedar. Demand the Certi-label™.
dar Shake &
ingle Bureau
isit us online for additional resources, technical assistance and much more.
CIRCLE 8
EB: www.cedarbureau.org | PHONE: 604-820-7700 | EMAIL: info@cedarbureau.com
EDITS: Smiros & Smiros Architects, LLP
Lower photos from left to right: Photographer: Mario Novak, Architect: Bob Ortmann; Zwirko & Ortmann Architects, P.C., Builder: Telemark Inc. | Olson Photographic, LLC. | RW Mulligan Co, Inc.





ARCHITECTURE EDUCATION NOW

Students at the School of Architecture at the University of Texas, Austin, are fulfilling a special assignment: conquering public space by design. Here the 2015 summer academy proves it can build a bridge over untroubled waters.

With the soaring cost of education in the United States—for both private and public architecture schools—it's little wonder that the focus on rankings is intense. Architecture students may spend as much as $47,286 a year (Cornell University's undergraduate tuition and activity fees in the B.Arch program), or $45,590 (Harvard University's Graduate School of Design tuition and fees for an M.Arch.) Naturally, the next question is, How do these ratings correlate with incomes after graduation? Since Cornell and Harvard consistently place at the top of undergraduate or graduate programs compiled annually by *DesignIntelligence*, the research publication of the Design Futures Council, RECORD has asked its chair, James B. Cramer, to discuss the connection between education costs, school ratings, and the future incomes of graduates. In the following pages, Cramer talks about his insights, while acknowledging that not everything can be quantified. Not all careers in architecture—such as teaching or designing socially conscious housing—are going to be as well compensated as other avenues. But there are deeper rewards.

America's Top Architecture Schools 2016

RECORD presents the ratings of the top 10 undergraduate and graduate programs in U.S. schools, compiled by Design Intelligence. James P. Cramer, founder, and the publication's editor in chief, talks about this year's findings.

REVIEW FROM THE TOP
Cornell University's architecture students occupy the new Milstein Hall, designed for the school's Ithaca, New York, campus by Rem Koolhaas and OMA in 2011.

RECORD'S 2016 rankings of top architecture school programs, provided by Design Intelligence, the research arm of the Design Futures Council, comes amid good news that more women are being trained as architects. Women now compose 44 percent of those enrolled in graduate and undergraduate programs. (In 2011, that percentage was 41 percent.)

At the same time, there is a growing debate about the value of architectural education. Enrollment of first-year architecture students dropped almost 20 percent over a five-year period ending in 2013, Frank J. Mruk III, associate dean at New York Institute of Technology's School of Architecture and Design, pointed out in an op-ed piece in the September 29 *Wall Street Journal* (*WSJ*). Mruk argues that the drop comes from the "outdated, costly and time-consuming qualification process" and suggests developing a tiered system where architectural training will be specific to the skills and goals of the students.

Yet, according to executive director of the National Architectural Accrediting Board (NAAB) Andrea Rutledge, the decrease could depend on any number of factors, including generational swings in student-aged populations. Rutledge also notes that the latest numbers drew from data released for the academic year 2013–14, when enrollment in accredited programs totaled 24,989. The results for 2014–15 will not be published until January 2016.

In another response to the *WSJ* essay, Marilys Nepomechie, president of the Association of Collegiate Schools of Architecture, wrote that architecture and design schools are already increasing flexibility in their programs. Students can pursue a number of different options, including working toward registration while in school. The National Council of Architectural Registration Boards (NCARB) is considering proposals from over a dozen accredited architecture schools that want to offer this option.

In an interview accompanying the 2016 rankings, RECORD asked James Cramer, editor in chief of the publication *DesignIntelligence* (*DI*) and the chairman of the Design Futures Council, to address these and other changes he sees confronting architectural education today. *Suzanne Stephens*

The Top 10 Undergraduate Programs

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

The Top 10 Graduate Programs

1. Harvard University
2. Cornell University
3. Yale University
4. Columbia University
5. Massachusetts Institute of Technology
6. University of California, Berkeley
7. University of Michigan
8. Rice University
9. Virginia Polytechnic Institute and State University
10. Washington University, St. Louis

COMPARISON OF PREVIOUS RANKINGS: UNDERGRADUATE

	2016	2015	2014	2013	2012	2011	2010	2009
Cornell	1	1	2	1	1	1	1	1
Cal Poly SLO	2	2	1	5	4	4	3	3
Virginia Tech	3	4	5	7	3	4	4	2
Syracuse	4	5	6	3	7	2	2	4
Rice	5	3	3	3	5	3	9	8
RISD	6	7	10	7	6	11	7	4
UT Austin	7	6	4	6	2	7	5	6
Auburn	8	12	8	9	14	18	13	12
Carnegie Mellon	9	11	15	12	11	7	11	7
USC	10	10	7	16	12	9	10	12

COMPARISON OF PREVIOUS RANKINGS: GRADUATE

	2016	2015	2014	2013	2012	2011	2010	2009
Harvard	1	1	1	1	1	2	1	1
Cornell	2	5	5	5	6	6	7	6
Yale	3	3	2	3	2	3	2	4
Columbia	4	2	3	2	3	4	4	3
MIT	5	4	4	4	6	5	3	4
UC Berkeley	6	10	9	7	14	10	9	17
U Michigan	7	6	7	11	8	1	-	9
Rice	8	7	5	15	14	16	15	16
Virginia Tech	9	14	12	18	-	12	8	6
Wash U	10	10	11	9	4	9	11	6

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

***RECORD*: What changes are you seeing overall in the top 30 rankings?**

JAMES P. CRAMER: We live in a time of hyper-evolution. The profession is reinventing itself and expanding its definitions of responsibility in construction. It is developing new business models and technologies, and public/private partnerships that result in new forms of team leadership. For example, an architect today may team up with a contractor on a design/build project using modular systems pre-assembled off-site. The delivery time is speedier, yet fees can't be calculated on a traditional basis. Nevertheless, the architect is still indispensable.

It seems that the same schools remain in the top rankings from year to year. What is the point in doing these annually?

This year's rankings may seem similar to last year's, but on closer inspection, certain shifts can be noted. At the graduate level, for instance, the University of Virginia is no longer in the top 10: it dropped from ninth place to 13th. And the University of Pennsylvania went down a few notches from seventh place to 15th. The graduate schools that moved up in the top 10 include Virginia Tech (which climbed from 14th to ninth place), and the University of California, Berkeley, which went from 10th to sixth. The movement has a lot to do with the perception of how well the schools relate to the profession. Look at Virginia Tech: the dean of the College of Architecture and Urban Studies, Jack Davis, has served as the regional AIA president and was active in the national grassroots program. That put him in communication with the profession's leaders.

How about the changes in undergraduate rankings?

It was interesting to see Auburn move up to the eighth place from the 12th and Carnegie Mellon go up to the ninth spot from the 11th. Cornell and Cal Poly at San Luis Obispo once again are in the top two slots. The architects who recruit graduates of these schools believe that they are in tune with the changes in the profession.

SCI-Arc is out of the top 10. Why?

SCI-Arc and Pratt Institute's School of Architecture dropped out of the top 10 but are still strong in the top 30.

How serious is the year-to-year change?

Don't get too concerned about a one-year shift. We should study a trend over three years. If schools dip a bit, they should examine their communications, their leadership, and what they are offering, along with their agility in adapting to the profession's needs. It is important to keep any school rankings—including our own—in the right perspective. There is no single "best" school but rather a best fit for each student. Our rankings can be helpful, but they are only one of many factors to consider.

Does the tenure system work?

I'm not a fan of tenure. But I'm not an expert either. Nevertheless, in private conversations, educators and students tell us about dead wood that they have in some positions in their schools. Laggard educators cheat students. My advice is to challenge the tenure track. It is set up to protect the faculty, not the students.

Is last year's emphasis on a STEM (science, technology, engineering, and math) curriculum still going strong?

Many assume that STEM prepares students best for future employment, for top pay, with a good return on the investment in education. This supposition is somewhat flawed and shallow. Architecture curriculums that combine technology and art along with design thinking are better.

Are you including the need to study design theory?

Theory and history are important, but there is so much more. In schools, students are best served when they begin to understand design theory along with business skills. Mix them together. We call this the Design Enterprise Model, which includes finance, operations, marketing, and professional services. Designers need management skills to be successful. Students have to learn about construction contracts, budgets, schedules, and delivery methods. The faculty members who teach design studios have to know how marketing, finance, and operations work with project leadership. Design studio can be the best place to learn this.

Your emphasis on business is strong. What do you see in the economic picture for architects?

Being a professional is difficult. Financial security is dependent on the ability to learn and to accept uncertainty. The economy and changing demographics are going to offer challenges over the next five years to every profession. So resilience needs to be part of every personal game plan. That said, it is ironic that we're facing a shortage of talent with future professionals. Yet, after studying this over the years, I believe the architecture profession—including architects who choose to work in the construction industry or in development—will have a bright future.

What is the job market for the new graduates?

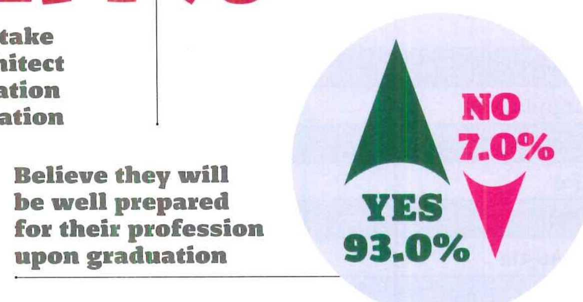
Today there is zero unemployment. Graduate salaries start at approximately $43,390 (B.Arch.) and $47,449 (M.Arch.) and are rising. A few firms begin salaries for graduates at $60,000. At mid-career, the compensation often includes a base salary plus a bonus. Principal owners of firms currently have a mean base salary in firms of all sizes of just over $142,289, and a growing number make over $200,000. The average salary for managing partners is now approximately $212,240, plus a bonus. Of course, these

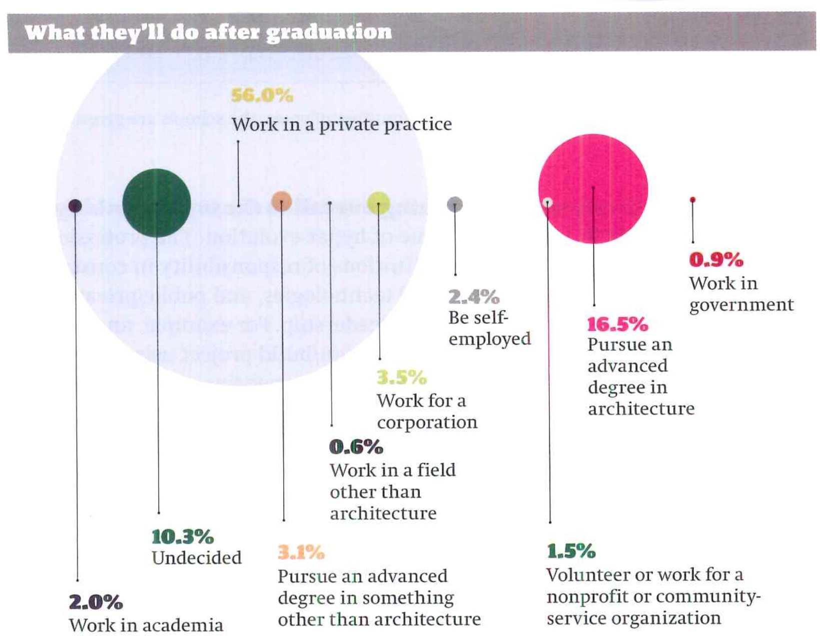
Architecture Student Survey

This year, 2,775 students from 60 schools responded to *DesignIntelligence*'s survey about their satisfaction with architectural education. Of this group, 67 percent of the respondents were undergraduates. Of that percentile, 53.3 percent were enrolled in a B.Arch program; 20.5 percent are seeking a B.A. in architecture, and 16.2 percent a B.S. From the remainder of the total, 27.8 percent are enrolled in graduate programs. Of those, 93.1 percent are pursuing an M.Arch.

82.4%

Plan to take the Architect Registration Examination





Skills Assessment

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

DESIGN

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

PLANNING

1	Harvard
2	Columbia
3	Cornell
4	MIT
5	UC Berkeley and U Penn

SUSTAINABILITY

1	Harvard
2	U Oregon
3	UC Berkeley
4	Arizona State
5	U Minnesota

CONSTRUCTION METHODS & MATERIALS

1	Cal Poly SLO
2	Auburn
3	Virginia
4	Cornell
5	Carnegie Mellon

CROSS-DISCIPLINARY TEAMWORK

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

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

Most Admired Programs From Deans and Chairs

This year, Design Intelligence polled 90 deans and chairs for their rankings of architecture schools.

UNDERGRADUATE

1	Cornell
2	Cal Poly SLO
3	Cooper Union
4	Auburn
5	Syracuse and UT Austin

GRADUATE

1	Harvard
2	Yale
3	U Penn
3	U Michigan
5	MIT

are averages. Those who desire to be part of large-firm leadership will find the annual compensation, bonus, and equity distributions to be higher. Generally speaking, you can have a respectable compensation in architecture even if you stay in traditional practice. But there are also the options to become a developer, or a construction executive or entrepreneur. *DI*'s January 2016 issue will report on new research that suggests the profession will be more broadly defined in the years ahead, with more meaningful career choices for architectural graduates. Bottom line: the world needs more architects, and architects will continue to be well compensated.

What is your view about the National Council of Architectural Registration Board's (NCARB) considering proposals from over a dozen schools to speed up registration through an "integrated path" to licensure—where students fulfill internships and take registration exams by graduation?

There is a lot of talk about these changes with NCARB and the effect on NAAB rules. This dialogue (or controversy) is good for the future of the profession. And it is important for teachers to be licensed—fewer than 50 percent are now.

What about online education in architecture?

With a huge growth of information and knowledge, every school should have a strategy for adapting quickly, and online education is one important component. This is not an overall solution but a crucial part of total education. The paradox is that face-to-face relationships and human collaboration are increasingly important for architects.

How should you teach design leadership in school?

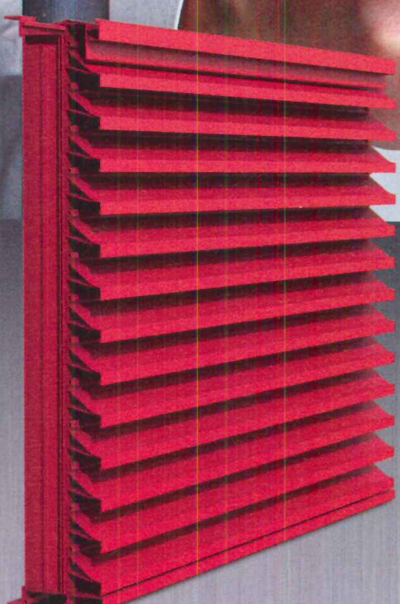
Again, mix business and design. Teach design thinking in business schools and business leadership in architecture schools. Make it a cross-campus collaboration model. There could then be a shifting to the new realities of professional practice. Call it a reinvention strategy benefiting the entire future of higher education.

James P. Cramer is the founder of Design Intelligence *and editor in chief of its publications, and chair of the Design Futures Council. He is also the chair of Greenway Group, a management consultancy.*

Methodology

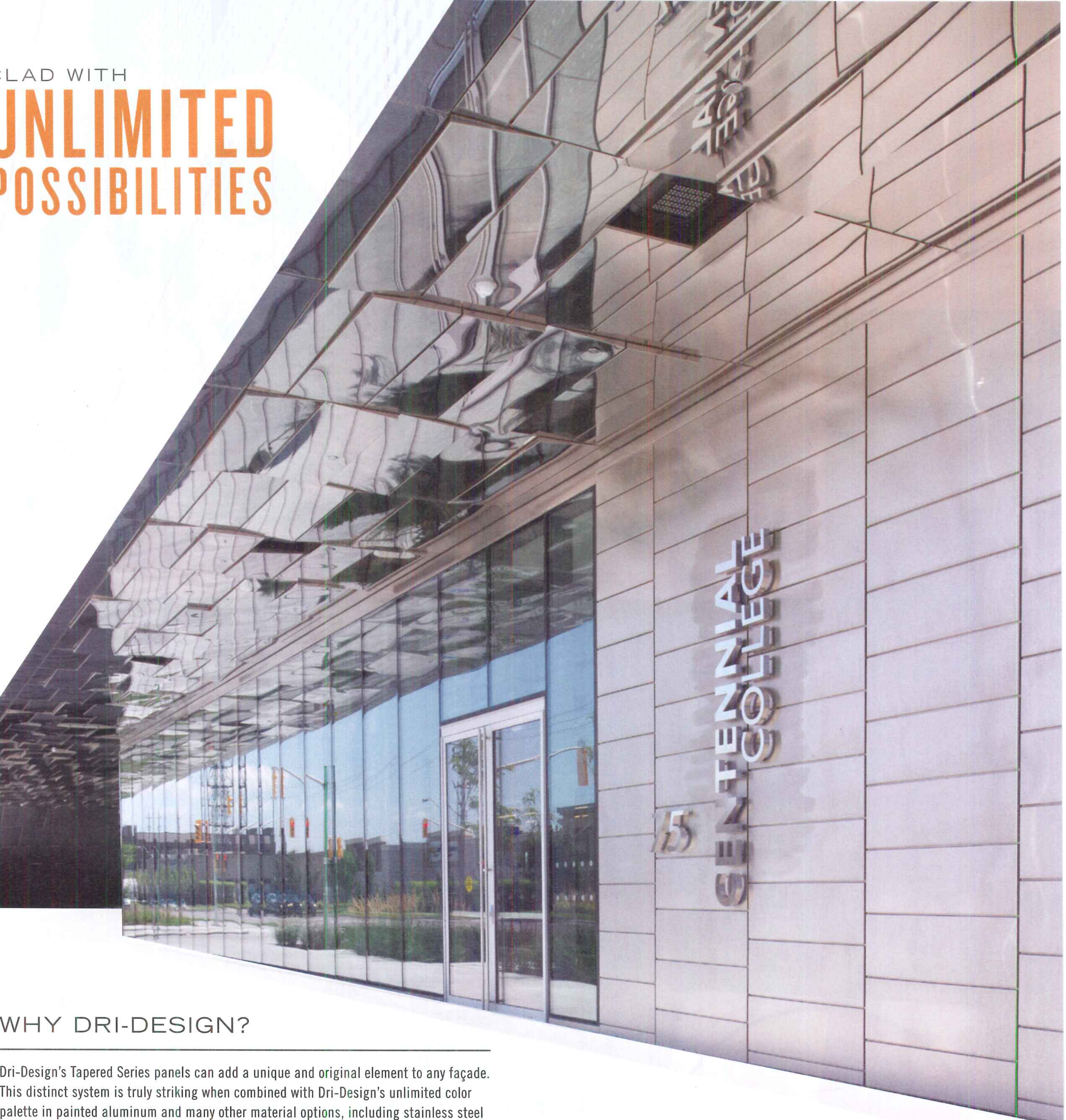
Design Intelligence sent surveys to CEOs, managing partners, and human resource directors asking about their findings in hiring architecture graduates. The respondents could select up to 10 NAAB-certified undergraduate and graduate programs in each category. Each survey response was checked for authenticity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


Are new codes holding you prisoner to vertical-blade louvers?



CLAD WITH

UNLIMITED POSSIBILITIES



WHY DRI-DESIGN?

Dri-Design's Tapered Series panels can add a unique and original element to any façade. This distinct system is truly striking when combined with Dri-Design's unlimited color palette in painted aluminum and many other material options, including stainless steel (pictured), VMZINC and many more. The tapered series, while attractive, still maintains Dri-Design's true dry joint rain-screen technology, sustainability and ease of installation.

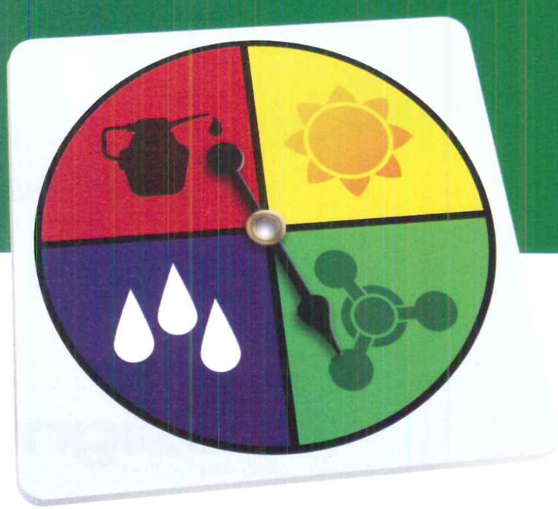
- No sealants, gaskets or butyl tape means no streaking and no maintenance for owners.
- Not laminated or a composite material, so panels will never delaminate.
- At Dri-Design, we have a strict policy of recycling and creating products that the world can live with.
- Fully tested to exceed ASTM standards and the latest AAMA 508-07.
- Available in a variety of materials, colors, finishes, dimensions and textures.

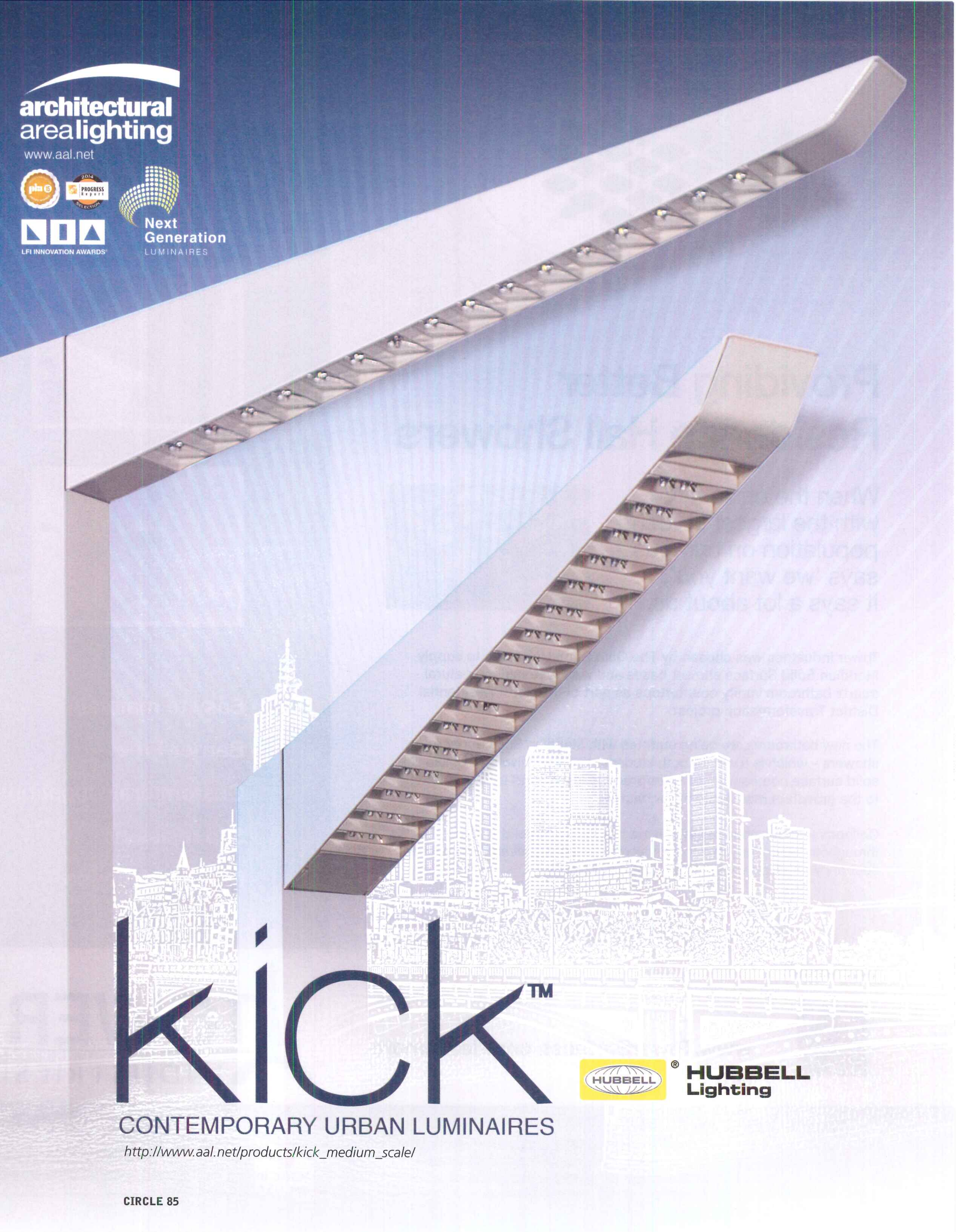
Centennial College – Toronto, Canada
Architect: MacLennan Jaunkalns Miller Architects

CIRCLE 22

dri-design®
WALL PANEL SYSTEM

616.355.2970 | dri-design.com




architectural
area lighting
www.aal.net
2014
PROGRESS Report
LFI INNOVATION AWARDS
Next
Generation
LUMINAIRES
kick™
CONTEMPORARY URBAN LUMINAIRES
http://www.aal.net/products/kick_medium_scale/
HUBBELL
HUBBELL
Lighting
CIRCLE 85

Providing Better Residence Hall Showers

When the university with the largest student population on campus says 'we want you', it says a lot about us.

Tower Industries was chosen by The Ohio State University to supply Meridian Solid Surface shower bases and wall systems and natural quartz bathroom vanity countertops as part of the North Residential District Transformation project.

The new bathrooms are being outfitted with Meridian Solid Surface showers – which is a win for both students and the university. Unlike tile, solid surface comes without waterproofing issues and isn't susceptible to the growth of mold, mildew, or bacteria.

Colleges and universities are making the switch to solid surface throughout the country due to the low maintenance cost and the reduced cost of ownership over the lifetime of the product.

- Easy to maintain
- Barrier-Free
- Custom drain locations
- Slip resistant
- Made in America

Learn more:

www.TowerSurfaces.com/learnmore

CIRCLE 2

TOWER INDUSTRIES

From custom showers to custom countertops, Tower Industries' specialty is creating solutions for any surfacing challenge. Tower Industries is the premier provider of creative surfacing solutions for all institutional, healthcare, and commercial applications. Tower Industries is driven by top-quality surfacing products, hard work, innovative solutions and continuous improvement.

Made in the USA

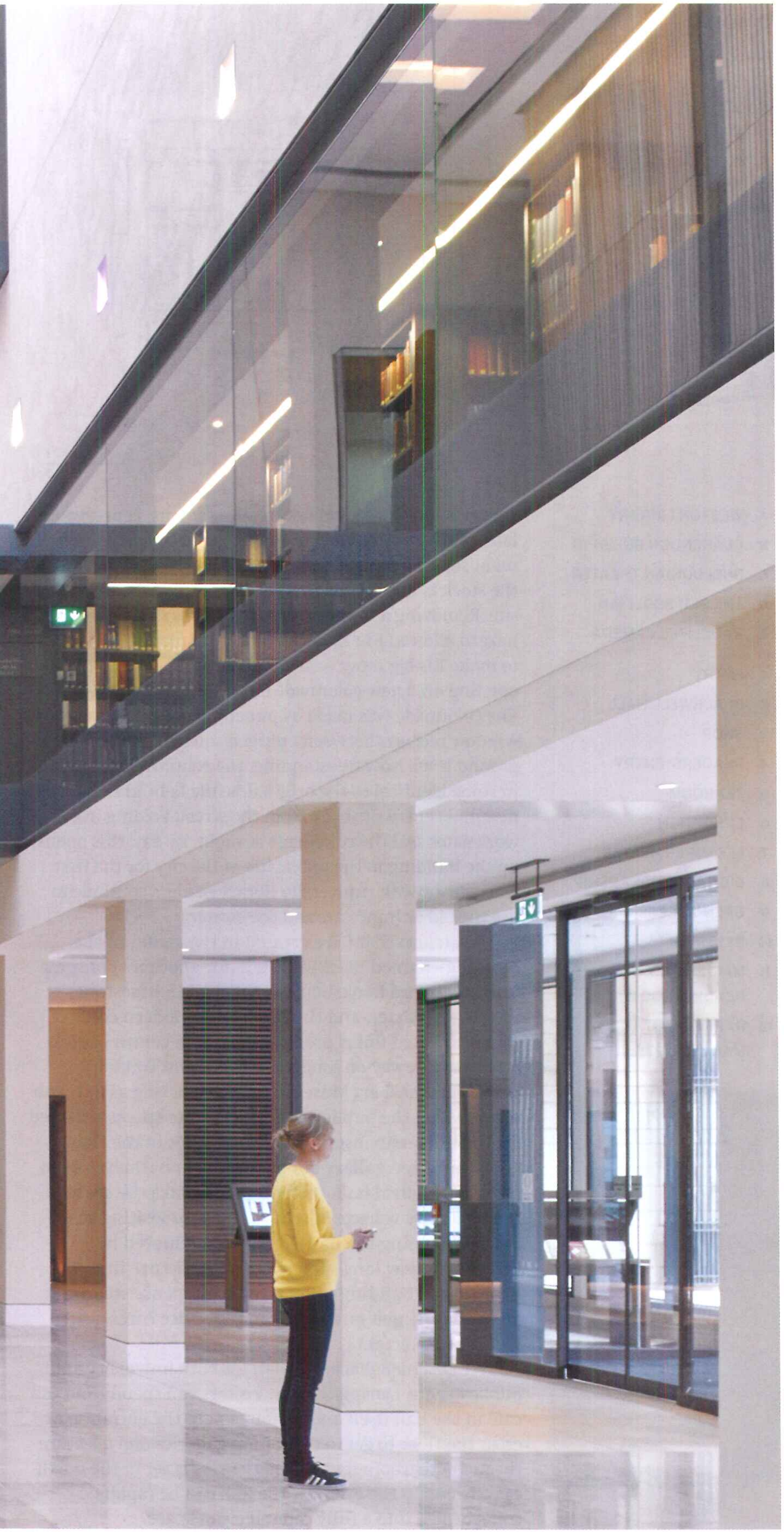
2101 Ninth Street S.W
Massillon, Ohio 4464
Phone: 330-837-221

COLLEGES & UNIVERSITIES

Academic buildings increasingly serve as the public face for an institution. Several projects featured on the following pages, such as the new studio-art building at Pomona College, in Claremont, California, illustrate this trend. Covered with a swoopy roof, it radically departs from its Spanish Mission surroundings. Similarly, at Ryerson University in Toronto, a new student commons with a geode-like form and a shardlike entrance canopy now dominates its urban streetscape. And a singular structure can comprise–and symbolize–an entire institution, as does the new University of Engineering and Technology building in Lima, Peru, which strikingly echoes the nearby natural terrain. This tendency to create powerful architecture to announce an academic program is not limited to new construction. Several designs demonstrate how a skillful expansion, renovation, or insertion can instill new energy into an old building and its surroundings.

WESTON LIBRARY, OXFORD, ENGLAND, WILKINSONEYRE

TIME SPAN
The architects carved out a new atrium and inserted a glazed mezzanine gallery on four sides. Above the gallery, they added a two-story volume with study rooms for visiting scholars. A 17th-century brick-and-iron gateway from a different building serves as an entry to areas for university readers.



Weston Library | Oxford, England | WilkinsonEyre

VIEW FROM THE BRIDGE

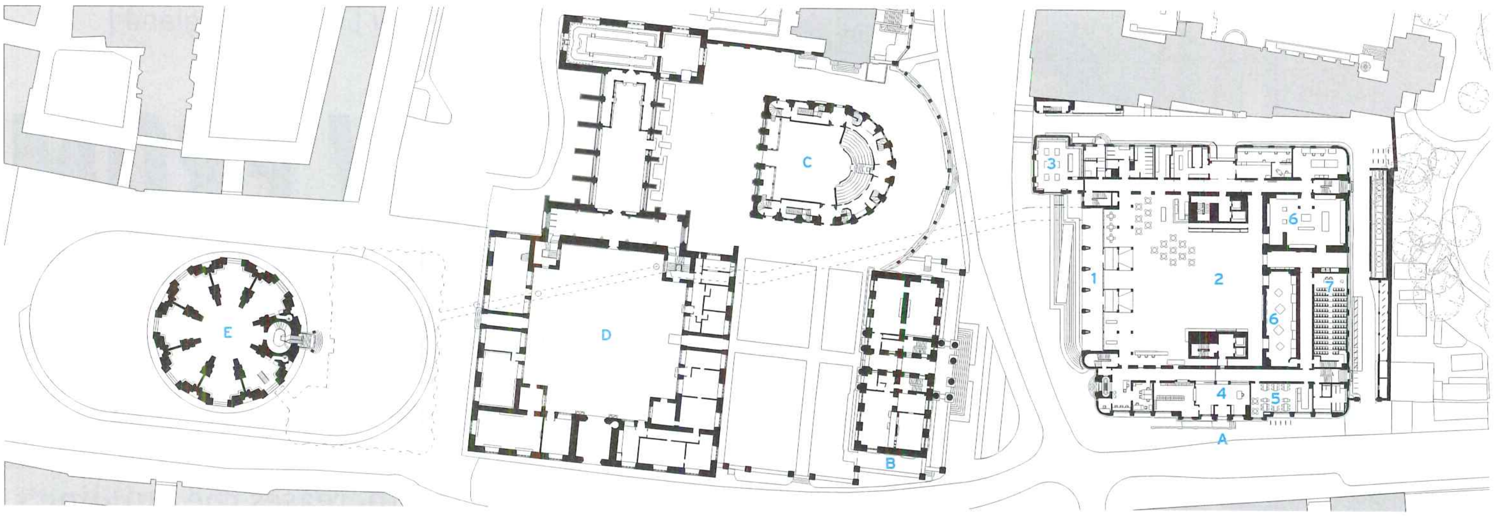
A major renovation of a stodgy old library carves out new space for the public and increases the building's engagement with the city.

BY HUGH PEARMAN

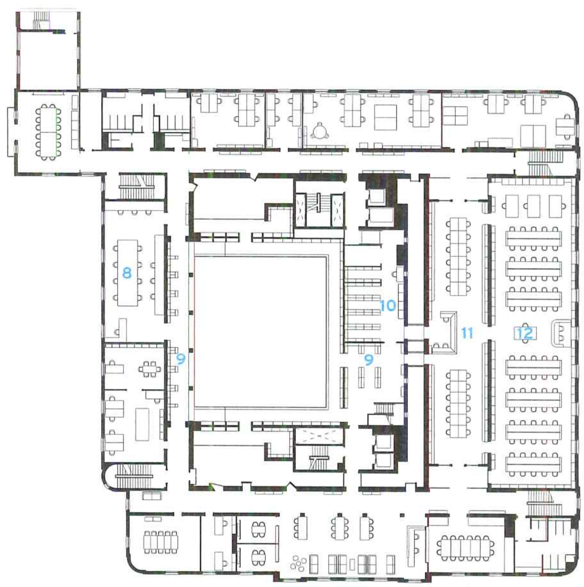
The New Bodleian Library in the historic center of Oxford had for years been so unfashionable as to be all but invisible. Designed in the mid-1930s by Sir Giles Gilbert Scott (1880–1960) in a stripped-down classical style, and not completed until 1946, it was already a throwback at a time when modernism was rising. Although its rough-textured golden-stone facades became blackened with dirt, and its entrance was always difficult to find, it was nonetheless well proportioned and detailed, sitting on a prominent one-acre corner site. It was just opposite two of this ancient university town's architectural jewels: the 17th-century Sheldonian Theater by Christopher Wren and the early 18th-century Clarendon Building by Wren's onetime assistant Nicholas Hawksmoor. Scott's dowdier building deliberately did not attempt to compete with those masterworks. Yet now, after a $124 million upgrade by architects WilkinsonEyre, it has been turned into a cultural asset for the city. Reborn as the Weston Library, it dares to open up the flank facing its illustrious forbears and has at last become visible.

The Bodleian is an official "deposit library," collecting everything that is published in the United Kingdom. Dating back to the Middle Ages and expanding piecemeal over time into other buildings—such as Hawksmoor's and James Gibbs's circular Radcliffe Camera of 1712–48—its collection is second in size and value only to the British Library in London. Hence the urgent need for massive expansion in the 1930s, which led to Scott's "New" Bodleian. With its transformation into the Weston Library (named for its sponsor, the Weston Foundation), it is, like the British Library, now both a public museum and a private study center.

Scott conceived his steel-framed, stone-clad building as a central book repository surrounded by reading rooms. As upgraded, it remains a key part of the overall university library system, with an irreplaceable historic



GROUND-FLOOR PLAN



SECOND-FLOOR PLAN

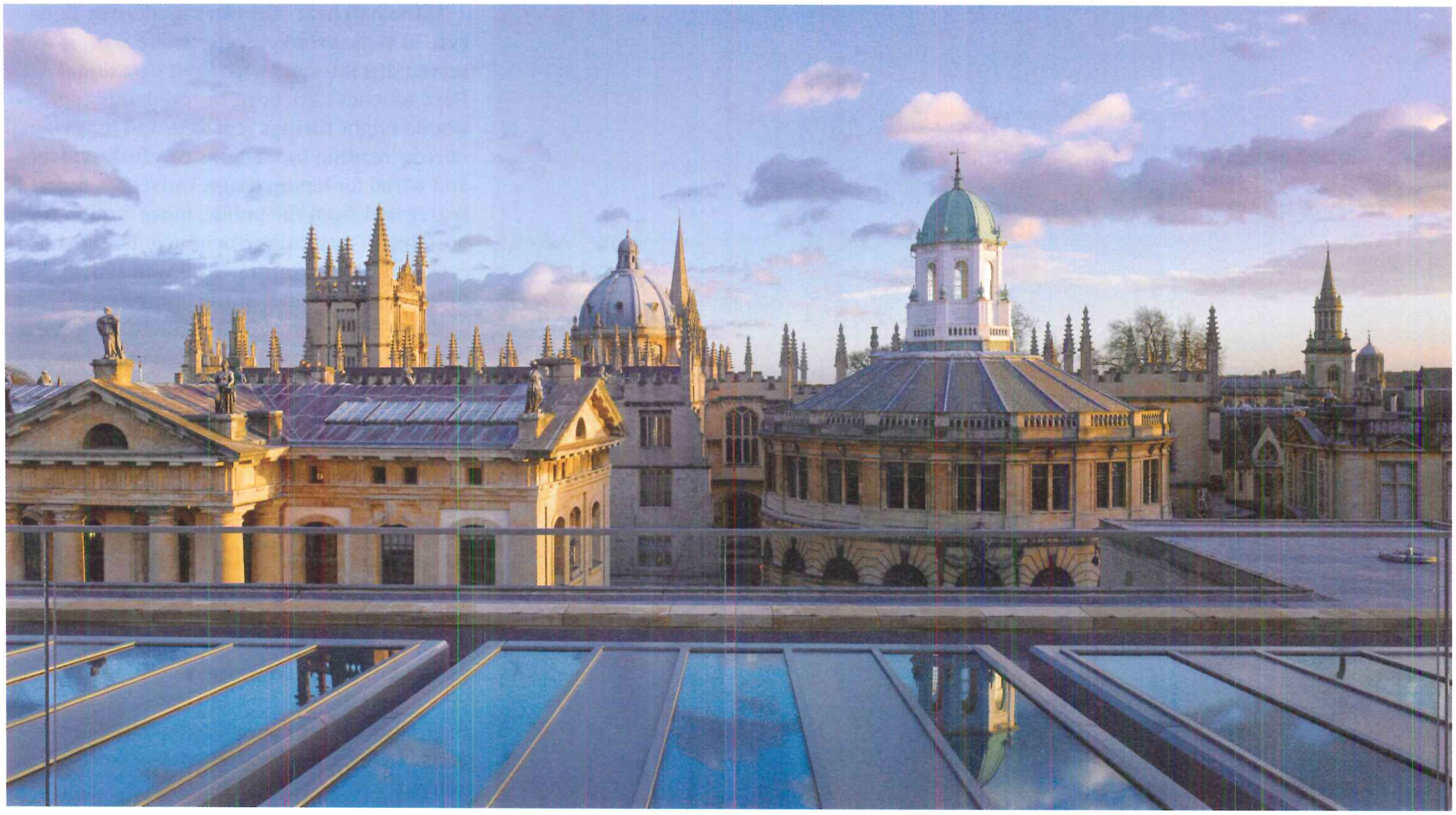
A WESTON LIBRARY
B CLARENDON BUILDING
C SHELDONIAN THEATER
D THE OLD BODLEIAN
E RADCLIFFE CAMERA

1 ENTRY
2 BLACKWELL HALL
3 SHOP
4 READERS' ENTRY
5 TEAROOM
6 EXHIBITION
7 LECTURE THEATER
8 DIGITAL SCHOLARSHIP
9 OPEN-ACCESS GALLERY
10 RESERVE
11 MACKERRAS READING ROOM
12 RARE BOOKS AND MANUSCRIPTS

collection, restored and new reading rooms, conservation labs, and new fire-protected and compartmented basement stacks for some 2 million books—though the bulk of the stock is now stored in a new warehouse facility off-site. Removing a tower of old book stacks that were a fire hazard allowed Jim Eyre, partner in charge of the project, to make his big move—carving out a large, full-height hall opening off a new colonnade on Oxford's Broad Street. The colonnade was made by punching out the existing window recesses between engaged square columns on the ground level. Now freestanding, the columns are finished in stone identical to the original, while behind them a new glass entry sits back from the street. Folding ironwork gates seal the colonnade at night. By day, this opens up the building to the public life of the city for the first time; meanwhile, university library readers continue to use the old entrance around the corner.

The atrium that Eyre created in the center of the building—named Blackwell Hall (for another sponsor, a famous Oxford bookshop)—is finished in limestone, roughcast plaster, and timber. In this modern context, an unexpected foil is provided by a 17th-century brick-and-iron gateway on long-term loan from London's Victoria and Albert Museum and here acting as a threshold between the public areas and private spaces reserved for the university users. On all four sides of the floor above, a glazed gallery of open-access bookshelves overlooks the central hall. But what dominates the space is the two-story volume of study rooms for visiting scholars overhanging the hall–something achieved by inserting a new long-span concrete structure into the heart of the building to replace Scott's dense steelwork, and supporting it on two concrete service cores rising from the basement.

Eyre designed Blackwell Hall for both university and public events. During the day, visitors can spend time at a café in the hall itself and a shop next to the entrance, or cross the floor to get to exhibition galleries and a lecture theater. A tearoom for university users is set in the northeast corner. In the evening, the hall can be rapidly transformed into a fully catered event space.



URBAN CONTEXT The Weston looks toward a group of famous neighbors designed by Hawksmoor, Gibb, and Wren (above). Jim Eyre created a new colonnade (opposite) on the south facade of the Weston Library, opening the building up to the city of Oxford (below).

If the hall bears the clear modernist signature of WilkinsonEyre, elsewhere Scott is well served: his interiors with their occasional Art Deco touches have been restored, missing wooden light fittings replaced, and his original narrow reading-room desks carefully widened and wired for laptop usage. University users, segregated from the public, move around the building in a circuit, which includes two enclosed bridges spanning Blackwell Hall and linking the two sides of the library.

On the exterior, WilkinsonEyre removed a clumsy postwar rooftop extension and repaired and cleaned the stonework. Scott's original unpainted aluminum lattice window frames were found to be in excellent condition and have been renovated and reused. The conservative but highly crafted architecture of Scott can now be properly appreciated—and it has proved capable of absorbing a sizable 21st-century structure on the inside while hardly showing it on the outside. In Jim Eyre's hands, a building that had been strangely mute has finally found its own voice. ■

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

credits

ARCHITECT: WilkinsonEyre – Jim Eyre, director; Geoff Turner, associate director; Andrew Walsh, Leszek Marszalek, Julia Barker, Julia Glynn-Smith, design team

ENGINEERS: Pell Frischmann (structural, fire); hurleypalmerflatt (m/e, concept, detailed design); Long and Partners (m/e, detailed construction design)

CONSULTANTS: Sandy Brown Associates (acoustic); Frontline Fire (fire suppression); DHA (lighting); Holmes Wood (signage)

MAIN CONTRACTOR: Mace

CLIENT: University of Oxford

SIZE: 200,150 square feet

CONSTRUCTION COST: $92 million

PROJECT COST: $124 million

COMPLETION DATE: March 2015

SOURCES

BRASS CLADDING AT COLONNADE: Basset & Findley

BRASS-FRAMED GLAZED DOORS: Secco Sistemi

EUROPEAN OAK DOORS: Shadbolt

CHAIRS: Barber Osgerby (design), Isokon Plus (manufacture)

TABLES: WilkinsonEyre (design), Opus Magnum (manufacture)

RESILIENT FLOORING: Forbo Marmoleum

MIND THE GAP
An enclosed bridge (this page) connects the visiting-scholars center with the rest of the library. The spirit of Scott's designs has been restored to spaces such as the Mackerras Reading Room (opposite, top) and the Rare Books and Manuscripts Reading Room (opposite, bottom).

Janet Wallace Fine Arts Center
St. Paul | HGA Architects and Engineers

ARTISTIC LICENSE

A Minneapolis-based firm transforms a tired Brutalist structure into a state-of-the-art facility and a vibrant campus hub.

BY ANNA FIXSEN

PHOTOGRAPHY BY PAUL CROSBY

In developing the ceramic facade for a revamped studio-art wing for Macalester College's Janet Wallace Fine Arts Center, the architects at Minneapolis-based firm HGA started to feel as if they had enrolled in an art class of their own. For four months, they worked with a terra-cotta manufacturer, experimenting with different clays and glazes to get the desired hues—a warm spectrum of burnt red, gray, beige, and brown—just right. The firm would receive a batch of freshly fired samples every few weeks that soon began to pile up in the office.

The labor-intensive process paid off, as is evident in the resulting facade, a rhythmic composition of terra-cotta fins. It also embodies the design approach that HGA took throughout the $63 million multiphase renovation of the center's studio-art facility, a campus commons, and an adjacent music wing. "We wanted to express the art happening in the building to the rest of the campus," says project manager Rebecca Celis.

When the Janet Wallace Fine Arts Center first opened, in 1965, it was one of the country's premier art facilities, thanks to a generous personal donation from DeWitt and Lila Wallace, cofounders of the *Readers Digest* magazine empire. (DeWitt's father was an early president of the college; Janet was his mother.) The original Brutalist complex—designed by Boston-based firm Perry, Shaw, Hepburn & Dean—was composed of four volumes devoted to theater and dance, music, humanities, and visual arts, connected by a central art gallery and interspersed with outdoor courtyards.

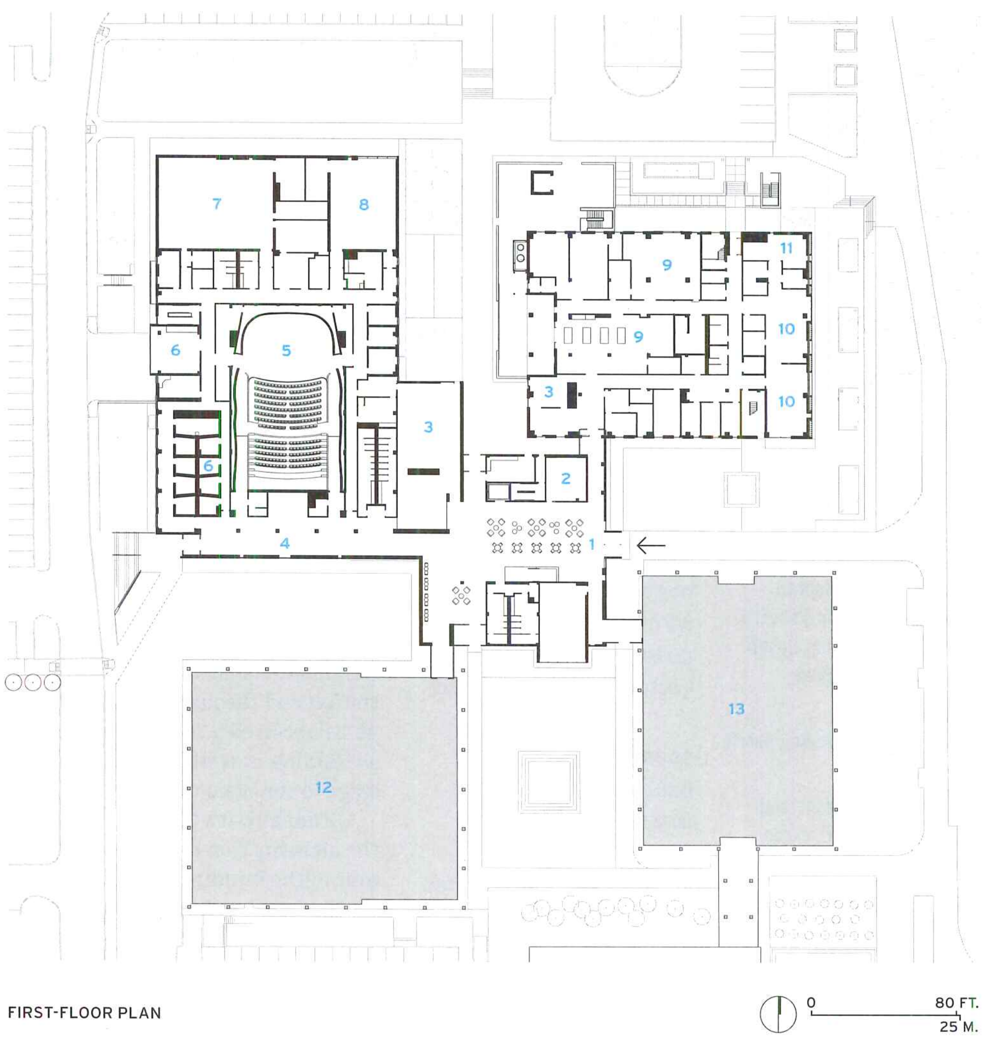
But time and the changing needs of Macalester made it clear the art and music facilities were no

View additional content at architecturalrecord.com.

SCREEN PLAY HGA designed a welcoming landscaped terrace to bring Macalester students up close and personal with the renovated studio arts building. The architects played with the pattern of the facade by varying the depth and placement of the generous windows and positioning the terra-cotta fins at various angles.


JANET WALLACE FINE ARTS

1 COMMONS
2 MEETING ROOM
3 GALLERY
4 LOBBY
5 CONCERT HALL
6 PRACTICE ROOM
7 INSTRUMENT REHEARSAL
8 CHORAL REHEARSAL
9 3-D ARTS
10 CERAMICS
11 KILN
12 EXISTING THEATER WING
13 EXISTING HUMANITIES WING



FIRST-FLOOR PLAN

TWO-PART HARMONY
The transformation of the Janet Wallace Fine Arts Center was conducted in two phases: the first expanded an existing music wing (above at right), while phase II modernized the studio-art wing (above at left). The latter phase took on a more industrial look, in part because of an updated boiler plant concealed below.

LIGHT TOUCH In a print-making studio in the phase II building (left), floor-to-ceiling windows bring in vistas of the surrounding campus. A slatted screen in the arts commons allows views into classrooms (opposite, top). The screen motif continues in the music wing's performance hall (opposite, bottom), where it conceals acoustic curtains and integrates specially designed acoustic ledges.

longer adequate: galleries, studios, and practice spaces were lightless and claustrophobic; the exterior leaked; and the midcentury-era boiler and chiller facilities—which supported the entire campus—needed an overhauling.

In spite of the poor condition of this half of the Janet Wallace complex (the existing theater and humanities wings are being maintained for now), a teardown didn't seem right, in terms of design and economics. "As we began to look at the existing building and spaces, it made much more sense to renovate. Each one was a different puzzle," says Tim Carl, the lead project designer and CEO of HGA.

The terra-cotta-wrapped studio-arts wing marked the culmination of that puzzle. Completed in January 2014, the renovated 27,000-square-foot building, with a new steel-framed third floor, branches off from a new central student commons. While the terra-cotta rainscreen was treated as an artwork, the architects wanted the interiors to have a more industrial feel, with exposed ductwork and simple finishes to accommodate the heavy-duty equipment inside, including fume hoods, a foundry, kilns, and a ceiling crane system. The updated facility contains separate state-of-the-art work areas for sculpture, ceramics, painting, and print-making.

While the studio art spaces are straightforward, interior drama can be found in an earlier phase of the renovation, completed in 2012. Here HGA created a new arts commons on the site of the old central gallery. Students enter an airy, double-height atrium, which is punctuated by light monitors with clerestory glazing and lined with slatted screens of red oak. The wood addresses acoustic concerns, while glass openings illuminate interior spaces and enable occupants to see activities inside the building as well as out to the surrounding campus.

Extending to the west of this commons is a renovated music block, which includes 51,000 square feet of new construction containing practice space for both full ensembles and individual musicians. At the music wing's heart is a dramatic 318-seat concert hall. Working with consultants Acoustic Distinctions, the architects removed a balcony and added an undulating red oak screen over acoustic curtains to modulate sound.

The transformation of the Janet Wallace Fine Arts Center has been successful in the eyes of both Macalester's administration and the architecture community (the studio-art phase received a 2014 AIA Minnesota honor award). As soon as funding is available, the college will embark on a third stage to renovate the theater and humanities wings.

Ultimately, it's the student life within that is providing the alchemy that finally completes the architecture. On a tour of the building, the architects peered into a senior art studio. It was in happy disarray, with a motley assortment of chairs and sofas, heaps of art supplies and books, and a life-size effigy of a character from the animated film *Spirited Away* leering through one of the substantial windows. Carl looked admiringly at the clutter: "It's so much better now." ■

credits

ARCHITECT: HGA Architects and Engineers – Gary Reetz, principal; Tim Carl, lead designer; Rebecca Celis, project manager; Steven Dwyer, Doug Gerlach, Andrew Weyenberg, Jesse Zeien, Rebecca Krull Kraling, Tim Carlson, Justin Bice, Robert Johnson Miller, project team

INTERIOR DESIGNER: Amy Tasch, Ariane Laxo

ENGINEERS: BKBM (structural, civil); Michaud Cooley Erickson (m/e)

GENERAL CONTRACTOR: McGough Construction

CLIENT: Macalester College

SIZE: 57,000 square feet, renovation; 51,000 square feet, new construction (phase I); 27,000 square feet, renovation; 7,000 square feet, new construction (phase II)

COST: $37.2 million (phase I); $25.7 million (phase II)

COMPLETION DATE: August 2012 (phase I); January 2014 (phase II)

SOURCES

RAINSCREEN: Boston Valley Terra Cotta

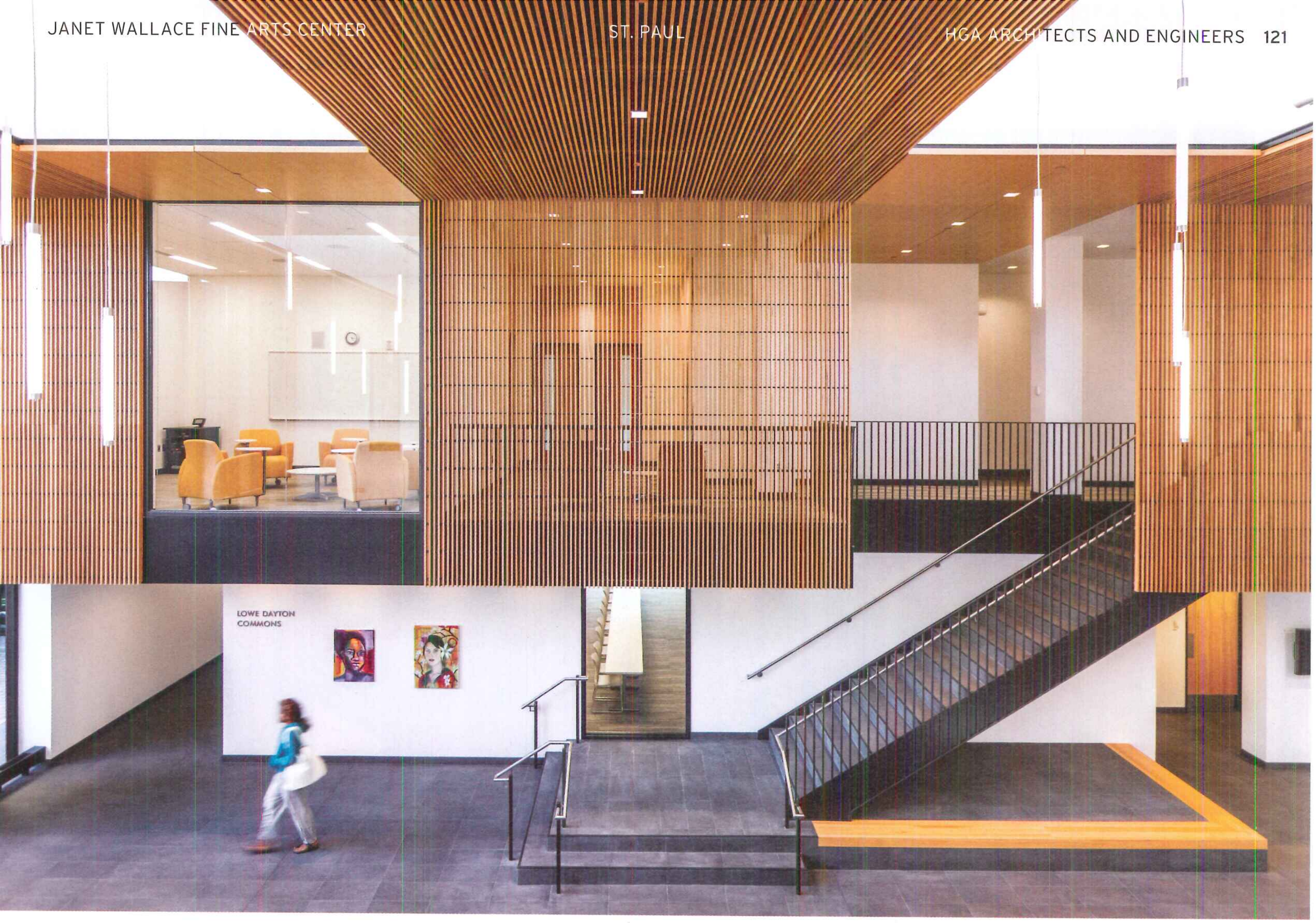
MASONRY: Glen-Gery Brick

ANODIZED ALUMINUM METAL PANELS: MG McGrath

GLASS CURTAIN WALL: EFCO

SKYLIGHTS: Viracon

ACOUSTICAL CEILINGS: Armstrong

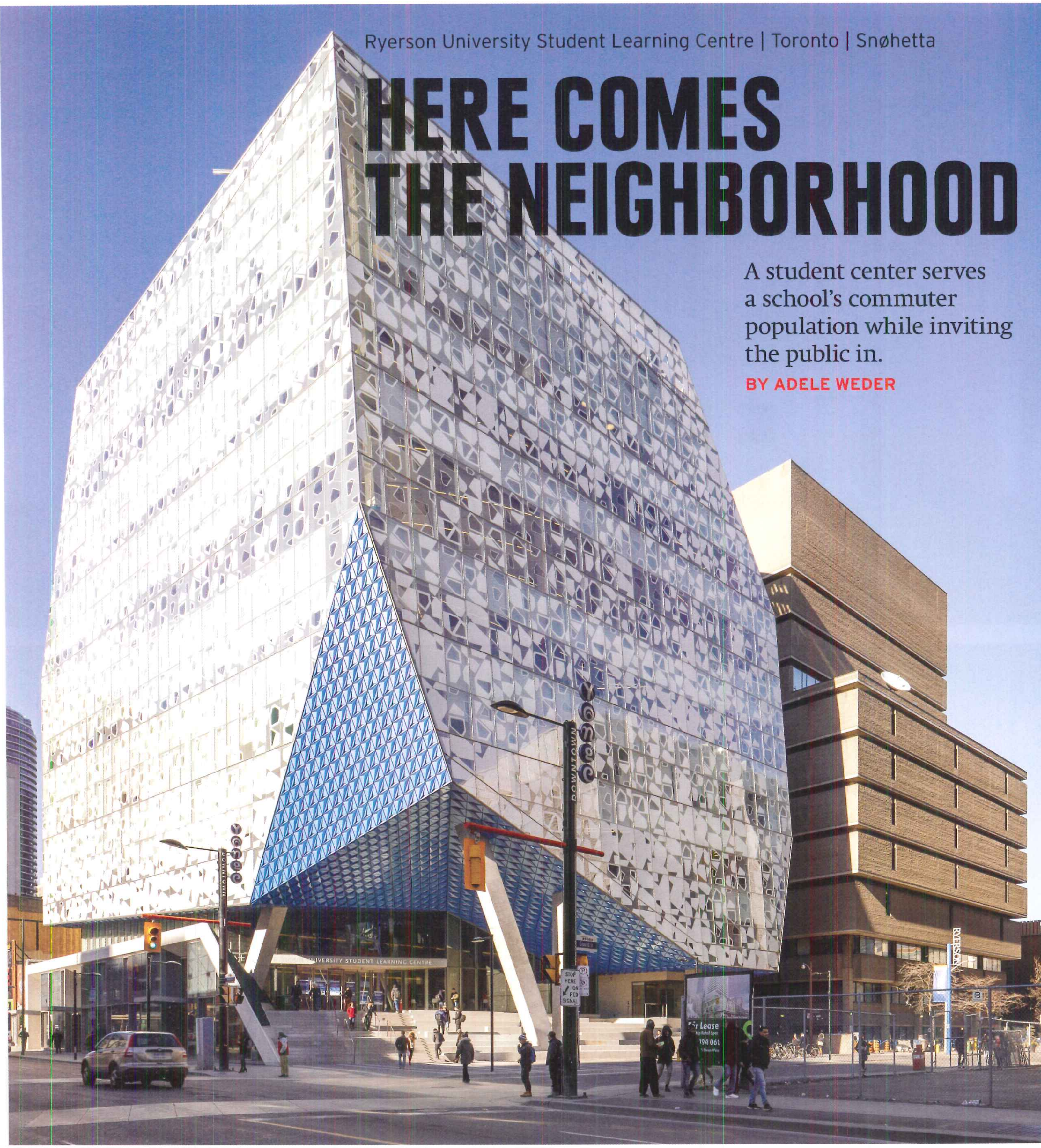

LOWE DAYTON
COMMONS

Ryerson University Student Learning Centre | Toronto | Snøhetta

HERE COMES THE NEIGHBORHOOD

A student center serves a school's commuter population while inviting the public in.

BY ADELE WEDER



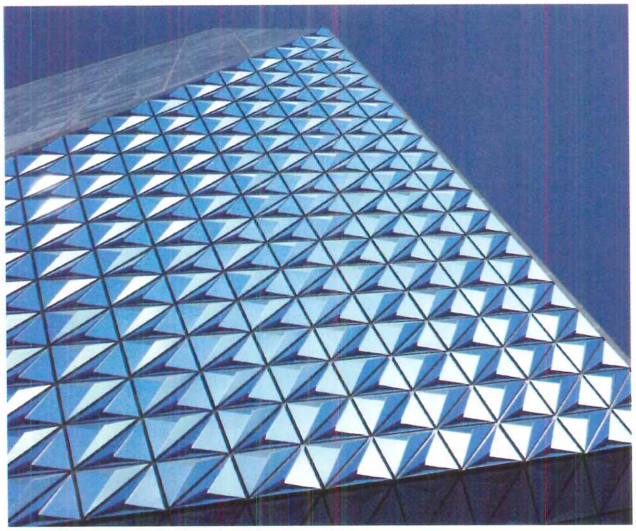
STREET WISE
The building's distinctive form and the blue shard of the entrance canopy visually mark the gateway to Ryerson University amid the retail patchwork of the busy downtown street.

It's an urban oasis, an indoor landscape, and an effective solution to brand a university campus otherwise lost in the chaos of downtown Toronto. Designed by Snøhetta in collaboration with local firm Zeidler Partnership Architects, Ryerson University's new Student Learning Centre is an audacious bid to redefine the concept of an inner-city student commons. "The program is amazingly open," says project architect Michael Cotton, of Snøhetta's New York office. "It's almost like a 10-story lobby. Sometimes we call it a library without books."

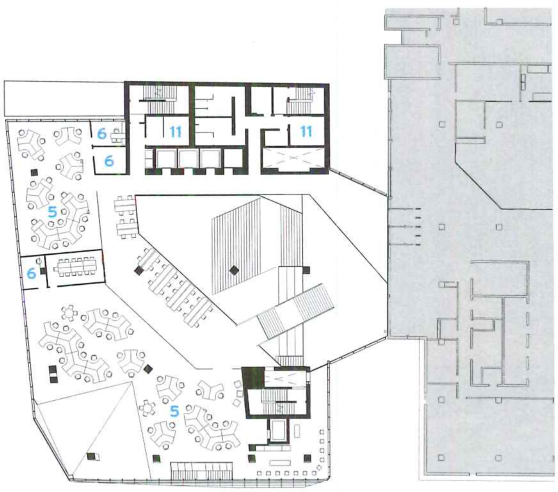
Designed for Ryerson students but technically open to the general public, the building's principal function is to provide a sense of place and a refuge for the school's largely commuter population. Sitting at an intersection teeming with shoppers, panhandlers, and flâneurs, it appears at one with the surrounding crazy-quilt district, even while serving its august academic purpose. "When you're in the urban center," notes Ryerson president Sheldon Levy, "you're building for the city as well as for the university."

The Centre, says Levy, serves as the gateway to the campus and, as such, had to be iconic (most of the polytechnical university's buildings are earth-toned, generic, and forgettable). "We wanted to build something so that no one would ever forget where Ryerson is located," he continues. "We used to be defined as 'behind Sam the Record Man,'" he notes, referring to Toronto's beloved and now closed music retailer, which used to stand on the site. Although a row of retailers is programmed into the Yonge Street facade, these small outlets will never inherit the giant record store's erstwhile role as place-marker. But, in some ways, the Student Learning Centre itself is assuming Sam the Record Man's role as a community gathering spot.

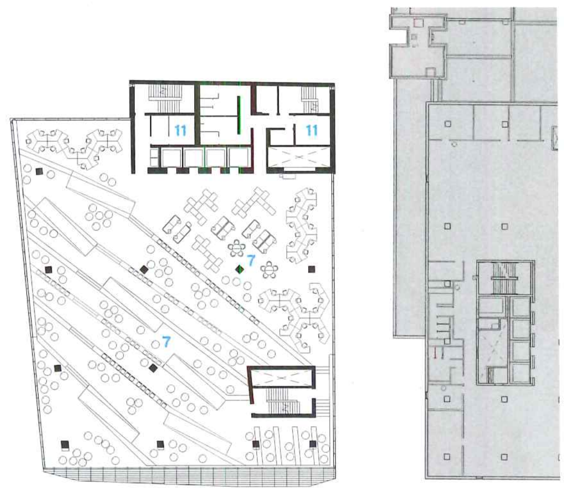
WELCOME SIGN
The canopy (right) is made of aluminum panels coated with irridescent paint and then folded, origami-like, into recessed inverted pyramids. A broad maple staircase (opposite) leads to an existing library next door as well as the student center's upper levels.



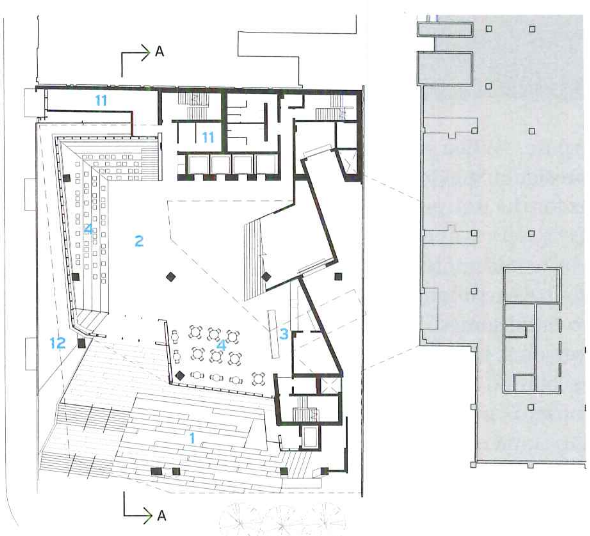
Atop a plinth, the entrance buffers the center from the lively chaos of Yonge Street while creating a smooth transition from gritty street life to academic arena. Overhead, a bright, shardlike canopy, with its irridescent aluminum-panel ceiling, appears to shift from indigo to turquoise to purple. The building itself is an eye-popper, with the kind of massing gyrations that architects sometimes employ just to stand out from the sea of rectilinearity. Here, though, non-orthogonal form and canted lines make practical sense as a way to incorporate both the various sloped seating installations inside and the ground-level retail component on Yonge Street. "Students told us they didn't want to run a gauntlet of retail," says Zeidler's Mike Smith. The solution was to tuck the stores into the building's base, beneath the foyer's maple bleachers. That way, the souk-like shops—all at street level—are visually separated from the main path to the entrance. "It's a gentle way to separate the public and the students," says Smith.



LEVEL-THREE PLAN



LEVEL-SIX PLAN



LEVEL ONE PLAN

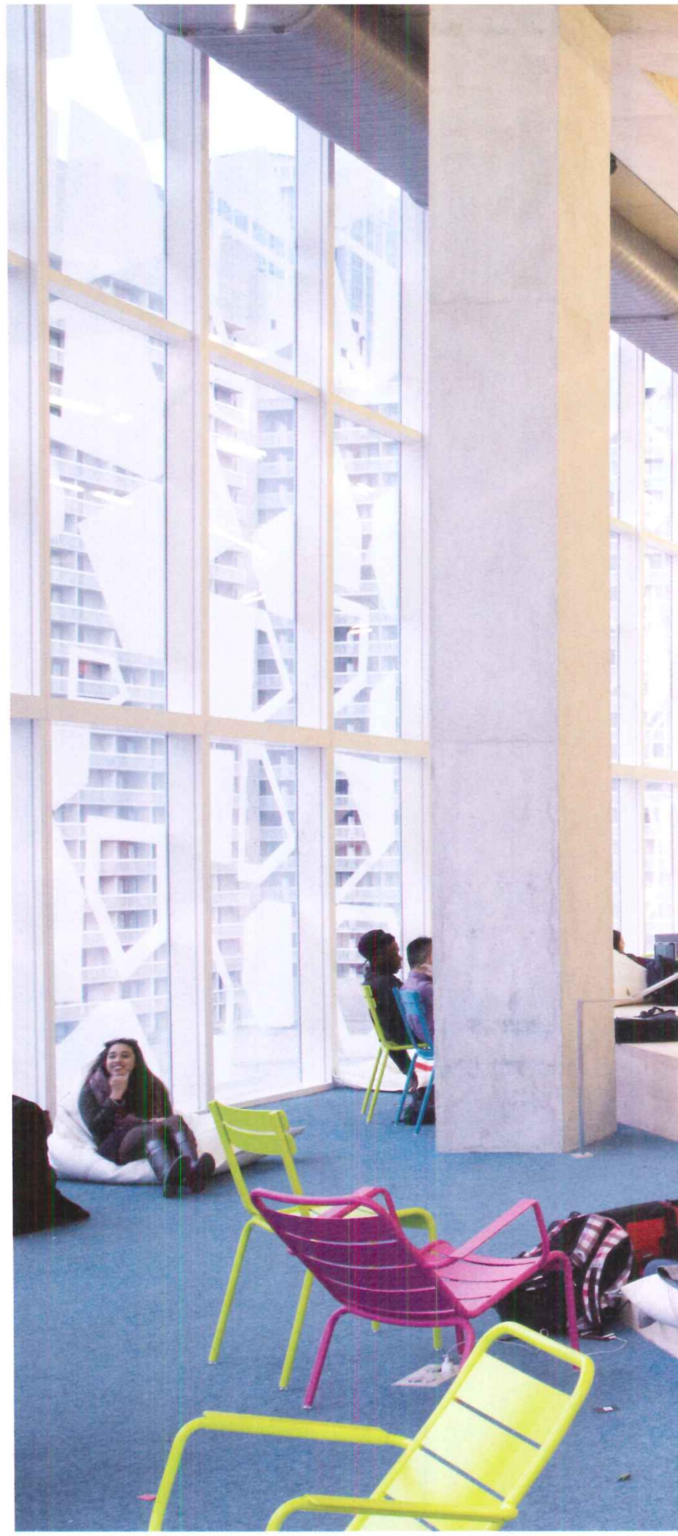
0 30 FT. 9 M.

SECTION A - A

0 20 FT. 6 M.

1 ENTRY PLAZA
2 ENTRANCE HALL/ EVENTS SPACE
3 CAFÉ
4 CASUAL SEATING
5 DIGITAL MEDIA AREA
6 OFFICE
7 STUDY AREA
8 COMPUTER STATION
9 CLASSROOM/ SEMINAR ROOM
10 RETAIL
11 SERVICES/STORAGE
12 GREEN ROOF


STARBU



SUN AND SURF
On the fifth-floor "sun" level, the central study rooms' tinted glass walls connect their users with the open perimeter while maintaining visual and auditory privacy. At the double-height "beach" level (right), students study and socialize on maple-wood stadium seating that slopes down toward a carpeted patch of "water."

The Centre's distinctive fritted glass facade helps integrate the building into the densest patch of downtown. Muted in color but exuberant in pattern, the frit projects the illusion of a random array of geometric forms (though the pattern does, in fact, repeat itself). On the sun-exposed south and west sides, the pattern reaches 90 percent coverage, and on the darker north and east sides, which are partly in the shadow of other campus buildings, it's as little as 10 percent, allowing the light inside while mediating the unappealing parking-lot view to the north.

Inside, color and form distinguish the Centre's eight levels, from a powerful electric blue defining the third-floor technology zone to a white-and-wispy-blue open top floor, intended for receptions and special events as well as everyday study. In between are the green-hued fourth floor, with student-support services, tutorial spaces, offices, and classrooms; the bright-orange fifth floor, with open study around its perimeter and enclosed rooms in the center; and the beige, double-height sixth floor, known as "the beach"—a mock-waterfront made of shallow, maple stadium seating, cascading down to a triangular patch of turquoise carpeting standing in for the water. Here, students bask in the sunlight, some engrossed in solitary reading, while boisterous cliques and break-dancers animate the space a few yards away. Just above is a complete change of mood: the gray-brown seventh-floor quiet area, with smaller rooms geared to silent study and graduate research.

At every level, power outlets abound and can instantly transform any of the spaces into study zones at the will of those using a computer. On every floor, the sense of student ownership is evident, with many young people plugged in and hunkered over white tables, some flopped on beanbag or lounge chairs, others reclining on the upholstered benches. Levy has no qualms about the near-total lack of books in his university's main study center. "We wanted to make a clear statement that the digital world has arrived," he says. And, undeniably, there is no turning back. ■

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

credits

ARCHITECT: Snøhetta – Craig Dykers, Michael Cotton, Michael Loverich, Jon Kontuly, Anne-Rachel Schiffmann, Carrie Tsang, Samuel Brissette, Misako Murata, Elaine Molinar, Fred Holt

ARCHITECT OF RECORD: Zeidler Partnership Architects – Vaidila Banelis, Mike Smith, Dennis Rijkoff, Mitsuru Delisle

ENGINEERS: Halcrow Yolles (structural); RV Anderson (civil); Crossey Engineering (m/e/p)

CLIENT: Ryerson University

SIZE: 153,000 square feet

PROJECT COST: $86 million

CONSTRUCTION COST: $56 million

COMPLETION DATE: March 2015

SOURCES

CURTAIN WALL: Prelco

ALUMINUM EXTRUSION FINISH: PPG

METAL PANEL CLADDING: Dri-Design

PRECAST CLADDING: Tri-krete

CEILING TILE: Armstrong

WINDOW SHADES: Lutron

ROOFTOP REFUGE The plaza between ASRC (left in photo, this page) and the Center for Discovery and Innovation (on the right) is actually a green roof. It covers an at-grade level that links the two structures and houses shared facilities. Approaching the complex from the north (opposite), the buildings appear as beacons.

CUNY Advanced Science Research Center and City College Center for Discovery and Innovation
New York | Kohn Pedersen Fox Associates

TWIN SET

Two buildings with a similar genetic makeup anchor a science precinct on a city campus.

BY JOANN GONCHAR, AIA

PHOTOGRAPHY BY JEREMY BITTERMANN

The City College of New York (CCNY) is a bit like an academic Acropolis. Situated in Upper Manhattan on one of the island's highest points, its collection of early 20th-century neo-Gothic buildings, by George B. Post—and more recent additions by architects that include Skidmore, Owings & Merrill and Rafael Viñoly—sit high above the surrounding neighborhood of townhouses and low-scale apartment buildings. Here, on the site of a former athletic field, City College and its parent institution, the City University of New York (CUNY), have created a new type of beacon on a hill, with two sleek but sculptural glass-clad buildings housing state-of-the-art laboratories for research in disciplines such as neuroscience, nanoscience, and environmental science.

The two new facilities—the Advanced Science Research Center (ASRC), serving visiting scientists and the whole CUNY system, and the Center for Discovery and Innovation, for CCNY's own graduate and undergraduate programs—reinforce the planning logic established by the rest of the City College campus. The four- and five-story steel structures, comprising almost 400,000 square feet of laboratories, offices, an auditorium, and meeting rooms, extend the pattern of paired buildings flanking a central pedestrian spine, says Hana Kassem, a director at Kohn Pedersen Fox Associates, the project's design architect. By compressing the buildings and pushing them together, the architects create a common entry plaza for the research complex and also release some of the open space provided by the former athletic field, preserving part

of the site for recreational use by students and the surrounding community, she explains.

Below the new plaza, the two buildings are connected by a supersize at-grade floor partially submerged in the surrounding terrain. It contains shared facilities, including clean rooms, a vivarium, and imaging suites. But above the plaza level, they clearly read as two separate structures, albeit with nearly identical DNA. Almost mirror images of each other, the office spaces for both are enclosed behind gently curving, ribbonlike curtain walls that help define the entry plaza. But beyond these sinuous elements, rising more than a full story taller (due to their considerable mechanical equipment requirements) are the buildings' bar-shaped lab volumes. These were made rectilinear and orthogonal so that their interiors could be easily reconfigured to accommodate rapidly evolving research.

A common genetic structure is also found in the buildings' interior organization: both are arranged around central stair atriums, conceived as hinges that link different programmatic elements both vertically and horizontally. These atria are the most dramatic of several types of spaces—including lounges, conference rooms, and informal meeting areas—intended to promote social interaction and interdisciplinary collaboration.

Although the buildings can be thought of as twins, they have distinct personalities, as exemplified by, for instance, their interior palettes. The Center for Discovery and Innovation is the more gregarious sibling, at least in terms of its finishes: its atrium has a bright-white terrazzo floor, a red resin stair balustrade, and yellow-stained laminated plywood on the walls. The ASRC materials, meanwhile, are more subdued: its atrium features soft-green terrazzo, bamboo, and polychroic glass that subtly changes color with the lighting conditions.

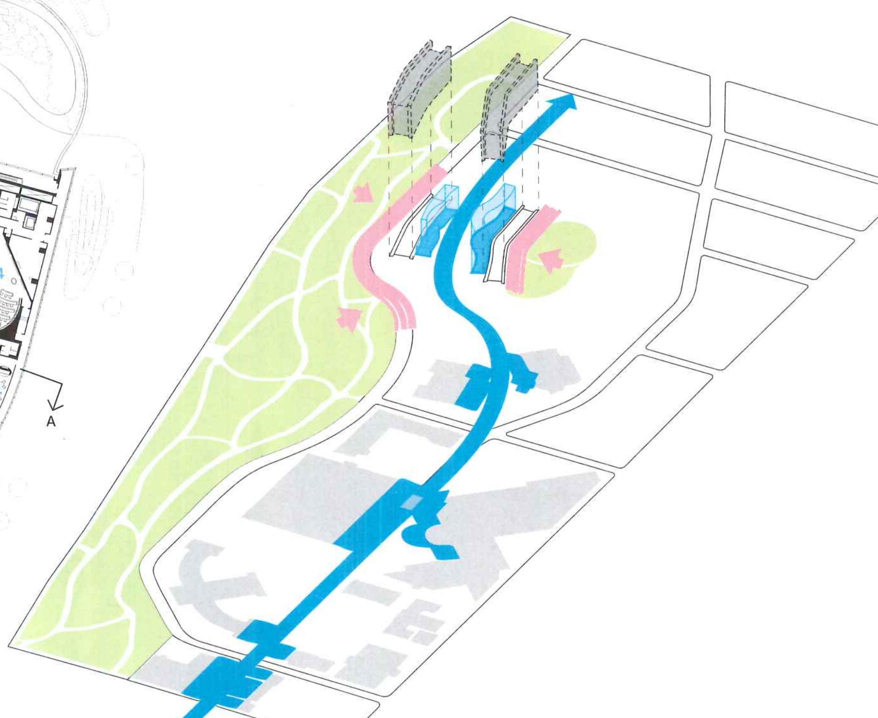
The two buildings have other slight differences, reflecting the needs of their users. One illustration is each facility's linear equipment room, or LER—a space for heat- and noise-generating equipment that doubles as circulation. At the Center for Discovery and Innovation, the LER runs down the spine of the floor plate, between the offices and labs. But at the ASRC, where scientists required a stronger link between their research and support spaces, this element has been pushed to the building's perimeter, allowing the labs

SOFTENED EDGES The curtain walls for both the ASRC (left) and the Center for Discovery and Innovation include projecting fritted glass fins to mitigate glare within the offices. Within the Center for Discovery and Innovation, the main stair's landings have been enlarged to create informal collaboration spaces (opposite).

THIRD FLOOR PLAN

SECTION A - A

1 LABS
2 OFFICES
3 CAFÉ
4 AUDITORIUM
5 LOUNGE
6 CONFERENCE ROOM
7 ENTRY
8 LOBBY
9 MEETING SPACE
10 GARDEN
11 SHARED RESEARCH
12 OBSERVATORY
13 MECHANICAL
14 RECREATION



SITE DIAGRAM

FIRST FLOOR PLAN

0 60 FT.
20 M.

and the offices to be adjacent to each other. The arrangement has a fringe benefit: it meant the project team could create a daylight-filled LER that is glazed on both sides, so that anyone passing through it has views into labs and also out over the neighborhood rooftops.

These minor differences not withstanding, the buildings come across as a cohesive ensemble—an outcome of attention to details like the frittted glass fins that project from the undulating curtain walls. The fins' primary purpose is to mitigate glare within the offices, but, outside, they also blur the buildings' profiles against the sky and provide texture, and scale that helps mask the buildings' true size. The effect is reinforced by the plaza's landscape, which includes tall grasses and attenuated birch trees that gently sway in the wind.

It is through such subtle moves that the buildings stand out as welcoming beacons for the sciences. The ambition, says Kassem, was to create "a space that envelopes, and not buildings that overwhelm you"—a goal that she and the rest of the team have unequivocally achieved. ■

credits

ARCHITECT: Kohn Pedersen Fox Associates – Jill Lerner, Michael Greene, managing principals; William Pedersen, design principal; Hana Kassem, senior designer; Phillip White, Gregory Waugh, project managers; John Oliver, job captain

ARCHITECT OF RECORD AND LAB PLANNER: Flad Architects

CONSULTANTS: Leslie E. Robertson Associates (structural); Cosentini Associates, Affiliated Engineers (mechanical); Jacobs Consultancy (lab programming); Weintraub Diaz Landscape Architecture (landscape)

CONSTRUCTION MANAGER: Skanska USA

CLIENT: City University of New York

SIZE: 399,460 gross square feet

COST: $708 million

COMPLETION DATE: September 2014

SOURCES

CURTAIN WALL: Permasteelisa

EXTERIOR GLAZING: Viracon

POLYCHROIC GLASS: Bendheim

PLYWOOD PANELING: Sloan & Company

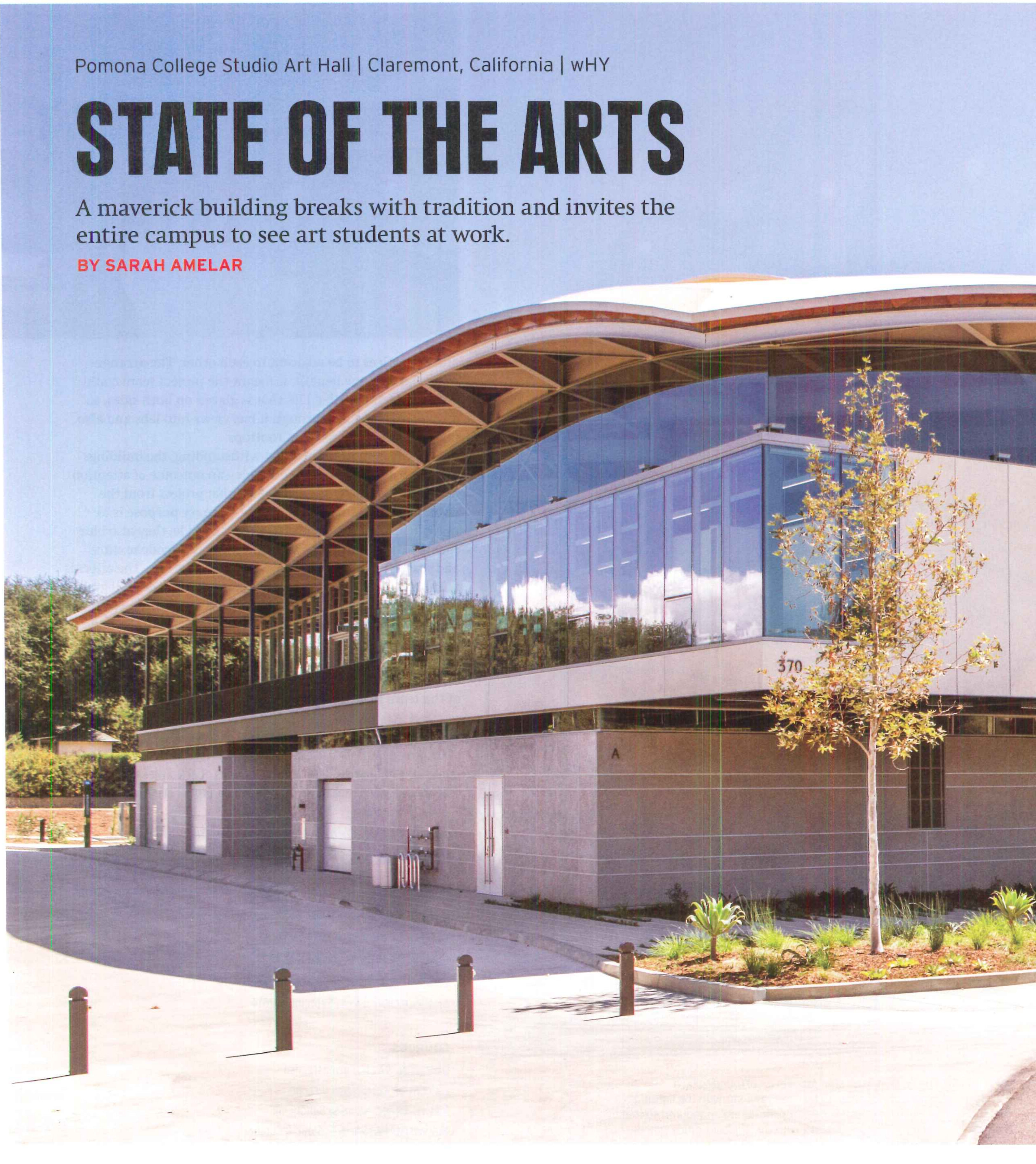
IDEA MIXER The ASRC's main stair (above) is surrounded by a polychroic glass balustrade that subtly changes color with the lighting conditions. That building's laboratories (top, right) are configured so that they have a direct physical and visual link to the adjacent office spaces.

Pomona College Studio Art Hall | Claremont, California | wHY

STATE OF THE ARTS

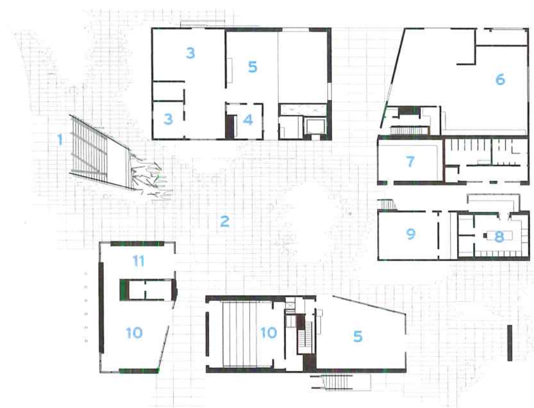
A maverick building breaks with tradition and invites the entire campus to see art students at work.

BY SARAH AMELAR



HOVER CRAFT The building's billowing roof seems to float above cast-concrete, stucco, and aluminum elements that enclose rugged spaces such as a foundry and fabrication lab on the ground floor and light-filled studios on the second. A freestanding stair welcomes everyone to explore the facility.

SECOND-FLOOR PLAN



FIRST-FLOOR PLAN

1 ENTRY
2 PLAZA
3 SHOP
4 OFFICE
5 STUDIO
6 FOUNDRY
7 DIGITAL FABRICATION
8 PHOTOGRAPHY
9 COMPUTER LAB
10 LECTURE HALL
11 GALLERY
12 CLASSROOM
13 LAB
14 PANTRY
15 SALON
16 FLEX SPACE

GREEN THEME
The LEED Gold building takes advantage of the area's mild climate to provide shaded but unenclosed spaces around its perimeter (above) and overlooking its central plaza (opposite, top). A citrus-leaf-shaped cutout in the roof recalls the area's orange-growing history (opposite, bottom).

"Art breaks the rules" is an idea Pomona College's art faculty hoped its new building would convey, recalls department chair Michael O'Malley. In that spirit, Studio Art Hall—completed by wHY in late 2014—departs strikingly from the Spanish Mission architecture around it. Unlike the stuccoed, terracotta-roof-tiled buildings with which architect Myron Hunt shaped this Claremont, California, campus in the early 20th century, the new facility is sculpturally exuberant. Its long, extroverted front stair draws you in under a broad, gestural roof that hovers over a cluster of indoor and outdoor art and gathering spaces.

Rising to that undulant canopy, the 35,000-square-foot structure stands along the fringes of an academic quad, replacing a parking lot. It's a maverick building that might appear foreign within this traditional setting, except that it engages the context in other ways—with a roofline echoing the San Gabriel Mountains behind, and with a semi-open, pavilion-like form that extends a cross-campus route up its front steps and inside. "There was a strong desire—a vision from both the college president and art faculty," says Kulapat Yantrasast, wHY's founding partner and creative director, "for a place not just for art students, but welcoming for everyone."

While Pomona's alumni roster includes such stellar artists as James Turrell and Chris Burden (both 1960s graduates), the school's emphasis on mainstream academics has overshadowed the arts in recent decades. But with this project, the administration aimed to redress that imbalance. "After feeling marginalized," says O'Malley, whose department collaborated with wHY throughout the project, "we needed a building that would announce the arts as an important field.

This called for a symbolic presence, embodying imagination, creativity—and even art's badass rebellious side."

For them, it was also critical to overcome the previous art facility's shortcomings. Compartmentalized and old-fashioned, it created divisions between such disciplines as painting and sculpture. "It didn't reflect or accommodate contemporary practice," recalls O'Malley—"not in its scale, not in its technologies, and not in its limited potential for cross-pollination."

Embracing the mild climate, the architects proposed a "village," interweaving two stories of open and closed spaces under one roof. A collection of discrete volumes, it brings together studios for sculpture, wood- and metalworking, ceramics, drawing, painting, photography, and digital experimentation, as well as a small gallery, visiting artists' quarters, and several intentionally unprogrammed areas.

SECOND STORY
The exposed steel-and-wood roof has integral skylights that help make studios on the upper level good places to create art (above). The architects also provided more intimate spaces, such as a seminar room (opposite).

Art-making and circulation spill outdoors. "Letting people work inside and out was important," says Yantrasast. "Also, the building couldn't be precious—it needed to be more like a laboratory or kitchen, functional and able to take real hacking."

In relaxing barriers, his team drew on its own transdisciplinary experience. Yantrasast—a Thai-born former associate of Tadao Ando—started wHY in Culver City, California, in 2004, fusing architectural practice with "idea-based" research and landscape, furniture, and industrial design. And, like creative studios across Los Angeles, the firm occupies semi-industrial space beneath a dramatic timber bowstring truss—an inspiration for Studio Art Hall.

Though the Pomona roof's exposed underside—incorporating structural-steel framework—is not a bowstring per se, its powerful overarching form and integration of raw lumber evoke that precedent, allowing for soaring ceilings and long spans that accommodate large-scale work and the machinery—such as CNC milling equipment and 3-D printers—that help produce it. Light scoops overhead, clerestories, and walls of predominantly north-facing glass provide even illumination. This extensive glazing—playing against exterior cladding of coarse-aggregate stucco and, in places, cast concrete—also offers inspiration, Yantrasast points out, letting "everyone, even people wandering across campus, see what's going on."

Near the roof's center, a huge leaf-shaped cutout—an allusion to Claremont's orange-growing history—brings daylight deep inside, where wHY's courtyard landscaping allows a natural process to creep into the paving. This oculus is most successful from out front, where it lends the stair the sensation of an ascent to the sky. From other angles, though, it gives the roof a more unwieldy appearance. (Recently, an anonymous student intervention modulated the gap using a tiny, colorful canopy to span its center.)

The building, with its expressive forms and muted earth tones, straddles a fine line between bold and quiet. Fulfilling the mission to shape an unmistakable art-department identity, it's hardly demure. Still, "We wanted to provide a stage for what goes on here, not upstage it," Yantrasast says. In some areas, that stage, or "blank canvas," however, can appear bland or stiff, notably where stucco borders common areas. (Here, value engineering undercut a design that called for a collage of different stucco tones and textures, side by side.)

Nevertheless, Studio Art Hall is alive with student energy, punctuated by colorful skateboards casually parked outside every classroom. "This place is already doing way more than we expected," says O'Malley. "It's a magnet. Enrollment is now high, with students gravitating to the arts. Almost instantly, they formed collectives here, doing their own shows, installations, and film screenings. That didn't happen before. This is their place, their world. They get it." ■

credits

ARCHITECT: wHY – Kulapat Yantrasast, creative director; Yo Hakomori, project architect; Benjamin Ott, project manager; Tim Paulson, design team

ENGINEERS: Thornton Tomasetti (structural); IBE Consulting Engineers/now Stantec (m/e/p); Magnusson Klemencik (civil)

CONSULTANTS: EPT Design (landscape); George Sexton Associates (lighting); Veneklasen Associates (acoustic)

GENERAL CONTRACTOR: Hamilton Construction

CLIENT: Pomona College

SIZE: 35,000 square feet

COST: withheld

COMPLETION DATE: October 2014

SOURCES

LAMINATED VENEER LUMBER: Redbuilt Engineering Wood Products

ALUMINUM CURTAIN WALL: Arcadia

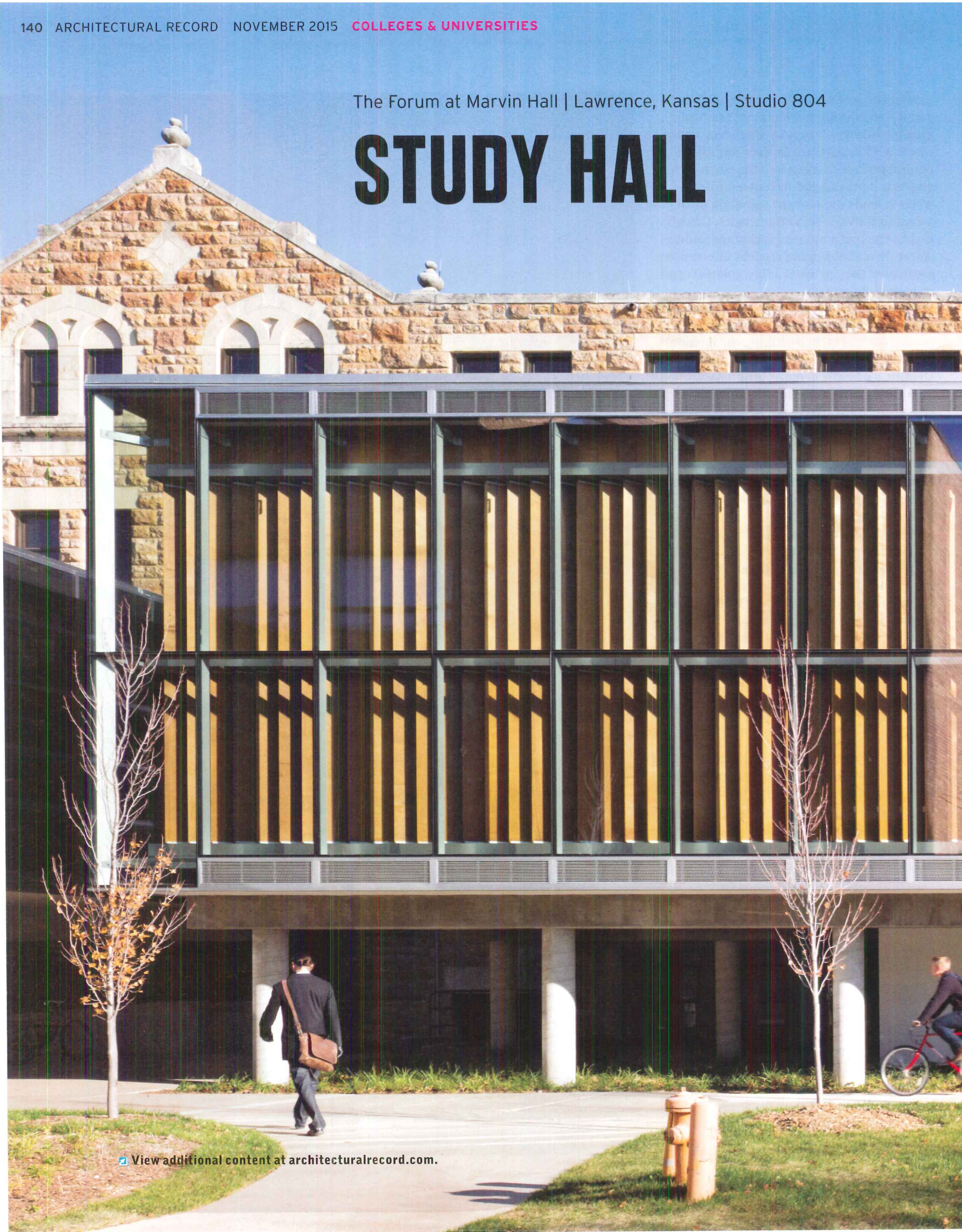
METAL WINDOWS: Functional Fenestration

ROLL-UP DOORS: Cookson

SOLAR SHADES: Mecho Systems

The Forum at Marvin Hall | Lawrence, Kansas | Studio 804

STUDY HALL

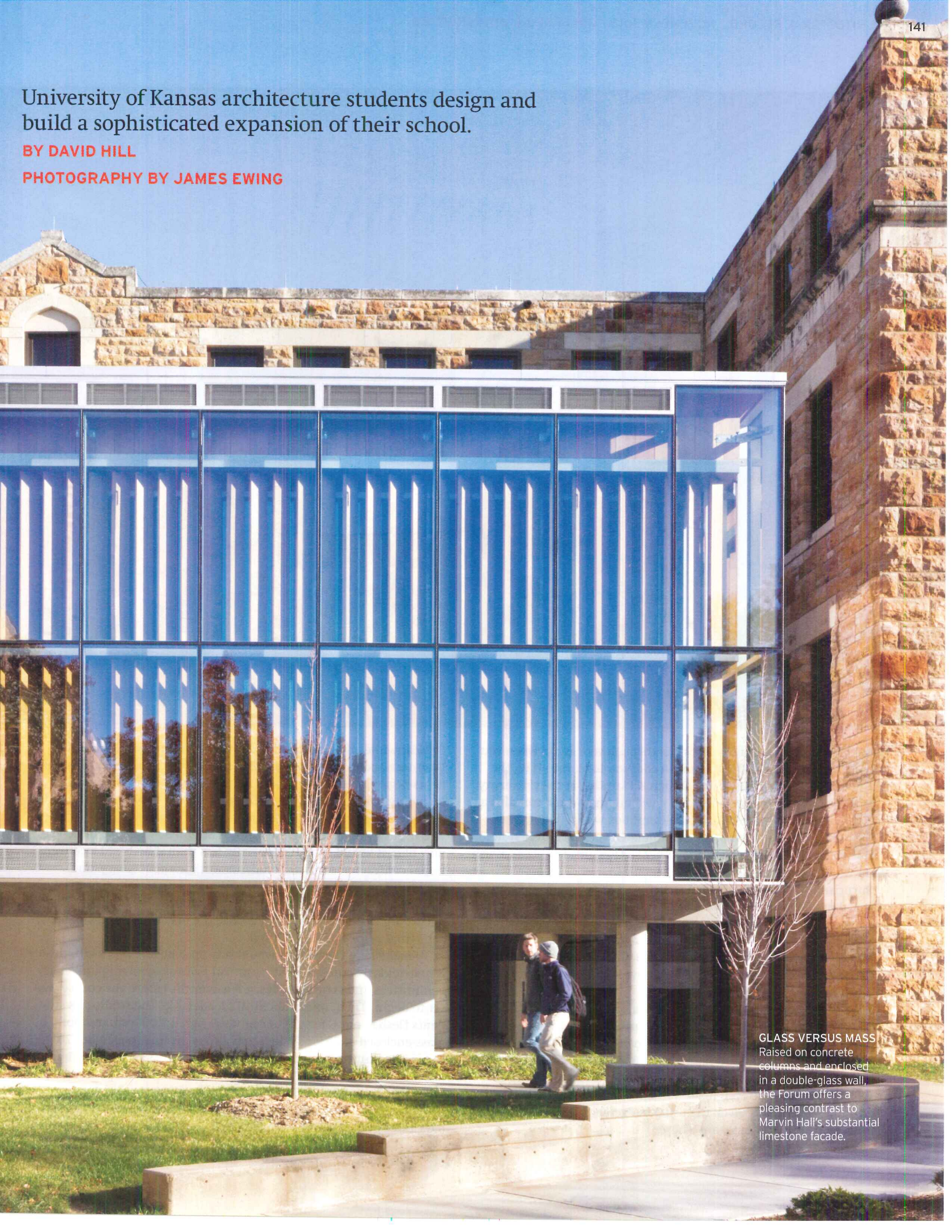


View additional content at architecturalrecord.com.

University of Kansas architecture students design and build a sophisticated expansion of their school.

BY DAVID HILL

PHOTOGRAPHY BY JAMES EWING



GLASS VERSUS MASS Raised on concrete columns and enclosed in a double-glass wall, the Forum offers a pleasing contrast to Marvin Hall's substantial limestone facade.

There's a disconnect that runs through your mind when you set foot inside the Forum, an addition to Marvin Hall, the School of Architecture, Design & Planning at the University of Kansas in Lawrence. The new building, which contains a 121-seat lecture hall, is an elegant box with a double-glass-wall facade. It employs an automated vertical louver system, controlled by a rooftop weather station. Inside, there's a lush plant wall brimming with ferns and begonias.

Surprisingly, this sophisticated structure was designed and constructed in a little over a year by a group of KU graduate architecture students in the celebrated Studio 804 design-build program, founded by Dan Rockhill in 1995. Many of them had never picked up a hammer before the project began in the fall of 2013. "They're great kids, but they don't have a lot of life experience," says Rockhill."They get smart in a hurry."

Built in 1908 of rusticated limestone, Marvin Hall has several classrooms, but none hold more than about 16 people. For years, architecture students traipsed across campus to other buildings for larger classes. Longtime dean John Gaunt (he stepped down earlier this year) dreamed of building an addition on a small site directly behind the school, and in 2004, he even made a rough sketch of a glass box with horizontal louvers. But, given the usual budgetary constraints, Gaunt's plans seemed unlikely to go anywhere.

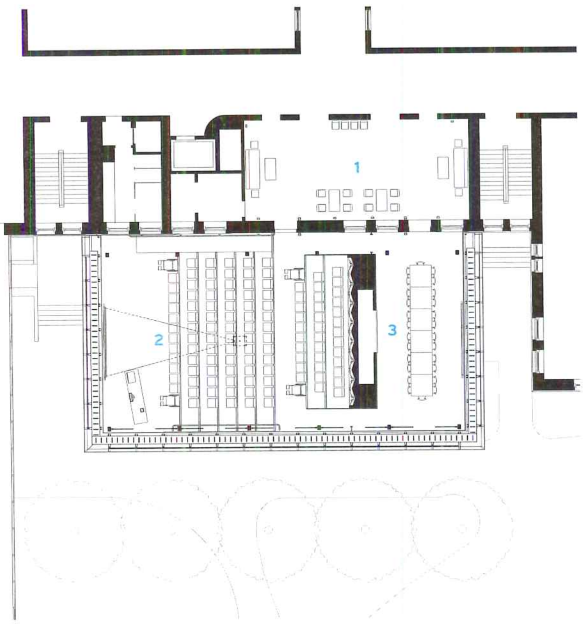
Meanwhile, after completing a string of sustainable houses in Lawrence and in Kansas City, Missouri, Rockhill and Studio 804 students began to design and build increasingly ambitious buildings, including two at KU: the 2011 Center for Design Research and the 2013 Ecohawks Research Facility. Both have been certified LEED Platinum.

Gaunt saw his opening. He knew if Studio 804 were to build the new hall, it would cost substantially less than if he hired a conventional contractor. After all, students work without salary, and Rockhill has a knack for procuring donated materials. Gaunt asked Rockhill, "Can you do this?" Without hesitation, he replied, "Yes." According to Gaunt, who helped raise the necessary funds, the project's final price was $1.5 million.

To make sure the project would stay on schedule, Rockhill initiated a "particularly cumbersome" approval process involving university committees and state agencies, a few months before the course was set to begin. Then, under Rockhill's leadership, the studio's 18 students fleshed out Gaunt's concept to design a 3,000-square-foot glass-enclosed addition. When they broke ground in October 2013, they were immediately confronted with a century's worth of buried infrastructure, much of it undocumented. "We had to pick through all of that by hand," Rockhill says. "It was a little harrowing."

For the next 10 months or so, Rockhill and his students worked six days a week constructing a building that combines cutting-edge technolo-

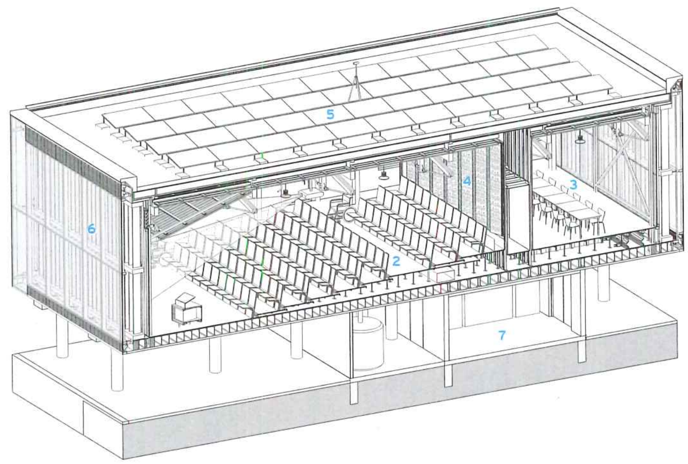
POST AND BEAM
A heavy timber structure gives the new lecture hall (opposite) a turn-of-the-last-century warehouse feeling. The ferns and begonias growing on the hall's rear wall (left) are irrigated with stored rainwater.



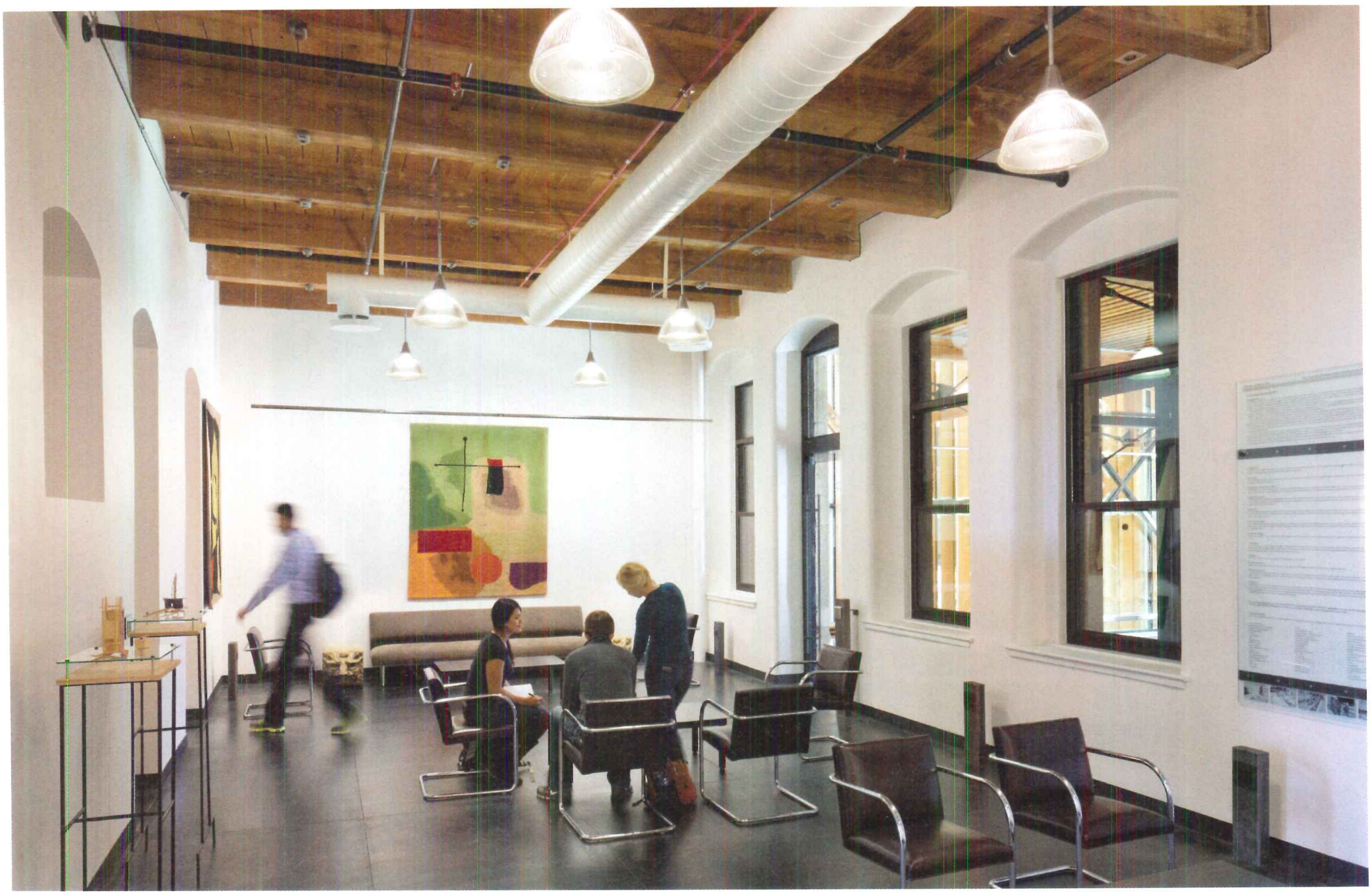
FLOOR PLAN

0 16 FT. 5 M.

1 COMMONS
2 AUDITORIUM
3 JURY ROOM
4 GREEN WALL
5 SOLAR PANELS
6 DUAL CURTAIN WALL
7 MECHANICAL



SECTION - AXON



gies with a rustic heavy-timber frame. With the exception of some mechanical and electrical tasks, they did all the work themselves, from pouring concrete to installing 300-pound glass panels. The result is well designed and seems professionally built, hardly like a do-it-yourself affair.

The addition is elevated on concrete columns, in part because of an existing ground-level mechanical room. But the strategy also helps it rest delicately on the tight site, set against Marvin Hall's sturdy rear facade. The entrance is through the older building's jury room, which has been converted into a commons. Two window openings now frame glass doors; one leads to the auditorium, the other to a new jury room. Glue-laminated Douglas fir posts and beams evoke Marvin Hall's own interior structure and create a turn-of-the-last-century warehouse feeling.

The Forum's perimeter comprises two separate walls of insulated glass set 3½ feet apart. Vertical louvers of western red cedar fill the cavity in between. The louvers automatically close or open to reduce heat gain and provide controlled daylighting. The facade also has motorized dampers. When closed, they trap heat within the cavity, cloaking the building in a "warm blanket," Rockhill says. They open to prevent heat buildup. The New York office of Transsolar and local firm Henderson Engineers helped with the facade's design.

Other sustainable features include a rooftop solar array, a 1,100-gallon cistern that stores rainwater for irrigating the interior plant wall, and LED lighting. LEED Platinum certification is expected.

Ben Peek, one of the students who helped design and build the Forum, is currently working on another master's degree at Harvard University's Graduate School of Design. Like other Studio 804 participants, he now has a kind of I-can-do-anything attitude. "It definitely made me a better designer," he says of the experience. In March, Peek attended his first lecture at the Forum when he returned to KU for a symposium celebrating 20 years of Studio 804. "It just blew me away," he says. "I couldn't believe I was part of making it happen." ■

Denver-based writer David Hill is a frequent RECORD *contributor.*

credits

ARCHITECT: Studio 804 – Dan Rockhill, distinguished professor; Nathan Brown, Renee Brune, Krista Cummins, AJ Dolph, Nicholas Elster, Jordon Goss, Kenneth Grothman, Christine Harwood, Ian Heath, Sara Lichti, Michael McKay, Josh Ostermann, Tim Ostrander, Benjamin Peek, Alyssa Sandroff, Aaron Sirna, David Versteeg, Johnathan Wilde, student team

ENGINEERS: Bartlett and West (structural); Henderson Engineers (m/e/p); Transsolar (climate)

CLIENT: University of Kansas School of Architecture, Design & Planning

SIZE: 2,800 square feet

COST: $1.5 million

COMPLETION DATE: November 2014

SOURCES

CURTAIN WALL, ENTRANCES: Oldcastle BuildingEnvelope

GLUE-LAMINATED TIMBER: Timber Systems

GREEN WALL: VaproShield, Sutherland Felt Company, Cope Plastics

PHOTOVOLTAICS: Astroenergy

FINAL REVIEW Students and faculty enter the Forum through Marvin Hall's old jury room (opposite), now a commons area. The eastern end of the Forum serves as the new jury room (this page).

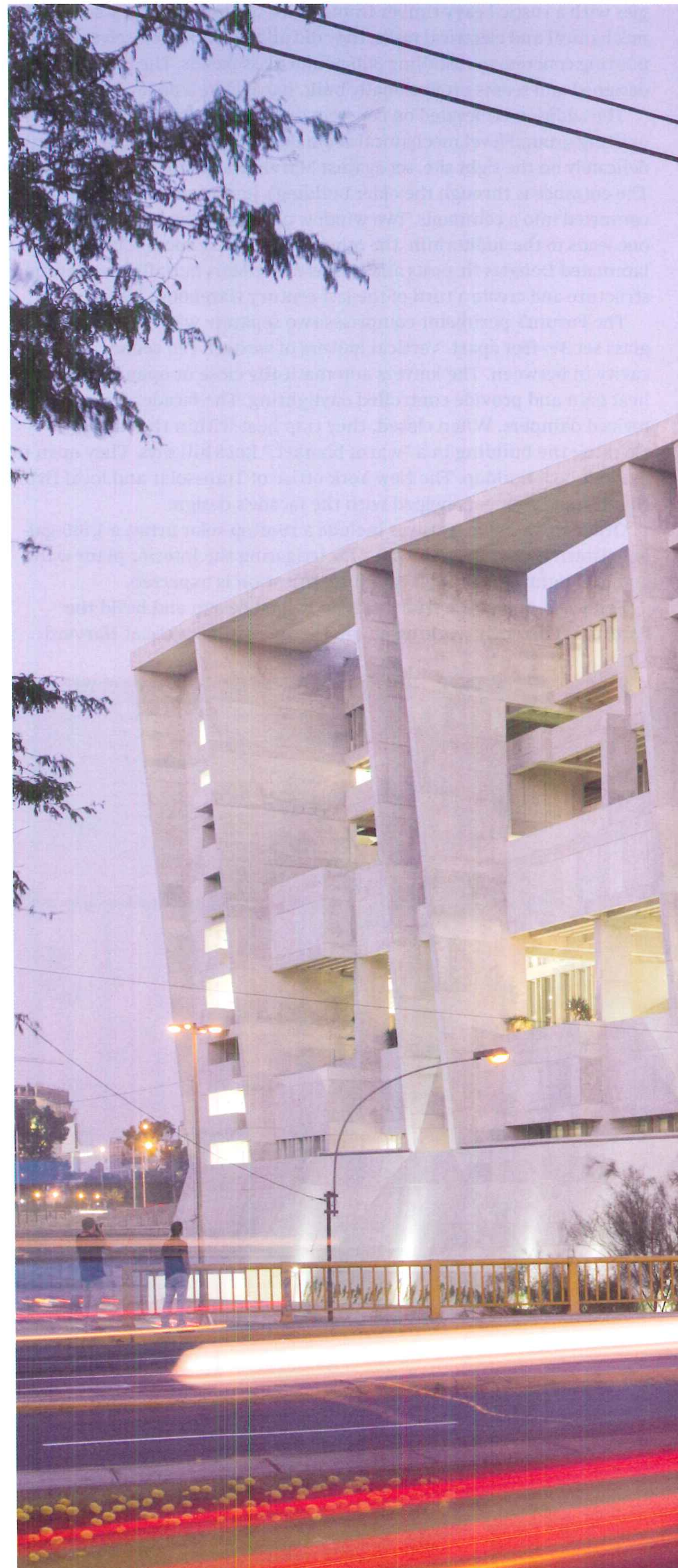
UTEC | Lima, Peru | Grafton Architects

TOP OF THE CLASS

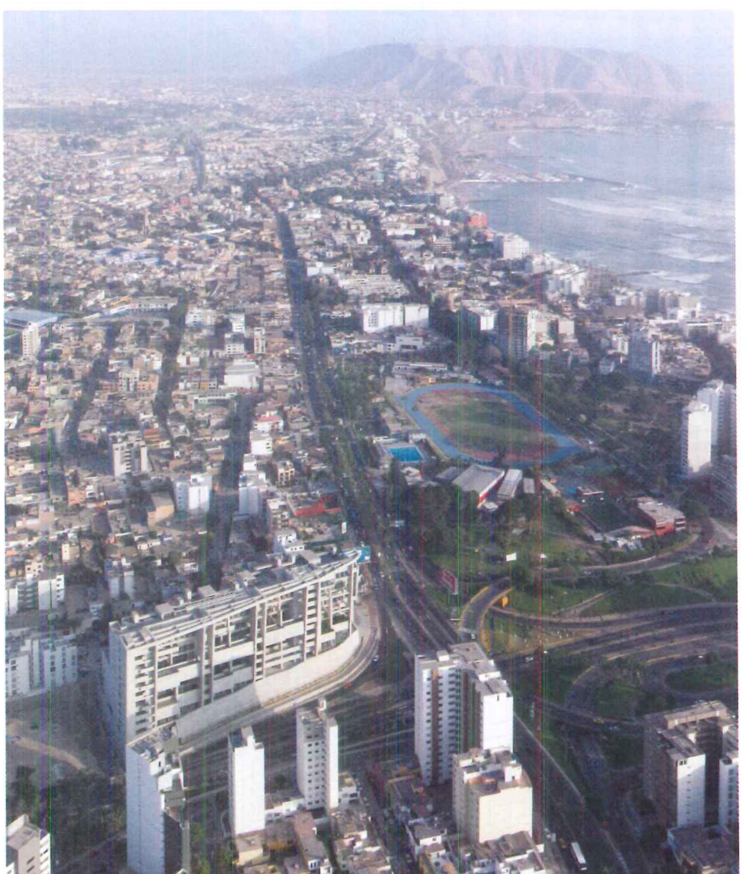
A vertical campus for a new urban university rises to the occasion by fitting in.

BY TOM HENNIGAN

PHOTOGRAPHY BY IWAN BAAN

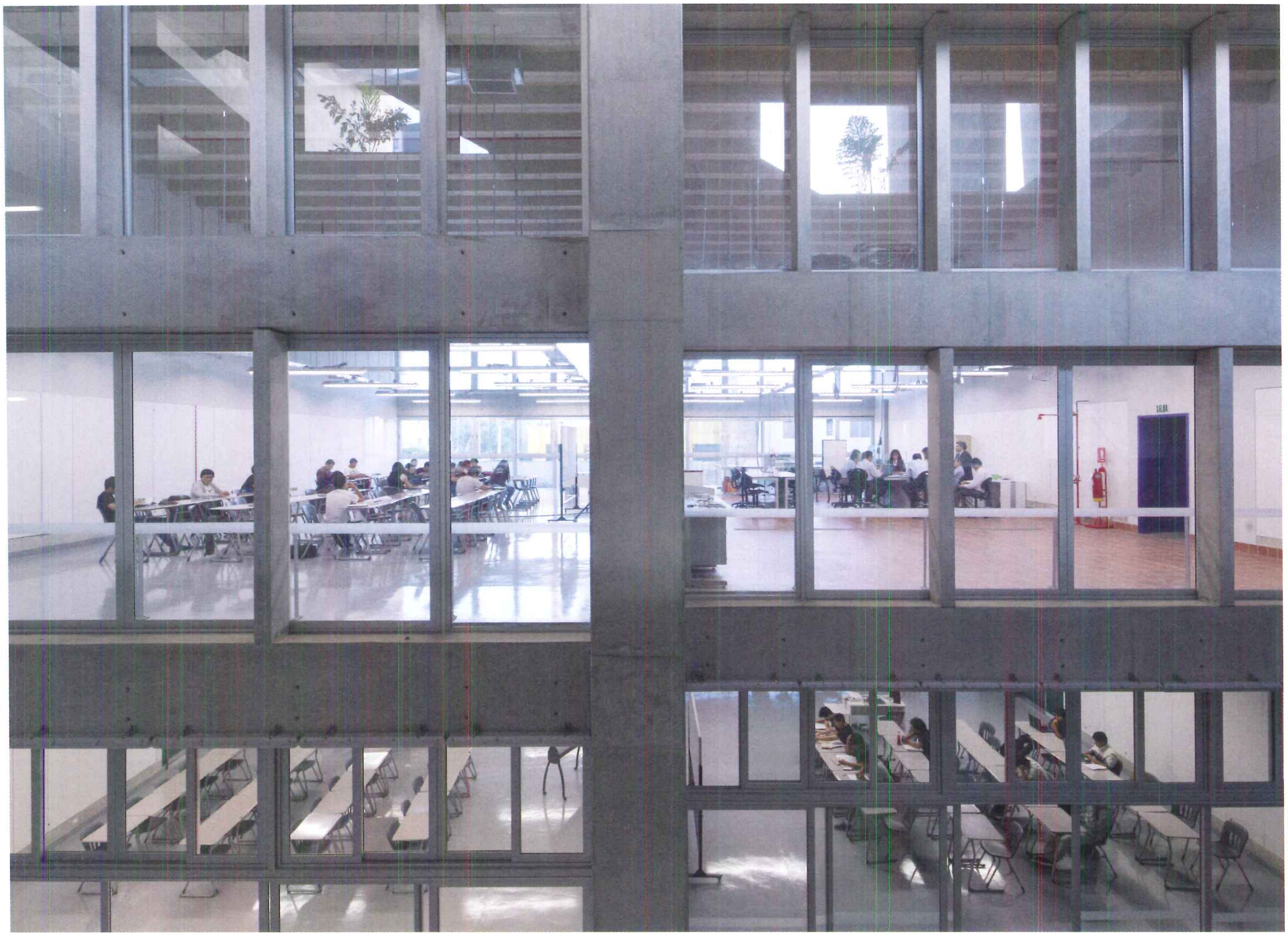


Approaching the design for a university building in the Peruvian capital of Lima, Dublin-based Grafton Architects turned to their belief that architecture is the "new geography." The firm's founding directors, Yvonne Farrell and Shelley McNamara, also wanted the University of Engineering and Technology, or UTEC—a new single-building institution underwritten by the philanthropic Hochschild family—to capture the essence of the Latin American city, which lies just 12 degrees below the equator, sandwiched between the Pacific Ocean and a desert.



View additional content at architecturalrecord.com.

LANDMARK STATUS
Perched on a sliver of land above a freeway, UTEC is a dramatic addition to Lima's skyline.



Responding to the existing context, Grafton's "vertical campus" triumphantly fulfils these goals. And, in the process, the new building has opened up exciting new frontiers for architecture in a country undergoing a physical transformation as a result of strong economic growth.

A close study of Lima's geography suggested the solution to the challenges posed by a tricky site, a sliver of land above a ravine containing a busy freeway, with the tony high-rise Miraflores district to the north and the more bohemian neighborhood of Barranco to the south. Fascinated by the cliffs from which Lima overlooks the ocean, the architects, who won the commission through an invited competition, looked to create a building that would be a continuation of this natural feature. Approaching UTEC from the water, the concrete structure forms a man-made cliff, echoing the natural ones looming in the distance. The soaring facade dramatically announces the new private university while also acting as a hard shoulder against the din of traffic below.

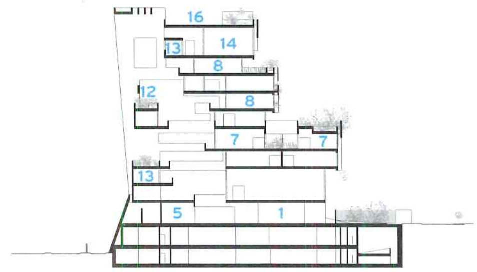
From its heights, the 10-story building cascades down in a series of patios south toward Barranco. Inspired by the intensive use of terrace farming by pre-Columbian civilizations, this move downplays the monumentalism of the north elevation and produces a sympathetic transition as the building approaches this quiet low-rise neighborhood. The effect was achieved by placing the building's larger spaces, mainly laboratories, on the lower floors, with the successively smaller volumes of classrooms and professors' offices on top. This stacking allows for the transformation of the larger volumes' roofs into garden terraces, onto which the smaller upper spaces have access. The green areas also help the designers achieve their goal of creating a living campus rather than another high-rise box housing an educational institution.

Made of a combination of poured-in-place and precast concrete, the 365,000-square-foot building is supported on its northern side by a series of giant reinforced columns. The component volumes are stacked leaning northward, resulting in a canted structure whose deep overhangs provide shading to the north-facing circulation areas (which, being in the southern hemisphere, receive the intense sunlight), while creating an atrium that gradually reveals its views through the building to those using the main entrance, on the south.

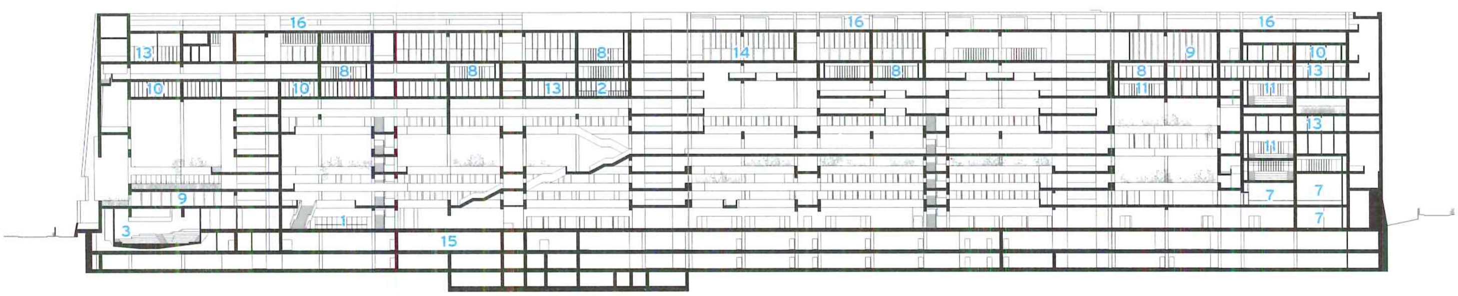
Inspired by Brazilian brutalist master Paulo Mendes da Rocha, the Grafton team has made full use of the possibilities of his concept of the "free section," which prizes generous, open spaces. A dramatic example of this, UTEC's atrium cuts through the building both horizontally and vertically, blurring the external and internal and creating a multitude of informal communal areas that are the lifeblood of every university's existence. Interiors are largely left open to the elements, allowing the ocean breezes to cool the building and minimize the need for air-conditioning.

HIGHS AND LOWS
Inspired by the terrace farming of Peru's pre-Columbian civilizations, the architects designed the building to cascade down in a series of patios south toward Barranco, producing a sympathetic transition to this low-rise neighborhood. Glass-walled labs and classrooms (opposite) enjoy views onto both interior and exterior spaces.

1 ENTRANCE
2 CAFÉ
3 AUDITORIUM
4 CINEMA
5 RECEPTION/INFORMATION
6 ADMINISTRATION
7 LABORATORY
8 CLASSROOM
9 DINING HALL
10 MEETING ROOM
11 LECTURE HALL
12 GARDEN
13 OFFICE
14 LIBRARY
15 PARKING
16 LOGGIA

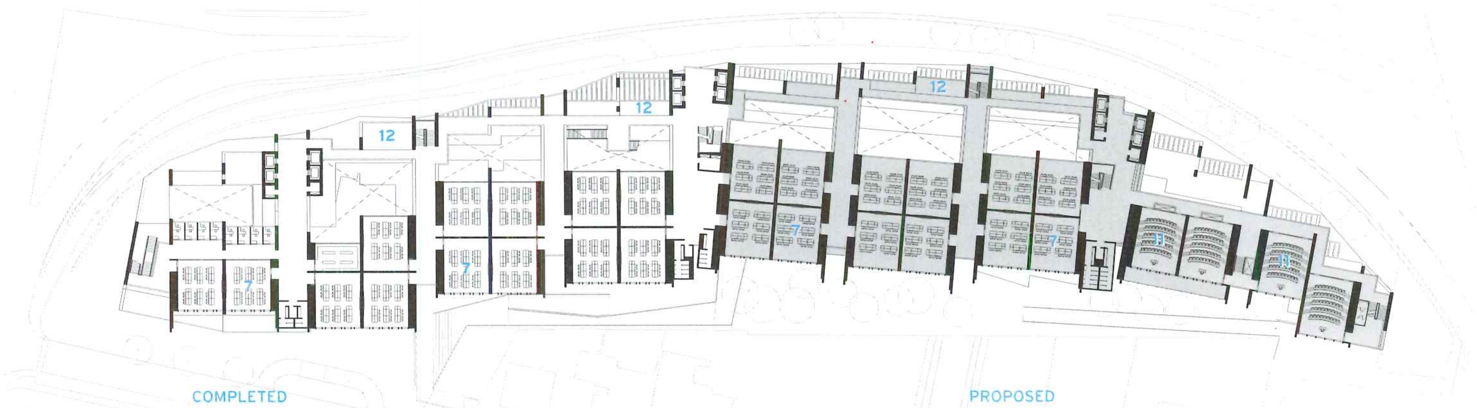


SECTION B - B

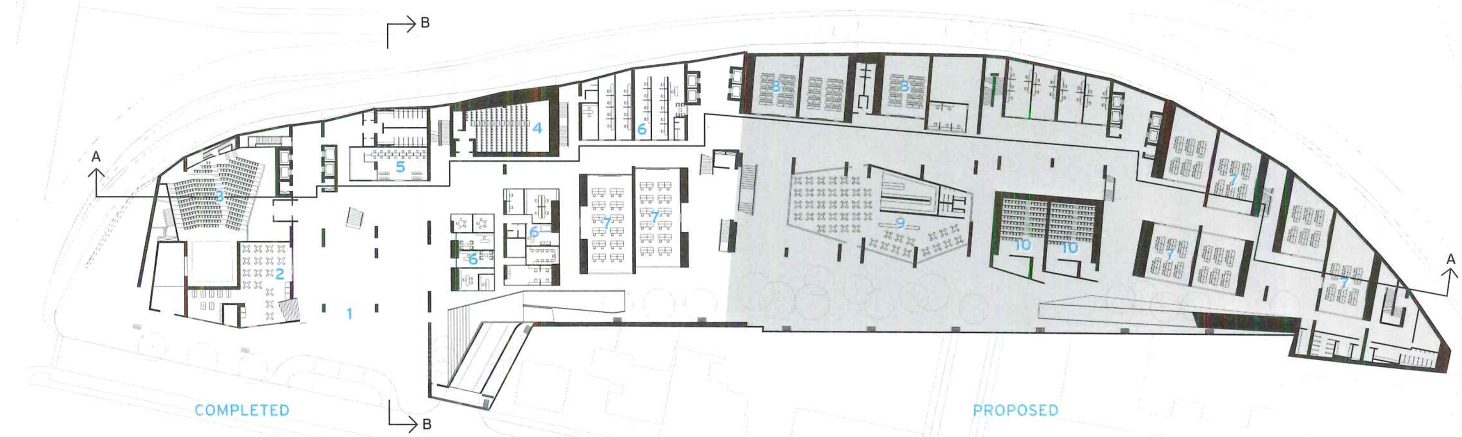


SECTION A - A

0 60 FT. 20 M.



LEVEL-THREE PLAN



LEVEL-ONE PLAN

0 60 FT. 20 M.

DRAMA SCHOOL
Students pass through and linger in one of the building's soaring concourses, where sightlines cut both horizontally and vertically.

LAYERED LOOK Using Paulo Mendes da Rocha's concept of the "free section," the building's canted structure shades the north-facing circulation areas from the tropical sun (above) while creating an atrium (right) that gradually reveals its views through the building the more deeply one penetrates the ground floor.

From within, UTEC creates a thrilling visual experience in which the eye is constantly drawn to dramatic new sightlines, and its sculptural interiors are animated with the movement of air, light, and people through the open spaces, which are framed by geometrical concrete. As one ascends to the upper floors, this effect intensifies, creating the sensation of being suspended within the panoramic views of the city.

"Students will be able to see back to the mountains, the sea, and the desert and know where they are. What we are trying to do in our work is heighten awareness of place," says Grafton's Farrell. "We hope it feels like a university in Peru—that it is not like a university in any other place."

The hanging gardens are only just being planted, and the concrete has yet to acquire the coating of desert dust that the architects hope will further connect the building to its site. And a whole second phase that will double the school's size (and allow the student body, now at 600, to grow) is yet to be built. Though already a magnificent feat, UTEC's full potential is still to be realized. ■

Tom Hennigan is the South America correspondent for the Irish Times, *based in São Paulo.*

credits

ARCHITECT: Grafton Architects – Shelley McNamara, Yvonne Farrell, founding directors

ARCHITECT OF RECORD: Shell Arquitectos

ENGINEERS: GCAQ Ingenieros Civiles (structural); AT Consultores (electrical); GC Ingenieros (mechanical)

GENERAL CONTRACTOR: Graña y Montero

CLIENT: UTEC

SIZE: 365,000 square feet (phase I)

PROJECT COST: $100 million

COMPLETION DATE: April 2015

SOURCES

CONCRETE: Unicon

WINDOWS, GLAZING, & SLIDING DOORS: Corporación Furukawa

METAL & WOOD DOORS: Pucon

ACOUSTICAL CEILINGS: Tectum

DRYWALL: Parqma

RESILIENT FLOORING: Increte, Rosello

ELEVATORS: Schindler


WOOD DESIGN & BUILDING®
ONLINE SUBMISSIONS NOW OPEN
Submit your project to the Wood Design & Building Awards and gain recognition for your work with wood!
Wood Design & Building awards is the only North American program to annually recognize excellence in wood architecture for over 30 years.
Award winners receive the recognition they deserve with features in:
- Wood Design & Building magazine and website
- Wood Design Awards Book 2015
- Architectural conferences throughout North America
Finalize your submission until December 4, 2015
Submit at:
www.wooddesignawards.com
Have questions? Contact:
Ioana Lazea or Natalie Tarini
Award Coordinators
1-800-463-5091 ext. 227 or 225
CIRCLE 51
wood WORKS!
Canadian Wood Council
Conseil canadien du bois
SUSTAINABLE FORESTRY INITIATIVE
REAL CEDAR

Pushing the [Brick] Envelope

Architects find new forms of expression with an ages-old material.

By Katharine Logan

LEARNING AND brick-building share a deep affinity: to build with brick is to join a conversation that's almost as old as civilization itself. Academic structures are often brick, so it's a common choice for new ones. Yet, despite all that's been said in brick in the last 9,000 to 10,000 years (including brick's own preference for an arch, as Louis Kahn famously told us), each new building has the potential to contribute something fresh, perhaps even astonishing.

In awarding a slew of honors last year to the Saw Swee Hock Student Centre at the London School of Economics, for example, jurors for Britain's Brick Awards declared themselves "blown away" by what the architects, O'Donnell + Tuomey, describe as "familiar materials made strange"—familiar in that each of the project's 175,000 bricks was individually cast in a wooden mold by hand, giving the building the same dappled and dimpled surfaces that make old brick walls lovable. They were made strange, said the jury, in that the way the project uses the material "creates a whole new language for brickwork."

Embedded within a complex network of streets in London's city center, the form of the Saw Swee Hock building, completed in 2014, responds to the rights-to-light easements of its neighbors, which define the buildable envelope, as well as to lines of sight along the narrow streets. The result is a faceted and canted volume that seems sliced from a larger rectilinear mass.

The planes that make up the building's complex form are built of long and short bricks, including 46 standard shapes and 127 special shapes, in a pattern based on flemish bond. Except where glazing cuts through the brick envelope for major inflections—at the entrance, for example—windows do not interrupt. Instead, the brick envelope maintains the continuity of the building form by passing right over them, about 8 inches in front of the glass, supported by rectangular-section steel posts aligned with mullions. Where that occurs, short bricks in the bond pattern are omitted to create a perforated screen and let in daylight and air. At night, the windows glow like lattice lanterns, their brick-size apertures expressing the building's handmade scale.

Extensive drawing and physical and digital modeling, as well as the use of the special shapes, achieved a design that required no brick cutting. Designing with the brick module helped speed the work on-site. It also eliminated waste, thereby improving brick's already strong environmental profile.

Conservatively warrantied at 100 years, with periodic inspection and repair of joints and flashing in the interim, brick is both durable and recyclable. It is made from clay and shale, some of the most abundant materials on earth. Manufacturing is typically located close to sources, and, in the U.S., the average distance from plant to project site is about 175 miles.

Properly detailed and constructed, brick cladding presents a rugged face to the elements. However, the thermal performance of the envelope can be compromised if relieving angles are attached to a building's primary structure continuously. To mitigate this thermal bridging, intermittent attachment angles can be welded to the back of the relieving angle to create a gap through which insulation can pass. Proprietary two-part and thermally broken relieving angles are now available to achieve the same result.

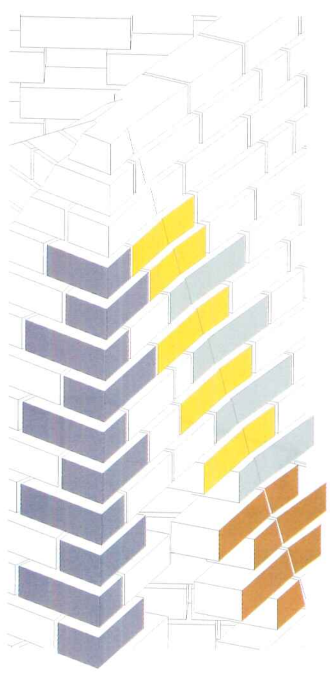
Although brick's range of colors, shapes, and sizes is almost limitless, it's not uncommon for an academic client to require the use of a specific brick. The University of Rochester, for example, has mandated the same brick on some half dozen projects in the last 10 years alone. But that's not necessarily a problem. "Once that decision is made, we can move on," says Frano Violich, principal at Kennedy and Violich Architecture (KVA). "Sometimes it's good to be limited," he adds. Violich's firm is designing the university's Institute for Data Science, now under construction.

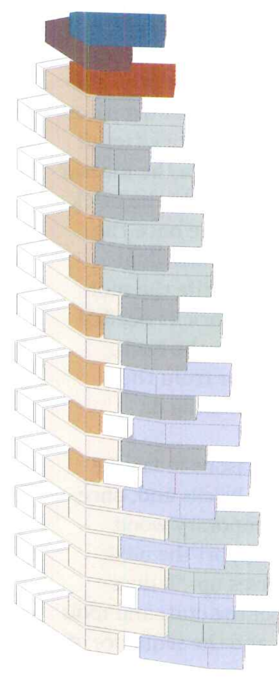
For KVA, the real focus of interest is the contrast between brick's qualities of thick and thin—the dichotomy between historic multi-wythe, load-bearing walls and contemporary single-wythe suspended veneers. The firm has explored this theme in past academic projects such as Gorkin Hall, at the University of Pennsylvania Law School (RECORD, November 2012, page 109) and the recently completed Tozzer Anthropology Building, at Harvard University.

For the University of Rochester commission, KVA found its inspiration in the project's program. The focus of study for the new institute is big data: looking for patterns in data streams and assembling them to make sense. "We were interested in working with brick in the same way," says Violich, and so an analogy emerged between bricks and bits of data.

By turning bricks so they are perpendicular to the wall at computer-scripted intervals, and

"It does require an understanding of the craft and tools used to make a brick wall, especially when you challenge traditional techniques," says architect Frano Violich.





BRICK JUNCTION DETAILS

CUTTING EDGE
Architects O'Donnell + Tuomey used bricks in 46 standard shapes and 127 special shapes to create the faceted skin (left) enclosing the Saw Swee Hock Student Centre (opposite) at the London School of Economics.

View additional content at architecturalrecord.com.

BRICKS AND BYTES For the facade of the Institute for Data Science at the University of Rochester (left), KVA is turning bricks perpendicular to the wall and cantilevering them at various depths (below).

cantilevering them at varying depths, patterns are generated in a field of bricks. The projecting bricks create a play of light and shadow, as well as an impression of depth in the thin brick veneer. Overall, the bricks appear to flow by in a manner evocative of a data stream.

The challenge in translating this concept into reality was figuring out how to prop the cantilevered bricks so they wouldn't drop out before the mortar set. Although brick ties or anchors are typically embedded in the mortar between courses of brick, they hold the brick veneer as a whole to the substrate once the mortar sets; they don't secure individual bricks that would tend to tip while the mortar is soft. So the cantilevered bricks needed additional support, either from the back, with some kind of restraint, or from the front, with a temporary scaffolding or falsework.

KVA's solution is for the masons to lay the initial course of cantilevered bricks and, once those have set, to stand a temporary wood block on the cantilever to support the next protruding brick a few courses up. "It does require an understanding of the craft and tools used to make a brick wall, and the sequence of construction," says Violich, "especially when you challenge traditional techniques."

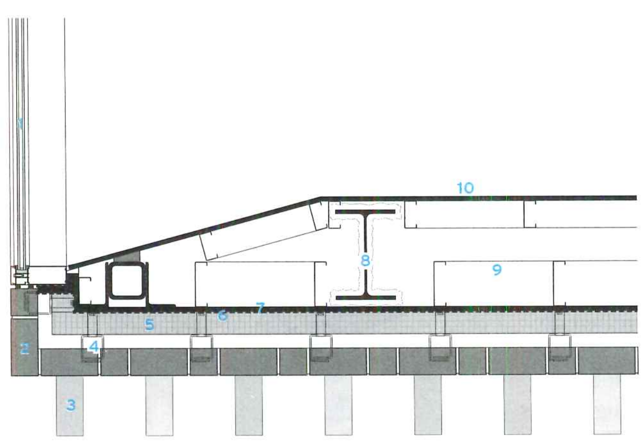
For Pelli Clarke Pelli's recently completed Lanphier Center for Mathematics and Computer Science, at Choate Rosemary Hall, a prep school in Wallingford, Connecticut, a scrupulous attention to the craft of building began with selecting the brick. The intention was for the building to look modern and yet fit into the campus as if it had always been there, says Victor Agran, a former Pelli Clarke Pelli senior associate, and now a senior associate with Architectural Resources Cambridge.

After seven on-site mock-ups to test different types and various combinations of bricks, the architects selected, in close consultation with the client, a simple white brick. The white, which makes a pleasing counterpoint to the red brick of a Georgian-style building nearby, derives from a clay coat that is baked in with the brick. (The clay coat, unlike a glaze, provides a vapor-permeable surface.) Seen from a distance, the brick appears uniform—crisp and contemporary; a closer vantage point reveals subtle mottling where the buff tones of the base brick show through. "It got us everything we wanted," says Agran. "It is monochromatic and abstract yet soft, with a lovely material quality."

The Lanphier brick is an example of the FBX brick type—one of three ASTM classifications that specify manufacturing tolerances. "FB" stands for facing brick, and the "X" indicates extreme or extra control criteria: corners sharp, edges square, dimensions accurate, chippage tiny and rare. The FBS classification designates standard production bricks, while "FBA" indicates unusual architectural or aesthetic criteria that must be specified, such as handmade or non-uniform molded bricks.

Exactitude on the Lanphier Center didn't stop with the selection of the bricks—it carried through development of the design and construction. "We did not want brick cut into odd sizes where the wall would begin to look messy," says Agran, "so we were careful to make sure the brick and brick-joint layout worked precisely."

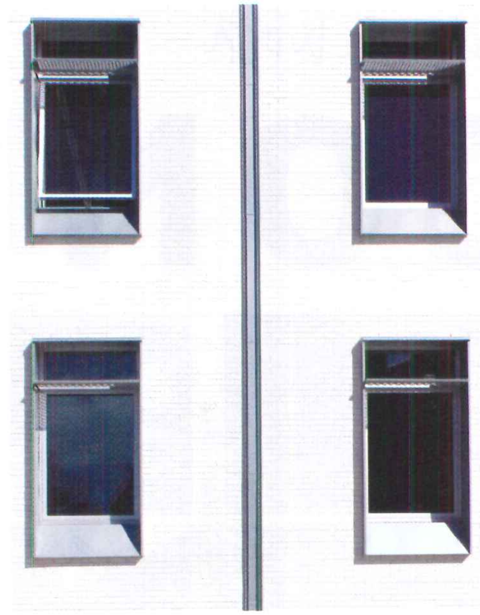
For ornamentation, the architects emphasized a modern approach, to contrast with older buildings on campus, using titanium zinc to turn key aspects of the weather enve-

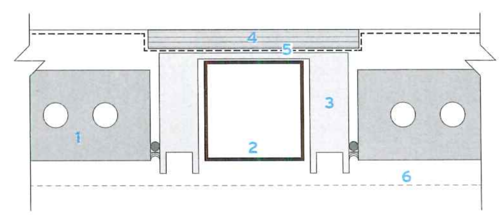


EXTERIOR WALL DETAIL

1 CURTAIN WALL
2 BRICK VENEER
3 PROTRUDING BRICK
4 MASONRY ANCHOR
5 INSULATION
6 AIR & VAPOR BARRIER
7 SHEATHING
8 STRUCTURAL STEEL
9 METAL STUDS
10 INTERIOR SHEATHING

DECISIVE DETAILS Titanium zinc turns key elements of the building envelope—downspouts, gutters, and window frames—into expressive moments at the Lanphier Center for Mathematics and Computer Science at Choate Rosemary Hall (left, below, and bottom).





EXTERIOR WALL DETAIL

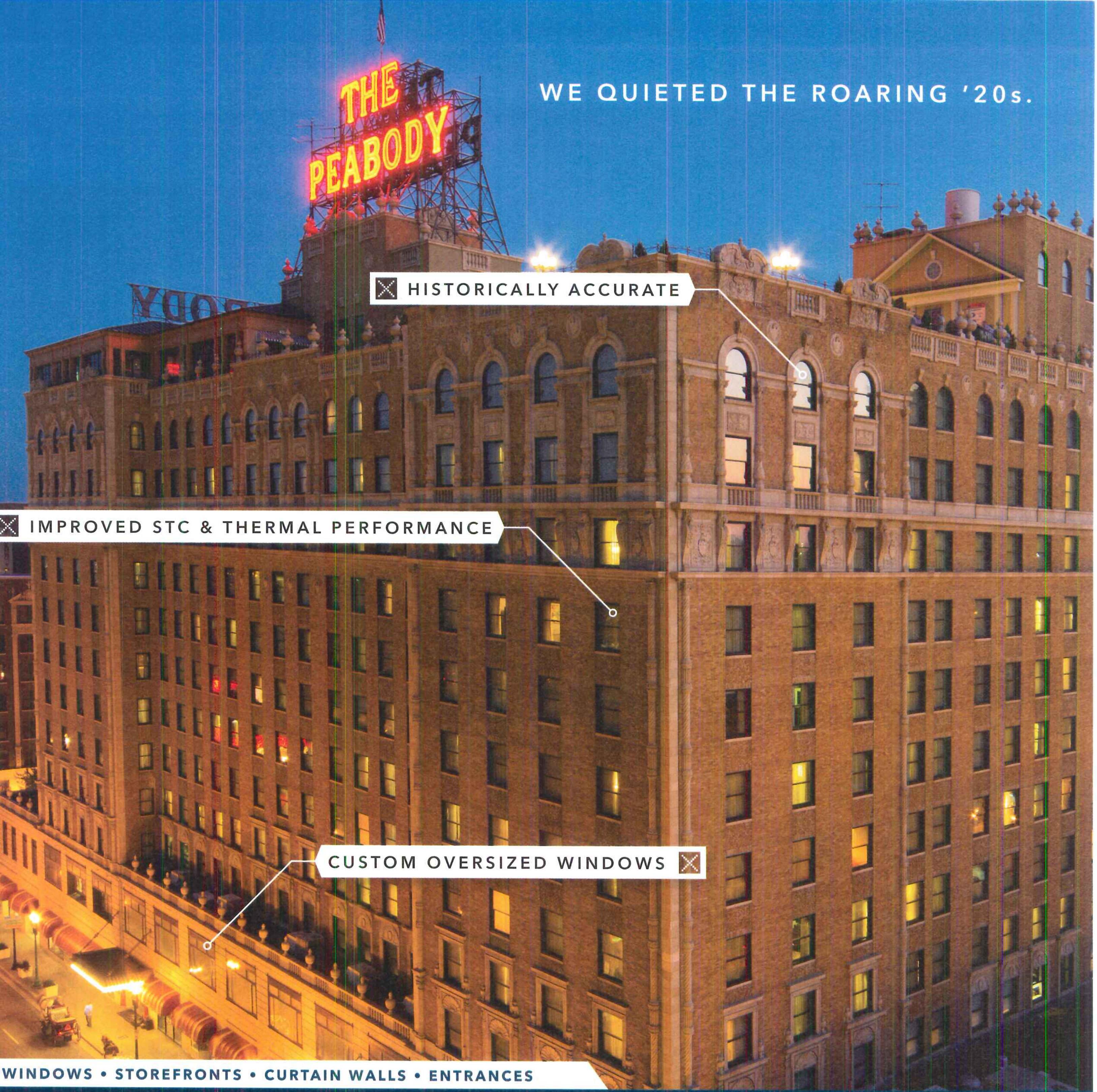
1 BRICK
2 TITANIUM-ZINC DOWNSPOUT
3 TITANIUM-ZINC CHANNEL
4 MARINE PLYWOOD
5 WATERPROOFING MEMBRANE
6 TITANIUM-ZINC FASCIA ABOVE

lope—downspouts, gutters, and window frames—into expressive moments. Windows, for example, are deeply inset, with prominent frames and raked sills in gray metal. Downspouts are recessed flush with the surface of the brick and double as expansion joints, thereby eliminating the sealant joints that often mar brick veneer envelopes.

Since a skin with such a high a level of abstraction succeeds or fails on the quality of the brickwork, the architects were on-site nearly every day, climbing the scaffolding to monitor progress and quality. Once expectations were clear, the masons began catching imperfections on their own initiative, winnowing 10 masons down to six who could reliably meet the project's standards, which, of course, made the work slower.

Those masons might want to swap stories with the crew from the Chau Chak Wing Building, designed by Frank Gehry for the business school at the University of Technology Sydney. On a typical project, a mason can lay 400 to 600 bricks a day, according to Gus Galati, supervisor with Favetti Bricklaying, masonry contractors for the project. Here they averaged 70 to 80—on a straighter run, maybe 100 to 120, Galati says. "At the beginning, it was embarrassing."

Even so, the brickwork was finished ahead of schedule. "It helped that we had the most enthusiastic team of bricklayers I have ever met," says Brad Winkeljohn, a senior associate at Gehry Partners and project architect for the building, which was finished in late 2014. Much of the team's enthusiasm arose from pitting their skill against the challenges of walls that were, to understate the case, not straight.



Preservation Innovation. From EFCO.

When planning the renovation of the 1925 landmark Peabody Hotel, better noise control was a top priority. EFCO created custom glazier-friendly dies and profiles to replicate 880 historically accurate window reproductions. Insulated glass helped to dramatically raise both thermal and acoustical performance, resulting in a quieter, more comfortable environment for guests.

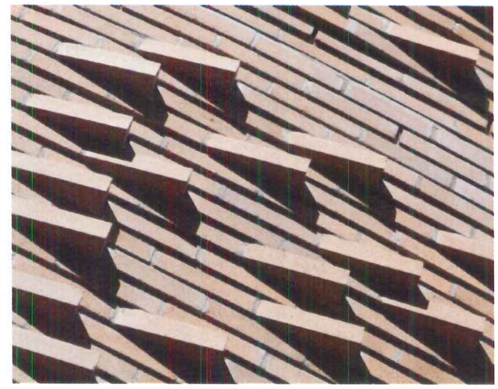
COMMERCIAL SOLUTIONS

pecsAR.com • 800.591.7777

The Peabody Hotel • Memphis, TN

CIRCLE 68

FROZEN FOLDS Despite its visual complexity, the facade of Gehry Partners' Chau Chak Wing (left and below) at the University of Technology Sydney relies on only five different types of bricks.



Continuing Education
To earn one AIA learning unit (LU), including one hour of health, safety, and welfare (HSW) credit, read "Pushing the [Brick] Envelope," review the supplemental material at architecturalrecord.com, and complete the online test. Upon passing the test, you will receive a certificate of completion, and your credit will be automatically reported to the AIA. Additional information regarding credit-reporting and continuing-education requirements can be found online at continuingeducation.bnpmedia.com.

Learning Objectives

1 Discuss some of the qualities that give brick a strong environmental profile.

2 Explain how thermal bridging can be avoided in brick veneer walls.

3 List the different ASTM classes of brick and describe their properties.

4 Describe several methods of achieving sculptural effects with brick veneer walls.

AIA/CES Course #K1511A

FOR CEU CREDIT, READ "PUSHING THE [BRICK] ENVELOPE" AND TAKE THE QUIZ AT CONTINUINGEDUCATION.BNPMEDIA.COM, OR USE OUR ARCHITECTURAL RECORD CONTINUING-EDUCATION APP, AVAILABLE IN THE ITUNES STORE.

One source of inspiration for the undulating brick skin of Gehry Partners' Chau Chak Wing was the flowing robes in Renaissance sculpture.

For more than 30 years, Gehry has been drawing inspiration from artwork that creates an impression of movement in stone—the flowing and folding of robes, for example, in the sculptures of Michelangelo, Bregno, and Bernini. But in this project, "he really wanted to push the envelope," says Winkeljohn. "The sheer mass of the brick swerving in and out over your head—it's amazing."

For all the visual complexity of the walls, only three main types of brick were needed in the end: a typical brick, a lipped brick to accommodate support angles, and a "K" brick to create the wall's roughened nap. Corner versions of the typical and lipped bricks brought the total number to five. All are solid dry-pressed bricks, a variation on molded bricks, which enabled the intricate shapes to be formed.

While panelizing the brickwork could have brought the bricklaying indoors, improving speed and accuracy, Gehry was adamant that the brick be laid on-site. He wanted it to be legible as a handmade process, with the softness and warmth human touch imparts. So, for the design team, facilitating the work of the bricklayers became an important objective.

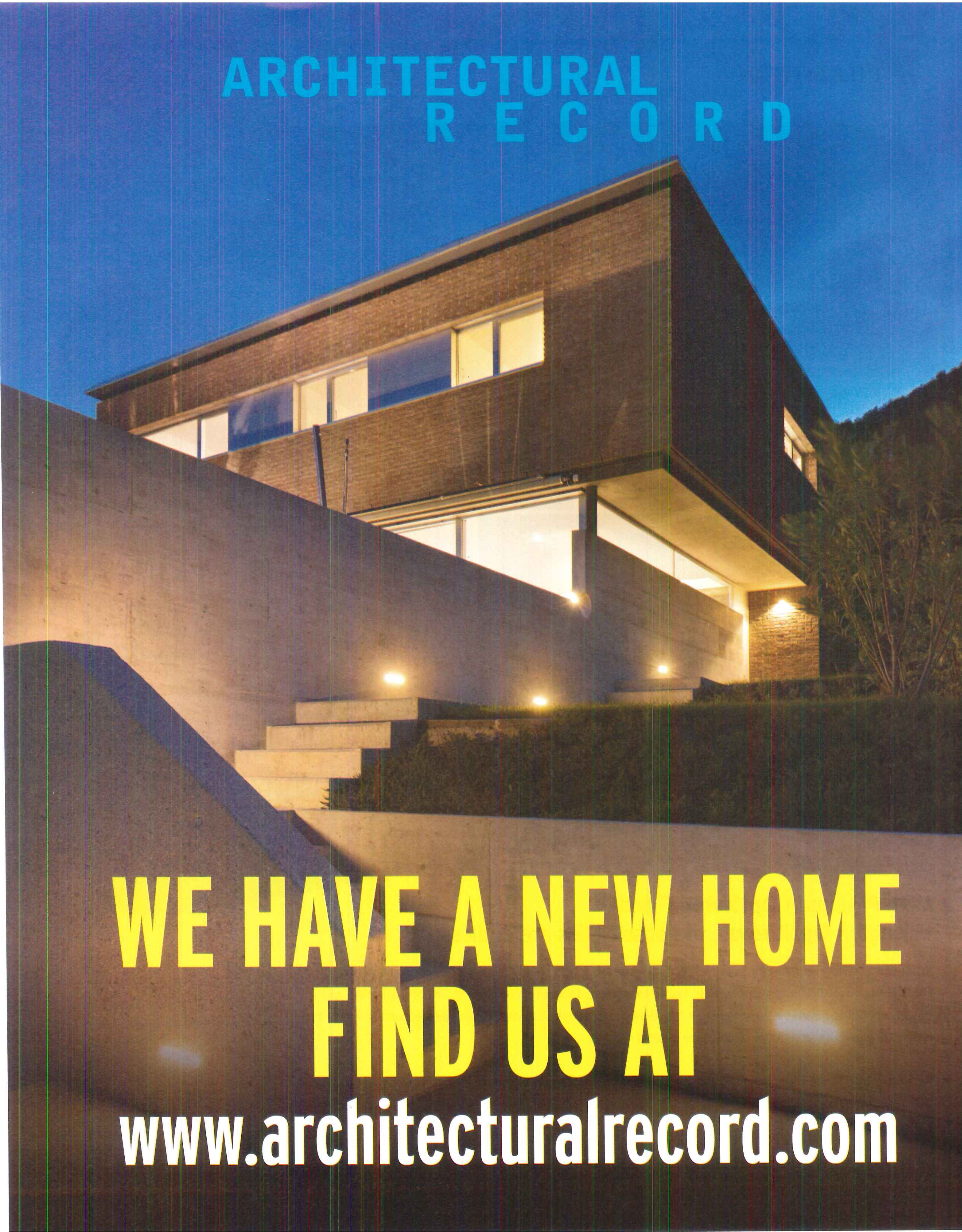
To free the bricklayers to do what they know best, the project team built the envelope's formal complexity into the supporting substrate, an egg-crate framework of mild steel fins generated using software and technology imported from the aeronautics and automobile industries. The panelized substrate was preassembled, complete with brick tie holders to eliminate the need for decisions on-site as to number and placement of ties.

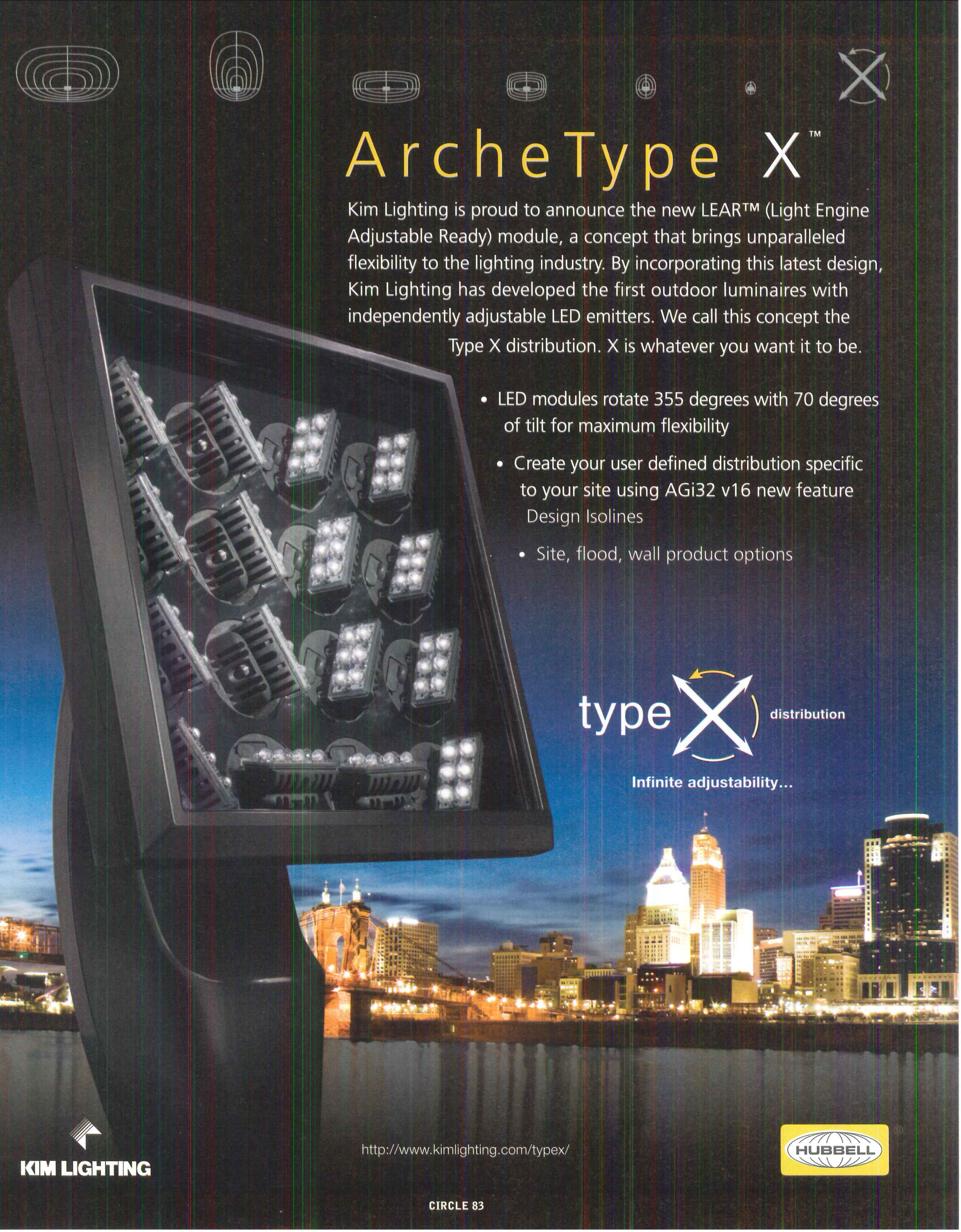
The ties consist of a threaded rod with a washer that is set into a continuous groove in the top of the brick, and another, smaller, washer that tightens behind the brick to lock it into place. They support the weight of corbelled bricks so that the bricks don't tilt while the mortar is soft, and so the more dramatically undulating parts of the wall don't have to defy gravity on the strength of mortar alone.

While few projects are likely to confound convention to the extent Gehry has done with the Chau Chak Wing building, many new directions still remain for the long conversation that is brick. "There's not a whole lot of people out there pushing its limits," says Winkeljohn. "It's a fabulous material, and it's underused." ■

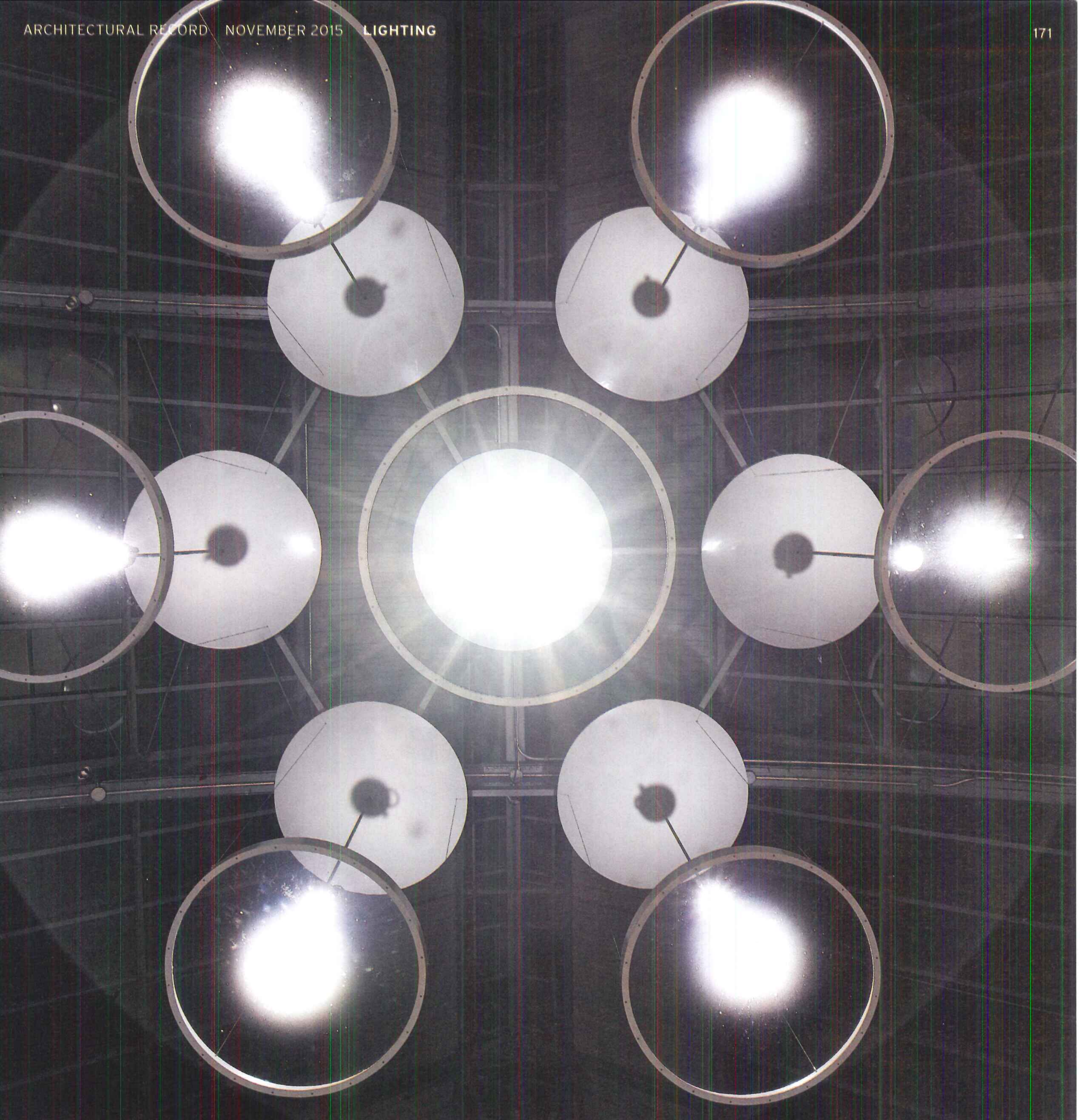
Katharine Logan is an architectural designer and a writer focusing on design, sustainability, and well-being.


WHY ARCHITECTS LOVE US TO PIECES
DATA I CAN'T FIND ANYWHERE ELSE
EARN THESE CEU CREDITS
COOL NEW PRODUCTS
PRODUCTS IN MY AREA
GREEN PRODUCTS TO INVESTIGATE
GOOD ADVICE FOR NEXT PROJECT
snap
SWEETS NEWS AND PRODUCTS
NEW FEATURE
BUILDING PRODUCTS
MADE IN THE USA
PAGE 42
Mix It Up
WITH THE TOP PRODUCTS OF THE YEAR STARTING ON PAGE 14
KWC AVA Faucet from KWC
FINE FINNISH
New Materials + Projects From Finland
PAGE 20
HAND DRYER WARS
The Battle Over What's Greenest
PAGE 12
WOOD PART DEUX
How to Use Reclaimed Wood
PAGE 36
DODGE
DATA & ANALYTICS
sweets.com


ARCHITECTURAL
RECORD
WE HAVE A NEW HOME
FIND US AT
www.architecturalrecord.com


ArcheType X™
Kim Lighting is proud to announce the new LEAR™ (Light Engine Adjustable Ready) module, a concept that brings unparalleled flexibility to the lighting industry. By incorporating this latest design, Kim Lighting has developed the first outdoor luminaires with independently adjustable LED emitters. We call this concept the Type X distribution. X is whatever you want it to be.
• LED modules rotate 355 degrees with 70 degrees of tilt for maximum flexibility
• Create your user defined distribution specific to your site using AGi32 v16 new feature Design Isolines
• Site, flood, wall product options
type X distribution
Infinite adjustability...
http://www.kimlighting.com/typex/
KIM LIGHTING
HUBBELL
CIRCLE 83


MIRROR-LUX®
FORTE
This decorative, LED illuminated mirror
is designed with side glass walls
and perimeter backlighting, creating a
three dimensional aura of light.
This mirror can be customized to
most specifications.
Sensor activation and intensity options
are available.
May We Build One for You
1975 – 2015
40
YEARS OF EXCELLENCE
AAMSCO LIGHTING, INC.
AAMSCO LIGHTING, INC.
100 Lamp Light Circle
Summerville, SC 29483
1-800-221-9092 • Fax 843-278-0001
www.aamsco.com
AAMSCO
THE INTELLIGENT ALTERNATIVE SOURCE℠
CIRCLE 77



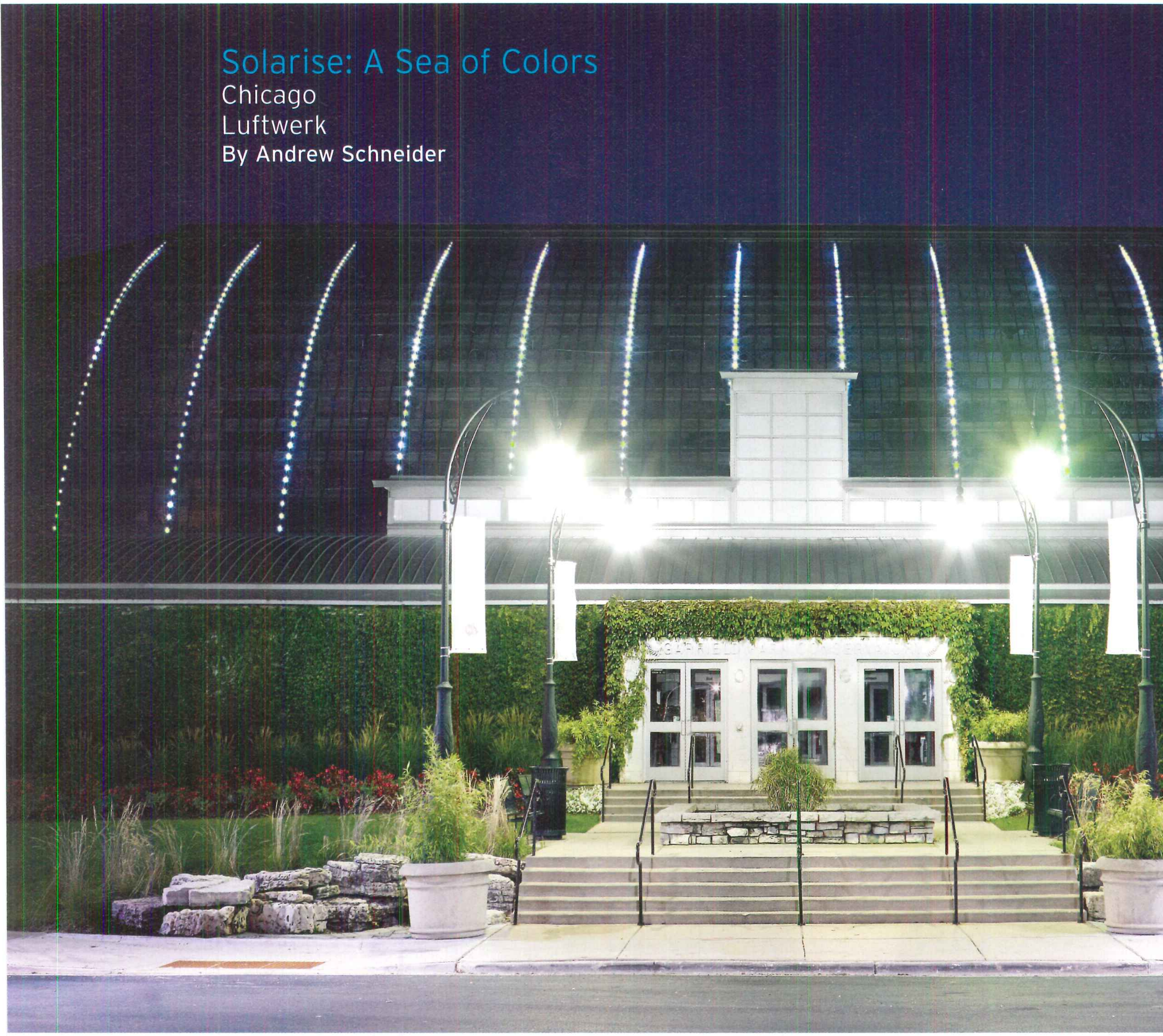
Urban Transformations

Three design teams illuminate three very different city programs—both artistic and pragmatic—balancing daylight, craft, and man-made lighting techniques to enhance the built environment and engender public awareness, well-being, and pride.

SEED OF LIGHT INSTALLATION AT *SOLARISE: A SEA OF COLORS* BY LUFTWERK

Solarise: A Sea of Colors

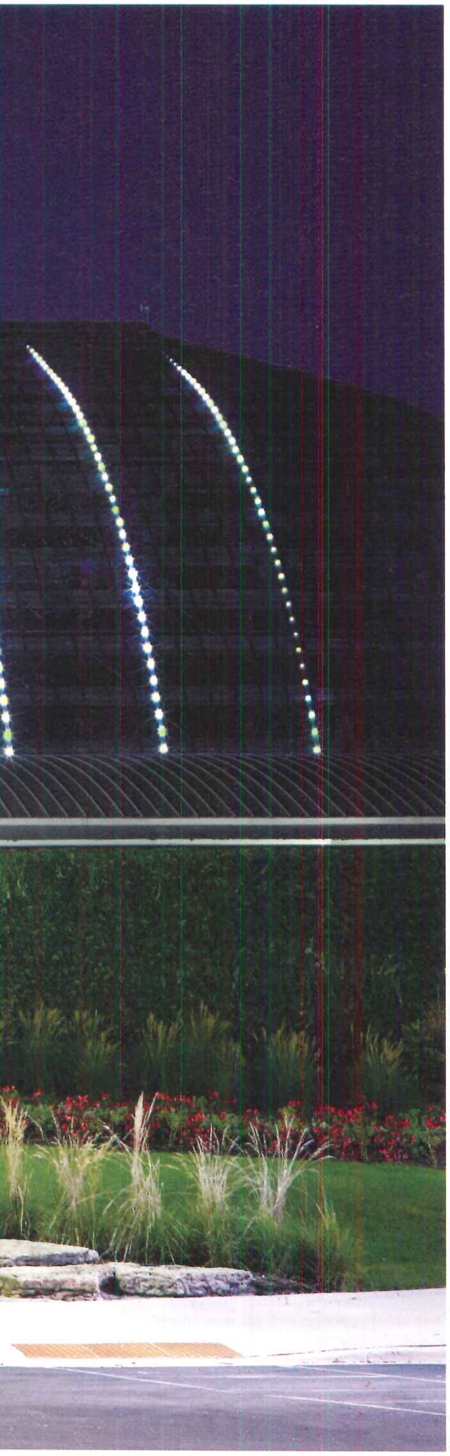
Chicago
Luftwerk
By Andrew Schneider



CHICAGO'S GARFIELD Park Conservatory is a historic structure known for its extensive botanical collections. For the next year, however, the nearly 90,000-square-foot glazed building will be home to a very different attraction—one that will illuminate the architecture of its contiguous display houses.

Solarise: A Sea of Colors, by artists Petra Bachmaier and Sean Gallero, was conceived as a response to architecture and follows their other site-specific works, such as the 2012 *Luminous Field* at Millennium Park's Cloud Gate and 2014's *INsite*, which transformed the Farnsworth House into a canvas of light and sound. For this most recent endeavor, the partners and founders of the multidisciplinary practice Luftwerk created five distinct light-driven installations at the Conservatory, based on the 1907 building's design by landscape architect Jens Jensen, who collaborated with Schmidt, Garden and Martin. Jensen's intention was to create a landscape under glass, "which was revolutionary at the time," says Bachmaier.

Bachmaier and Gallero began discussions with the Chicago Park District in 2011, after the Conservatory was badly damaged during a hailstorm. The city wanted to cre-

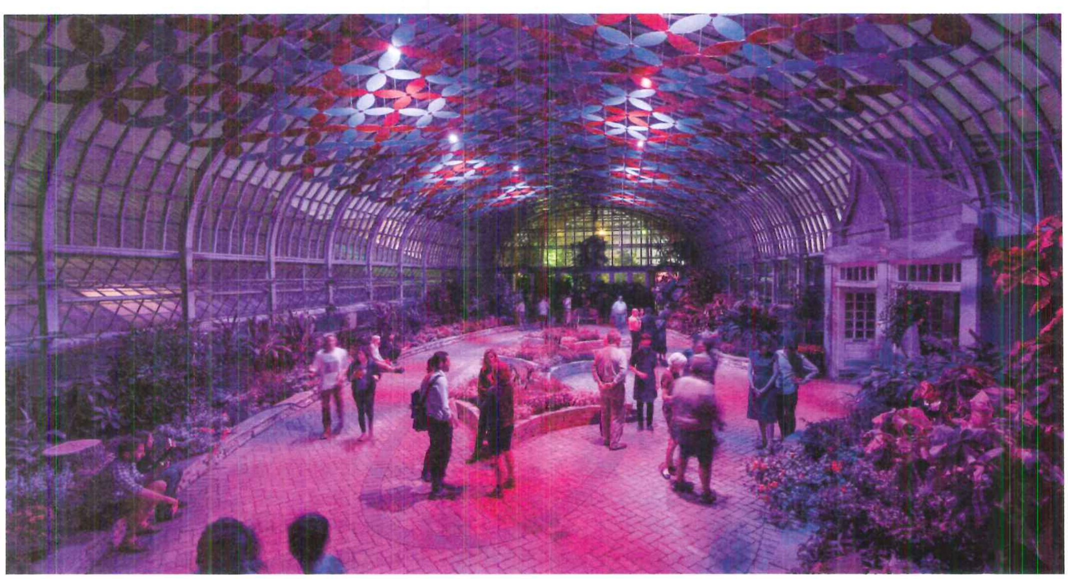


ate a site-specific installation there to celebrate its grand reopening after extensive repairs. The partners received the go-ahead for the project's final design in March 2015, just one month prior to the reopening of the Conservatory in April. On view for one year, from September 23 through September 22, 2016, this series of installations—named *The Beacon*, *Portal*, *Florescence*, *Seed of Light*, and *Prismatic*—is illuminated by 672 LEDs, all powered by a photovoltaic array located atop a nearby building on the grounds.

The first of the Solarise installations is immediately visible as one approaches the entrance to the Conservatory. Aptly named *The Beacon*, it wraps the expansive glass roof of the building's Palm House—a vaulted space inspired by a prairie haystack. For this dynamic display, the artists attached rows of the light-emitting diodes to the structure's steel ribs with magnets, accentuating its skeletal frame. The lighting is controlled by an anemometer, which measures the speed and course of the wind. The effect: patterns of light that mimic the swaying of prairie grass. The color shifts as the spectrum of flora inside changes with the seasons.

The exhibit continues inside, just west of the Palm House, in the Conservatory's Fern Room. Here Bachmaier and

LUMINOUS ILLUSIONS The art collaborative Luftwerk wrapped the Garfield Park Conservatory's Palm House (opposite) in solar-powered LEDs for an installation named *The Beacon*. In the nearby Fern Room (above), the artists employed mirrors to evoke a reflecting pool for a work called *Portal*.



PATTERN PLAY The artists manipulate light and shadow, both day and night, throughout the Conservatory with five distinct installations, including *Florescence* (above and left), *Prismatic* (opposite, top), and *Seed of Light* (opposite, bottom).

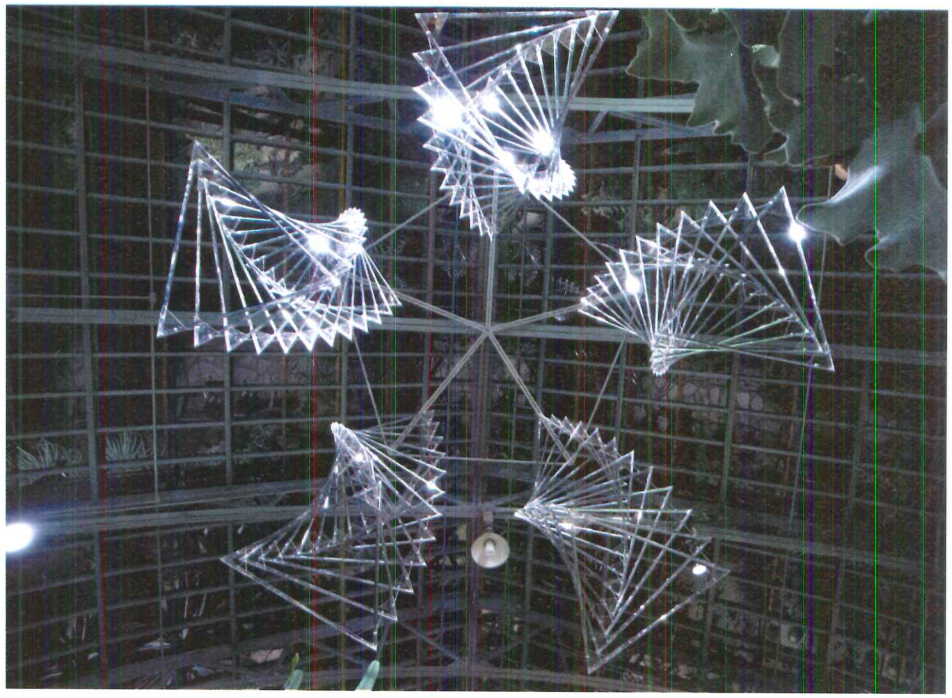
Gallero utilize a series of multifaceted mirrors for *Portal*, which frames a waterfall designed by Jensen and evokes a reflecting pool, inviting visitors to meditate on their surroundings.

Florescence, located in the Show House next door, is a flora-inspired canopy made up of acrylic "petals" that hug the ceiling. Taking its cues from the red and blue spectrums of sunlight that plants use to photosynthesize growth, this intervention filters the sun's rays during the day. At night, light from LED banks mounted on the metal framework above casts colorful shadows and highlights the plants below.

From there, visitors move on to *Seed of Light* in the Horticulture Hall. Created in collaboration with event producer Bill Bartolotta, this graceful chandelier comprises an integrated computer-controlled plumbing system at the top that releases synchronized water droplets onto circular glass trays. Slender pendant fixtures, suspended above, enhance the gentle dripping sound as they illuminate the water and crystalline surfaces, projecting ever-changing patterns and shadows on the floor below,

The last installation, *Prismatic*, is on the building's west side in the Desert House. Suspended from the ceiling, it is composed of prism-shaped acrylic spokes that refract the sun's rays so that they move across the plants in a changing display throughout the day. Illuminated in the evening, *Prismatic* is accompanied by a sonic component from composer Owen Clayton Condon, who was on hand for the installation's opening to "play" the conservatory's desert plants by plucking the hard needles of the various cacti.

The effect throughout the exhibit is beautiful, haunting, and occasionally eerie as one detects the drip of the water chandelier and experiences the dry air of the Desert House. The artists hope that *Solarise* will bring more Chicagoans to appreciate their landmark Conservatory. "I just want visitors to be enchanted," Bachmaier says. "Not only by the exhibit but by the Conservatory." ■



credits

DESIGN TEAM: Luftwerk – Petra Bachmaier, Sean Gallero, lead artists

ARCHITECT OF RECORD: Olsen | Vranas Design and Build – Jeremy Olsen, studio director

CONSULTANTS: Matt Barrett, Deputy Director of Conservatories, Chicago Parks District (landscape); RGBLights, Philips (lighting); Continental Electric Construction Company, Continental Energy Solutions (electrical); Navillus Woodworks, CFDevices (fabrication)

INSTALLATION: Chicago Flyhouse

CLIENT: Chicago Park District

COST: $300,000

COMPLETION DATE: September 2015

SOURCES

LIGHTING: Philips; Beacon

CONTROLS: Pharos

PHOTOVOLTAIC SYSTEM: SolarWorld; Enphase

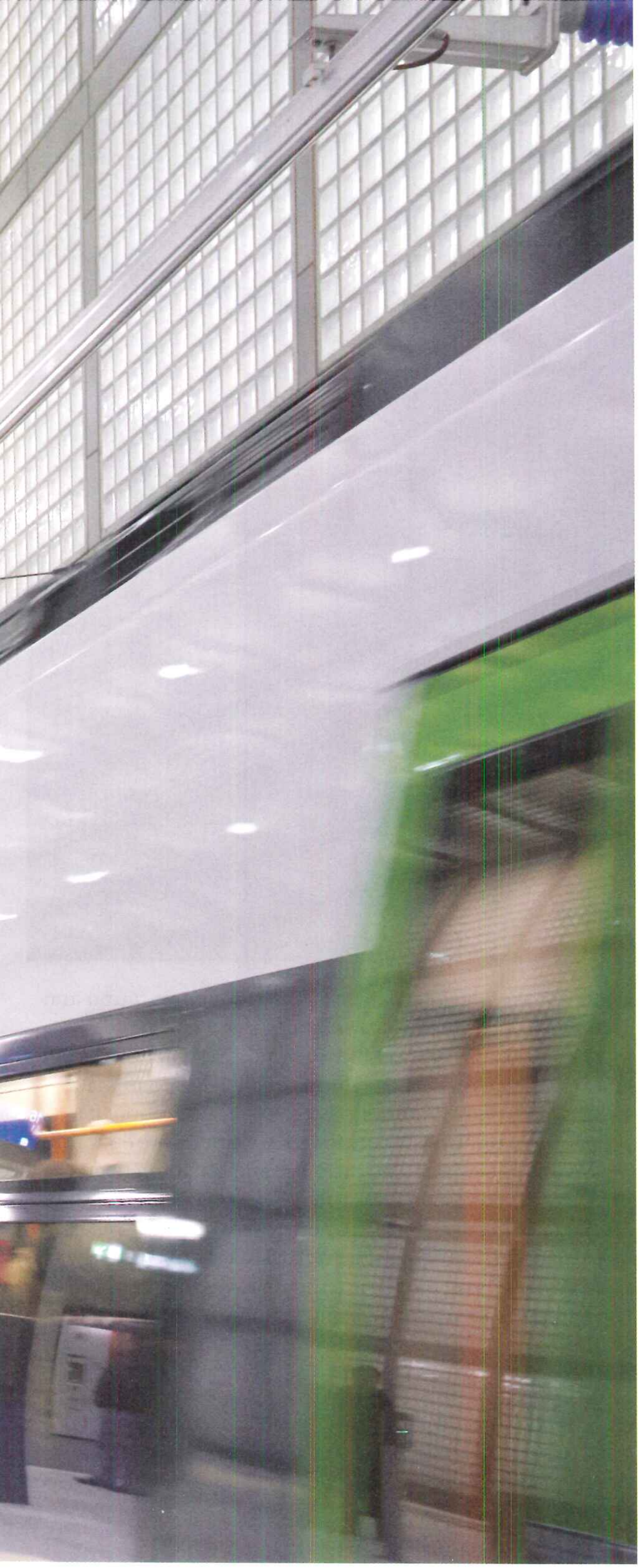
Wilhelm-Leuschner-Platz

Leipzig
Max Dudler Architect
Licht Kunst Licht

By Mary Pepchinski

THE WILHELM-LEUSCHNER-PLATZ station lies 60 feet under the inner city of Leipzig, yet architect Max Dudler, who is based in Zürich, Frankfurt, and Berlin, wanted to create the impression that this public space is flooded with daylight. The station is one of four stops on the City Tunnel, a below-grade artery completed in 2013 that allows regional trains to pass under Leipzig, located 100 miles southwest of Berlin.

At its core, the Wilhelm-Leuschner-Platz station is a cavernous reinforced-concrete shell measuring 80 feet wide, 60 feet high, and 460 feet long, with ceiling girders spanning the width at 5-foot intervals. To create the illusion of a daylit



LIGHT SHED
Part of a greater four-station City Tunnel project in Leipzig, the Wilhelm-Leuschner-Platz station is clad with glass block at both its street-level entrance (above) and underground, filtering daylight from above and backlit around the platform for daylight-like illumination underground (left).

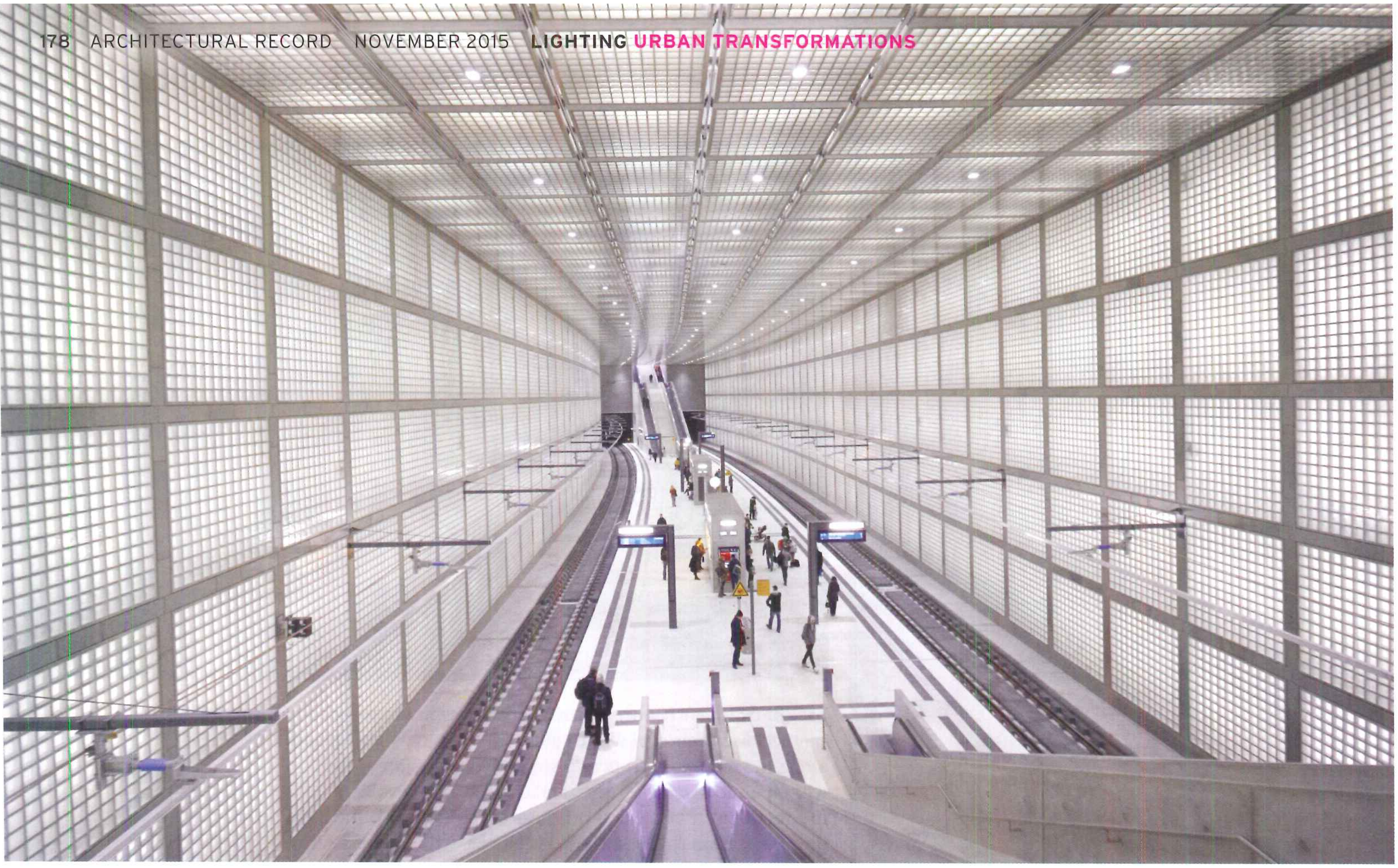
space, the architect masked the structure and kept the architectural design simple. For their part, collaborating lighting designers Licht Kunst Licht "strove to minimize the visual impact of the lighting fixtures, and have the light appear to emanate from the architecture," says lead designer Edwin Smida.

First the concrete shell and girders were painted white. Then the architect inserted a continuous semitransparent glass-block surface, held in place by a 10-by-10-foot grid of thin reinforced-concrete strips, leaving gaps of 5 feet from the walls and 6½ feet from the ceiling. The glass block is backlit by linear fixtures with T16 fluorescent lamps—chosen because their cool white color resembles daylight—placed along the rear of the concrete strips to direct light at the white-painted walls, girders, and ceiling. This results in indirect light that reflects off these surfaces and bounces out into the station through the glass blocks, which have a satin-finish on the back side and are transparent toward the platform. For commuters, it is like looking out onto a foggy day. "One does not feel claustrophobic," notes Edwin Smida,"not only because of the unusual height, but also because we wanted to give the feeling of limitless space, like being outdoors."

Three parallel rows of surface-mounted metal halide luminaires run the length of the ceiling. Unlike the wall fixtures, these are installed behind thin glass brick with 90 percent transmission, providing direct illumination to accent people and objects on the platform. These fixtures are also clustered above the ends of the platform, to illuminate the stairs and escalators leading to the street above. Two ceiling tracks, also placed along the length of the station, guide adjustable telescoping wagons to maintain and clean the glass blocks.

In keeping with the station's minimalist aesthetic, three rectangular concrete boxes on the platform contain signage, advertising, and seating, and also house recessed, vandalism-proof luminaires with linear fluorescent lamps, which provide emergency lighting. At street level, wall-washing projectors equipped with asymmetrical wide-beam distribution and metal halide lamps illuminate the entrance pavilions, made of panels of transparent glass blocks and panes.

Descending from the city to the platform, the underground station initially appears dim when compared to daylight, even on an overcast day. Yet when one spends time there—as many commuters and travelers certainly do—one quickly adjusts to the reduced brightness, and the ruse that there is daylight takes over. Although the ceiling effect is less convincing, because the densely positioned girders impede an even reflection of light, the glass-block



UPSTAIRS, DOWNSTAIRS
Each end of the 460-foot light-filled platform (above) has two entrances. There are stairs and escalators at each (right) to transport passengers in and out of the 60-foot-deep station.

walls aid the illusion that this station is aboveground and that natural light shines through.

The station doesn't feel like typical infrastructure. Ignore the arrival and departure signage, and one could mistake the gridded, glazed interior for a place of meditation: it's surprisingly calming. If only for a few minutes while waiting for a train, the minimalist aesthetic and the impression of daylight offer a respite from urban stress and mitigate the reality of being deep below the city. "We wanted to restore a sense of dignity—and maybe even splendor—to this space of everyday life," says project architect Christof Berkenhoff, "and create a place where people will like to be." ■

credits

ARCHITECT: Max Dudler – Max Dudler, principal; Christof Berkenhoff, project architect

LIGHTING DESIGN: Licht Kunst Licht – Andreas Schulz, Edwin Smida

ENGINEERS: Pichler (structural)

CONSULTANTS: WINTER (lighting); Graner (acoustic)

GENERAL CONTRACTOR: Ed. Züblin

CLIENTS: Deutsche Bahn, City of Leipzig, State of Saxony, Federal Republic of Germany

OWNER: Leipziger Verkehrsbetriebe (LVB)

SIZE: 56,800 square feet

COST: approximately $20 million

COMPLETION DATE: December 2013

SOURCES

LIGHTING: Norka (interior); Bega (exterior projectors)

GLASS BLOCK: Seves

FLOORING: Freese, Ammelstädt (platform)

PRECAST CONCRETE: Guido Teschner


MORE BRILLIANT
THAN EVER
MEGALŪM
DOWNLIGHT | CYLINDER
High lumen downlighting up to 16,500 lumens
Designed for ceiling heights up to 60ft and above, the Prescolite Megalum is the highest output LED downlight (MD8LED) and cylinder (MC10LED) in the market.
With an extensive variety of outputs, beam angles, kelvin temperatures, and control options, the Megalum can be configured for a multitude of high ceiling applications.
You Tube
prescolite
http://www.prescolite.com
CIRCLE 70
HUBBELL®
Bob Jones University- Greenville, SC


jeg drømmer om sol og sommer jeg drømmer om skiferie jeg drømmer om at flytte til mars jeg
drømmer om plads til fantasifuldhed jeg drømmer om penge jeg drømmer om større rummelighed
jeg drømmer om en kongepuddel jeg drømmer om at rejse jorden rundt jeg drømmer om at komme
hjem jeg drømmer om fred i verden jeg drømmer om at blive stor jeg drømmer om et langt liv
med min kone jeg drømmer om næstekærlighed jeg drømmer om at kunne udnytte mine muligheder
jeg drømmer om at holde kontakten jeg drømmer om et hus i italien jeg drømmer om en verden
uden krig jeg drømmer om silent angels jeg drømmer om en gavl uden kunst jeg drømmer om at
vågne jeg drømmer om gensidig respekt blandt os jeg drømmer om et liv i frihed jeg drømmer
om at vores søn får et godt liv jeg drømmer om ferie jeg drømmer om at få lov til at blive
gammel jeg drømmer om bosnien og hercegovina jeg drømmer om hende på anden sal jeg drømmer
om en tur til venedig med min mand jeg drømmer om at få mine drømme opfyldt jeg drømmer om
at være ydmyg jeg drømmer om dengang danmark vandt em i fodbold jeg drømmer om at male jeg
drømmer om at møde min mand igen jeg drømmer om at gå på styltер uden at falde og slå mine
knæ jeg drømmer om duften af gule rapsmarker og nyslået græs jeg drømmer om mere i løn jeg
drømmer om at lykkes jeg drømmer om sommerfugle jeg drømmer om et langt liv jeg drømmer om
sommeraftner med grill og vin jeg drømmer om varme himmelstrøg jeg drømmer om grønne træer
jeg drømmer om et sundt liv jeg drømmer om at skrive en bog jeg drømmer om et godt liv med
familie og venner jeg drømmer om at verden bliver mere grøn jeg drømmer om at blive boende
jeg drømmer om en ferrari jeg drømmer om at blive politidame jeg drømmer om at spille godt
på spade jeg drømmer om at få bedre forståelse for livets lys jeg drømmer om at vinde guld
i halvtreds meter crawl ved de olympiske lege jeg drømmer om at leve i nuet jeg drømmer om
mere sikkerhed i gården jeg drømmer om olsenbanden jeg drømmer om en båd jeg drømmer om at
få et arbejde jeg drømmer om at huslejen ikke stiger jeg drømmer om at røre stjernerne jeg
drømmer om gode naboer jeg drømmer om sex jeg drømmer om at gøre en forskel jeg drømmer om
at forstå universets gåde jeg drømmer om at sidde på en lyserød sky jeg drømmer om at være
drengen med guldbukserne jeg drømmer om min nabo jeg drømmer om at gå caminoen jeg drømmer
om kommunisme jeg drømmer om en ipad jeg drømmer om at finde min drømmemand jeg drømmer om
at verden kun er smuk jeg drømmer om at komme ud i naturen jeg drømmer om at bokse lige så
godt som mikkel kessler jeg drømmer om at flytte til ghana jeg drømmer om at kunne opfylde
dine drømme jeg drømmer om at sidde på en af de små caféer i paris jeg drømmer om at valby
vil blive bæredygtigt jeg drømmer om at forblive positiv og glad jeg drømmer om at leve et
langt liv og få familie jeg drømmer om at danse jeg drømmer om at blive musicalstjerne jeg
drømmer om at blive dyrepasser jeg drømmer om et tolvtal og et højt snit jeg drømmer om at
vinde i lotto jeg drømmer om global økologisk balance og høj dyreetik jeg drømmer om at dø
uden smerte jeg drømmer om at vinde en million jeg drømmer om hansi hinterseer jeg drømmer
om at bo tæt på vandet jeg drømmer om at mit liv bliver langt jeg drømmer om at være noget
for andre jeg drømmer om stjerneskud jeg drømmer om et smukt valby jeg drømmer om at bygge
et hus jeg drømmer om efterår og vinter jeg drømmer om dig dag og nat jeg drømmer om at se
mine børnebørn blive voksne og stifte familie jeg drømmer om at kunne rappe jeg drømmer om
at møde messi jeg drømmer om rabarberkage i solen jeg drømmer om at tiden stod lidt stille
jeg drømmer om kvinden i mit liv jeg drømmer om at blive danmarksmester i længdespring jeg
drømmer om en sikker fremtid for mine børn jeg drømmer om at komme i cirkus jeg drømmer om
at blive skuespiller jeg drømmer om mindre fattigdom i verden jeg drømmer om at flytte til
udlandet og arbejde jeg drømmer om at der vil være plads til alle jeg drømmer om højere su
og flere pladser på ungdomsuddannelser jeg drømmer om hygge med vennerne jeg drømmer
vi må have hund jeg drømmer om smukke sommerblomster jeg drømmer om at

The Wall of Dreams

Copenhagen
Ramboll Group with Morten Søndergaard

By Chris Foges

COMMISSIONED TO create a public artwork as part of a housing-project renovation in Copenhagen, poet Morten Søndergaard sought to express the individuality of the residents in counterpoint to the anonymity of the architecture. His text-based work, covering a six-story, 2,700-square-foot street-side elevation made of precast concrete panels, would proclaim the residents' private hopes and unspoken longings.

For more than 18 months, he solicited 350 contributions from tenants, whose secret desires ranged from the material to the spiritual, the sublime to the ridiculous. "I dream about making a difference," said one. "I dream about the woman on the second floor," confessed another. "I dream of rhubarb cake in the sun," revealed a third. From this haul, Søndergaard selected 117 short phrases to form a continuous, unpunctuated prose poem.

As a verbal rather than visual artist, Søndergaard was teamed with the Ramboll Group, architect of the building's renovation, to give physical expression to the idea and to handle its execution in anodized aluminum, to match cladding used elsewhere. Søndergaard's initial assumption was that the piece would be designed primarily for daytime viewing, but there was a small budget for floodlights to illuminate the wall like a billboard at night. "That's where I came in," recalls Ramboll lighting designer Vladan Paunovic. "I argued that it would be better to have nothing than to have floodlights, as they wouldn't work with the materials or the concept," he said. "For dreams, a more subtle approach was needed."

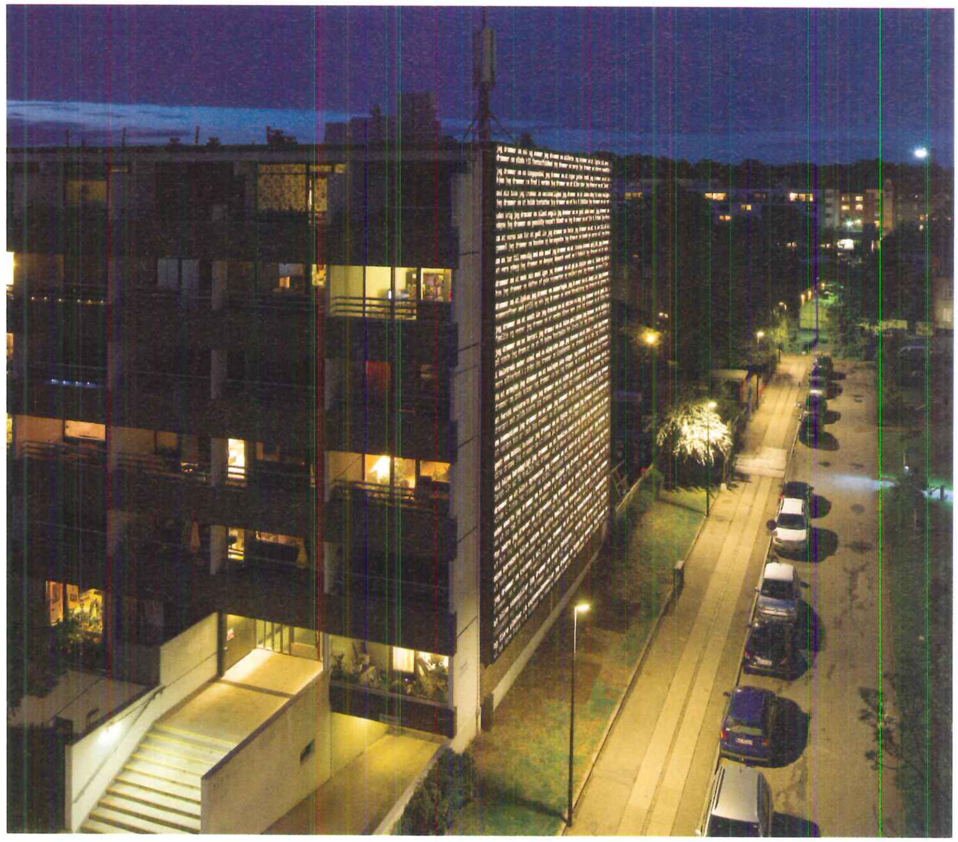
Paunovic proposed that the installation should work both by day and night, but with a greater presence in the hours of darkness. His concept takes the form of a giant lightbox faced with aluminum panels on which the words of the poem are laser-cut in foot-high type. In daylight, it is unobtrusive, and the shaded letter holes are hard to decipher against the dark metal surface; text becomes texture. At dusk, however, as trees and buildings recede into the night, the script begins to glow. "My idea was that light should appear to radiate from this artwork," says Paunovic. "It is a metaphoric rather than a purely functional use of light, to illustrate that the dreams belong to the inhabitants of the building."

To evoke an appropriately dreamlike atmosphere, the designers wanted the illumination to be "as smooth as possible, soft and warm, like candlelight," says Paunovic. Custom-made fixtures give an even light with a warm color temperature of 2700K. A regular array of 20 LEDs is distributed along each of 115 10-foot-long linear fixtures that are attached horizontally to the back of the aluminum panels, which are 4 inches from the building. They point inward toward the wall, where a reflective back panel acts as a diffuser, bouncing indirect light through the perforations in the metal facade.

The light's intensity varies: at sunset, when there is still some ambient daylight, the LEDs produce their maximum output—around 880 watts—but dim down to 20 percent of that by the middle of the night. Controls incorporating an astronomical clock adjust the schedule throughout the year.

A full-scale mock-up was used to test the stability of the perforated aluminum and to convince city authorities that the artwork adhered to strict rules on light pollution. No direct light reaches neighboring apartments, and the overall level of illuminance is lower than that from existing street lighting. Experiments with letter sizes and the chosen typeface—a customized lower-case Courier—ensure that the text is legible from an adjacent public square intended as the principal vantage point.

"People now gather in the square every evening," says Paunovic, and residents report that the Wall of Dreams has become a landmark on guided tours of the district. In drawing out the individuality of the inhabitants, Ramboll and Søndergaard have lent a powerful sense of place to a nondescript space. ■



GLOWING ALLEGORY Poet Morten Søndergaard worked with Ramboll Group to create a luminous installation based on the wishes of this public-housing project's residents.

credits

DESIGN TEAM: Ramboll Group – Vladan Paunovic, lighting designer; Sidsel Gelting Hodge, Katja Waagepetersen, project architects; Lars Jevanord, building architect; Jannik Løngren Karlsen, site supervisor

CONSULTANT: Morten Søndergaard (artist and poet)

GENERAL CONTRACTOR: Enemaerke & Petersen

CLIENT: Domea

SIZE: 2,700 square feet

COST: Approximately $90,000

COMPLETION DATE: May 2015

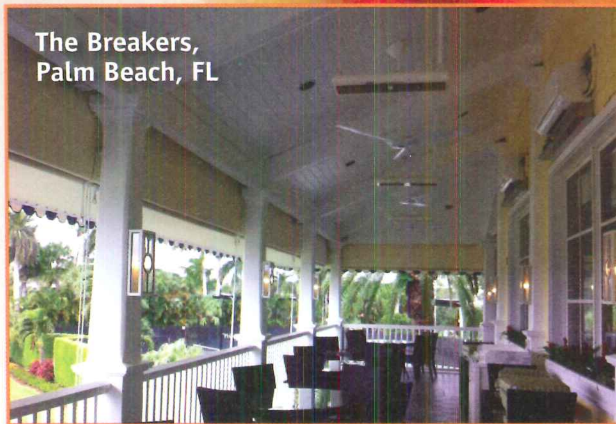
SOURCES

CLADDING: Muncholm

LIGHTING: SpektraLED (fixtures); Osram (LEDs)

CONTROLS: EldoLED; e:cue

Radiant Infrared Heating Technology


The Breakers, Palm Beach, FL


NEW Solaira ICR Series for recess applications


New York Presbyterian Hospital, NY


New York Palace Hotel Courtyard New York, NY

Solaira Commercial Electric Infrared Heaters are engineered for architecturally sensitive indoor/outdoor heating on patios, decks and waiting areas. Solaira technology converts 91% of the energy consumed into directional, comfort heating. Solaira Heaters achieve full output within 1 second and can also be controlled with digital variable controls, thermostatic, timer and occupancy sensors to minimize consumption.

- Virtually unaffected by wind
- Waterproof engineering
- Color options available to suit

Solaira

The Architect and Engineers Choice

In association with members of:

ASHRAE Advancing HVAC&R to serve humanity and promote a sustainable world · AIA · American Society of Landscape Architects

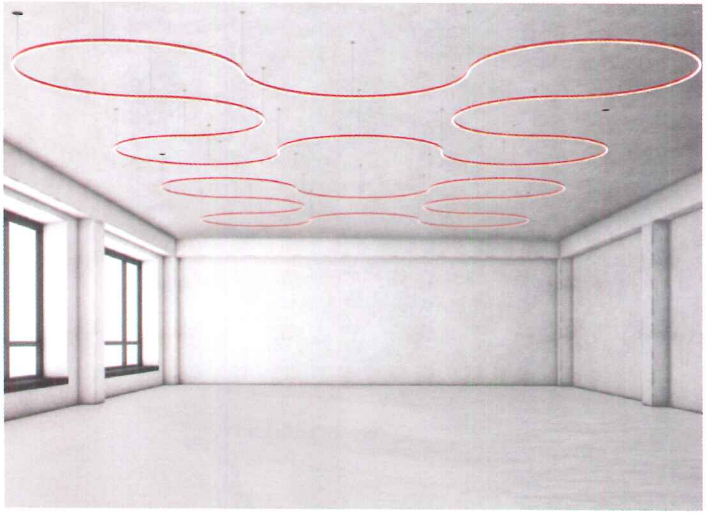
CIRCLE 134

www.SolairaHeaters.com
866-321-8373

products lighting

LED FIXTURES CONTINUE TO PROVE THAT YOU CAN BE ENERGY-EFFICIENT WITHOUT COMPROMISING AESTHETICS.

BY JULIE TARASKA



Bow

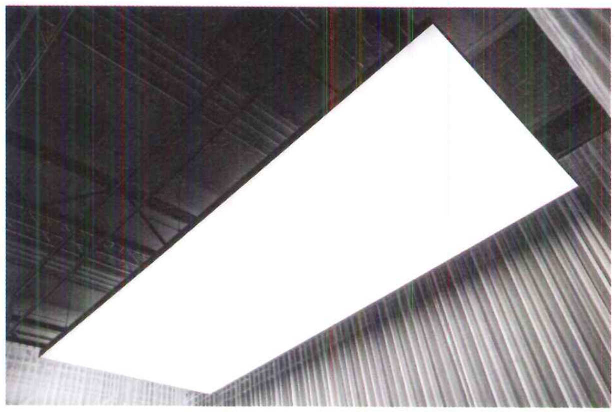
While searching for a shape suitable for LED technology, Nada Nasrallah and Christian Horner hit upon the design for this metal floor lamp. The slim shade enhances the arc shape of the fixture, while an integral LED module in its head emits the equivalent of 180W of warm white light. Ligneroset.com

CIRCLE 156

Moonring

Comprising a flexible LED source woven within a 1-inch housing of varying lengths, Moonring can be specified as individual luminaires or joined together to form a wide variety of customized S-shape and curvilinear configurations. Dimmable, the units are available in 3,000K, 3,500K and 4,000K CCT. They also may be suspended or surface-mounted. alwusa.com

CIRCLE 157



OneSpace

Made with a single panel less than 5 inches thick, this custom luminous ceiling provides a dimmable, uniform sea of LED light. Sizes range up to 33' x 10', with mounting options including free-hanging, ceiling-mounted, or recessed. Three different color temperatures and an NRC of 0.75 round out the offering. philips.com

CIRCLE 158

002 LED Bulb

A variation on the company's original 002 bulb, which uses CFLs as its light source, this LED version is both dimmable and more energy-efficient than its predecessor. It emits the equivalent illumination of a 25W incandescent, making it ideal for ambient lighting in hotels, bars, hallways, and sleeping areas. plumen.com

CIRCLE 159

LEDge

This lightweight sconce comprises just two pieces: a solid-cast aluminum body with integrated heat sink and an opaque PMMA acrylic lens to diffuse the LEDs inside. Able to be mounted with the light facing up or down, the fixture offers 700 lumens of illumination. It's also available in multiple colors and surface finishes. richbrilliantwilling.com

CIRCLE 160

Aero

Offered in 22 finishes, as well as with outer and inner shades in two tones, this LED fixture meets a wide range of needs and preferences. It comes in arm, stem, and pendant options, and in two sizes and light outputs (840 and 1260 lumens). Made on demand, it can only be ordered through company showrooms and dealers. troylighting.com

CIRCLE 161

Cora

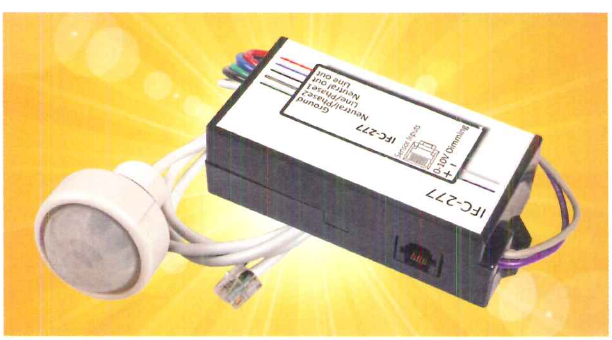
This machined-aluminum pendant by Karl Zahn contrasts stark metal with warm illumination. Available in 2-, 4-, and 8-light configurations, it features 12W LEDs that produce an ambient 432 lumens in total. Comes in four finishes. rollandhill.com

CIRCLE 162

Warp 9 Solar LED

This 100% solar-powered aluminum fixture for lighting roadways, parking lots, and walkways operates independently of electrical grids. It is available in IESNA Type II, III, IV, and V light-distribution patterns and may be mounted on a pole or other surface. Each unit also stores a minimum of five days' power to ensure backup in inclement weather. sepco_solarlighting.com

CIRCLE 163



IFC Standalone Controller

Programmable via an Android app, this in-fixture device uses sensors and a built-in clock to power up, turn off, or dim fixtures based on any combination of light level, motion, and schedule. Each unit offers up to 4 amps of electrical load and supports 120 to 480 VAC indoor and outdoor applications. hubbell-automation.com

CIRCLE 165

Fiora

Designed around a T6 ceramic metal halide source, this pole-mounted luminaire uses a series of reflectors to direct light beams up and then downward, creating uniform pools of low-level illumination. The device—made of cast aluminum, acrylic, medical-quality plastic, and tempered glass—is available in a choice of two wattages and four optical configurations. hessamerica.com

CIRCLE 164


Crush
your to-do list.
Cherish
your holiday.
Amerlux helps you slice through your design to-do list in time to celebrate the holidays.
In two short weeks, we'll turn around your order for Hornet® Downlight, Linea® 1.5", Cylindrix® III Mini, or our amazing new Murro®.
Rediscover joy at holiday time, with a little help from amerlux.com/holidayquickship.
Follow us on Twitter @AmerluxLighting.
amerlux
Passion. Power. Performance.
Hornet® Downlight
Linea® 1.5"
Cylindrix® III Mini
Murro®
CIRCLE 6

Information you can count on.

Even if you're a veteran lighting professional, you never stop learning. The Lighting reSOURCE features information, education and inspiration powered by over 100 years of expertise to energize your lighting career. From LED toolkits and photo galleries to original feature content on emerging lighting trends, The Lighting reSOURCE gives you 24/7 access to the information you need to deliver world-class results. Enhance your lighting knowledge at **TheLightingResource.Eaton.com**.

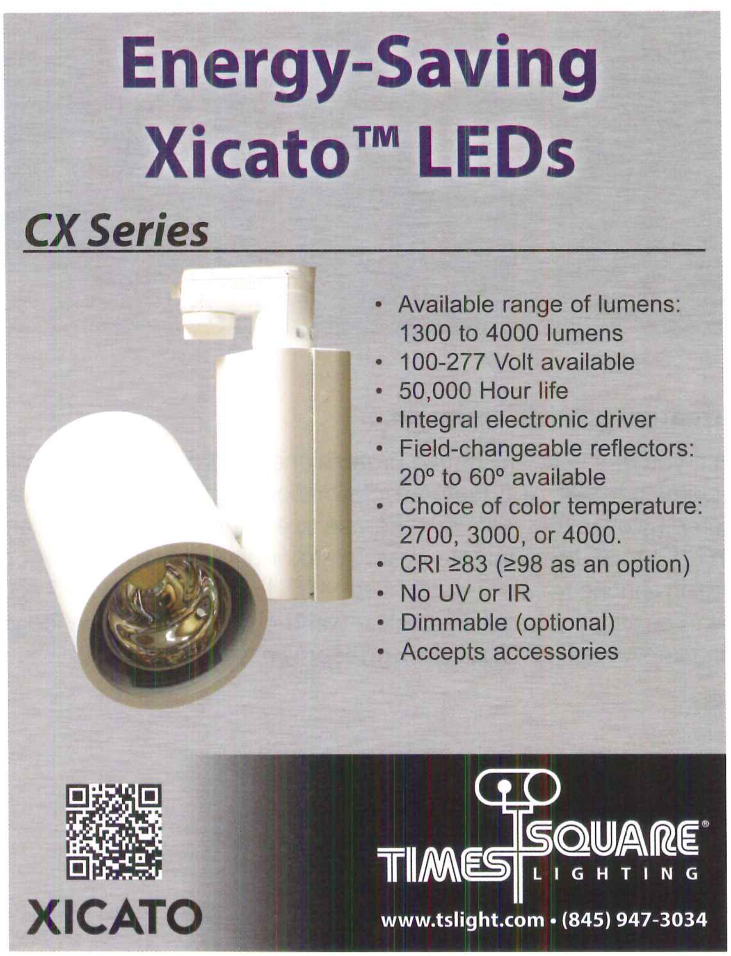
CIRCLE 32

EATON

Powering Business Worldwide

Follow us on social media to get the latest product and support information.


Architectural Record
is always a click away.
ARCHITECTURAL
RECORD
Have you connected?
G+
in


Energy-Saving
Xicato™ LEDs
CX Series
• Available range of lumens: 1300 to 4000 lumens
• 100-277 Volt available
• 50,000 Hour life
• Integral electronic driver
• Field-changeable reflectors: 20° to 60° available
• Choice of color temperature: 2700, 3000, or 4000.
• CRI ≥83 (≥98 as an option)
• No UV or IR
• Dimmable (optional)
• Accepts accessories
XICATO
TIMES SQUARE LIGHTING
www.tslight.com • (845) 947-3034


THE SKYSCRAPER MUSEUM
For exhibitions and programs:
www.skyscraper.org
39 Battery Place, NY, NY 10280 I Wed.-Sun., 12-6

ARCHITECTURAL RECORD

RECORD ON THE ROAD

December 2, 2015 • 5:00PM – 8:00PM
Dallas, TX Nasher Sculpture Center • 2001 Flora Street

Schools of the 21st Century

Design matters when it comes to education, and more cities around the country are realizing that as they consider new school construction. In the city of Dallas, home to one of the largest and most diverse school districts in the country, over 200 schools serve almost 200,000 students.

The K-12 public school systems in the greater Dallas-Fort Worth area educate several hundred thousand students and feature many of the nation's top-ranked schools. Dozens of new school buildings, additions, and renovations are planned in the next few years. Their designs incorporate healthier, more sustainable spaces, as well as opportunities for individual and collaborative study in both formal and informal settings.

In this symposium, Record will explore innovative school buildings in Dallas and elsewhere with the architects who are shaping these new types of learning environments.

Agenda

Earn 2 AIA LUs

4:00 PM - 5:00 PM **Registration**

5:00 PM - 6:00 PM
CertainTeed Sponsored CEU Symposium

6:00 PM - 7:15 PM
Editorial Program

Panelists: **Mark Vander Voort, AIA,**
Principal, Education Group Director, HKS
Peter Brown, AIA, Principal, Peter Brown Architects

Moderator: 
Cathleen McGuigan,
Editor-in-Chief
Architectural Record

7:15 PM - 8:00 PM **Networking Reception**

Key Corporate Sponsor CertainTeed SAINT-GOBAIN

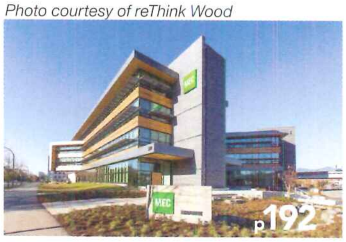
Product Gallery Sponsors NICHIHA fiber cement *the power of possibilities* OWENS CORNING®

Register Today at RecordontheRoad.com

CONTINUING EDUCATION

In this section, you'll find ten compelling courses highlighting creative solutions for tomorrow's buildings—brought to you by industry leaders. Read the courses and then go to our Online Continuing Education Center at ce.architecturalrecord.com to take the tests free of charge to earn AIA/CES Learning Units (LUs).

Photo courtesy of reThink Wood



Disruptive–and Green

Sponsored by
Mitsubishi Electric Cooling & Heating, MP Global Products, LLC, PIMA – Polyisocyanurate Insulation Manufacturers Association, reThink Wood, and Simonton Windows & Doors

BE | PM | SU

CREDIT: 1 HSW, 1 GBCI CE HOUR

Photo: ©Mark Herboth Photography LLC

Building Materials Matter

Sponsored by
reThink Wood

LS | PM | ST

CREDIT: 1 HSW, 1 PDH, 1 GBCI CE HOUR

Photo courtesy of MKA

Weight Watching: Adaptive Reuse with Structural Steel

Sponsored by
the Steel Institute of New York

PM | RR | ST

CREDIT: 1 HSW

Photo courtesy of Guardian/Greg Benson Photography

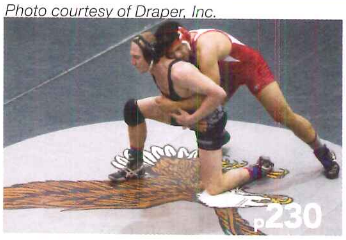
Daylighting Design Update

Sponsored by
Guardian Industries Corp.

BE | PM | SU

CREDIT: 1 HSW, 1 GBCI CE HOUR

Photo courtesy of Draper, Inc.



Safety in the Gym: Specifying Equipment to Protect Users and Spectators

Sponsored by
Draper, Inc.

EM | LS | PM

CREDIT: 1 HSW

Image courtesy of Sefaira

Performance Matters!

Sponsored by
Sefaira, Inc. and SketchUp

BE | PMD | SU

CREDIT: 1 HSW, 1 GBCI CE HOUR

Photo courtesy of Garaventa Lift

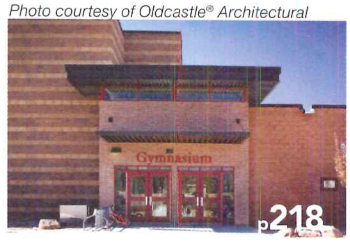
Accessibility, Safety, and Platform Lifts and Elevators

Sponsored by
Garaventa Lift

ACC | LS | PM

CREDIT: 1 HSW

Photo courtesy of Oldcastle® Architectural



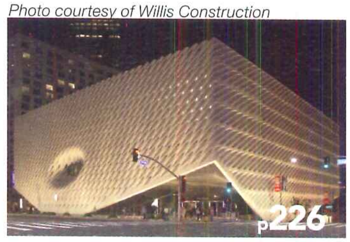
Controlling Moisture in Masonry

Sponsored by
Oldcastle® Architectural

BE | PM | SU

CREDIT: 1 HSW

Photo courtesy of Willis Construction



High-Performance Aesthetics in Precast Concrete

Sponsored by
Precast/Prestressed Concrete Institute

BE | LS | PM

CREDIT: 1 AIA LU

Photo courtesy of Lutron Electronics Co., Inc.

A New Methodology for Successful Daylighting Design

Sponsored by
Lutron Electronics Co., Inc.

IN | PM | SU

CREDIT: 1 HSW, 1 GBCI CE HOUR, 1 IDCEC CE HOUR

CATEGORIES

ACC ACCESSIBILITY
BE BUILDING ENVELOPE DESIGN
EM ELECTRICAL AND MECHANICAL
IN INTERIORS
LS LIFE SAFETY AND CODES
PM PRODUCTS AND MATERIALS
PMD PRACTICE, MANAGEMENT, DIGITAL TECHNOLOGY
RR RENOVATION AND RESORATION
ST STRUCTURAL
SU SUSTAINABILITY

Photo courtesy of reThink Wood

Headquarters for outdoor retailer Mountain Equipment Co-Op, by architect Hugh Cochlin with Proscenium Architecture + Interiors, uses fir and glued-laminated timber columns and beams with nail-laminated timber floor decks.

Disruptive–and Green

A few technologies have radicalized sustainability. Here are five.

Sponsored by Mitsubishi Electric Cooling & Heating, MP Global Products, LLC, PIMA – Polyisocyanurate Insulation Manufacturers Association, reThink Wood, and Simonton Windows & Doors | *By C.C. Sullivan*

Integration and holism are hallmarks of sustainable design today. In fact, being green is all about being the ultimate design polymath—or to use an antiquated term, a true Renaissance man (or woman). Green building requires some knowledge, if not mastery, of everything from transportation analysis and life-cycle assessments (LCAs) to mechanical engineering and materials chemistry. No wonder sustainability consultants are in such high demand.

One of the truisms of this complex and multidisciplinary world of green building has been that no single product or system can, on its own, make a building green. Yet it can be argued that a number of specified items do have, in fact, an outsize influence on the building's success. A few relatively recent innovations have shown that incremental and sometimes sudden game-changing advances are possible. Some have humble beginnings—industrial lint from fiber spinning, for example, long a waste stream in search of a purpose—while others hail from America's heyday in aerospace invention. These novel creations have influenced how architects and interior designers even define and measure sustainable performance.

This learning unit considers five innovative products or systems on the market today that have disrupted and realigned the world of sustainable design. Two of them play unique support roles: closed-cell insulation and recycled-fiber floor underlayments, while another is a structural system: mass timber.

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. Explain how building materials and systems such as ductless HVAC and structural timber systems affect building sustainability and carbon footprint.
2. Discuss how building envelope design, particularly insulation choice and thermal bridging at window frames, impacts building energy efficiency and sustainability.
3. Describe how building materials and product solutions, including underlayments and other unseen elements, can improve building occupant health and productivity.
4. List recent trends in product development and application that impact building performance and sustainability.

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

AIA/CES COURSE #K1511M
GBCI COURSE #0920005783

The highly energy-efficient variable refrigerant flow (VRF) zoning system was used in Hotel Wilshire, which earned key LEED credits.

Two others are unitized products delivering novel advances in their categories: ductless split air-conditioning and vinyl-clad and -framed fenestration assemblies. While they are all very different with unique potential impact on green building projects, each one has had a disruptive effect on the trajectory of underlying green design trends.

FROM ASIA WITH LOVE: VRF AIR-CONDITIONING

Let's start with a technology for more flexible and efficient HVAC systems, called variable refrigerant flow zoning, or VRF. More and more, architects worldwide are adopting these products pioneered in Japan that, similar to ductless mini-splits, push conditioned refrigerant rather than air to spaces requiring cooling or heating. This is a radical notion in the United States, where more than three-quarters of buildings and residences use ducted conditioning. Yet, for the green building world, the rate of adoption is high, with increasing use on the commercial side. Why?

First, the systems are highly efficient and also eliminate thermal losses and leaks associated with ductwork, which "can account for more than 30 percent of energy consumption for space conditioning, especially if the ducts are in an unconditioned space such as an attic," according to the U.S. Department of Energy (DOE).[1] Second, "Personal comfort control requirements are driving the use of VRF in assisted living facilities, health and wellness facilities, college dormitories, classrooms and more," says Kevin Miskewicz, senior manager of commercial marketing for Mitsubishi Electric US Cooling & Heating. "The individual control aspect as well the emphasis on personalized comfort makes VRF a disruptive technology in the relatively staid world of HVAC systems."

LUMBER GOES BIG TIME: MASS TIMBER STRUCTURES

A second area of unexpected yet radical change is in structural systems, where mass timber is suddenly competing with concrete, steel, and unit masonry. Embraced enthusiastically by some architects, these systems include cross-laminated timber (CLT), glue-laminated timber (or glulams), and also nail-laminated timber (NLT, or nail-lam), which is created from dimensional lumber stacked on edge, fastened together with nails, and often topped with plywood sheathing to create a structural diaphragm. (One architect called the concept "plywood on steroids.") All these thick panels and massive columns and joists are being used for midrise projects in North America and Europe up to 15 stories high, with projects on the boards that will create innovative skyscrapers—of timber.

According to the USDA's Forest Products Laboratory, next-generation lumber and mass timber products are becoming the latest innovation in building, enabling longer wood spans, taller walls, and higher buildings. And it's not just the time-tested benefits of timber driving this adoption. "Wood can contribute considerably to reducing carbon emissions associated with the built environment—both embodied and operational," adds Rebecca Holt, a LEED-accredited sustainable building advisor and senior researcher with Perkins+Will, because wood stores carbon and simultaneously offsets emissions from conventional building materials. Plus, there's also the pure excitement of the notion. A recent study by Perkins+Will on tall wood buildings and a TEDtalk by architect Michael Green on wood skyscrapers, for example, have become viral sensations.


IF YOUR BUILDING PLANS CALL FOR NEXT GENERATION HVAC TECHNOLOGY, YOU'RE READY FOR MITSUBISHI ELECTRIC.
Location provided by Cooper Cary – The Center for Connective Architecture

SPACE-AGE R-VALUE: CLOSED-CELL POLYISO

In a very different arena, carbon emissions have been a target for advanced building enclosure designs, including the continuous insulation (CI) detailing that cuts thermal losses, reduces condensation and eliminates thermal bridges, among other benefits. One of the unexpected materials to attain great prominence in this trend has been rigid polyisocyanurate foam sheathing with a foil facer, a technology adopted in the aerospace industry in the 1960s that became a staple of roof systems and premade ductwork just a decade or two later. The reasons were similar to those that made polyiso perfect for spacecraft: the highest R-value per inch of any common construction material, good fire performance, and a long service life.

"For sustainable design, polyiso is shown in life-cycle studies to be among the least burdensome on future generations in terms of energy savings or carbon emissions reductions, as a recent study by McKinsey showed," says Jared Blum, president of the polyiso manufacturer group, PIMA – Polyisocyanurate Insulation Manufacturers Association. "For each one unit of energy to produce insulation, the return is 32 to 33 units of energy saved." This story of durability and return on investment is a lasting dividend of the Space Race, now applied without interruption across the opaque portions of entire building facades.

Photo courtesy of PIMA – Polyisocyanurate Insulation Manufacturers Association

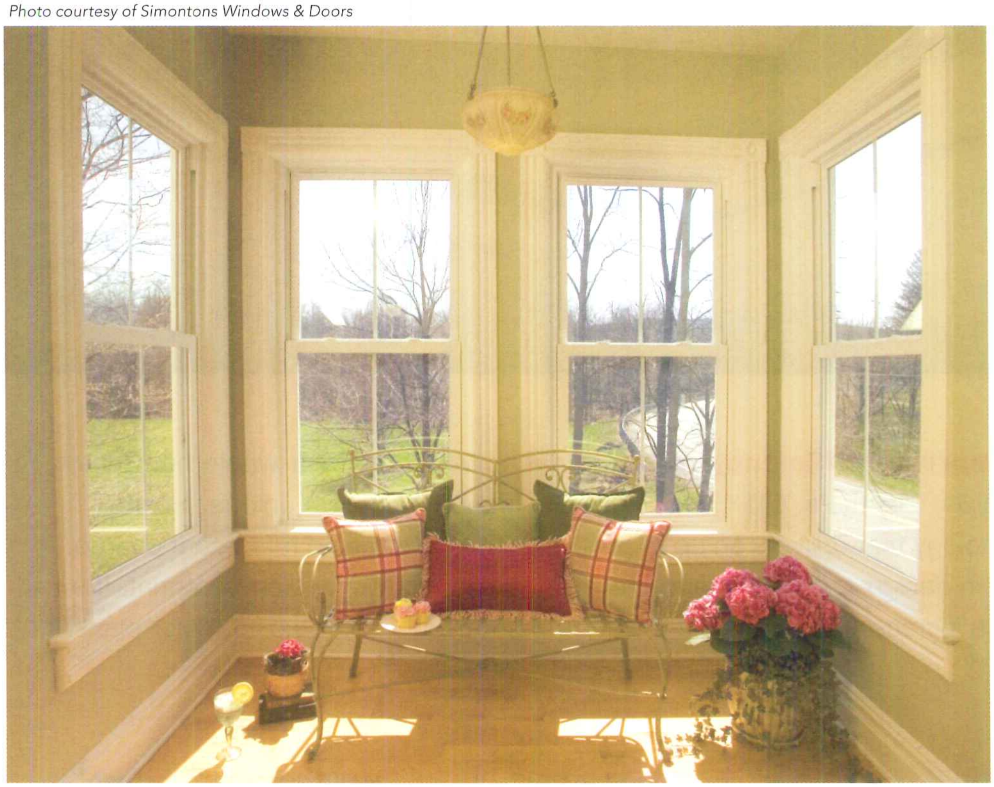
For the Weinberg Commons affordable housing renovation in Washington, D.C., the Passive House certified building with very low energy usage was designed by architects Matt Fine and Bruce Zavos of ZA+D.

BRIDGE-FREE FRAMES: LASTING VINYL FOR WINDOWS

In a related development, a technique for improving envelope performance with materials that last virtually forever is the use of integrated and exposed vinyl fenestration systems. These include the so-called fusion-welded frames and sashes that create windows with a strong, precision-engineered interlock to the envelope. Several benefits are making vinyl a preferred green spec for fenestration, even as it may raise eyebrows as a choice for other building materials: First, its maintenance needs are negligible, and second, the resulting window and door assemblies have very good thermal properties.

"The airtight seal of many vinyl windows also ensures the occupied spaces are sealed from drafts that increase the need for heating and cooling costs," says Megan Mazur, a marketing director at Simonton Windows & Doors. "Combined with laminated glass, they offer excellent noise reduction of up to 50 percent—a key feature as acoustics play a greater role in healthy, sustainable design, and new project certifications like the WELL Building Standard."

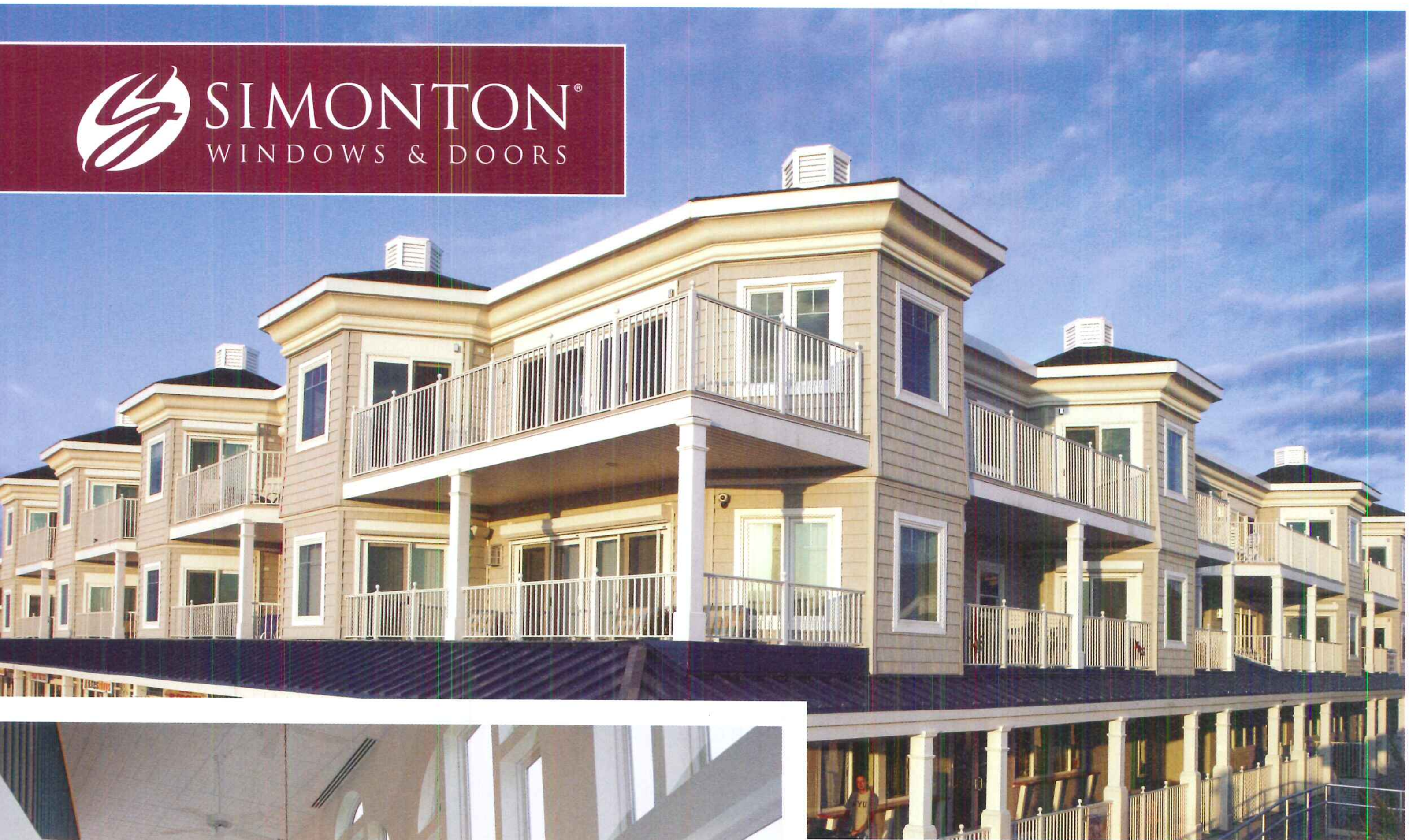
Photo courtesy of Simontons Windows & Doors



This historic bed and breakfast was retrofitted with airtight, double-glazed replacement windows with an Argon gas fill, low-emissivity (low-E) coatings, and vinyl frame construction that reduces thermal bridging and other through-wall energy loss.

HIGH-PERFORMANCE LAYERS: RECYCLED FIBERS UNDERFOOT

Also responding to the need for better interior sound abatement has been a class of floor underlayments for laminate and wood finishes developed recently by companies like MP Global Products. Not only were the layers an improvement on the foams popular in the 1990s—which sometimes had high levels of formaldehyde or volatile organic compounds (VOCs) and, with use, tended to lose bounce as their chemically trapped air bubbles popped—but the new materials also captured a large waste stream that no one was using much for building products: postindustrial and preconsumer recycled textile fibers, which would otherwise be headed for a landfill.


SIMONTON®
WINDOWS & DOORS

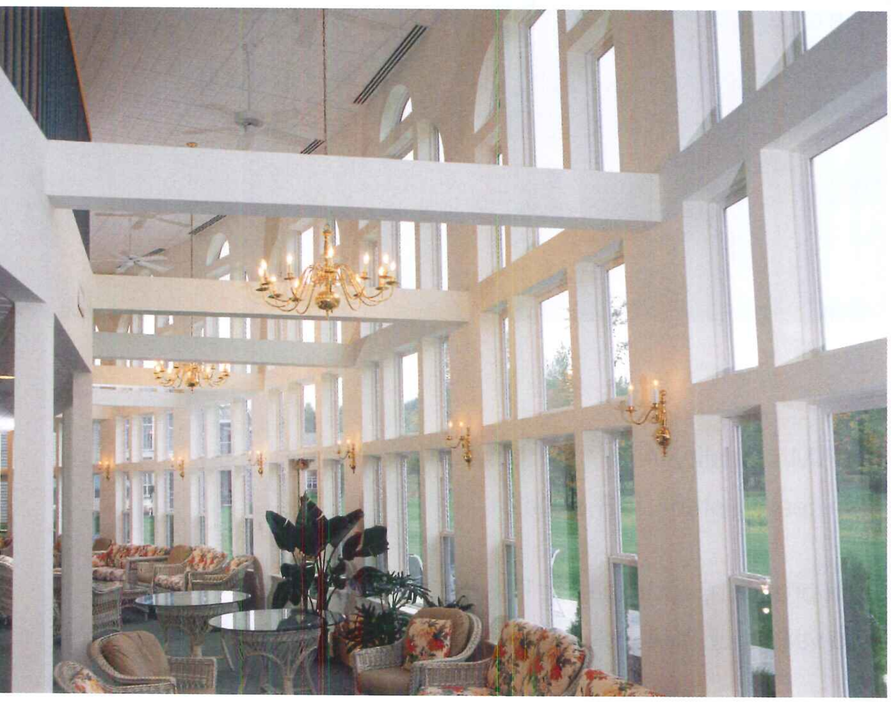
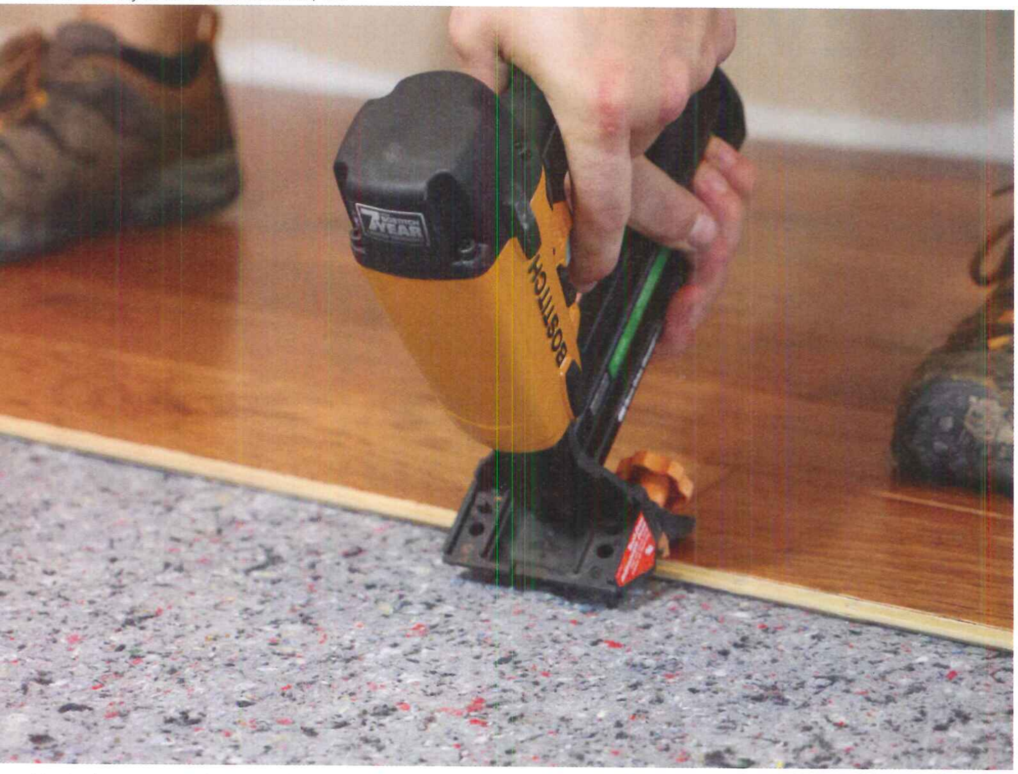


Photo courtesy of MP Global Products , LLC



Underlayments of postindustrial and preconsumer recycled textile fibers are used to cushion the floor, dampen ambient sound, and absorb impact sound.

"We found that by randomly air-laying and then thermally bonding these short fibers together, we were able to create an exceptional capillary effect to cushion the floor, dampen ambient sound, and absorb impact sound," says Duane Reimer, technical director for MP Global. In addition, the recycled filament materials could manage moisture, rather than trap it, and be treated with an antimicrobial, if desired. In this way, this unlikely hero deals with multiple green building needs: acoustics, recycled content, benign resources, and interior mold and air-quality concerns.

Specifying Green: Principles and Practice

From waste fibers and laminated timber to refrigerant piping and space-age thermosets, the constituents of today's green building are evolving rapidly, says Kevin Krumdieck, AIA, LEED AP, a principal and senior project manager at the San Diego-based architecture, interior design, and strategic branding firm, Carrier Johnson + CULTURE. "Product innovations are changing the way materials are being used, and the systems that control building products are becoming more sophisticated," he says, with "smarter" qualities that affect long-term durability as the aging and maintainability aspects of these new systems become better understood.

"Still, architects must balance the value of greater performance with the costs of unforeseen product application limitations," says Krumdieck, sounding a note of caution.

Among the key variables to understand are those measuring the tradeoff between, for example, manufacturing impact and operational benefits. "Is the value-add worth the impact on the environment?" asks PIMA's Blum. "That's why architects look at life-cycle assessments and environmental product declarations, or EPDs, to evaluate sustainability defined as the least burden on future generations." Other new rating programs similarly help to assess the effectiveness of green measures, such as the Healthy Building Network, the Living Building Challenge, Passive House, and the WELL Building Standard, to name just a few.

To warrant specific performance levels, specifiers can rely on independent laboratory testing as well as certifications. For the fiber acoustic underlayment, the key test can be conducted by SCS Global Services, which also qualifies wood, insulation, and carpeting products for recycled content and indoor environmental quality (IEQ) impacts.

One category is composed entirely or predominantly of pre-consumer recycled textile content, yielding high-performance fibers engineered for use under glue-down and nail-fastened hardwood and engineered wood floors. These typically measure about one-tenth of an inch in thickness—enough to smooth minor subfloor imperfections. They include premium underlayment of about 94 percent postindustrial and pre-consumer materials, specified for floating wood and laminate floors, that also compensate for uneven subfloors while quieting impact sound and floor-to-ceiling noise. The roll mats also wick away subfloor or incidental perimeter moisture and disperse it through the pad.

For high-end vinyl flooring in glue-down and floating applications, a 25-mil underlayment and film barrier can be used, though it is not fiber based. The product is a polyethylene film with blended recycled PET fibers and inert hot-melt adhesive, with about 31 percent post-consumer recycled material—PET from plastic bottles. This heavy-duty roll product limits the denting often seen in luxury vinyl flooring (LVF) and dampens ambient sound in areas where it is installed. "The film-type underlayment also acts as an excellent moisture barrier," says Joshua Zinder, AIA, principal of the New Jersey firm of the year, JZA+D. "Sometimes concrete floors allow too much moisture in, so the barrier layer and sealants become important."

With these options for flooring, IEQ improves proportionally with acoustics and air-quality measures, and inversely with moisture levels. The bonus of recycled content adds another green dimension, and the roll materials are shown to maintain integrity and performance for decades of use.

This is good news because underlayment is difficult to access and replace easily, as is the case with cavity insulation and CI materials behind finished exterior walls, Blum notes. "Longevity is now a resuscitated concept of sustainability, which is vital for insulation because it is one of the hardest to replace," he explains.

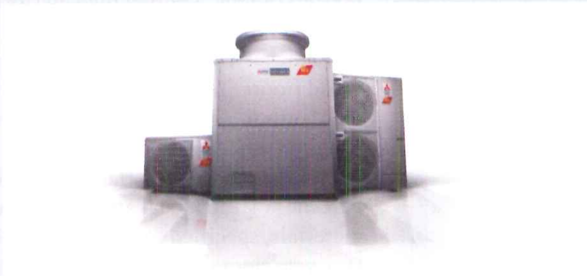
Continues at ce.architecturalrecord.com

C.C. Sullivan is a marketing communications consultant specializing in architecture and construction.

PRODUCT REVIEW

Disruptive–and Green

Mitsubishi Electric Cooling & Heating



M-Series, P-Series, and CITY MULTI® systems

Add highly responsive multi-zone comfort to any building project, in any climate. Mitsubishi Electric's CITY MULTI H2i® R2- and Y-Series VRF systems provide you with flexibility to fit the needs of any building. Enjoy 100% heating capacity at 0°F outdoor ambient, and 85% heating capacity at -13°F outdoor ambient.

MitsubishiPro.com/Ready Circle 120

MP Global Products, LLC

Photo courtesy of MP Global Products, LLC

LuxWalk®

LuxWalk® is an acoustic underlayment for glue-down and floating Luxury Vinyl Flooring applications that enhances the performance and durability of luxury vinyl flooring. Featuring environmentally responsible manufacture, it is made from materials derived from discarded water bottles diverted from landfill. LuxWalk helps minimize impressions and indentations that can occur with LVF.

www.quietwalk.com Circle 121

PIMA – Polyisocyanurate Insulation Manufacturers Association

Image courtesy of Johns Manville

Polyiso

Polyiso is a closed-cell, rigid foam board insulation used primarily on the roofs and walls of offices, health facilities, warehouses, retail and industrial manufacturing facilities and educational institutions. Because of its high thermal performance, it is the product of choice for energy-aware architects, builders and consumers.

www.polyiso.org Circle 122

reThink Wood

Photo courtesy of Uihlein/Wilson Architects, Inc./C&N Photography, Inc.

New and Innovative Wood Uses

reThink Wood represents North America's softwood lumber industry. We share a passion in wood and the forests they come from. Our goal is to generate awareness and understanding of wood's advantage in the built environment. Wood can help balance cost, code and functionality. Visit reThinkWood.com to learn more and join.

www.rethinkwood.com Circle 123

Simonton Windows & Doors

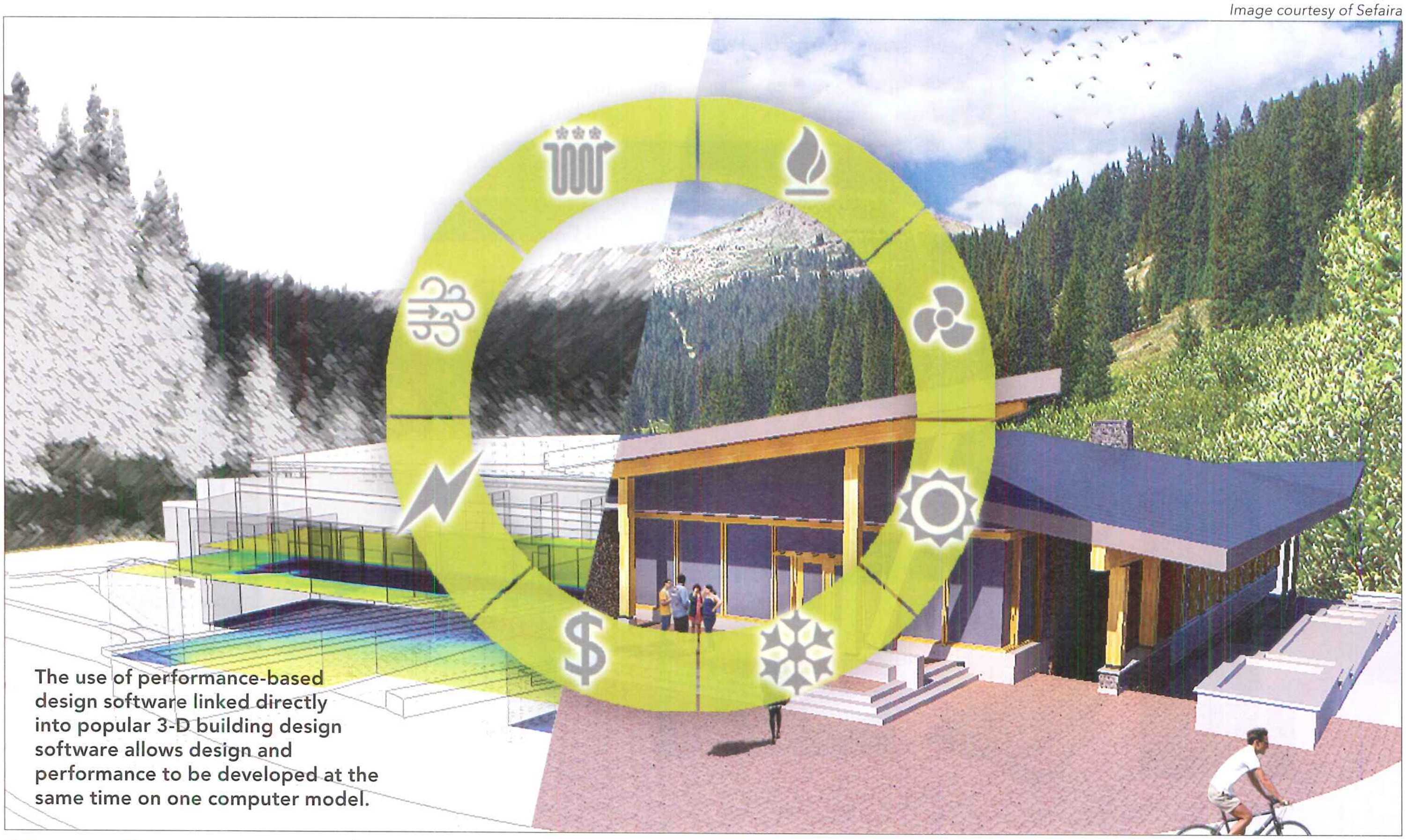
Photo courtesy of Simonton Windows & Doors

Custom Made & Energy Efficient

As an ENERGY STAR® partner, Simonton Windows & Doors is dedicated to providing products that help lower heating and cooling costs and reduce energy consumption in homes across the country. For nearly 70 years, Simonton's hallmark has been to deliver award-recognized, quality windows and doors with the industry's shortest most dependable lead times. Simonton is also proud to be part of Ply Gem Building Products, joining their quality brands that help design beautiful, low maintenance homes. For more information, call (800) SIMONTON (1-800-746-6686) or visit simonton.com.

www.simonton.com Circle 124

Image courtesy of Sefaira



The use of performance-based design software linked directly into popular 3-D building design software allows design and performance to be developed at the same time on one computer model.

Performance Matters!

How to use performance-based design to achieve project goals efficiently, collaboratively, and very effectively

Sponsored by Sefaira, Inc. and SketchUp | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

The design of a new building or the renovation of an existing building usually starts with a set of programmatic goals, objectives, and requirements. Some of these relate to user needs, some to space needs, and some to time and budget constraints. Increasingly, they also relate to a building's performance in terms of energy usage, daylighting, operating costs, and life-cycle assessment. To gauge this performance during design, computerized analysis is becoming common as owners request it, and building codes and green standards tend to require it. In fact, many owners are seeking, and design firms are striving to create, high-performing buildings which go beyond code minimums and excel in all performance aspects. In this regard, it appears that the conversation on performance is clearly shifting away from 'why' and has become more focused on 'how' to achieve the desired level of performance. This means that architecture and engineering firms are looking for new and better ways to collaborate to allow for ongoing performance discussions and analyses. It also means that firm-wide processes are required throughout the design and documentation process that incorporate performance analysis as a core task.

PERFORMANCE-BASED DESIGN

It has been observed by many in the design professions that the new normal is to design buildings based on performance as much as on other design criteria. The term "performance-based design" has been used to capture this new approach that is becoming increasingly common. Now, to be clear, the performance of building envelopes, systems, and components have always been important design considerations, However, it has only been fairly recently that computer software has become available that can readily and affordably simulate the wide variety of variables and elements that influence building performance. More traditionally, rudimentary calculation tools or rules of thumb were relied upon

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

EARN ONE GBCI CE HOUR FOR LEED CREDENTIAL MAINTENANCE

Learning Objectives

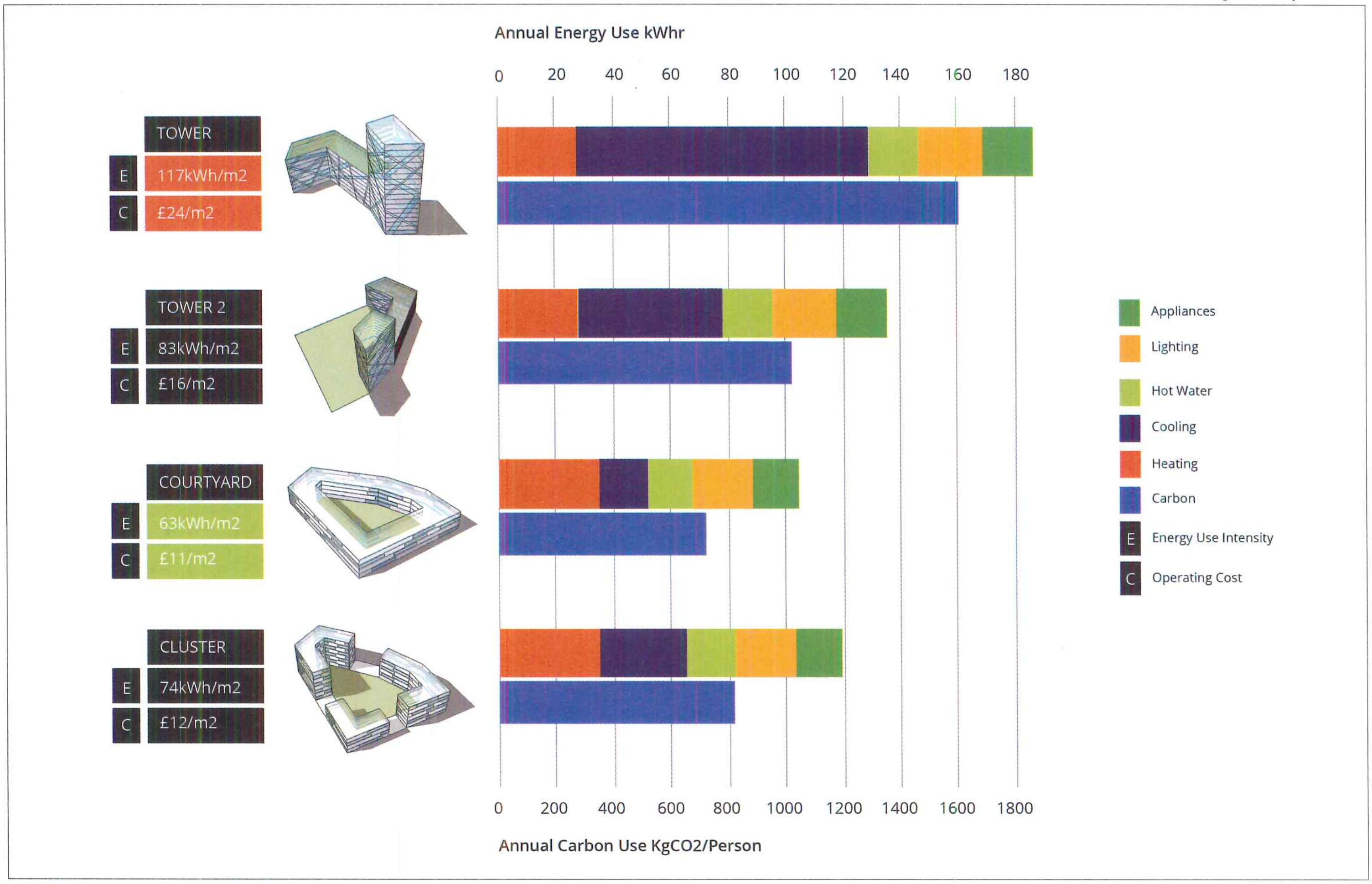
After reading this article, you should be able to:

1. Identify and recognize the characteristics of performance-based design as it applies to buildings.
2. Investigate the design potential and innovative opportunities to create buildings that can be optimized to achieve building-performance goals that benefit both occupants and owners.
3. Assess the functional contributions of performance-based design software paired with 3-D BIM and modeling software to achieve green and sustainable designs.
4. Explore the ways to incorporate performance-based design throughout the entire design process and effectively collaborate with others on project teams.

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

AIA/CES COURSE #K1511F
GBCI COURSE #0920005780

Image courtesy of Sefaira



While many things can contribute to the final form of a building, performance is playing more of a role as demands for lower energy use, more daylighting, and better life-cycle costing come into play.

because it simply wasn't possible to do multiple performance analyses quickly or economically enough to make meaningful impacts during the design process. Instead, it became much too common for architects to plow ahead through design based on performance assumptions or generic standards. Then, when final construction documents were completed, they would be turned over to an engineer or other third party to carry out one energy model or other calculation to see how the building performs. That approach brought the inherent risk that the performance would fall short of design or code targets and require some costly redesign to correct it. It also missed a huge opportunity to use energy models to learn which design decisions made the most or least impact on the building's performance.

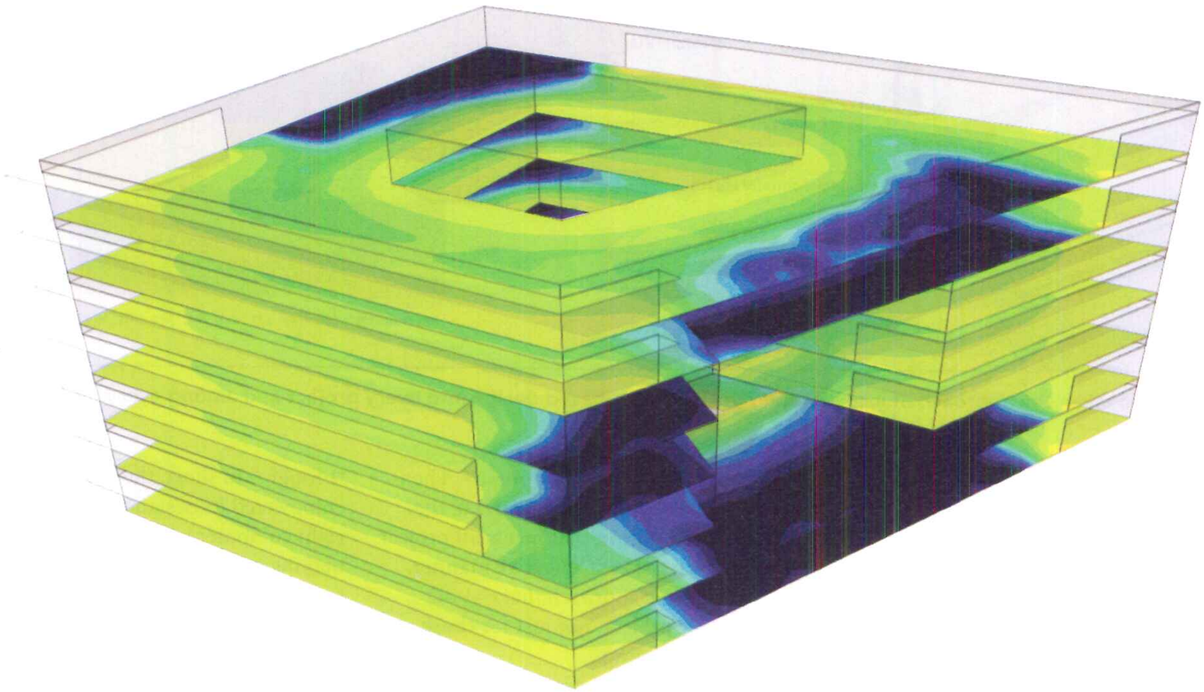
Fortunately, things have changed for the better. Many architects have quickly come to understand that a building's performance is affected by a great many decisions made from the earliest stages of design all the way through final construction documents. Understanding the impacts of those decisions all along the way not only helps prevent the need for redesigns, it informs the process so the design can be optimized toward all performance goals. Those who have embraced this approach are using performance-based design most effectively.

The computer technology making all of this possible starts with the use of popular design software programs. Moving from hand drafting to computer aided drafting (CAD) was a significant step in the past for many design professionals but is now very commonplace. The more recent move to 3-D computer models or design representations including building information modeling (BIM) allows designs to be virtually "built" in three dimensions instead of two-dimensional lines and symbols. Performance-based design (PBD) is the next step that goes beyond computerized visual and informational representations of buildings. It is based on adding on software to a 3-D-based design program, which allows analyses of a building design to be performed within that 3-D model. As such, it can eliminate the need to create a separate energy model of the building or the need to hire others to run a separate analysis since everything can be directly linked to the software already being used to design the building. This is a true game-changing evolution of the design process, which seems to be finally realizing the promise of computer-based design. In essence, PBD allows an analysis to be performed at any step, by any member of the design team, quickly, easily, and affordably.

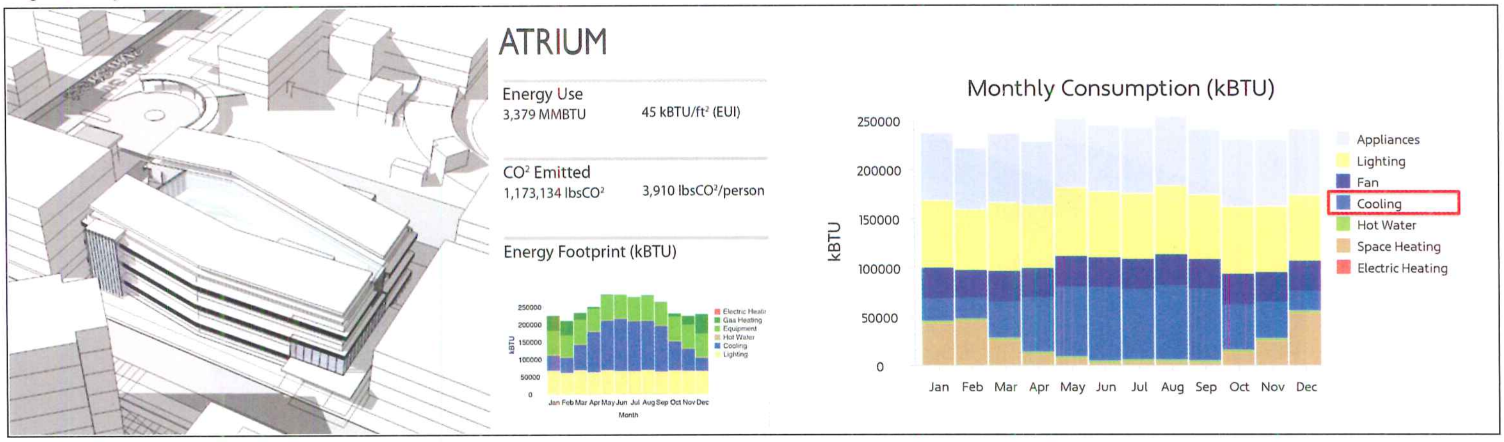
Form Follows Performance?

The Bauhaus era mantra of "Form follows function" reflected a philosophy of defining the form of a building around the function of spaces, materials, or systems in that building. Today, building form is increasingly being influenced and even defined by the performance of that building. This is readily seen in designs where occupied areas are opened up to the outdoors, roofs and ceilings are sloped to take advantage of sunlight, and materials are selected based on their ability to protect from, absorb, or reflect weather conditions.

The PBD approach to building design seeks to optimize outcomes so that performance is enhanced by design, not compromised by it. It is an ongoing part of the design process during which building performance is continuously analyzed by assessing the impacts



Images courtesy of Sefaira



The SmithGroupJJR has taken the approach of incorporating performance-based design into every project and among every design team member.

of design changes on things such as energy use, cost, daylighting, thermal comfort, and environmental impact. To do so, it applies industry-based analyses to building-design items such as form and massing, the site where it is located, the materials used, and the make-up of the construction.

The software available to carry out performance-based design also helps design teams to see, in real time, whether the buildings they are designing are on track to meet performance standards or certifications such as LEED, Green Globes, Architecture 2030, or the English BREEAM standard. Most of the available software uses an analysis engine for energy-performance calculations developed for public use by the U.S. Department of Energy known as EnergyPlus. There are also industry-standard engines for daylighting inputs and analysis. The software is streamlined enough that it is very easy to perform numerous analyses quickly and easily such that many different design options can be looked at in a single day, dramatically faster than using traditional separate energy modeling. This software can then be used as the basis to demonstrate compliance with the appropriate performance standard or certification.

Integrating Performance into Design

When fully integrated into a design process, PBD provides better and more accurate awareness of the impact that design decisions have on building performance. At the outset, project teams can establish the appropriate performance goals and prioritize them compared to other project goals. Then analyses can be run on different design schemes or variations in order to compare the different performance results. Depending on the magnitude of difference between schemes or elements, the design team can begin to make informed design decisions about how to maximize performance or where to make adjustments by learning which elements don't provide enough benefit to pursue. Then more time can be devoted to optimizing the best overall design option that meets all project objectives in the most cost-effective manner. By default, then, this approach makes PBD relevant for every project, not just for those labeled 'high performing.'

As an example of this "every project" applicability, consider the case of the SmithGroupJJR, which is one of the oldest firms in the country with offices across the United States and in China. Its success with performance-based design comes from a very basic, yet powerful, approach: the firm simply practices it early and often as a normal and natural part of every design process. To be more specific, it has embraced the premise that designers are able to make PBD an integral part of their own workflow. That means performance analysis is no longer the purview of one specialist in the firm, but rather is able to be used and integrated into design by everyone. Don Posson, vice president of the SmithGroupJJR, points out how the firm is doing this: "We start using it in the conceptual and early design stages, where it is led by the architect and assisted by the engineers. As we move into more systems-based analysis, the process becomes led by the engineers and assisted by the architects. That way all of the key decision makers are involved all the way through." In short, the firm has equipped and empowered its design professionals with the right computer tools to inform their decision-making process while creating a fully integrated, seamless, and effective work flow.

To illustrate how this approach plays out in practice, the firm recently worked on a new construction project consisting of 75,000 square feet of medical office building space located in northern California. Project Architect Jon Riddle and his colleague, Associate Kim Swanson, used PBD to assess this project throughout its progress, thereby enhancing the team's understanding of the building performance, as well as adding to the firm's design capabilities and energy-performance portfolio.

Initially, four unique and fairly well-developed design options had been completed, represented by design massing strategies of 1) an atrium, 2) a courtyard, 3) an interlocking arrangement, and 4) a plaza. Energy and daylighting performance was not a specific project goal per se; however, the team needed to meet rigorous California Title 24 energy code requirements. Riddle used PBD to compare the energy performance of the four options and found them to be fairly close in overall energy use with Energy Use Intensity (EUI) ratings between 41–45 kBTU/square foot/year. It was determined that the atrium design best met

Image courtesy of Sefaira

Run Analysis / New Strategy	Annual Energy Consumption kBTU	Annual Energy Use per Gross Internal Area kBTU/ft2	Annual Utility Cost $	Heating Capacity ton	Cooling Capacity ton
T 24 Baseline w/o Shading	**2,884,907**	**38**	**175,252**	**62.85**	**128.66**
▶ Accumulation of Strategies	2,630,936 ↓9%	35 ↓8%	159,424 ↓9%	56.26 ↓10%	96.62 ↓25%
▷ Strategy 3: Materials Optimized	2,696,403 ↓7%	36 ↓5%	163,715 ↓7%	59.36 ↓6%	106.30 ↓17%
▷ Strategy 2: Glazing Optimized	2,806,756 ↓3%	37 ↓3%	170,355 ↓3%	59.48 ↓5%	119.00 ↓8%
▷ Strategy 1: Shading Optimized	2,850,126 ↓1%	38 0%	172,446 ↓2%	62.92 ↑<1%	122.24 ↓5%

PBD analyses allow individual strategies to be looked at or a combination of strategies to be considered to determine the best overall solution for a particular building design.

Images courtesy of Sefaira

Lorton Volunteer Fire Station (top) designed by Lemay Erickson Willcox Architects, Reston, VA, and Jefferson Fire Station (bottom) designed by Hughes Group Architects, Sterling, VA, all in collaboration with Brinjac Engineering using performance-based design.

the design team's programmatic performance requirements and aesthetic intent. While its energy use was higher than other options, it was fully acceptable for the project's goals and code requirements. This basic exercise introduced the team to an important aspect of performance-based design: optimizing performance is relative to the entire scope of design considerations. In other words, a given project may or may not accommodate aggressive performance goals, but every project benefits from well-informed and holistic decision making.

With the best overall basic design selected, Riddle and Swanson then set out to see how they could further improve performance and reduce the EUI. To do so, they used a simple four-step process. First, they analyzed the details of the performance data and observed that while lighting and plug loads were basically fixed due to the building use, the cooling load was a potential area for improvement. They recognized that lowering the cooling load can often decrease the size of the HVAC system, resulting in lower capital costs, lower operating costs, and/or more usable square footage. Second, they sought to identify potential strategies that could be used to achieve the lowered cooling load. The team determined that external loads (e.g. solar gain) would likely be the most fruitful to be explored and managed. Third, they began the process of trying different strategies, recognizing that the successful use of performance-based design is not a purely linear process. Rather, it is more iterative, meaning that it involves some back and forth, even some trial and error based on educated assumptions. They started with the selected design as a baseline and then analyzed one strategy at a time to determine the net improvement (or not) on the cooling load. Each of these analyses then provided quick feedback on where to focus additional design efforts. In this case, the strategies fell into three categories:

- **Glazing Ratios:** Lowering the glazing ratio helped lower solar gain, and in turn, helped lower cooling capacity.
- **Shading Strategies:** Adding brise soleil shading improved performance; analysis also showed that north facade shading of any kind was unnecessary, providing a potential capital cost savings.
- **Materials:** Given the early stage of this project, understanding materials' effects on performance was key. The team learned that the core structural material and glazing's solar heat gain coefficient (SHGC) stood to affect cooling capacity.

With a newly gained understanding of design elements that were driving performance, the final step was to present their findings and design recommendations. After reviewing the multiple strategies, the best approach proved to be combining them. This required treating the combination as a separate analysis, since the team recognized that strategies interacting with each other are not always additive (e.g. three separate strategies that save 5 percent each does not mean combining them will save 15 percent).

By taking the design to this next step, Riddle and Swanson showed that even given a fixed massing and siting, performance gains could still be made through glazing ratios, shading, and material selection. Their selected combination of strategies proved to be very effective—the Energy Use Intensity of the building dropped from the original EUI of 45 to an EUI of 35 due in large part to achieving a significant reduction in cooling load. This savings in cooling also translated into a 25 percent reduction in equipment size and a 9 percent projected reduction in annual utility costs. In addition to the project benefits of the effort they led, it also provided valuable internal experience and a case study for their colleagues' reference, as well as a marketable example to demonstrate the firm's capabilities to future clients.

IMPROVING PERFORMANCE THROUGH BETTER COLLABORATION

As we've just seen, implementing PBD just for the architects within a firm can already provide significant results. Of course, on a building project of any size, architects also need to work with mechanical, electrical, and plumbing engineers as key members of the design team.

Continues at ce.architecturalrecord.com

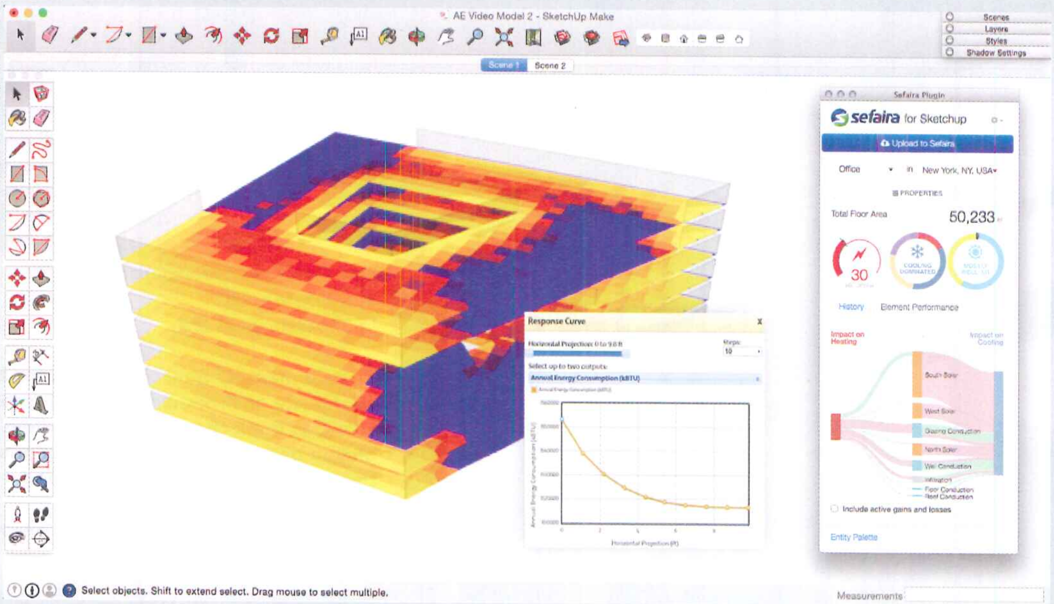
Peter J. Arsenault**, FAIA, NCARB, LEED AP is an architect and green building consultant who has authored over 100 continuing education and technical publications as part of a nationwide practice. **www.linkedin.com/in/pjaarch

PRODUCT REVIEW

Performance Matters!

Sefaira

Image courtesy of Sefaira



Performance Feedback At The Speed Of Design

Sefaira offers the industry's only software for real-time Performance Based Design. This allows design professionals to understand the daylighting, comfort and energy performance of their designs directly in their SketchUp and Revit design environment, so that they can create better and higher performing buildings with lower capital and operating costs.

www.sefaira.com

Circle 125

SketchUp

Image courtesy of Duane Addy

SketchUp is one of the most popular conceptual design tools.

SketchUp is the most intuitive way to design, document and communicate your ideas in 3D.

www.SketchUp.com

Circle 126

CONTINUING EDUCATION

Photo: ©Mark Herboth Photography LLC

Live Oak Bank Headquarters
Wilmington, NC
LS3P Associates Ltd.

To help meet its goal of creating the best workplace environment for employees, Live Oak Bank chose southern yellow pine glulam beams, columns, and king-post trusses, and cypress exterior siding.

2015 WoodWorks Wood Design Award – Jury's Choice

Building Materials Matter

Life cycle view supports informed choices, contributes to sustainable design

Sponsored by reThink Wood

From an environmental perspective, it is widely known that buildings matter. Buildings consume nearly half the energy produced in the United States, use three quarters of the electricity, and account for nearly half of all carbon dioxide (CO_2) emissions.[1] The magnitude of their effects is the driving force behind many initiatives to improve tomorrow's structures—from energy regulations and government procurement policies, to green building rating systems and programs such as the Architecture 2030 Challenge.

The focus on energy efficiency in particular has led to widespread improvements, so much so that many designers are now giving greater attention to the impacts of structural building materials.

With an abundance of information and competing environmental claims, determining a material's true impacts can be a challenge. Does wood reduce a building's carbon footprint in a meaningful way? Is it better to use recycled steel or wood from a sustainably managed forest? To what extent do structural materials impact operational performance? Does resilience depend on the material or proper design and maintenance?

This course seeks to address these and other questions. Examining materials throughout

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. Compare the life cycle impacts of common building materials, from the extraction or harvest of raw materials through end-of-life disposal or recycling/reuse.
2. Articulate the influence of wood on operational energy efficiency.
3. Consider a growing body of research on the impacts of visual wood on occupant health and well-being.
4. Discuss design considerations related to a building's safety, resilience, and long-term durability

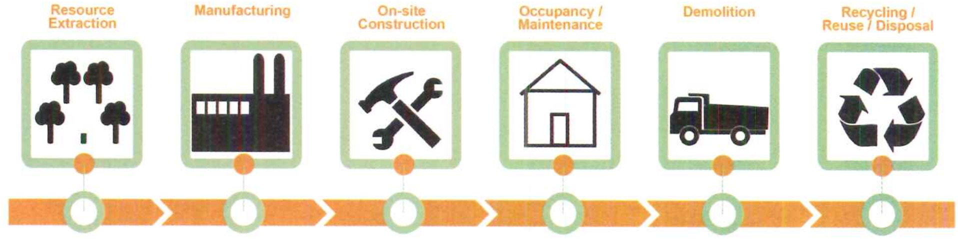
To receive AIA/CES credit, you are required to read the entire article and pass the test. Go to **ce.architecturalrecord.com** for complete text and to take the test for free. This course may also qualify for one Professional Development Hour (PDH). Most states now accept AIA credits for engineers' requirements. Check your state licensing board for all laws, rules, and regulations to confirm.

AIA/CES COURSE #K1511B
GBCI COURSE #0920005720

their life cycles, it focuses on international research supporting the use of wood for its carbon and other benefits while considering some of the advantages of concrete and steel. It also touches on efforts of all three industries to lessen their environmental impacts.

The reality is that no one material is the best choice for every application. There are trade-offs associated with each, and each has benefits that could outweigh the others based on the objectives of a project.

Image courtesy of naturallywood.com



Life Cycle of Building Products

IMPORTANCE OF A LIFE CYCLE VIEW

Understanding a material's impact at every stage of its life is essential for designers looking to compare alternate designs or simply make informed choices about the products they use.

Life cycle assessment (LCA) is an internationally recognized method for measuring the environmental impacts of materials, assemblies, or whole buildings, from extraction or harvest of raw materials through manufacturing, transportation, installation, use, maintenance, and disposal or recycling.

LCA is sometimes described as mysterious and complicated. Yet, what is involved is simply a thorough accounting of resource consumption, including energy, emissions, and wastes associated with production and use of a product. For a "product" as complex as a building, this means tracking and tallying inputs and outputs for all assemblies and subassemblies—every framing member, panel, fastener, finish material, coating, and so on. To ensure that results and data developed by different LCA practitioners and in different countries are comparable (i.e., that results allow apple-to-apple comparisons), LCA practitioners must strictly adhere to a set of international guidelines set forth by the International Organization for Standardization (ISO).

The use of LCA in North America is increasing due in part to the availability of easy-to-use and affordable tools (see sidebar, Calculating the Impacts of Building Designs). LCA is also included in all of the major green building rating systems, providing an alternative to the "prescriptive approach" to material selection. This approach assumes that certain prescribed practices, such as specifying products with recycled content, are better for the environment regardless of the product's manufacturing process or disposal. It was a cornerstone of early green building efforts, when there was relatively little information available on the impacts of individual products at different life cycle stages.

LCA studies consistently demonstrate wood's environmental advantages. For example, one literature review examined all of the available research from North America, Europe and Australia pertaining to the life cycle assessment of wood products.[2] It applied LCA criteria in accordance with ISO 14040-42 and concluded, among other things, that:

- Fossil fuel consumption, the potential contributions to the greenhouse effect, and the quantities of solid waste tend to be minor for wood products compared to competing products.
- Wood products that have been installed and are used in an appropriate way tend to have a favorable environmental profile compared to functionally equivalent products made from other materials.

The table below illustrates the results of an LCA comparing a simple commercial structure designed in wood, steel, and concrete. Designed for the Atlanta geographical area, the building footprint was 20,000 square feet (100 feet by 200 feet). The structure is two stories in height and 20 feet tall with 40,000 square feet of total floor area. To simplify analysis, the theoretical building was analyzed without windows, doors, or internal partitions. All three configurations were assumed to have a concrete foundation and slab.

The analysis involved systematic assessment, using life cycle methodology, of all building assemblies beginning with raw material extraction through primary and secondary manufacturing, transport at all stages of the production chain and to the job site, and building construction.

As shown in the table, impacts for the wood design are lower than either the steel or concrete design across all indicators.

CARBON FOOTPRINT: REDUCING GREENHOUSE GASES

Although there is growing awareness that using wood from sustainably managed forests can reduce a building's carbon footprint, only a portion of wood's benefits are recognized in an LCA.

As noted, the LCA literature review concluded that fossil fuel consumption and potential contributions to the greenhouse effect tend to be minor for wood products compared to competing products. This is because wood products require less energy to manufacture than other major building materials, and most of that comes from renewable biomass (e.g., sawdust, bark and other residual fiber).[3]

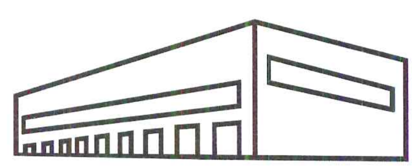
COMPARISON OF ENVIRONMENTAL IMPACTS OF STEEL VS. WOOD DESIGN
(Values indicate magnitude of impact associated with steel design as multiple of wood design impact)

Fossil Fuel Consumption	Weighted Resource Use	Global Warming Potential	Acidification Potential	Human Health Respiratory Effects Potential	Eutrophication Potential	Ozone Depletion Potential	Smog Potential
1.4x	1.02x	1.6x	1.4x	1.3x	3.0x	1.5x	1.2x

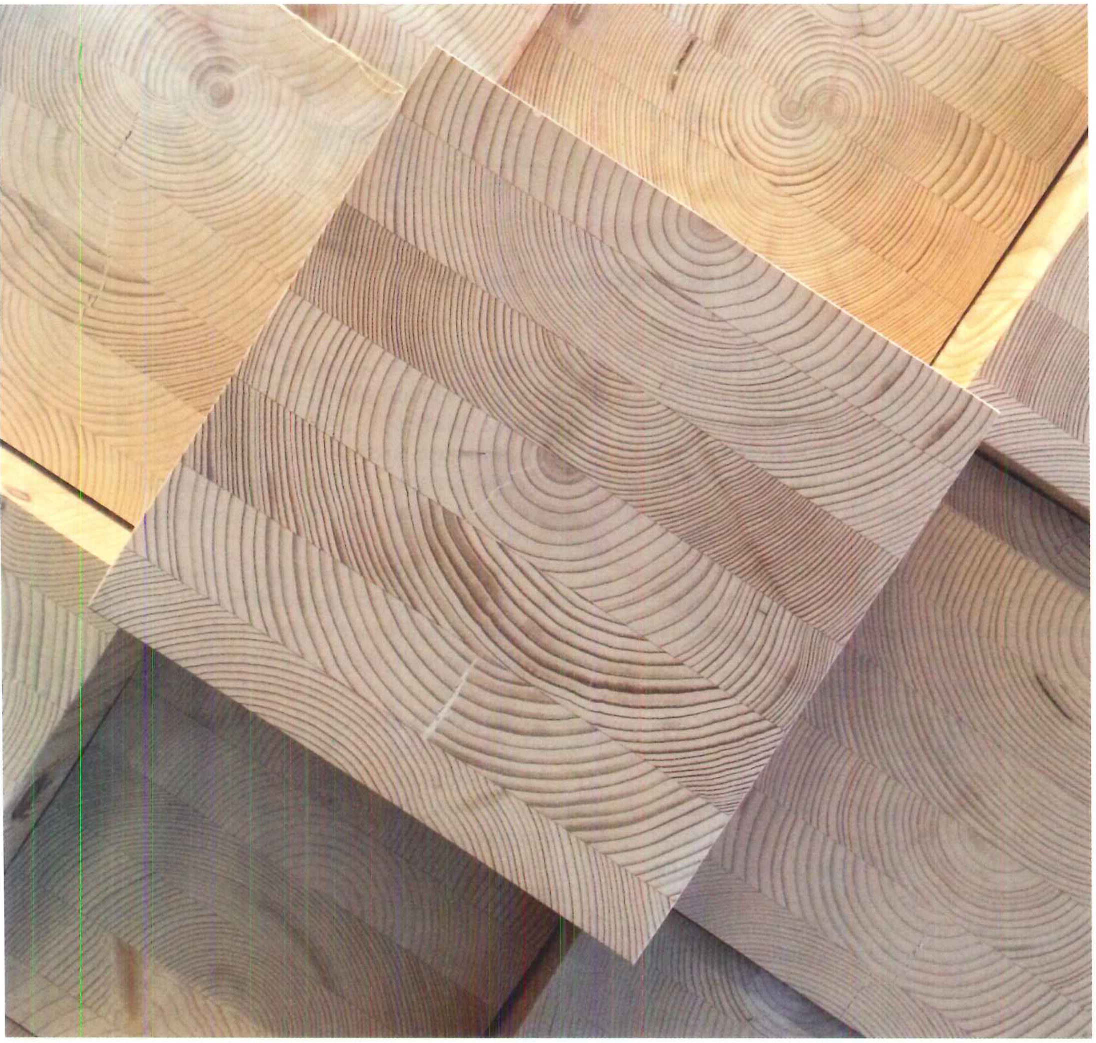
COMPARISON OF ENVIRONMENTAL IMPACTS OF CONCRETE VS. WOOD DESIGN
(Values indicate magnitude of impact associated with concrete design as multiple of wood design impact)

Fossil Fuel Consumption	Weighted Resource Use	Global Warming Potential	Acidification Potential	Human Health Respiratory Effects Potential	Eutrophication Potential	Ozone Depletion Potential	Smog Potential
1.9x	2.3x	3.0x	2.4x	2.1x	4.7x	5.8x	2.4x

Source: Athena EcoCalculator



TWO STORIES
200′ x 100′ x 20′ height
20,000 ft² footprint
Total ft² = 40,000



Wood products store carbon. In the case of wood buildings, the carbon is kept out of the atmosphere for the lifetime of the structure—or longer if the wood is reclaimed and reused or manufactured into other products.

The other aspect to wood's carbon footprint is that as trees grow they absorb carbon dioxide (CO_2) from the atmosphere, release the oxygen (O_2), and incorporate the carbon into their wood, leaves or needles, roots, and surrounding soil. Young, vigorously growing trees take up carbon quickly, with the rate slowing as they reach maturity (typically 60-100 years, depending on species and environmental factors). Over time, one of three things then happens:

- When the trees get older, they start to decay and slowly release the stored carbon.
- The forest succumbs to wildfire, insects, or disease and releases the carbon quickly.
- The trees are harvested and manufactured into products, which continue to store much of the carbon. (Wood material is approximately 50 percent carbon by dry weight.) In the case of wood buildings, the carbon is kept out of the atmosphere for the lifetime of the structure—or longer if the wood is reclaimed at the end of the building's service life and reused or manufactured into other products.

Unless the land is converted to another use, the cycle begins again as the forest regenerates and young seedlings once again begin absorbing CO_2.

For more information, the USDA Forest Service recently released an infographic illustrating the forest/carbon cycle (www.fs.fed.us/climatechange/advisor/scorecard/Carbon_Infographic_Final.pdf).

INITIAL EMBODIED IMPACTS: FROM EXTRACTION TO CONSTRUCTION

The impact of materials from extraction or harvesting through manufacturing, transportation, and construction are considered initial embodied impacts. They are distinct from operational impacts, which result from a building's operation, and from recurring embodied impacts, which relate to the durability of building materials, components, and systems; how well they're maintained; and the service life of the building.

CALCULATING THE IMPACTS OF BUILDING DESIGNS

Numerous free tools are available to evaluate the environmental impacts of building designs. For example, the Athena Impact Estimator for Buildings gives users access to life cycle data without requiring advanced skills. It can model over 1,200 structural and envelope assembly combinations, allowing for quick and easy comparison of design options. Another free tool, the Carbon Calculator for Wood Buildings, focuses on carbon footprint. Users input the volume of structural wood in a building, and the calculator estimates how much carbon is stored in the wood, the greenhouse gas emissions avoided by not using steel or concrete, and the amount of time it takes North American forests to grow that volume of wood.[4]

Building materials tend to have the greatest impact from extraction through manufacturing. Within an LCA, this is also where wood's advantages are most evident.

Raw Materials

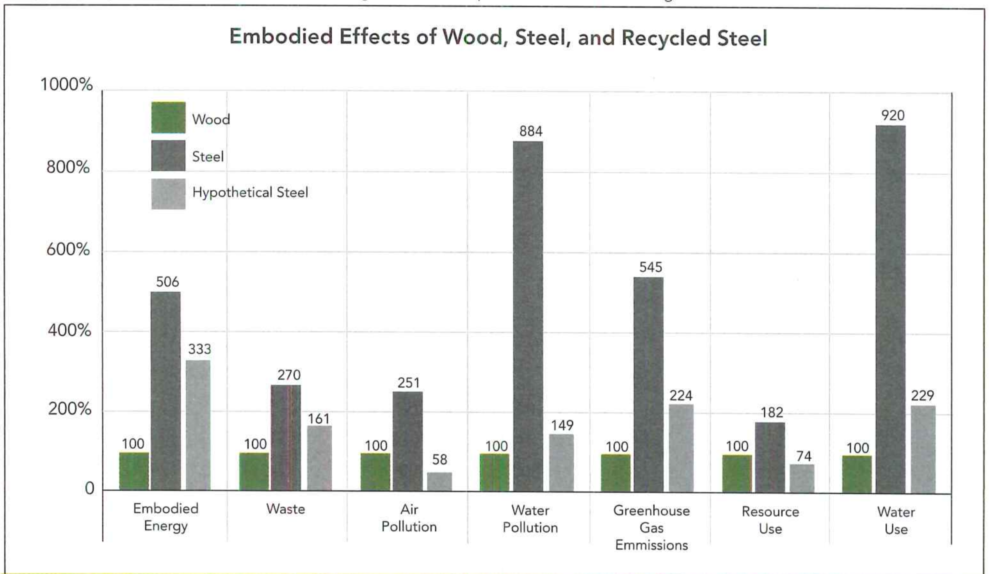
The life cycle of building products typically starts with the extraction of raw resources such as timber, iron ore, limestone, and aggregates. The collection of data starts here, with the tracking of energy use and emissions to air, water, and land per unit of resource.

Wood's impacts during this phase are relatively low compared to concrete and steel, which are made from substances that must be mined and heated to extremely high temperatures.[5]

A typical concrete mix is about 10 to 15 percent cement, 60 to 75 percent aggregate, and 15 to 20 percent water, though proportions change to achieve different requirements for strength and flexibility. While most of concrete's ingredients are themselves manufactured products or mined materials, it's the cement in concrete that has the highest embodied energy.[6] According to the U.S. Energy Information Administration, the cement industry is the most energy-intensive of all manufacturing industries. Cement is also unique in its heavy reliance on coal and petroleum coke.[7]

A major ingredient needed for cement is limestone, which is found in abundance in many places in the world. In most cases, limestone is blasted from surface mines and removed in large blocks to a crusher, mixed with other raw materials, and transferred

Image courtesy of FPInnovations, calculated using the Athena Impact Estimator for Buildings



RENEWABLE VS. RECYCLABLE

A natural resource is renewable if it can be naturally replaced at the rate at which it is consumed. Of the three building materials, wood is the only renewable resource.

Recyclability is another matter. Waste recovery and recycling are important societal goals in the quest to ensure efficient use of resources. It has become increasingly common to extend the life cycles of steel, concrete, and wood through recycling and reuse; however, there is room to improve the recovery rate for all three materials. (See section, End of Life.)

In the context of comparing one building design to another, it is also useful to consider the environmental impact of the applicable recycling process.

For example, recycling scrap steel requires approximately half the energy as refining virgin steel from iron ore, yet this is still considerably more energy than is required to manufacture wood products.[8,9] Expanding this point to other impact categories, the chart above compares the LCA profile of two standard structural post-and-beam systems, and one hypothetical steel system with 100 percent recycled content. Wood is shown to be superior to virgin steel in all categories and to the hypothetical 100 percent recycled steel in all categories except air pollution and resource use.

Photo courtesy of Sergey Zavalnyuk, Dreamstime

Opportunities for lessening the impacts of open pit mining include reducing the size of the mining area, minimizing waste, helping to maintain biodiversity by transplanting or culturing endangered plants found on-site, and planning mines around existing infrastructure.[11]

to a rotating furnace where it is heated to about 2,700 degrees Fahrenheit in order for the materials to coalesce. The mixture is cooled and ground to fine powder (cement), which is transported to its destination by truck, rail, or ship. Fly ash, a byproduct of coal burning, can be substituted for some of the cement, as can a variety of other ingredients, with associated reductions in carbon footprint.

Steel is an alloy consisting mainly of iron and has a carbon content between 0.2 percent and 2.1 percent by weight, depending on grade. Steel's main ingredient is iron ore, which must be extracted through open pit mining and heated to extremely high temperatures. In surface mines, ground is removed from large areas to expose the ore. Ore is then crushed, sorted and transported by train or ship to the blast furnace where the iron is heated to 3,000 degrees Fahrenheit, usually with charcoal or coke, and charged with the ore and limestone. The molten iron drains off, and iron ingots are formed. This pig iron, as the ingots are called, is the basis for steel.

For both concrete and steel there are environmental consequences from open pit mining, and from the fossil fuels used to process the raw materials. However, both industries continue making strides to lighten their environmental footprint.

Manufacturing

While the manufacturing stage typically accounts for the largest proportion of embodied energy and emissions associated with the life cycle of a building product, it is also an area where wood consistently outperforms steel and concrete.[10]

The process at a lumber mill is relatively straightforward. Bark is removed; logs are sawn; trimmed to produce smooth, parallel edges; cut to square and precise lengths; dried; and then planed, grade-stamped, and packaged.

For mass timber products, which have structural performance characteristics that allow them to compete with steel or concrete in many applications, the process is more involved. For glue-laminated timber, for example, wood laminations are bonded with durable, moisture-resistant adhesives. For cross laminated timber (CLT), several layers of kiln-dried lumber boards stacked in alternating directions are bonded with structural adhesives to form a solid, straight, rectangular panel. LCAs of mass timber products are discussed later in this course (see Toward a Sustainable Future).

Throughout the years, the lumber industry has set its sights on getting the most out of every tree harvested and brought to a mill. According to a report on wood utilization, "The term 'waste' is largely obsolete in the context of today's North American forest-products industry. Logs brought to U.S. and Canadian sawmills and other wood-product manufacturing centers are converted almost totally to useful products."[12]

This achievement can be attributed to state-of-the-art sawmilling that maximizes the quality and quantity of boards that can be cut from a tree, combined with further processing of fiber that is unsuitable for lumber production into composite products such as oriented strand board (OSB) or fiber boards and paper.

Producing concrete requires mixing cement, which has already been manufactured, with mined aggregates. Ready-mixed concrete is the most common form of concrete, accounting for up to 75 percent of the material made today. This is concrete that is "batched" from a central plant. Each batch is customized to the requirements of the specific job, and is usually delivered to site in cement-mixer trucks.

Iron smelted from ore contains more carbon than is desirable. To become steel, the iron must be melted, again at extremely high temperatures, and reprocessed to reduce the carbon, and to remove silica, phosphorous, and sulfur, which weaken the steel.

Photo courtesy of naturallywood.com

To manufacture CLT, several layers of kiln-dried lumber boards are stacked in alternating directions and bonded with structural adhesives to form solid, straight, rectangular panels.

There are two main technologies for producing steel in the United States. One involves a Basic Oxygen Furnace (BOF), in which high-purity oxygen blows through the molten pig iron, lowering carbon levels and those of other impurities. Alloys are added at this time to create the desired properties of the steel product. The other approach involves "mini mills" that use Electric Arc Furnaces (EAF) to produce steel from metal scrap.

Using wood products avoids the carbon emissions inherent in the industrial processes of concrete or steel products. While the concrete and steel industries are primarily powered by fossil fuels, many lumber companies use woody biomass (e.g., sawmill residues such as bark and sawdust) to fuel their operations. Dovetail Partners Inc., which provides information about the impacts and trade-offs of environmental decisions, calls the North American lumber industry 50 to 60 percent energy self-sufficient overall.

Construction

According to the Athena Sustainable Materials Institute, which specializes in LCA, the on-site construction stage is similar to an additional manufacturing step where individual products, components, and sub-assemblies come together in the manufacture of a building.

Although transportation may comprise a significant portion of the impacts at this stage, the prescriptive approach that says all materials should be produced locally may not yield the best environmental outcome. When life cycle impacts are viewed as a whole, it may be that the material produced a few towns over is better for the environment than one produced farther away. Or, the material's manufacturing process may be such that it uses the most fossil fuels and is responsible for the greatest volume of greenhouse gas emissions.

LCA helps to ensure that all aspects of energy use are considered. It also accounts for the effects of transportation mode and not just distance. A product traveling a long distance using a highly efficient transportation method can actually have a smaller transportation footprint than a closer product traveling inefficiently.

Continues at ce.architecturalrecord.com

Accessibility, Safety, and Platform Lifts and Elevators

Navigating the current standards and types of accessibility solutions

Sponsored by Garaventa Lift | *By Bruce Ramsay*

Photo courtesy of Garaventa Lift

We recognize the importance of elevators and lifts in today's design industry. Elevators and lifts can be extraordinary features added to homes and buildings to enhance the quality of life and safety of the end users. In this article, readers will learn about the requirements for platform lifts, the different types of lifts, and basic product design. The reader will also gain an understanding of code-compliance issues, how to solve accessibility problems, and solutions for evacuation for persons with disabilities.

ADA COMPLIANCE

The Americans with Disabilities Act (ADA) published the ADA Accessibility Guidelines (ADAAG) in July 1991. These standards for existing buildings, alterations, and new construction have generally been adopted into national and local building codes.

Continues at ce.architecturalrecord.com

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

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

1. Summarize the current Americans with Disabilities Act Accessibility Guidelines (ADAAG), and explore how the regulations apply to elevators and lifts.
2. Identify different types and designs of elevators and lifts, and describe their application in order to solve accessibility problems.
3. Examine code-compliance issues related to elevators and lifts.
4. Analyze the challenges and solutions for evacuation of persons with disabilities.

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

AIA/CES COURSE #K1511Z

Weight Watching: Adaptive Reuse with Structural Steel

Cost savings, flexibility, and a high strength-to-weight ratio make structural steel an ideal choice

Sponsored by the Steel Institute of New York | *By Barbara Horwitz-Bennett*

Rising land costs and pressure for increasing the density of our cities have made it necessary to redevelop existing low-rise urban areas. The result is an increasing popularity of existing building reuse and the increasing number of projects building atop existing buildings. Due to its high strength-to-weight ratio, recyclability, and flexibility, structural steel is particularly suitable for adaptive reuse and facility expansion projects.

"When evaluated for ease of construction, schedule, cost, dimensional impact, and architectural implications, steel framing is often found to be the optimal solution," says Eli B. Gottlieb, P.E., senior principal at Thornton Tomasetti's New York office.

Architects have long relied on steel for projects that require design flexibility and longevity. "Steel can be removed, reworked, and reused fairly easily and, in some respects,

CONTINUING EDUCATION

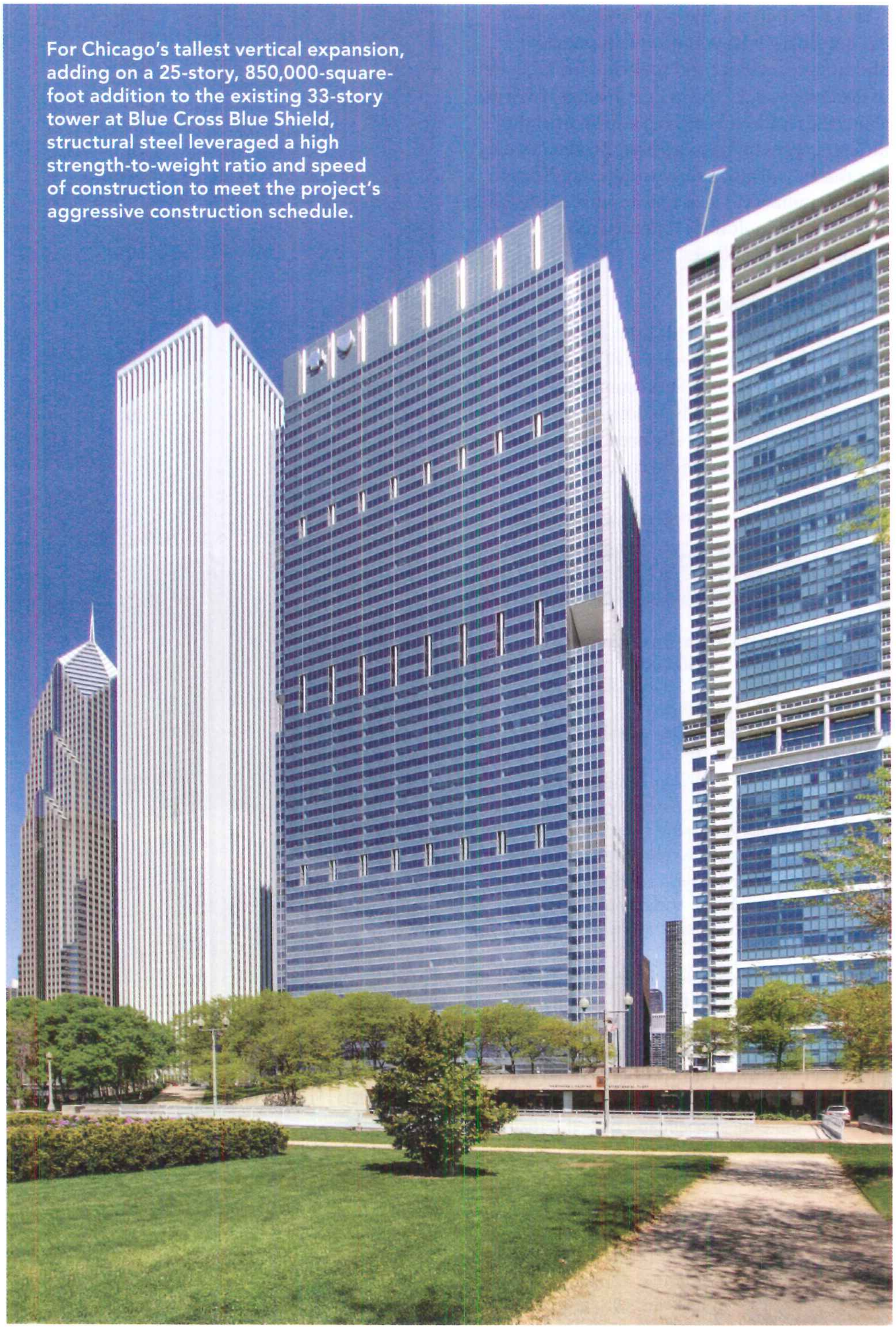
EARN ONE AIA/CES HSW LEARNING UNIT (LU)

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

1. Discuss aspects of the production of structural steel that make it ideal for building green.
2. Describe the scope of existing conditions study and/or testing involved in structural steel adaptive reuse.
3. List the various ways in which structural steel can be employed in the successful reuse of existing buildings.
4. Explain the benefits of utilizing structural steel based upon project costs, feasibility, and impact on construction schedule.
5. Describe the intangible and social benefits of reuse projects made feasible by utilizing structural steel.

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

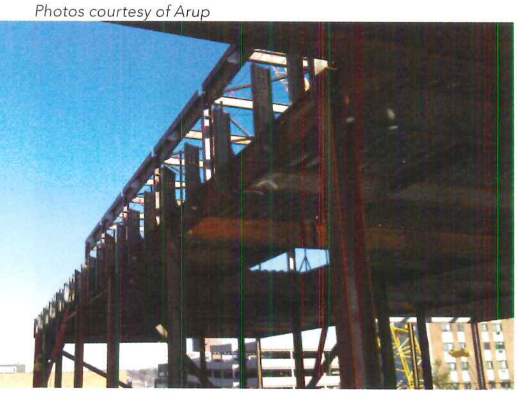
AIA/CES COURSE #K1510H



For Chicago's tallest vertical expansion, adding on a 25-story, 850,000-square-foot addition to the existing 33-story tower at Blue Cross Blue Shield, structural steel leveraged a high strength-to-weight ratio and speed of construction to meet the project's aggressive construction schedule.

Photo courtesy of MKA

Photos courtesy of Arup



At the State University of New York Institute of Human Performance Upstate Medical University, structural steel was selected for this laboratory expansion project. Pictured above, upper floor and mechanical penthouse levels of the steel frame with horizontal bracing members at the roof and attachments will support a tied-back infill skylight. In the photo to the right, the full-story transfer girders serving as an interstitial-level MEP services distribution zone can be seen.

it is similar to Legos or building blocks that can be deconstructed and rebuilt in a different configuration," explains Andrea Reynolds, P.E., LEED AP, director of structural engineering at SmithGroupJJR in Detroit.

Considered to be one of the most recyclable materials around, today's structural steel products are made with between 90 percent and 98 percent of recycled materials, according to the American Iron and Steel Institute (AISI). Fashioned from iron, and described as one of the most abundant materials on earth, steel can be endlessly recycled and reused without compromising the properties of the material. Furthermore, on a per ton basis, the iron and steel industry reduced its carbon emissions by 37 percent, and its energy intensity by 32 percent between 1990 and 2013, states the American Institute of Steel Construction (AISC).

Although the process of producing steel does require energy, its highly recoverable and recyclable nature makes it a very sustainable material, and in many cases—particularly where existing materials are salvaged and/or reused—fares quite well with LEED building credits (see LEED v4 and Structural Steel).

COMPARING CONCRETE

Consider concrete, for example. In addition to the fact that concrete's additional weight will increase foundation costs, in many cases this will also require the implementation of piles, caissons, mat-slab, or other deep foundations, which can easily create an unfavorable embodied-energy equation, explains Michael Liu, AIA, principal and vice president of The Architectural Team in Boston.

Or more simply stated, "An average concrete floor weight is 100 psf, as compared to steel, with a lightweight deck of 40 psf," says Janis B. Vacca, P.E., vice president and principal of The Harman Group in Philadelphia. "That means you can get two floors of steel for every one floor of concrete."

Another big difference with reinforced concrete, or masonry for that matter, is that it's usually more difficult to apply it to a dissimilar existing building material, such as structural steel, requiring welding or bolting via studs or dowels to attach and interface the two materials, according to Jimmy Su, P.E., LEED AP, an associate structural engineer for Arup Boston. "There is usually more benefit to simply attaching new steel to existing steel with the same effort, and offering the advantage of smaller sizes for similar strength and more flexibility in connection configurations. In the case of existing wood, it is nearly impossible," he says.

Raising another point about wood, Su adds that it is generally weaker when force is applied perpendicular to its grain, and this can create complications when one is attempting to reinforce or connect to wood. In addition, connection sizes into wood members can often be quite large because of the area required to disperse the force down to a level that won't damage the material. The unfortunate upshot is many rows of nails or bolts spread out over a larger area.

Steel-to-steel connections also have very high capacities for relatively small connection areas. For example, bolt holes on the order of a ¾-inch to 1½-inch diameter or single-digit inches of weld, according to Su. In fact, one can derive thousands of pounds of capacity out of bolted or welded connections that take up just a few inches.

In terms of opening up a space, which could involve the removal of a column, adding steel framing to reinforce existing structural framing is considered a fairly straightforward endeavor, void of messy, disruptive construction, adds Reynolds.

Add the efficiencies inherent in prefabrication, and this enables structural steel elements to be installed while portions of an existing building remain occupied.

Yet another advantage is the fact that structural steel framing works well in resisting lateral loads. "The lower weight can keep lateral seismic forces lower, which can minimize or avoid the need to reinforce existing lateral load resisting systems," says Gottlieb.

Bringing in another point, Reynolds explains that for exterior support facades, steel framing is a great solution, particularly in cases where the exterior walls are being upgraded to include tensioned glazing systems or blast loads. This is because it leverages one of steel's greatest strengths—the ability to resist tension loads with compact sections.

Specifically regarding adaptive reuse, William D. Bast, P.E., S.E., principal at Thornton Tomasetti's Chicago office, highlights the following:

- The prefabricated nature of steel can be an advantage in avoiding formwork and/or the need to vacate space within the building during construction.
- Steel members can be shallower or narrower than corresponding concrete members and

Photo courtesy of Arup

Incorporating Boston's historic Curtis and Waterman buildings, and uniting their facades with five additional stories of structural steel, Arup worked with Sasaki Associates to design this new 215,000-square-foot headquarters for the Boston Public School system.

therefore provide an advantage in ceiling or headroom program requirements.

- Steel can be used for temporary means and methods, such as shoring or bracing, and then become part of the permanent structural system.
- Structural steel is easily beneficial in filling-in floor openings due to its lightweight nature and ability to avoid the need for shoring.

EVALUATING CONDITIONS AND TESTING

When embarking upon any type of adaptive structural steel project, the first step is evaluating the existing structural framing. Obtaining the original design drawings is ideal, in addition to procuring any subsequent changes. Reynolds advises then visiting the site to confirm that the existing drawings are consistent with what appears in actuality. Unfortunately, it's not unusual to discover that existing drawings and documentation either don't exist or are incomplete.

"Surveying the site, locating framing, taking measurements of the framing, acquiring material samples, and performing testing can all be done to verify the existing framing in place," she explains. "Generally, steel structures can be easier to verify, assuming the structural framing is accessible. In recent years, the progression of 3-D/digital scanning of spaces is facilitating the process of surveying and measuring existing framing."

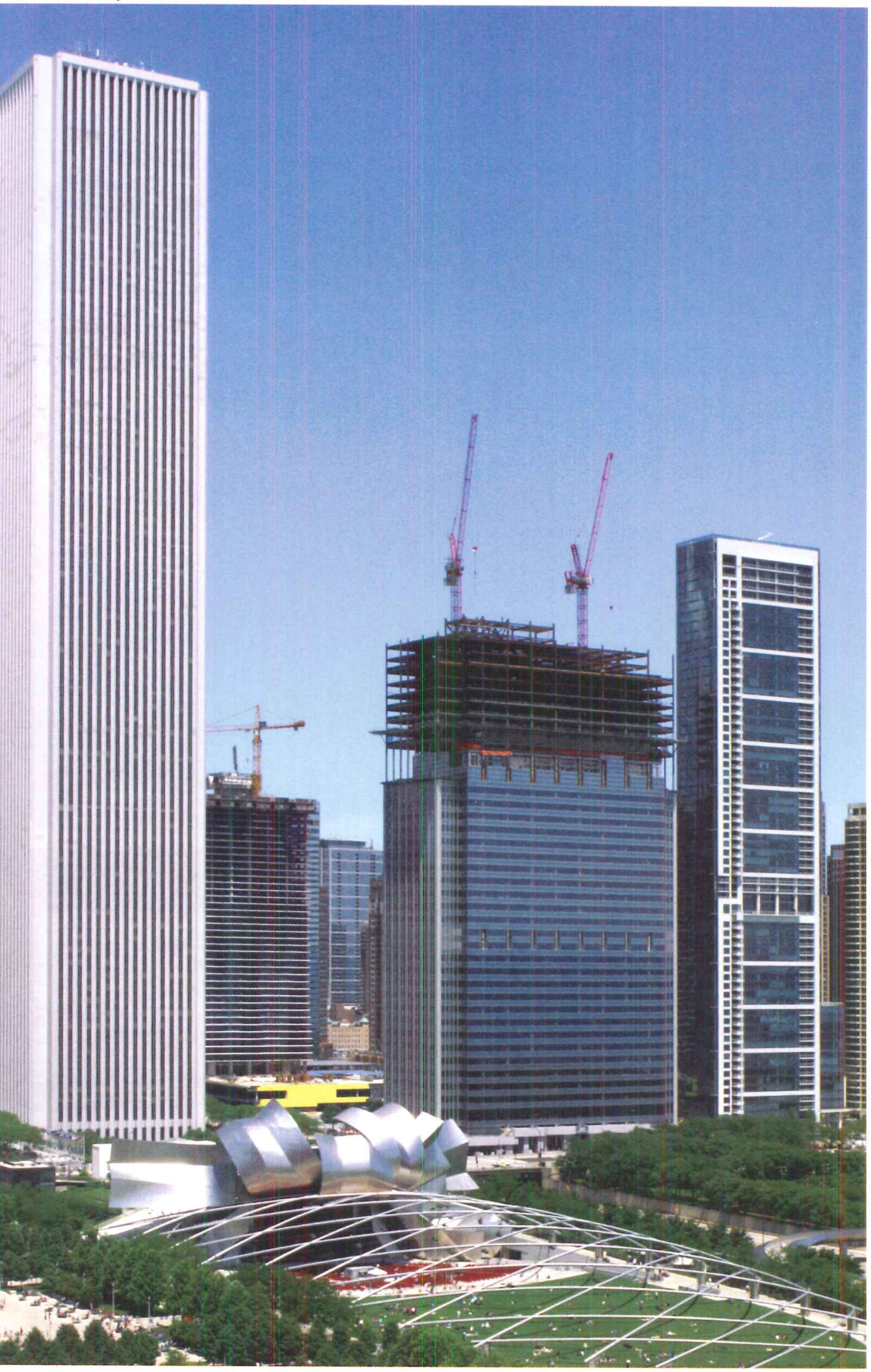
On the other hand, concrete structures can be more difficult to ascertain, unless scanning is utilized to determine the size, spacing, and location of is the reinforcements hidden within concrete framing.

In terms of material testing, these samples are evaluated for performance strength and material compositions in a laboratory. However, it can be tricky to determine where to extract the specimens so as to not compromise the integrity of the existing building.

As such, Su recommends cutting out these redundant segments of materials from safe places such as the ends of beams. "In my experience, I've found that structural steel, even from the early 1900s, can be weld-able," he observes.

"Once the existing framing is known, the real fun can begin—analyzing the strength of the existing framing, determining what the new demand may be on the existing structure or how it needs to be modified to meet the new program, and then determining how to accommodate the project requirements, whether it's adding new framing, removing existing framing, or reinforcing the existing framing to provide additional strength or stiffness," relates Reynolds.

Photo courtesy of MKA



For Blue Cross Blue Shield, MKA's optimized design of the lateral system, which incorporated a multistory intermediary truss, resulted in a 300-ton, 20 percent reduction.

For existing projects where space constraints and access might be an issue—for instance, when member sizes are limited to something that can fit within an elevator—steel can be broken into smaller pieces and re-attached during installation.

In terms of evaluating cost and feasibility for adaptive reuse, one of the main cost thresholds is the trigger for lateral upgrades, i.e., modern seismic and wind loads. This evaluation involves the original use versus intended use, the percentage of reinforced structure compared to the whole, and changes in area and weight loads, says Su. Considerable effort goes into gathering information, narrowing down options, and analyzing for levels of force changes in the adapted building.

"For expansion, the capability of the existing structure to be reinforced for both increased lateral and gravity loads is usually the key consideration," says Su. "Usually, there are limits on how much space can be taken up by reinforcing measures, and the smaller the better."

Overall, access and accommodating the installation of new framing must also be weighed, and as previously noted, existing documentation is important. If little to no information is available, this requires additional time and money for extensive surveying, testing, and documentation of the existing structure. Ultimately, inadequate information can result in more conservative solutions due to the unknown.

STRUCTURAL EXPANSION IN ACTION

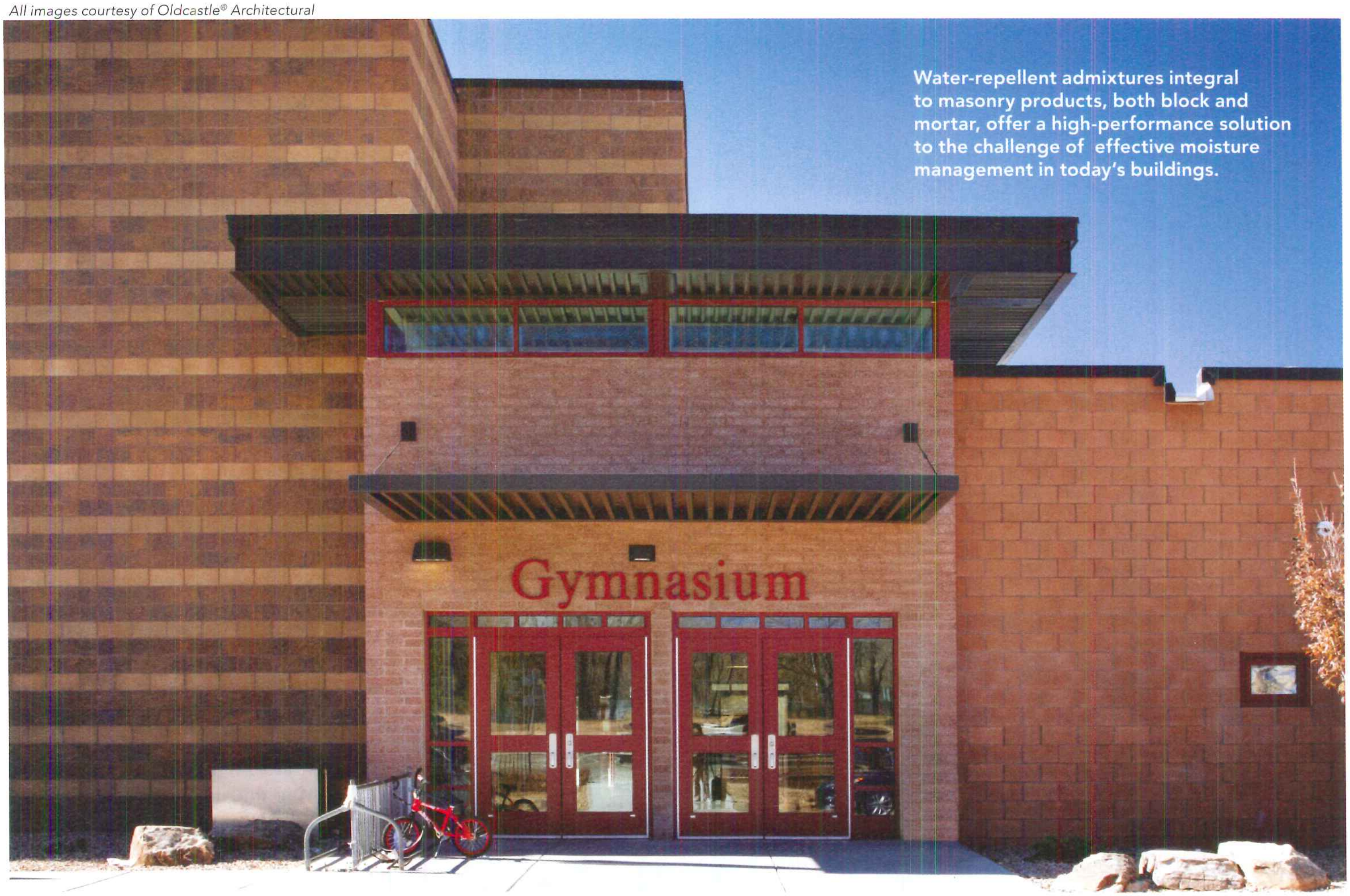
Looking at a number of projects that demonstrate the versatility and flexibility of structural steel, Magnusson Klemencic Associates (MKA) set out to provide the largest area of vertical expansion without over-stressing the existing foundations for Blue Cross Blue Shield in Chicago. To begin, extensive surveying was performed to confirm the tolerances and alignment of the structure. Fortunately, this alignment was such that the vertical expansion could be completed with only modest modifications to the original structure.

Continues at ce.architecturalrecord.com

Barbara Horwitz-Bennett *is a trade press journalist who has covered the design and building industry for the past 17 years. She contributes regularly to a number of leading architectural publications.*

CONTINUING EDUCATION

All images courtesy of Oldcastle® Architectural



Water-repellent admixtures integral to masonry products, both block and mortar, offer a high-performance solution to the challenge of effective moisture management in today's buildings.

Controlling Moisture in Masonry

Resolving the number one cause of structural deterioration in buildings

Sponsored by Oldcastle® Architectural

In 600 B.C. Lao Tzu, credited with authoring the esteemed spiritual classic known as the Tao Te Ching, weighed in on water. "Nothing in the world is more flexible and yielding than water. Yet when it attacks the firm and strong, none can withstand it, because they have no way to change it." Lao Tzu's words certainly ring true for the design and construction industries whose practitioners well appreciate the destructive potential of water which, in the wrong place at the wrong time, can cause devastating structural damage as well as mold and efflorescence. Properly protecting structures from moisture intrusion has been an ongoing mission in the design and construction environment, and advances in technology have enabled designers to specify the building materials and systems that limit intrusion through the wall facade. This article addresses not only the key concerns relating to moisture in masonry construction, but how to solve them through advancements in water repellent mortar and block systems that provide additional moisture control, environmental, and visual requirements.

MASONRY AND MOISTURE—WHAT CAN HAPPEN?

The design of masonry systems should prevent the intrusion of the elements, rain, snow, heat, and cold, into the building's interior, and it should safeguard the building's

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

Learning Objectives

After reading this article, you should be able to:

1. Discuss flashing and other proper masonry installation strategies to manage moisture in a masonry wall.
2. Describe water-repellent admixture advances and uses in concrete block and mortar that help control moisture and meet green building codes.
3. Explain the advantages of complete masonry systems that mitigate water penetration and provide backup moisture management.
4. Specify a masonry solution that delivers superior moisture control and an environmentally sound structure.

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

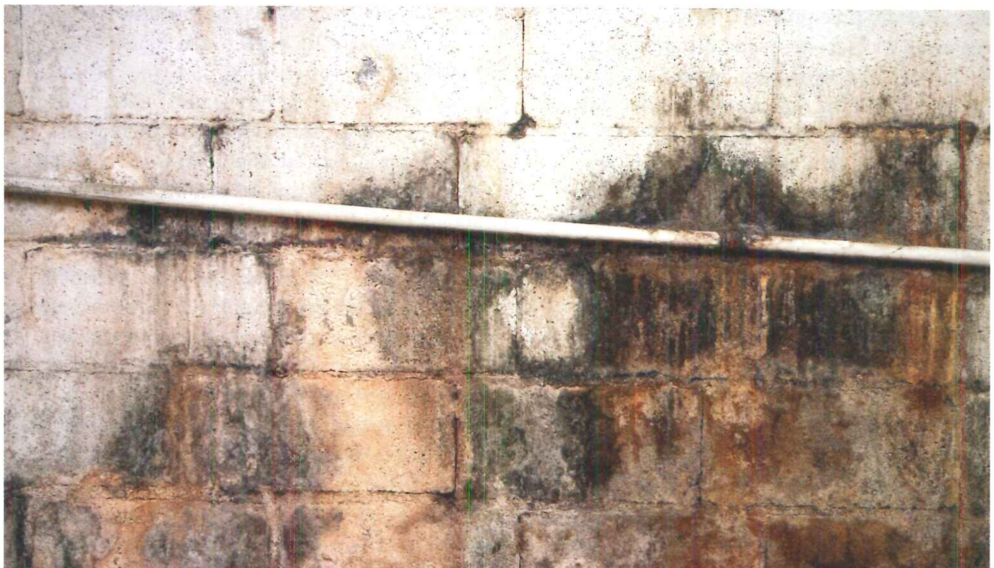
AIA/CES COURSE #K1511C

structural components. The design must be properly detailed, however, as there are many ways water can enter a masonry building—through porous or poor quality masonry units—mortar joints, hairline or shrinkage cracks, parapet, door and window details—in short, through any structural break in the wall. Water can also enter through vapor condensation and can penetrate the structure as a result of poor workmanship, with lack of proper drainage aggravating the impact of any type of moisture intrusion. Vapor condensation can also result from interior sources when thermal properties are not in alignment. The results can take a serious toll on a building along several fronts.

Structural Problems

Moisture has been the number one cause of structural deterioration as long as there have been structures. Moisture in all its forms—snow and ice, wind-driven rain, and water vapor—greatly affect the performance of building materials. With unwanted moisture intrusion, masonry units and mortar can crack. When water enters brick, concrete, or natural stone, thermal expansion can cause the surface to peel, pop out, or flake off—a phenomenon commonly known as spalling, which is caused by excess moisture in the masonry that exerts pressure outward. Eventually, spalling can cause large sections of the masonry to crumble and fall off, potentially leading to structural damage.

Excessive moisture also results in wall rot, an extremely unsightly and unhealthy condition, as well as in disintegration of insulation and the staining of interior finishes. Other adverse impacts include deterioration and/or corrosion of the wood/steel backup studs, cladding, ties and reinforcements, which, left untreated, allow the water intrusion to increase and even spread, causing additional structural degradation or, in extreme cases, outright structural failure.



MOLD—A GROWING CONCERN

To grow, mold needs the following: oxygen; a moderate temperature, generally between 40 to 100 degrees Fahrenheit; a food source; and, the single most important factor, moisture, which can come from leakage from the exterior building envelope or from high indoor humidity. If there is water damage to the structure, excessive humidity, water leaks, condensation, water infiltration, or flooding, mold will grow. When airborne molds find a damp indoor haven, the spores will begin to reproduce and morph from a nuisance into a dangerous health hazard.

Toxic mold is the source of a growing number of legal battles nationwide. Yet, mold has been with us for more than 100,000 years. Why has mold recently become such an issue in the built environment? The short answer is the change in building materials. Design and construction practices can have a profound effect on the potential for mold growth. In fact, continued efforts to reduce initial construction costs have resulted in increased use of lighter and/or organic materials that may provide food for mold. Paper-faced gypsum board, for example, has been substituted for plaster and lathe, oriented strand board (OSB) for plywood, or wood boards. Instead, products such as aluminum, molded plastics, fiber cement, and foam sheathings should be utilized. Pre-finished concrete masonry units manufactured with water repellent additives will also prevent moisture penetration without any organic materials.

While the quest for energy efficiency is a worthy goal, it has inadvertently created mold-related problems. Unless properly ventilated, tighter buildings are actually an ideal environment for mold growth, as are the givens of modern life, including wall-to-wall carpeting and air conditioning, which causes condensation. Mold arises in buildings because of the lack of "big picture" design. Changes are introduced in one component material or subsystem without evaluating their impact on other aspects of a building's overall performance.

Mold can never be completely eliminated, but it can be minimized by limiting excessive moisture sources. The best formula for a mold-free building is to use a systems approach, quality materials, and a tight wall interior construction with proper operating ventilation and dehumidification systems.

Aesthetic Degradation

High on the list of aesthetic impacts of too much moisture is efflorescence, a white, powdery, crystalline deposit on surfaces of masonry, stucco, or concrete. Essentially, efflorescence is the result of a salt within the masonry unit itself that has been dissolved by excess moisture and has migrated to the surface of a porous material, where it forms that unmistakable white bloom as the water evaporates. According to the Masonry Institute, three problems must exist in order for efflorescence to occur:

1) There must be water-soluble salts present somewhere in the wall.
2) There must be sufficient moisture in the wall to render the salts into a soluble solution.
3) There must be a path for the soluble salts to migrate through to the surface where the moisture can evaporate, thus depositing the salts which then crystallize and cause efflorescence.

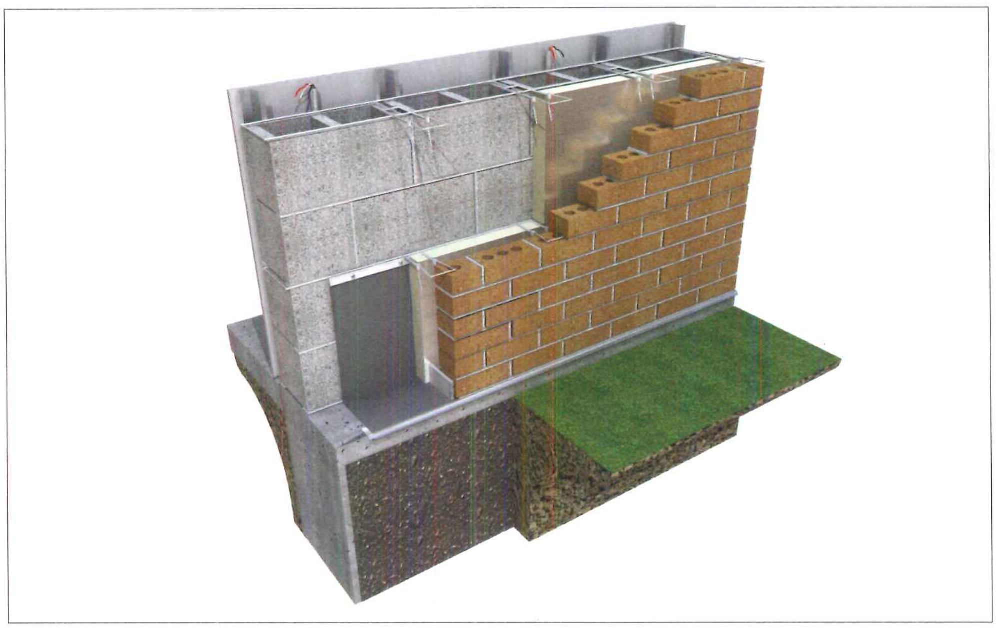
Even though sulfates may be present in a masonry wall, they must be dissolved by water in order to result in efflorescence. No moisture means no migration of sulfates to the surface. Certain conditions, however, will aggravate the potential for efflorescence. If the block has been exposed to cold, rainy weather during storage, for example, or to prolonged or heavy sprinkling, or if the structure has been poorly designed in terms of drainage and moisture control.

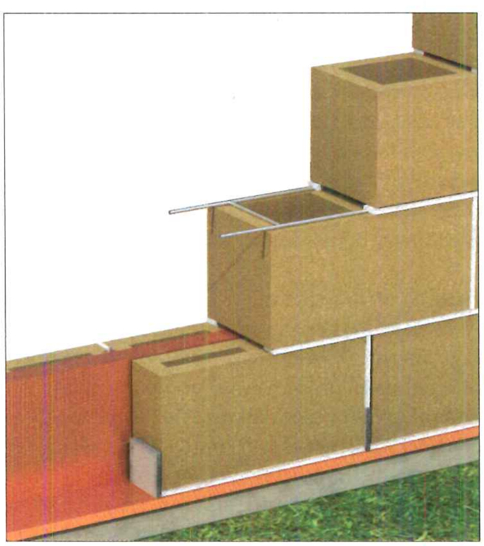
Health and Safety

According to the Department of Energy Building America Solutions Center, "Moisture is not often thought of in terms of occupant health and safety. Yet indoor air quality professionals consider moisture to be a 'pollutant' that can have a significant impact on the occupants' health." Excess moisture causes the growth of bacteria, which can generate new or worsening odors and harmful gases inside the building envelope. The effects can aggravate such conditions as asthma and allergies and, in some cases, result in cancer and birth defects. Airborne moisture is ripe for dust mites and roaches whose droppings exacerbate allergies and whose appearance necessitate the use of insecticides, which have their own deleterious effects. One of the most dangerous threats to human health and welfare from excess moisture in the building is mold. The subject of widespread media coverage and a surging number of cases across the country, mold can have severe consequences, and is extremely challenging to remove. Property insurance does not cover all mold damage, and insurance companies are scaling back on coverage and are not writing new policies in some states. Liability policies are now including mold exclusions. For further information on the growth and consequences of mold, see accompanying sidebar.

PROPER MASONRY DESIGN AND INSTALLATION FOR MOISTURE MANAGEMENT

Moisture management ranks as a top priority in a wall, and appropriate design and installation techniques will go a long way to eliminating the potential for health, legal, and financial devastation caused by excessive moisture in the building envelope. While it is best to keep moisture from entering a wall in the first place, that is probably an unlikely occurrence. Modern designs are geared to thin wall construction and, to some extent, this allows buildings to leak. Besides precipitation, moisture can enter masonry walls from several different sources, including capillary action, water vapor, and groundwater. The objective is to control the water that enters a wall and provide a way for it to drain before it has a chance to do any damage or penetrate further. The National Concrete Masonry Association maintains that





successful moisture mitigation in concrete masonry walls involves several techniques, including flashing and counter flashing, weeps, vents, sealants, water repellents, post-applied surface treatments, vapor retarders, and crack control measures. All components should have redundant use, with the preferred approach to controlling moisture being a four-level line of defense, including surface protection, internal protection, and drainage and drying. The strategy here is that a wall's water tightness will still be preserved if one of these systems fails.

Detailing techniques vary by type of masonry unit. The following are three of the most common masonry scenarios:

1) **Full Bed Depth Veneers:** In a cavity wall, moisture control relies on gravity and an unobstructed 2-inch airspace to get water down to the flashing and the weeps. This is the basic rainscreen principle wall.

2) **Single Wythe Walls:** A single wythe wall is a stone, brick, or concrete wall that is one masonry unit thick. Single wythe walls offer the economic advantage of serving as the structural system with multiple finish options on the exterior and the interior. Single wythe walls do not require the backup of a traditional cavity wall construction, but in order to provide full protection from the elements they must be carefully detailed and constructed

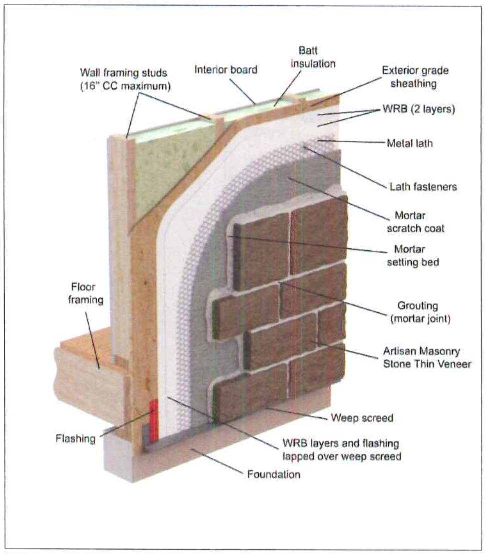
3) **Manufactured Stone Thin Veneer:** An increasingly popular masonry solution is manufactured thin veneer, which refers to a lightweight, flat-backed, thin surface product that is applied directly to a solid facing. Thin veneers average in thickness from 1-inch to 2-inches and, per International Code Council regulations, must weigh 15 pounds or less per square foot. Thin veneers can either be directly adhered or attached to a mounting system. According to the Masonry Advisory Council, a proper model for an adhered exterior veneer that provides adequate moisture control uses Oriented Strand Board (OSB) as sheathing on the outer face of the studs, followed by two layers of building paper. A drainage mat is then installed to drain any water that has penetrated to the flashing, which in turn sends it to the building exterior via the weepholes. Atop the drainage mat, a galvanized expanded metal lath, or diamond mesh, should be attached as it will hold the veneer to the studs. A parging backing, which is a thin coat of mortar to provide a smooth surface for masonry and seal it against moisture, should be applied onto the mesh. Mortar is applied to the back of the thin veneer and pressed on to the parged surface.

WATER-REPELLENT ADMIXTURE ADVANCES IN BLOCK AND MORTAR

An effective method in controlling moisture in the building envelope is through water-repellent admixtures. Advances in technology have enabled manufacturers to offer water-repellent admixtures in both block and mortar which, if used together, offer superior moisture control and protection against all types of moisture infiltration.

Because untreated masonry units typically absorb water through capillary suction or wicking, the anti-wicking action of an integral water repellent will minimize the amount of water absorbed, and enable any water that has breached the surface to drain toward flashing and weep holes. No film forms on the surface of the masonry as a result of the integral water repellent, nor is the admixture impervious to moisture, which means the masonry remains breathable.

Historically, three types of admixtures have been used. Calcium Stearate has demonstrated

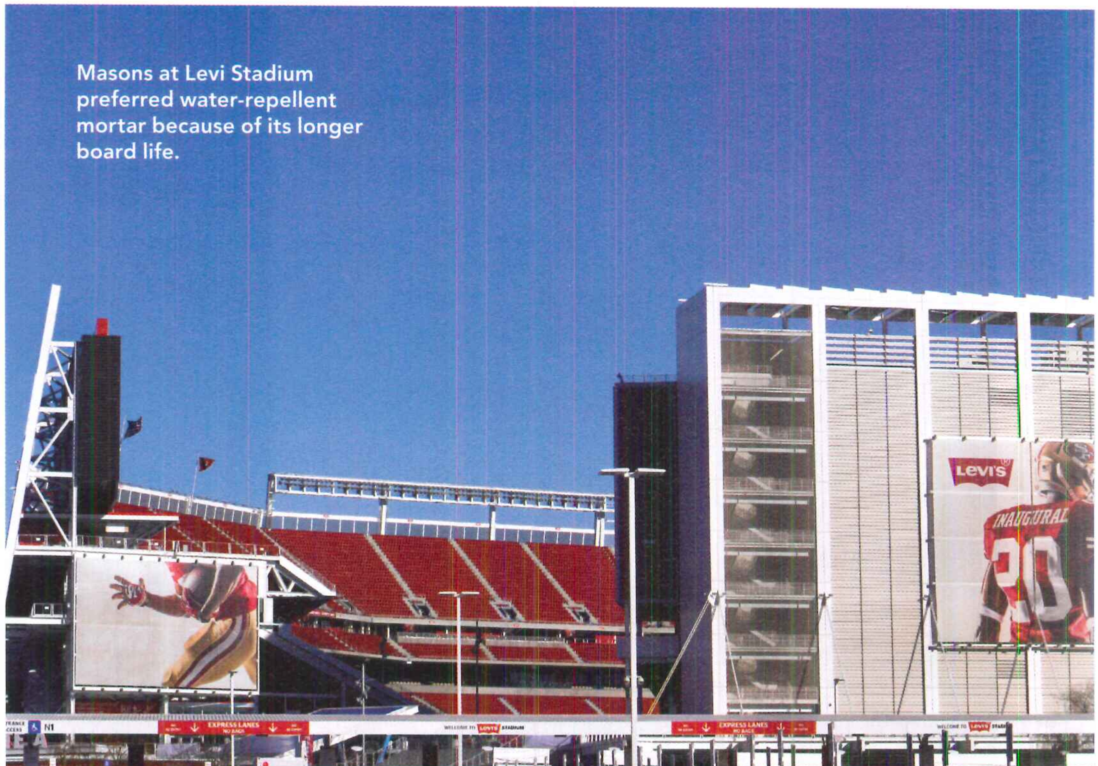


Isometric view of thin veneer in a grouted installation over wood framing.

an increase in air and a poor bond, as have the second type of admixture, tall oils. The third type, polymetric, has shown a better bond between units and mortar, though the air component has varied by manufacturer. High air content in mortar lowers the compressive strength and can reduce the bond between units. Low air content will reduce the freeze-thaw resistance of mortar. Polymeric admixtures do not alter the finished appearance of the block, nor do they affect its "paintability," but instead provide a denser, more uniform unit as well as moisture control and limited risk of efflorescence. The admixture is incorporated at the plant, ensuring even distribution throughout the concrete mix.

Especially effective in lightweight concrete masonry units and single wythe construction as added protection against water infiltration and wind-driven rain, an integrated water repellent agent assures design professionals that the product will be executed as specified and in the proper proportion for maximum protection.

While an integral water repellent in a masonry unit will go a long way to controlling moisture in a building, the joints are still susceptible to water infiltration. Consequently, use of both masonry units and mortar with an integral water repellent is necessary to provide full protection and ensure the surface is not breached by moisture in any form. Recently developed, specially engineered granulated formulas can be added to the mortar/sand during the blending process of premixed mortars, which can also improve bond strength over the service life of the building.



INTEGRAL WATER-REPELLENT MORTAR A WINNER FOR LEVI STADIUM

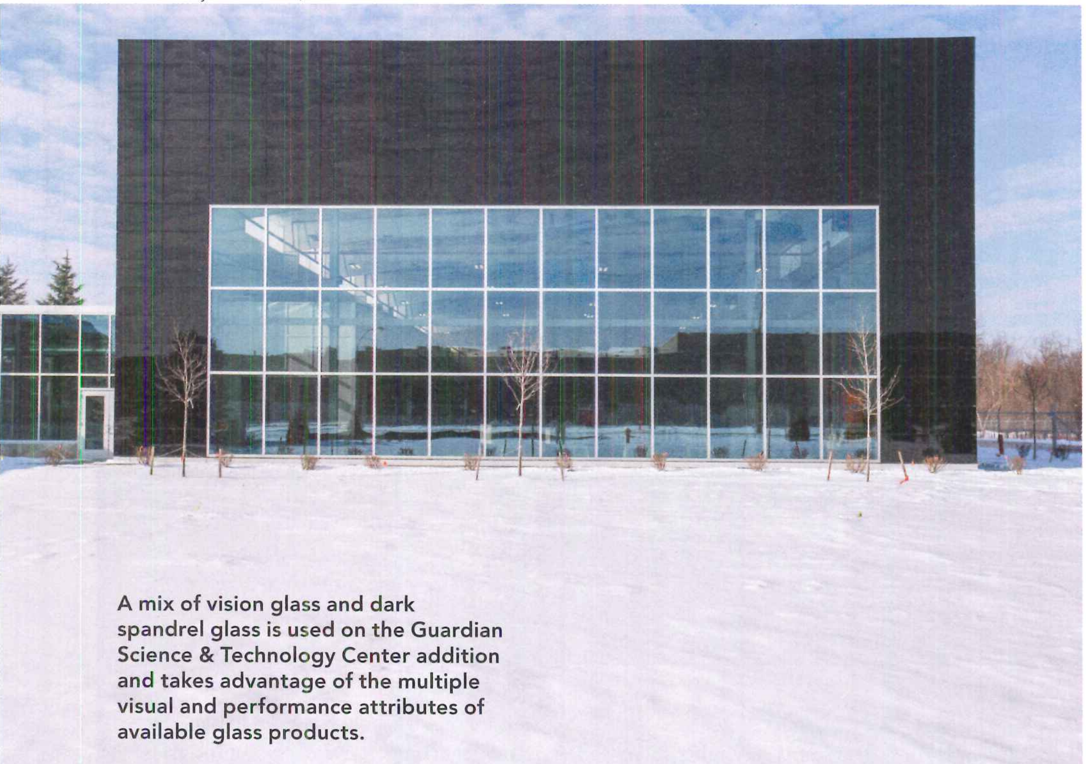
Levi's Stadium, located in Santa Clara, California, is the home of the San Francisco 49ers, future host to Super Bowl 50 in 2016, and widely considered the "next generation" of stadium design. When it came to the construction of this new stadium, concrete masonry was chosen for its versatility, durability, and structural qualities. Pre-blended Type S mortar with an integrated water repllent was used underneath the stadium for corridors, locker rooms, storage and mechanical rooms, and even a detention area for rowdy fans. Water-repellent mortar was specified for use in the architectural ground face blocks for an exterior wall. "The masons preferred the pre-blended water-repellent mortar because it was not as coarse as other local brands and had longer board life," says Chuck Wood, estimator and project manager of Bratton Masonry of Fresno California for Levi Stadium.

Introduced in the early 1980s, integral water-repellent mortars are available in liquid and powder form, with the liquid admixture applied on site at the mixer. Powders are typically found in preblended mortars. Each type of mortar is available in Type M, S, and N compressive strengths in compliance with ASTM C270 and is engineered as a preblended mortar for consistency, workability, and yield—providing factory-controlled mixes, batch to batch, compared to field-mixed mortars. In addition to creating a superior bond, these mortars can be formulated for extended board life, eliminating retempering in hot or windy climates.

Board life is a job-site-related term used by masons to define the working time of the mortar, and for them to assure a proper application. Job site conditions such as high ambient air temperatures, sunlit walls versus walls in the shade, windy conditions, etc., may affect the board life, depending on the overall performance or water retentivity of the mortar. In the event that the board life is reduced by job site conditions, retempering, which is the addition of water to the remaining mortar in the mixer or mortar pans, is permitted once during the plastic stage. Under no circumstances should colored mortar be retempered, as the addition of water will affect the final color of the mortar.

Continues at ce.architecturalrecord.com

Photo courtesy of Guardian; Photo credit: Ara Howrani



A mix of vision glass and dark spandrel glass is used on the Guardian Science & Technology Center addition and takes advantage of the multiple visual and performance attributes of available glass products.

The optimal glazing selection will depend upon matching the particular project requirements for performance and aesthetics with the combination of features provided by each glazing type. That includes understanding any effects of different glass types on the final color and appearance of the glass. It also includes determining the need for a clear line of sight, as in vision glass, or if diffuse light and privacy are needed, as in translucent glass. If a project design team prefers an all-glass exterior aesthetic, spandrel (fully opacified) glazing may be strategically placed on the building skin in order to conceal the structural and mechanical features of the building. There are numerous other options available to design teams that affect aesthetics and performance, including a range of tint colors, a palette of coatings, acid-etched glass, patterned glass, frit of many colors and in many configurations, colored interlayers, and digitally printed glass and interlayers.

For daylighting, glazing should be selected recognizing that a strategic level of visible light transmittance (VLT) is required while still needing to control solar heat gain. (See sidebar for performance term definitions.) IGUs are typically required by energy codes to improve U-Factor or R-value performance of exterior walls. All of these will impact the quality and color of the natural daylight, so they should be reviewed and selected with care in each daylighting situation.

Trends in Glass and Glazing

Architects have been using glass in innovative ways for decades, drawing upon an expansive array of glazing performance and design options. Computerized energy modeling and daylight simulations have facilitated the refinement of building designs for appearance, performance, and benefit to occupants. The outcomes have been increasingly advanced and efficient solutions.

In recent years, glass manufacturers have been asked to respond to the needs of owners and architects to provide new and higher-performing glass and glazing products to suit a range of design trends. For example, there has been a growing interest in large-sized IGUs to facilitate unobstructed vision. That can be done, but architects and owners are of course still seeking good glass flatness and optical clarity, so it is important that manufacturers have the capability to achieve all of those criteria. Larger glass sizes also mean that thickened glass may be necessary in order to maintain appropriate deflection control. As a result, the fabrication, handling, and installation of these glazing units may necessitate special provisions to accommodate the increased sizes and weights of the units. Special requirements should be carefully coordinated early in the design process.

There has also been a sustained trend in northern climates to control heat loss better in glazing. In commercial buildings, argon fill and triple glazing are among the features that are being increasingly specified to support intensified insulating performance. In addition, interior surface coatings are being used to reflect heat back inside a building, lowering the u-factor and improving the performance of IGUs.

For climates where cooling is the dominant control mode, intensified screening of solar energy is often a key objective while still achieving good daylight. The light-to-solar gain ratio (LSG) is a useful metric in this case and is

PERFORMANCE TERM DEFINITIONS:

- **Visible Light Transmittance (VLT):** The percentage of transmitted electromagnetic radiation within the visible spectrum (i.e. visible light). The higher the VLT rating, the more light that passes through. While high visible light transmission is often desirable from an exterior aesthetic standpoint, the long-range comfort of the building occupants must also be fully considered.
- **Solar Heat Gain Coefficient (SHGC):** The decimal share of the total solar energy transmitted through the glazing. A low SHGC associates with strong shielding of incoming solar energy; a high SHGC associates with passive heat gain.
- **Low Emissivity:** Emissivity refers to the ability to emit thermal energy, which inversely correlates with reflectivity. A low-E coating exhibits a high level of reflectivity relative to the overall incoming electromagnetic radiation from the sun, though not necessarily the visible portion of the spectrum.
- **U-Factor:** The thermal conductance of a material. The lower the number, the better the insulation or thermal control. The whole unit U-value is typically greater than the center-of-glass U-value because of the thermal conductivity of the frame.
- **R-Value:** The thermal resistance of a material. A higher number represents higher thermal resistance. The R-value is the reciprocal of the U-Factor (R= 1/U).
- **Lux:** A standardized unit of measurement of light intensity (which can also be called "illuminance" or "illumination"). One lux is equal to the illumination of a surface one meter away from a single candle. Average outdoor sunlight ranges from 32,000 to 100,000 lux. At sunset and sunrise (with a clear sky), ambient outdoor light is also about 400 lux. Moonlight represents about 1 lux. A bright office requires about 400 lux of illumination. Building corridors can be lit adequately at around 100 lux.

Photo courtesy of Guardian; Photo credit: Justin Maconochie

CASE STUDY #1

Project: Battle Creek Area Mathematics and Science Center
Location: Battle Creek, MI
Architect: TowerPinkster Architects

- **Challenge:** When the Battle Creek Area Mathematics and Science Center (BCAMSC) outgrew its previous facility, a community partnership selected the former Kellogg Cereal City Museum as the site for a new facility. An energy analysis showed the renovated facility would be at least 15 percent less expensive to operate than the current facility, but the plan required a new, energy-efficient and better-insulated building envelope that included high-performance glass. In addition, the center had to serve dual functions: education for exceptional high-school students from 16 neighboring districts; and the design, manufacture and distribution of science-related curriculum materials.
- **Criteria:** The community partnership tasked TowerPinkster Architects with designing a building that incorporated innovation, flexibility, advanced technology, natural daylighting, and most importantly, areas conducive to inspire students and support the BCAMSC's mantra of "Innovation through Inspiration." Taking that approach, the design team developed three design strategies into the building. The first strategy was to maximize the existing space and circulation in order to efficiently develop educational spaces around the existing atrium. The second was to transform the agrarian aesthetic of the museum to that of a cutting-edge learning facility to provide inspiration. Finally, the building was used as a teaching tool with built-in opportunities for learning.
- **Solution:** The solution involved removing the existing roofs and adding a cantilevered second and third floor over the entry plaza. A glass curtain wall was used on the exterior of the second floor allowing a greenhouse at the corner, showcasing the center's commitment to research-based learning. High-performance glass was used to transform the museum into its current modern design and meet criteria for energy efficiency and daylight. In the center of the building, advanced architectural glass was specified with a 31 percent visible light transmission (VLT) and ultra-low 0.20 solar heat gain coefficient (SHGC), which made it an ideal choice to allow natural light to penetrate the classrooms and open spaces. By contrast, on the perimeter of the building, the selected glass delivers a high, 68 percent VLT and has a SHGC of 0.38.

  "The glass selection played a very important role in helping us achieve our design goals," says Matt Slagle, senior design architect with TowerPinkster. "Its neutral appearance allows for the seamless transition from the building's original form, the former Cereal City USA Museum, to a state-of-the-art school."
- **Results:** Multiple studies have illustrated that student performance improves with access to natural light, and the selected glass offers the added benefit of managing solar energy, which helps reduce electric lighting and HVAC loads. That impact, and that of several other sustainability minded efforts throughout the building, adds up to a facility designed to LEED Gold levels.

calculated as the VLT divided by the SHGC. High LSG values mean strong levels of visible light transmission occur simultaneously with significant solar heat shielding. In some cases, low-E coatings may incorporate double or triple layers of silver in order to attain powerful LSG ratios.

Finally, the use of bent glass has been increasing to help to deliver architectural objectives. Testing has demonstrated that, in fact, there is little or no effect on VLT with bent glass, although it can certainly create some pleasant and varied lighting effects depending on the conditions. Robust energy performance remains available through the use of low-E coatings that have been proven to fully accommodate the glass-bending process. As with architecture involving large units, coordination on the prospective use of bent glazing units should begin early in the design process.

LEED AND DAYLIGHTING

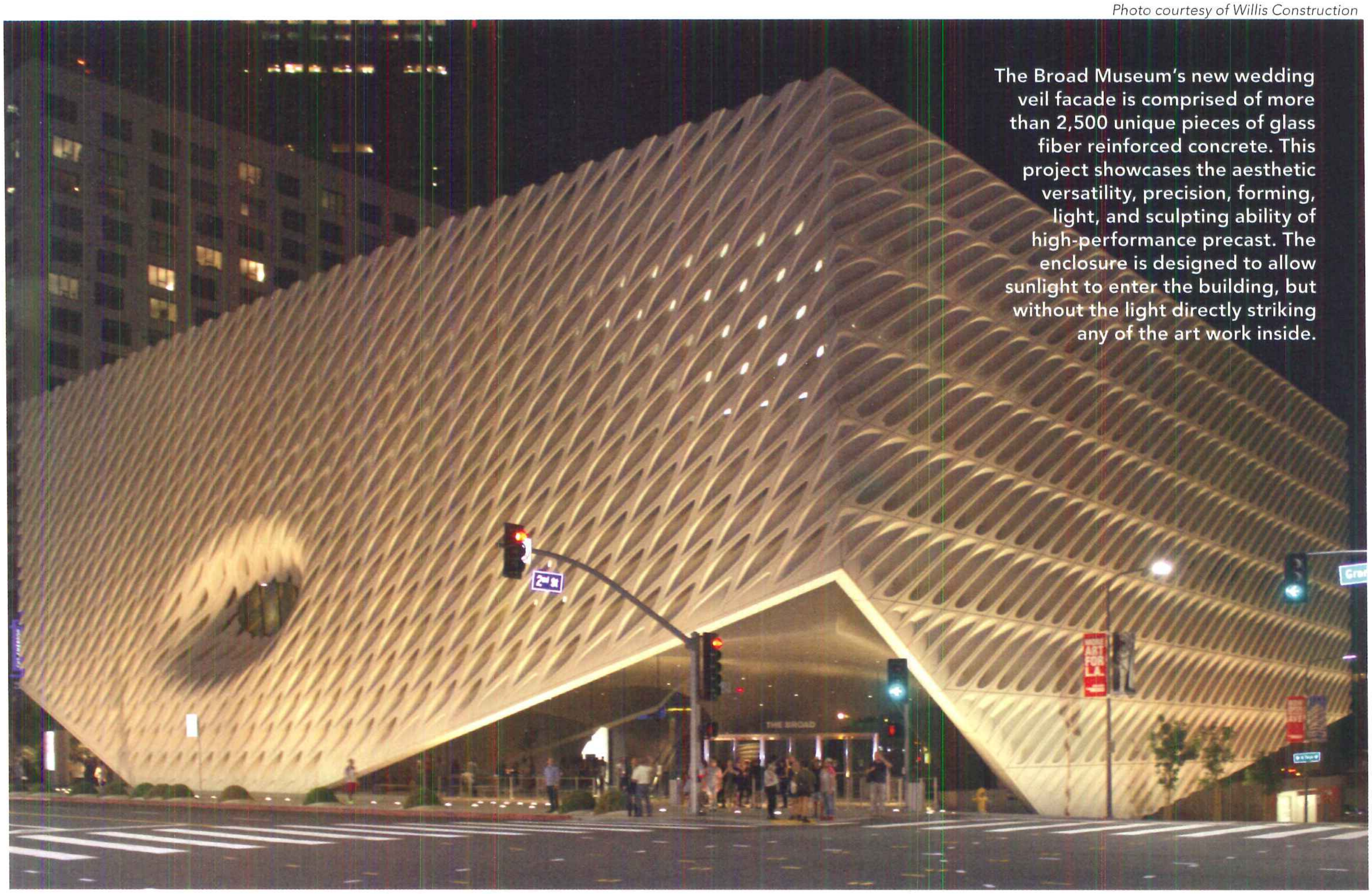
The LEED rating system of the U.S. Green Building Council (USGBC) has always recognized the significance of daylighting in buildings, and has listed it as a credit option under the general category of Indoor Environmental Quality.

Daylighting has also been linked to the support of other prerequisites and credits such as Minimum and Optimized Energy Performance, Quality Views, and Interior Lighting. LEED v4 contains significant updates and changes to the process of demonstrating how daylight is effectively used in buildings. The first distinction is that different point levels are available based on the particular building type or LEED program being used (i.e. LEED for Healthcare, Schools, etc.). The second distinction is that the previous prescriptive compliance-path option has been eliminated, meaning that computer simulation, calculation, or measured data are required in order to illustrate the performance benefits of daylight in a building.

Continues at ce.architecturalrecord.com

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

Photo courtesy of Willis Construction



The Broad Museum's new wedding veil facade is comprised of more than 2,500 unique pieces of glass fiber reinforced concrete. This project showcases the aesthetic versatility, precision, forming, light, and sculpting ability of high-performance precast. The enclosure is designed to allow sunlight to enter the building, but without the light directly striking any of the art work inside.

High-Performance Aesthetics in Precast Concrete

More than just a pretty face, precast concrete supports innovation, sustainability, and performance

Sponsored by Precast/Prestressed Concrete Institute | *By Amanda Voss, MPP*

Concrete. A vital ingredient in the built environment that we encounter throughout our day. While concrete can be found occupying the role of unsung hero in essentially all structures, as a design medium, precast concrete truly embraces a diversity of color, forms, and textures, making it a high-performance material, especially in terms of both sustainability and aesthetics.

A high-performance structure is one that integrates and optimizes all relevant attributes on a life-cycle basis. This means that we are being challenged not to just build a structure that meets codes, but one that is the best structure it can be for the given location and circumstances relative to that particular project. Designers should look for ways to truly leverage the benefits of the materials and systems they use, which often go beyond the original intent for a material. For example, precast concrete can serve as the enclosure, providing the aesthetics and thermal, air, and moisture management systems, but also contribute to the structural system.

PRECAST CONCRETE EMBODIES THE DEFINITION OF HIGH-PERFORMANCE MATERIAL

As a high-performance material, precast concrete contributes to the overall high-performance goals of a building. It provides energy and water conservation, safety, security, durability, and accessibility; and meets cost-benefit, productivity, functionality, and operational considerations. Yet, the term "high

CONTINUING EDUCATION

EARN ONE AIA/CES LEARNING UNIT (LU)

Learning Objectives

After reading this article, you should be able to:

1. Describe what high-performance aesthetics are.
2. Explain the finish options with precast concrete.
3. Explain how clay products and natural stones can be veneered to precast concrete to speed construction and reduce costs.
4. Discuss the latest innovations in aesthetics and finishes, including thin brick and terracotta, and polishing and burnishing.

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

AIA/CES COURSE #K1511J

performance" challenges designers and owners to go beyond optimization. It embraces other key concepts, including the performance of the structure in the long-term and through life-cycle costs. Furthermore, it encompasses sustainable design and sustainability.

Precast concrete integrates and optimizes all major high-performance attributes on a life-cycle basis. It integrates easily with other systems, and inherently provides the versatility and efficiency needed to meet the multi-hazard requirements and long-term demands of high-performance structures.

AESTHETICS PLAY IMPORTANT ROLE IN HIGH PERFORMANCE AND SUSTAINABILITY

In addition its high-performance attributes, precast allows designers to create a wide range of aesthetic effects and colors, to affordably incorporate historic elements, and to integrate a diverse array of facade elements into a single precast panel. Precast concrete facilitates a tremendous range of colors and textures through the use of formliners, raw materials (i.e. aggregates and cement), and pigmentation, as well as various finishing techniques, such as acid etching and abrasive blasting. Designers can create intricate bullnose detailing, reveals, and custom castings. Designers also can embed or veneer traditional materials, such as thin brick or stone, into precast panels to utilize their natural beauty while gaining the many high-performance benefits of precast concrete.

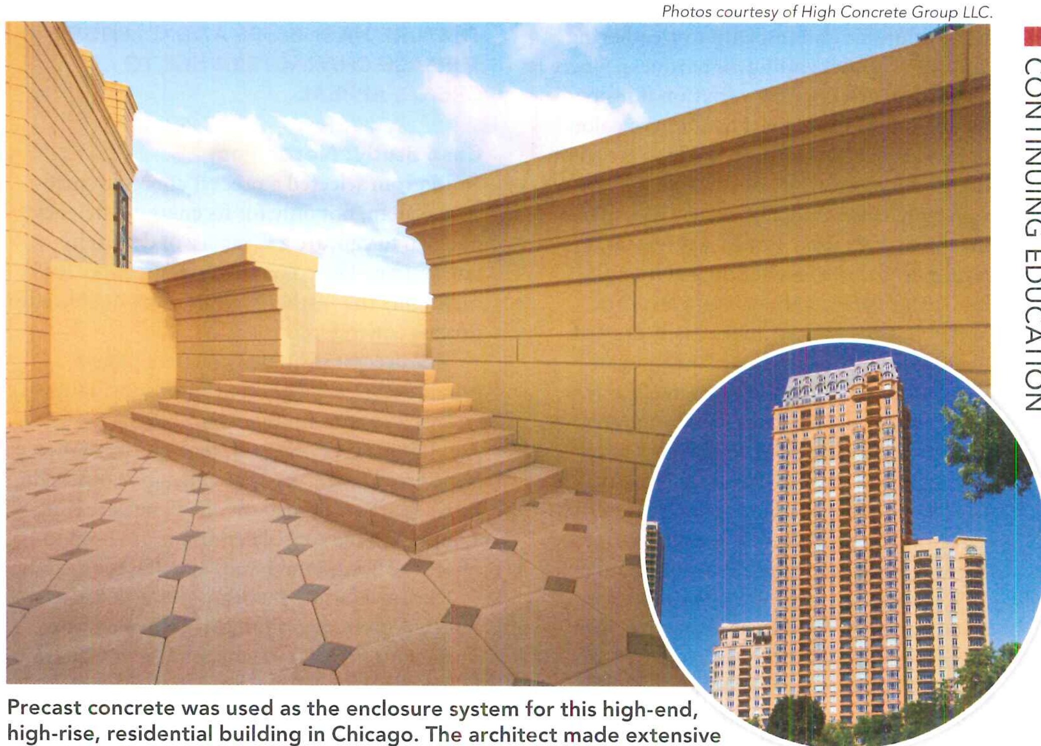
The aesthetic versatility of a material is important, because it allows us to be truly creative while still preserving efficiency. Not only does an aesthetically versatile material offer a broad design palette, but it should also minimize construction complexity, reduce life-cycle costs, be durable and have a long service life; and, contribute to the efficiency and resiliency of the structure.

PRECAST CONCRETE SEES THE WORLD IN FULL COLOR

Precast concrete comes in an almost endless array of colors. Color can be created by natural materials, such as aggregates like stone and sand, or via cements and colored pigments, or from a combination of both, depending on the finishes selected. To achieve optimum results, it is important to have a basic understanding of these ingredients, and to use high-quality, consistent materials and processes.

The color of concrete is composed of the paste (cement and water), matrix (paste and sand), and stone (coarse aggregate). Which components contribute most, or dominate, the color contribution depends on the finish selected and degree of exposure. The term "exposure" refers to the matrix and coarse aggregate.

Photos courtesy of High Concrete Group LLC.



Precast concrete was used as the enclosure system for this high-end, high-rise, residential building in Chicago. The architect made extensive use of detailed formwork to create extensive balconies, decorative features, detailed cornices, and more. A medium sand-blast finish was used with three different mix designs, resulting in different colors for each of the three towers.

To help differentiate the primary contributing material to color, we can place finishes into two basic groups. Both of these are different in terms of color, finish, reproducibility, and longevity. First is paste-dominant color, wherein the primary contributor to color is the paste. This color application is typically found in zero to light exposure finishes. Paste is made up of cement and water, which, when combined, create a chemical reaction called hydration. It should be noted that pigments that are used to sometimes tint the paste portion of the concrete are inert.

Aggregate-dominant color, where aggregate is the primary contributor to color, is typically seen in medium to deep exposure finishes. The term exposure refers to the degree to which the aggregate is part of the finish. "None" would denote a color that is paste only, or skin. Light exposures predominantly feature sand and paste. Medium exposures typically have half-and-half mix, where half of the visible concrete is aggregate. Heavy, or deep, exposures refer to coarse aggregate being mostly visible.

In form finishes and light exposures, most of the color is derived from the paste and matrix, whereas, with deeper exposures, the coarse aggregate becomes the primary contributor to color.

Paste is the binder in concrete, resulting from the mixing of the cement and water, and can be colored by a variety of pigments. During the chemical reaction of hydration, slight alterations in the variables can produce different results. For example, if more water is added to a concrete mix, typically a lighter color of paste will result. Furthermore, paste-dominant finishes may be more susceptible to color variation and changes in color over time, especially depending on the environment a project is located in.

When using paste, there are several important quality-assurance measures of which to be aware. Fluctuations in the water-to-cementitious ratio can result in panel-to-panel color variation. More curing will typically darken the final finish. High porosity can result in staining as well as absorb runoff water, so make sure the concrete has a low absorption rate. Paste-dominant color is also susceptible to weathering and acid rain, which may alter the color with time.

Aggregates Provide Great Color Stability

Aggregate-dominant color, the second major category of color, derives its hue from aggregate mixed into the concrete. Aggregate-dominant finishes may include coarse or fine aggregates, such as silica, limestone, granite, marbles, and quartz. Aggregate colors range from whites and pastels to red, black, and green. Natural gravels provide a wide range of rich, warm earth colors as well as shades of gray.

Color from aggregates is fairly consistent over time, and curing does not affect color. Typically, aggregate-color-dominant concrete is very durable and resistant to weathering and staining, depending on hardness. There is also less panel-to-panel variation if properly blended. Moisture does not alter the color of most aggregates. However, there are some design considerations when choosing an aggregate color. Soft aggregates, like silica, may wear over time. Round aggregates, like river gravel, have less bonding ability and less surface area, so they retain less dirt and pollution, and are more easily crafted to a consistent finish. Angular aggregate, like crushed granite, has more surface area, which allows for a better bond but more dirt retention. The irregular shape of this aggregate type makes it more difficult to develop a consistent profile between panels on returns.

Using the exceptional flexibility afforded by both paste- and aggregate-dominant color, architectural precast concrete can be cast in almost any color, form, or texture to meet the aesthetic and functional requirements of the designer in an economical manner. Complementary combinations of color and texture can aesthetically improve any project.

Case Study: Paseo Altozano

To reduce the visual scale of a 1.45-million-square-foot shopping mall in Mexico, designers used a variety of colors and finishes on more than 2,500 architectural precast concrete panels. The precaster used a combination of pigments, formliners, acid etching, and chiseling to emulate black and orange natural stone. The design created a series of independent-looking buildings within the long structure, while maintaining the high quality and uniformity of a single construction system.

The key challenge came in formulating all of the finishes and replicating the desired look of slate. This was achieved with rubber molds cast from discarded concrete flooring pieces at the precaster's plant. The resulting shapes were manually tinted by penetrating acid-based stains of various colors on every slate block. Replicating slate with formliners provided considerable savings over using natural materials.

Precast concrete elements were alternated across the large extended surfaces of each facade to create visually attractive and original areas within the larger complex. Components included a large number of column covers.

The project now serves as an inspiration to other owners and designers. As seen at Paseo Altozano, design flexibility is possible, with both color and texture of precast concrete varying in aggregate and matrix color, size of aggregates, finishing processes, and depth of aggregate exposure. Combining color with texture accentuates the natural beauty of aggregates.

TEXTURE HARNESSES AND CHANGES SURFACE CHARACTERISTICS TO CREATE APPEAL

Case Study: Nordstrom

Nordstrom selected a precast concrete enclosure system, not only for its energy efficiency, but also to capture a diversity of design in one system. The company's design approach highlights the aesthetic versatility possible with precast concrete.

The precast insulated concrete panels provide edge-to-edge, continuous insulation and serve as the air and vapor barrier, providing a very efficient, high-performance enclosure system. Aesthetically, four different finishes are combined on one panel, creating a multi-layered tone. Formliners are used to offset the horizontal bands at different heights.

The new facade incorporates a varied dimensional projection, furnishing a clean, fresh, white appearance. Entry areas feature 1-inch-thick reveals, producing a ribbed pattern that provides color contrast and dimension. Polishing the outer projections simulates natural stones. The projecting feature wall facade incorporates horizontal bands with four finishes: polished, burnished, acid-etched, and sandblasted. These bands create subtle distinctions within the white concrete panels that project an image of sophistication and elegance, while retaining the traditional durability offered by precast concrete. Acid etching and sandblasting are traditional finishes, but polishing is becoming more popular as architects look for new ways to create beautiful facades more economically. Both polishing and burnishing are created with diamond-tipped pads on either a handheld or machined polisher. The amount of grinding determines the finished look and which term applies. A dull matte finish (honed) is achieved by the least amount of grinding. A high-luster (polished) grinds off the most paste. A mid-range level creates an intermediate finish (burnished).

"The burnished, honed, acid-etched, and polished portions of the panels each reflect light differently when seen from different angles, thus taking on a light and airy quality throughout the day," notes Michael Lee, principal of Callison. The final design was such a success that it has become the design of choice for Nordstrom's new stores. "Only through great partnership were we able to create unique mixes, finishes, and designs that surpassed all preconceived notions of concrete and supported the store brand elements," Lee says. "The combination of horizontal reveals, layers of multiple finishes, and the building's proportions

Photos by Karen Weber © FOTOSENCONCRETO.COM

This large outdoor mall in Mexico used a precast concrete enclosure system that combined pigments, formliners, acid etching, and chiseling techniques to emulate the black and orange natural stone. Precast concrete reduced the overall time and cost of the project relative to using the natural stone.

Photo courtesy of CallisonRTKL

Nordstrom is using precast concrete to create its new high-performance enclosure system that is being used in all of the stores around the country. The precast panels provide edge-to-edge, continuous insulation and serve as the air and vapor barrier, providing a very efficient enclosure system. Aesthetically, four different finishes are combined on one panel: sandblast, acid etch, polished, burnished, and the use of formliners to create horizontal bands at different widths and depths.

formed a natural warmth from a modern mass. Artistry truly blended with execution."

Precast has many finish options. For each texture under consideration, it is important to ask whether the specified finish achieves the durability and aesthetic goals of the project.

AS-CAST

A smooth as-cast finish showcases the natural look of the concrete without trying to simulate any other building product. Fine surface details and sharp arrises can be achieved with a smooth finish. An as-cast, or form, finish requires no additional finishing after being removed from the form and is therefore one of the most economical finishes to produce. However, given the nature of a paste finish, panel-to-panel will mostly likely have less color uniformity and often a mottled look. There also is the potential for surface change when exposed to the weather. Smooth surfaces tend to weather unevenly and become discolored from rainwater and airborne particles. While a rough concrete surface will scatter reflected light and soften the impact of blemishes, a smooth surface will make variations more conspicuous.

Of all precast concrete finishes, this finish is the most misunderstood when it comes to acceptability. An acceptable smooth finish can be very difficult and expensive to achieve if the architect or owner anticipates a high degree of uniformity. However, if the surface is to be painted or stained, this finish will provide an excellent surface and keep costs to a minimum.

Many of the aesthetic limitations of smooth concrete can be minimized by the shadowing and depth provided by profiled surfaces, such as fluted, sculptured, or board finishes; by subdividing the panels into smaller surface areas, by means of vertical and horizontal reveals or rustications; or by using white cement. Any introduction of shapes to provide shadow effects will also enhance the final finish.

Abrasive Blast and Acid Etch

Both abrasive blast and acid etch methods provide exposure of the aggregate and matrix.

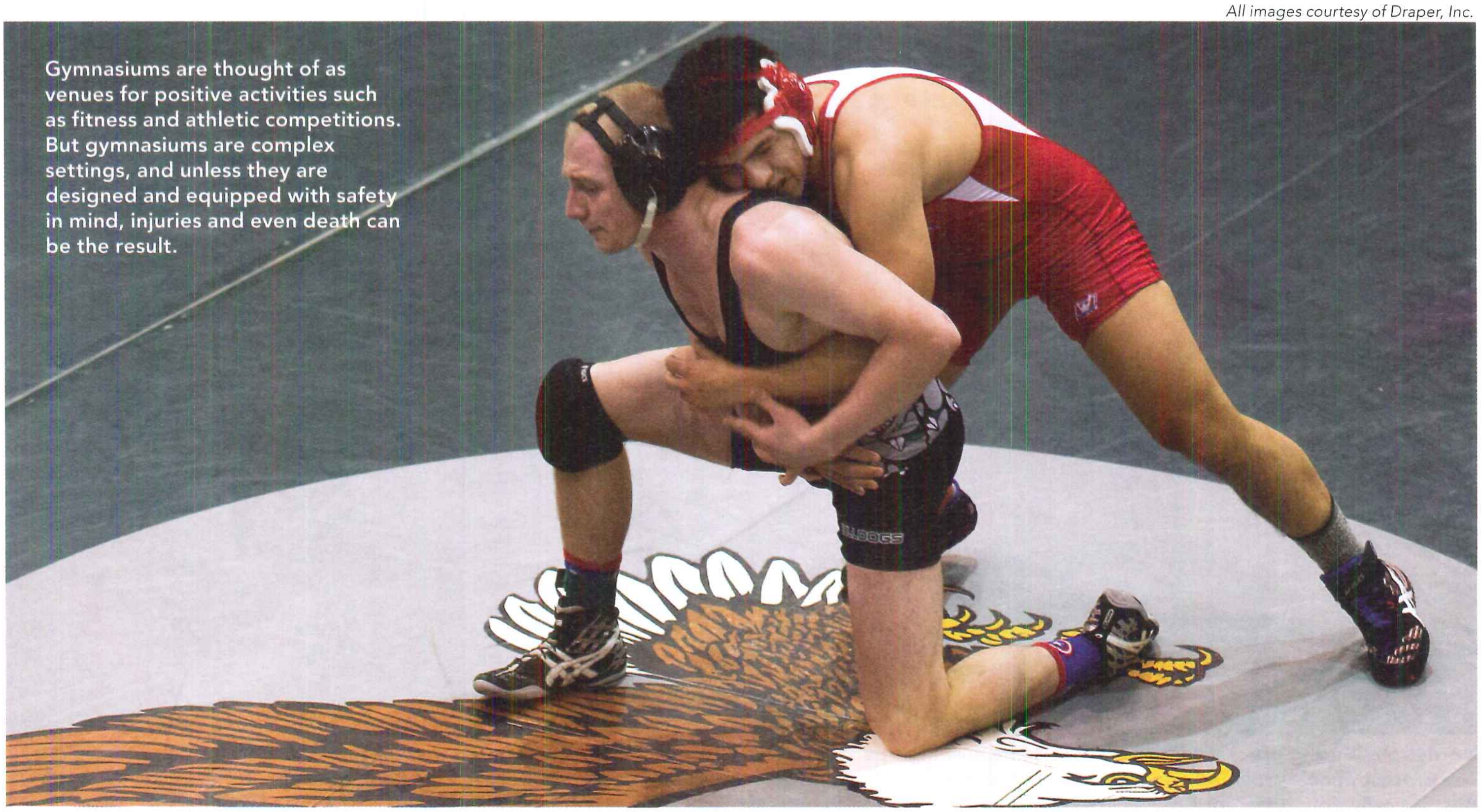
Continues at ce.architecturalrecord.com

Amanda Voss, MPP, is an author, editor, and policy analyst based in Colorado. She serves as the managing editor for Energy Design Update, has taught multiple live AIA CEU classes, and served on the board of Energy Literacy Advocates. She has a background in public policy, residential construction, and custom building.

Safety in the Gym: Specifying Equipment to Protect Users and Spectators

Sponsored by Draper, Inc.

All images courtesy of Draper, Inc.



Gymnasiums are thought of as venues for positive activities such as fitness and athletic competitions. But gymnasiums are complex settings, and unless they are designed and equipped with safety in mind, injuries and even death can be the result.

On a winter day in 2013, as Lori Williams sat in bleachers in a high school gymnasium in Weeping Water, Nebraska, to watch her sons' wrestling matches, she had no idea her life was about to change forever.

A heavy retractable basketball backstop/ backboard assembly swung loose, smashing into the backs of spectators sitting below.

When it was all over, four people—two children and two adults—had been injured. Williams was hurt the worst when the edge of the backboard smashed into her back, crushing vertebrae and damaging her spinal cord, leaving her with paralysis in her lower legs.

SAFETY IN THE GYM

A gymnasium environment is more complex than may be obvious at first glance. The typical gym is filled with both people and equipment, and may include:

- Gym users
- Facility personnel
- Spectators
- Basketball backstops
- Divider curtains
- Wall padding
- Volleyball equipment
- Wrestling mat lifters
- Practice/batting cages
- Other equipment

The focus of all gymnasiums is and should be positive. Professional and serious athletes train and test themselves. Recreational users get physically fit while having fun. Spectators sit or stand to cheer on accomplishments and competitive events.

However, a gym is an inherently dangerous place. Balls, bodies, and equipment often move with great speed and force. At times, multiple sports and activities take place simultaneously in a relatively confined space. As in the case of the backboard incident, heavy equipment from one sport may be tucked away while other sports or competitions occur. All of those people inside the gym—whether using the gym or spectating—should have a reasonable expectation of personal safety in terms of the gymnasium equipment.

To ensure that level of safety, the gymnasium designer, specifier, or architect should know and understand not only the importance of safety, but also how to achieve it.

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

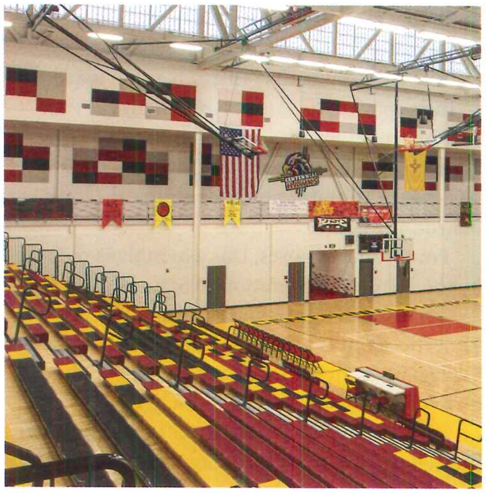
Learning Objectives

After reading this article, you should be able to:

1. Discuss the need for player and spectator safety in gymnasiums.
2. Identify the various components and stakeholders inside a gymnasium.
3. Define the standards and features to consider to ensure player and spectator safety.
4. Explain the specification and installation of gymnasium equipment.
5. Describe green certifications for gymnasium equipment.

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

AIA/CES COURSE #K1511K



Basketball backstops can weigh thousands of pounds and tend to be located high up in the gymnasium. Unless they are secured safely, both when in use and when retracted between times of use, people below are in danger.

Gymnasiums are designed to accommodate many types of sports, athletes, and spectators, either concurrently or consecutively.

Standards for Manufacturers

All gymnasium equipment products are associated with vitally important standards, features, or designs to protect the safety of spectators and participants. These should be considered when choosing, specifying, adding, or replacing this type of equipment.

As an architect or specifier designing a gymnasium quickly learns, there are many manufacturers of gymnasium equipment. Care should be taken to choose the one with the highest qualifications. Here are some questions to ask:

- *Is the gymnasium equipment supplier currently active in the market?* Ideally, the supplier is fully immersed in the market, and is aware of the latest standards and newest technologies.
- *Can the equipment supplier provide references in the market?* As we have seen, the issue of quality and safety of gymnasium equipment is critically important. A manufacturer or supplier of equipment that can show a history of success in the market can give the architect or specifier a greater level of assurance.
- *Can the supplier provide proof of quality manufacturing?*
- *In addition to references, can the manufacturer provide install locations to demonstrate firsthand the quality of its products?*
- *Have the manufacturer's clamps and fittings been tested by an independent party, in a testing lab accredited by an organization such as the American Association for Laboratory Accreditation (A2LA)?*
- *Is the manufacturer able to provide test reports on request?*
- *Does the manufacturer employ only certified welders to build the equipment?* The accepted standard for gymnasium equipment—D1.1 – Structural Welding Standard—has been developed by the American Welding Society (AWS).
- *Finally, does the manufacturer use Grade 5 or better hardware?* To determine this, look for SAE Standard J429, also known as Type 1 for ASTM Standard A449.

Standards for Installers

In a gymnasium, where the weight and movement of human bodies stresses and tests any equipment, the quality of the installation is nearly as impactful as the quality of the manufacture.

On Sept. 4, 2015, a four-year-old girl was playing in a high school gymnasium in Gwinn, Michigan, while her mother coached a cheerleading team. During that time, a safety partition (reportedly being installed) fell over, striking the little girl. She was unresponsive after the accident and taken to the local hospital, then flown to Ann Arbor. The next day, just about a week shy of her fifth birthday, she died.

The accident that caused this child's death drives home the point that gymnasiums are filled with not only athletes, participants, and spectators, but also massive pieces of equipment. Some of that equipment is designed for the sport, and some of it is designed for safety while playing or watching the sport.

The installation process itself brings its own set of perils. Here are the questions to ask regarding installation:

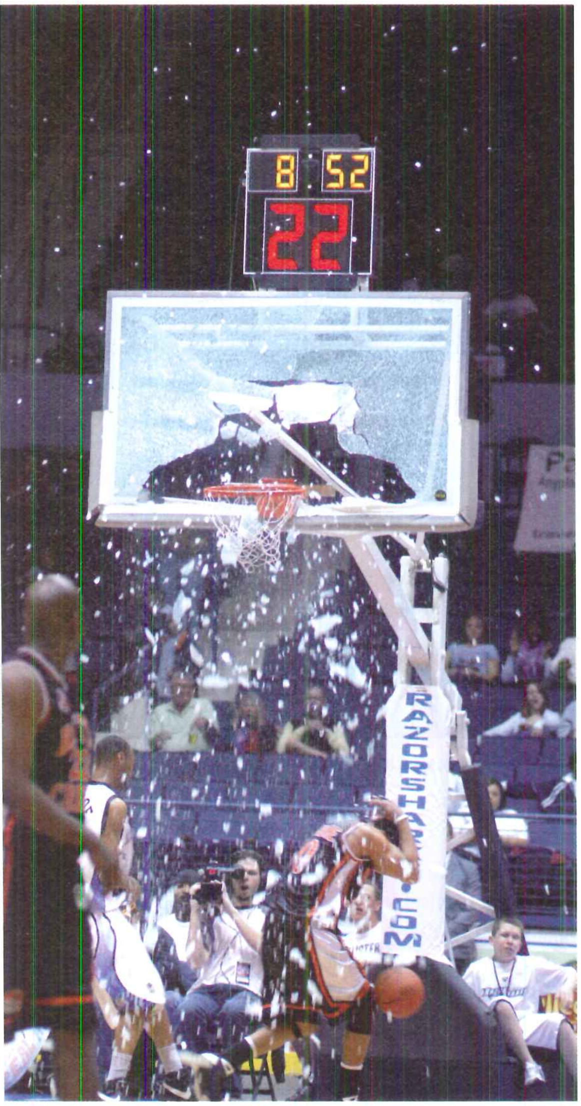
- *Can the installer provide you with job references?*
- *Can the company give you installation examples so you can inspect the installer's work for yourself?*
- *Can the company provide proof of insurance in case there is an accident on the job site?*

THE EQUIPMENT: SAFETY MEASURES

As accidents have shown over the years, gymnasiums can be dangerous places if the equipment is not secured properly and if necessary safety equipment is not in place. Many of the injured are children or athletes in the prime of their physical lives. It is incumbent on the gymnasium architect, designer, or specifier to understand the danger and safety implications of each piece of equipment, and each strategy for keeping gym users and spectators safe.

BASKETBALL BACKSTOPS

Basketball backstops can weigh thousands of pounds. That's a great deal of weight hanging above people's heads when they are in the gym. Unfortunately, there are no governing standards. There is nothing from ASTM or any other body, and there is nothing in the Uniform Building Code (UBC) that is specifically aimed at backstops or other ceiling-suspended gymnasium equipment.



Considering the amount of force glass backboards are subjected to, it's not surprising that they are susceptible to shattering when they are not constructed properly.

For safety in the gymnasium, however, some guidelines should be followed. First and foremost, every folding backstop should have a safety strap. Safety straps function similar to an automobile seat belt, and they prevent backboards from falling in the event of a winch or cable failure.

Safety straps come in several different forms and are available from every backstop manufacturer, as well as from other sources. Some claim to react a little faster than others. Some claim they are rated slightly heavier than others. Some may look a little better than others. Regardless of which you choose, make sure all folding backstops have a safety strap.

Backboard edge padding helps prevent serious head injury when a player jumps up and makes contact. Ideally, the edge padding is 2 inches thick and runs 15 inches up each side.

Winches for Basketball Backstops

Winches should be UL listed to ensure they meet minimum standards for hoisting devices. Standard UL1340 covers power-operated hoists of the overhead type, and are intended for material-lifting service using either chain or wire rope. The standard requires a self-locking gear ratio or brake mechanism, establishes load capacities, and requires the product to be marked with its capacity.

The Problem of Shattering Backboards

A shattered glass backboard can occur when the backboard itself, and not the support structure, is taking too much of the playing load. Even though glass backboards are required to be made of tempered glass, thus limiting the size of pieces, a shattered backboard means flying glass that could potentially be stepped on or cause damage to eyes.

Divider curtains allow a variety of sports to be played inside a gymnasium and protect participants from errant balls.

A concerned gymnasium designer or specifier will wonder: How can this be prevented?

The solution is to transfer playing loads to the support structure, which reduces the risk of breaking glass backboards. This is accomplished with bolts through the glass backboard to the support structure directly behind the goal.

For safety purposes, this assembly is required by the National Federation of State High School Associations (High School) in Rule 1, Section 11, Article 1. It is also required by the National Collegiate Athletic Association (College) in the form of Rule 1, Section 15, Article 1.

With this assembly, manufacturers can offer limited lifetime warranties for glass backboards.

The Importance of Backboard Edge Padding

Backboard edge padding is required by all sanctioning bodies, and for good reason. Backboard edge padding reduces the chances of player head injuries from jumping up and hitting his or her head on the board. To be effective, the padding must cover the bottom of the backboard and 15 inches up each side with 2-inch-thick padding.

The sanctioning bodies requiring edge padding include:

- National Federation of State High School Associations (NFHS) in Rule 1, Section 9, Article 1
- National Collegiate Athletic Administration (NCAA) in Rule 1, Section 11, Article 1
- International Basketball Association (FIBA) in Rule 2, Article 3

Note that the National Basketball Association (NBA) Rulebook does not address this issue. But, in fact, every NBA board is padded.

Although rulebooks don't recommend the type of padding, bolt-on padding has a better attachment and lasts longer than padding that is glued into place.

BEST USE OF DIVIDER CURTAINS

Divider curtains perform many safety and aesthetic functions in a gym. They prevent balls, and to a lesser extent people, from flying into adjacent areas, reducing the likelihood of injuries. Divider curtains also allow use of a walking track or other adjacent area(s) while basketball, volleyball, and other sports are going on.

Continues at ce.architecturalrecord.com

Photo courtesy of Lutron Electronics Co., Inc.

Achieve successful daylighting design by looking beyond the color of the fabric and using performance-based criteria to select a shade.

A New Methodology for Successful Daylighting Design

Selecting fabrics for performance shading

Sponsored by Lutron Electronics Co., Inc. | *By Jeanette Fitzgerald Pitts*

Imagine a new commercial building situated on a rural stretch of vacant farmland. The envelope of the building is predominantly comprised of large windows on every exposure and boasts a window-to-wall ratio of 60 percent. The intention of the design was to maximize the penetration of soft, glare-free daylight as deeply into the space as possible, saving energy, and providing unobstructed views of the nearby lake and rolling hills that sit adjacent to the site. To that end, an automated shading system was specified to ensure that the shades were always lowered to the most advantageous position. They will be deployed to prevent bright and direct sunlight from penetrating the interior and raised when soft ambient light is available, allowing that usable daylight into the space. Overhead lights can be turned off or dimmed for much of the workday. A beige shade fabric that perfectly complements the interior furnishings was selected.

Upon visiting the occupied building one sunny morning, it is immediately obvious that something has gone horribly wrong. The windows on the eastern exposure are ablaze. The deployed beige shade is backlit to a blinding white by the rising sun, creating an uncomfortable glare across the entire interior window wall. The idyllic view beyond is obscured by the overwhelming brightness at the window. Occupants of the space mention that a similar phenomenon occurs on the western-facing facade as the sun sets.

This tale of window shade woe usually occurs for two reasons: the wrong type of fabric is unknowingly specified onto a project, or, if the right fabric is specified, a fabric that does not meet the specification is delivered and installed, something that happens surprisingly more often than one might think. In either case, the use of an inappropriate shade fabric can be an egregious offense, as it can dramatically disrupt the comfort, productivity, and energy consumption of the interior. This sentiment is echoed by Darrell Sawatzky, senior interior designer, LM Architectural Group, Manitoba, Canada: "Because of its role in daylight and thermal management, and

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

EARN ONE GBCI CE HOUR FOR LEED CREDENTIAL MAINTENANCE

THIS CEU IS REGISTERED WITH THE INTERIOR DESIGN CONTINUING EDUCATION COUNCIL (IDCEC) FOR CONTINUING EDUCATION CREDITS (1 CEU VALUE). CREDIT IS ACCEPTED BY THE ASID, IIDA, AND IDC.

Learning Objectives

After reading this article, you should be able to:

1. Use performance metrics to quantify the level of glare reduction, daylight autonomy, or view preservation desired on a project.
2. Explain the relationship between certain fabric properties (openness factor and visible light transmittance) and the shade's ability to reduce glare, support daylight autonomy, and maintain views.
3. Explore how variances in the openness factor and Tv value negatively impact the glare control and energy savings that a fabric can provide.
4. Describe how a specification grade shade fabric is different from a typical shade fabric.

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

AIA/CES COURSE #K1511D
GBCI COURSE #0920005757
IDCEC COURSE #CC-104645-1000

Photo courtesy ©Doug Scott 2014

Different types of space have different daylight management needs in terms of the degree to which a shade must protect the interior from glare, preserve an outdoor view, and provide thermal regulation.

its potential effect on building performance, I believe a shading fabric should be considered as an integral part of the building envelope, instead of a decorative window covering."

The challenge for specifiers trying to select the right fabric is two-fold. Until recently, the process for identifying the best fabric for a project had not been simple or straightforward. Project objectives are often at odds with one another, like reducing glare, which requires that the shade provide an effective visual barrier between the exterior and the interior, and preserving an outdoor view, which requires that the shade remain as unobtrusive as possible. It is also unclear how various shade fabric characteristics contribute to the overall performance of the fabric, hindering a designer's ability to tailor the specification of a shade fabric effectively to deliver the necessary performance.

This article will fill in the information gaps and share specifics on how to select a shade fabric that will meet the daylight management objectives of the space and explore options for ensuring that a conforming shade fabric is delivered and installed onto the project.

DEFINING PERFORMANCE GOALS FOR SHADE FABRICS

Across the spectrum, shade fabrics provide varying degrees of glare mitigation, daylight management, outdoor view preservation, and thermal regulation. Selecting the right shade for a project requires that specifiers establish the degree to which they need a shade to deliver each of these four performance objectives. Quantifiable metrics can be helpful tools when trying to define how a shade fabric needs to perform in a space. Here is an overview of the four most common reasons that shades are specified on a project and a few metrics that can be used to define the level of performance desired.

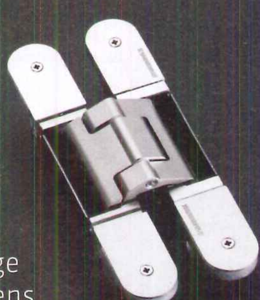
Glare Reduction

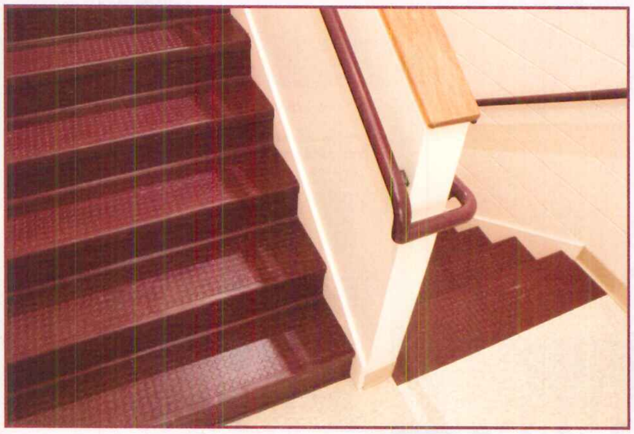
Solar shades are often used to mitigate glare that can be caused by a direct view of the sun or intense sunlight streaming through the windows on a bright day. Shades manage these glare conditions at the window by diffusing, reflecting, or absorbing light, delivering a less intense, more usable level of daylight into the interior.

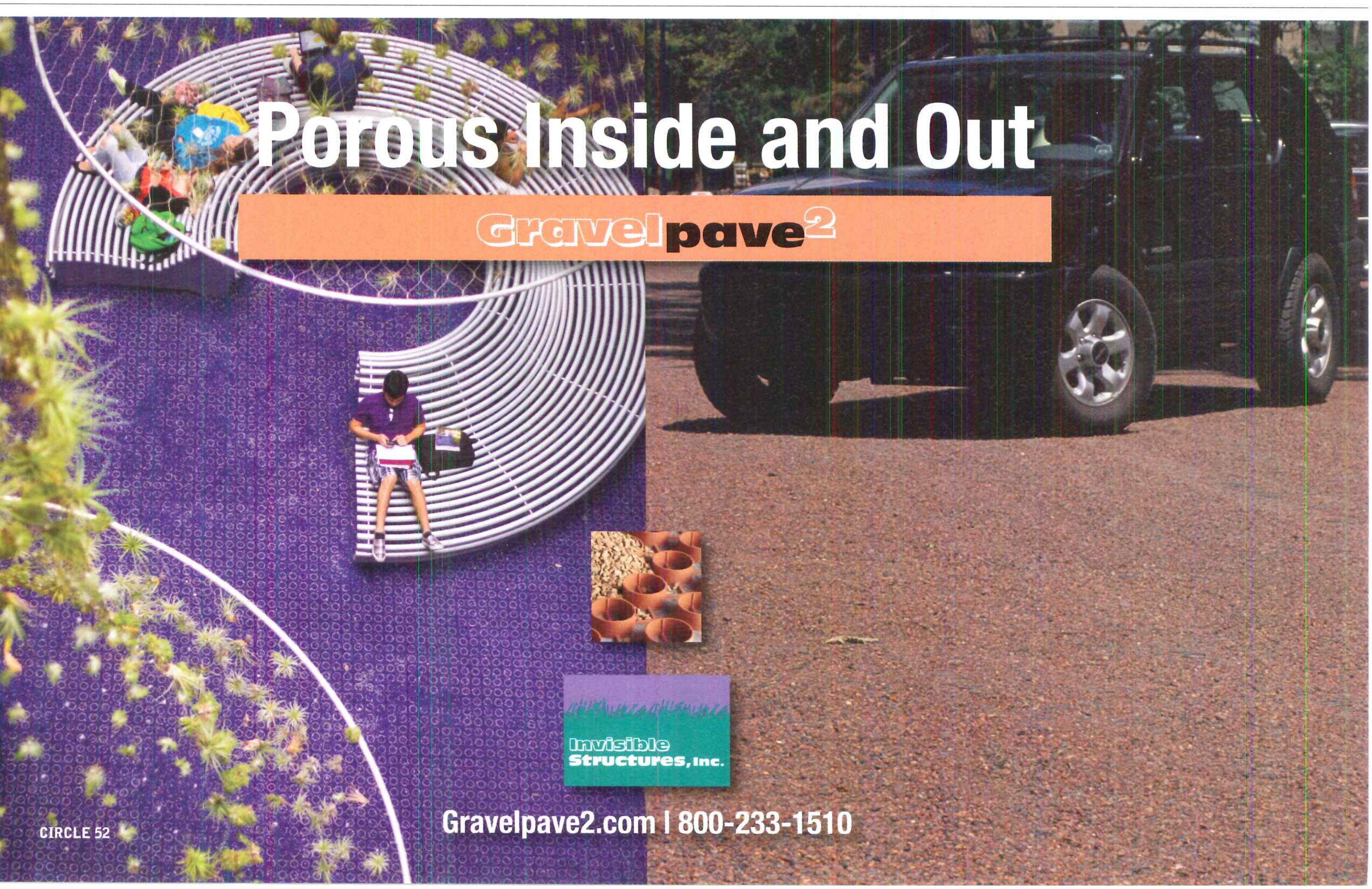
In terms of the level of glare prevention required in a particular space, different types of space tolerate different levels of potential glare. Spaces where vision-critical tasks are performed, such as office spaces, conference rooms, and classrooms, have a low tolerance for glare because it would disrupt the purpose of the space. Transitional spaces, such as hallways and stairways, can accept a higher level of potential glare, as long as it doesn't create a safety concern. Lobbies, break rooms, and other social spaces also have a higher threshold for potential glare because a brighter atmosphere would not negatively impact the casual interactions that occur there.

Continues at ce.architecturalrecord.com

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



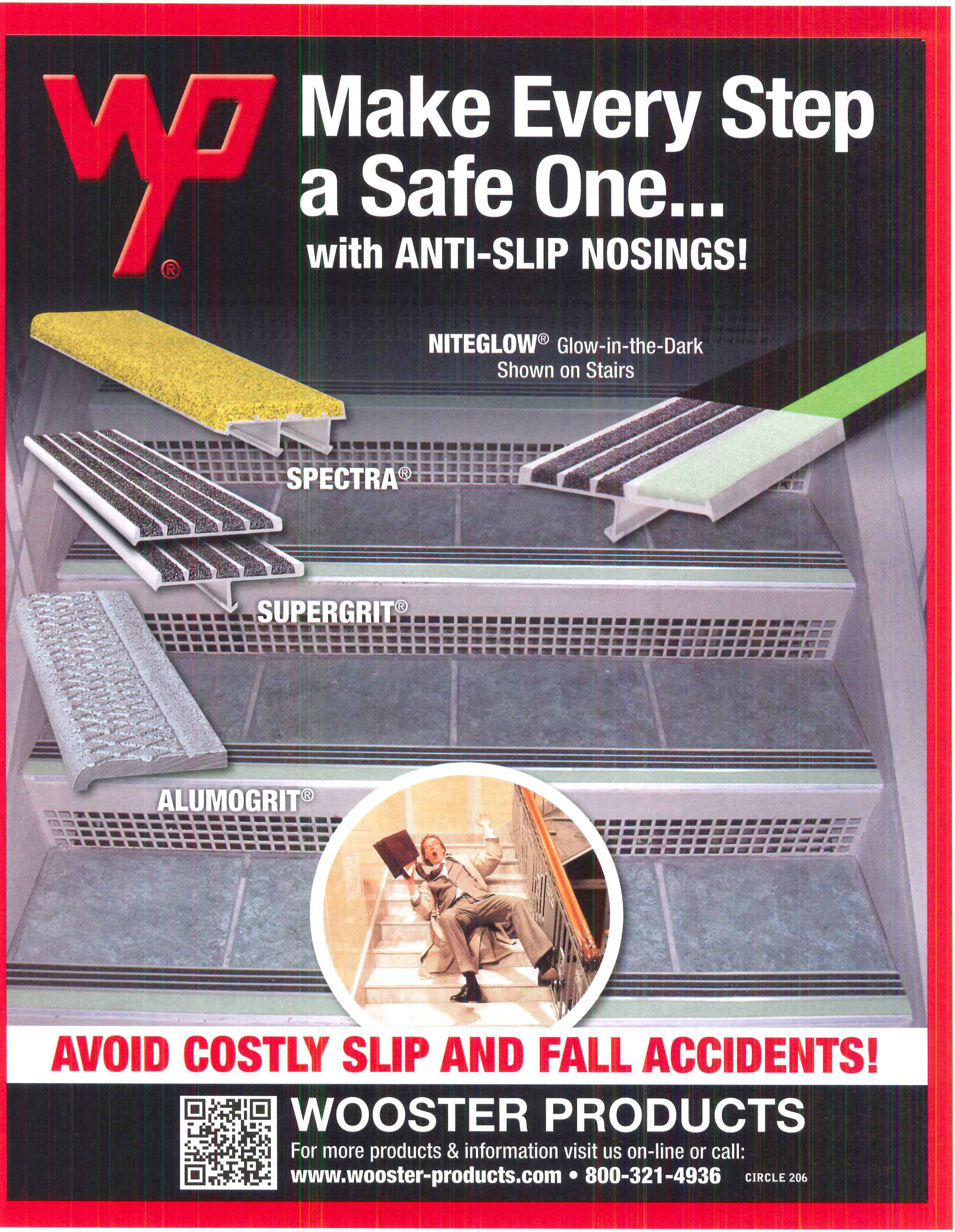




Porous Inside and Out
Gravelpave2
Invisible Structures, Inc.
Gravelpave2.com | 800-233-1510
CIRCLE 52

Advertisers Index

Get Free Information
from our advertisers! Fill out this Reader Service Card and send back today or go to **ArchRecord.com > Products tab > Reader Service**


Make Every Step
a Safe One...
with ANTI-SLIP NOSINGS!
NITEGLOW® Glow-in-the-Dark
Shown on Stairs
SPECTRA®
SUPERGRIT®
ALUMOGRIT®
AVOID COSTLY SLIP AND FALL ACCIDENTS!
WOOSTER PRODUCTS
For more products & information visit us on-line or call:
www.wooster-products.com • 800-321-4936
CIRCLE 206

New and Upcoming Exhibitions

St. Louis Modern
St. Louis
November 8, 2015–January 31, 2016
St. Louis Modern will explore a dynamic period (1935–65) when St. Louis–based architects, artists, and designers made innovative contributions to midcentury-modern design. Commemorating the 50th anniversary of Eero Saarinen's Modernist masterpiece the Gateway Arch, this exhibition will feature more than 150 objects and artworks drawn from the St. Louis Art Museum's own collection as well as from more than 30 museums and private lenders around the country. Many works in the exhibition will be shown for the first time. At the St. Louis Art Museum. For more information, visit slam.org.

Making Music Modern: Design for Ear and Eye
New York City
November 15, 2015–January 17, 2016
Music and design—art forms that share aesthetics of rhythm, tonality, harmony, interaction, and improvisation—have long had a close affinity, perhaps never more so than during the 20th century. Drawn entirely from the Museum of Modern Art's collection, *Making Music Modern* will gather designs for auditoriums, instruments, and equipment for listening to music, along with posters, record sleeves, sheet music, and animation. For more information, visit moma.org.

Pushing the Press: The Typecraft Design Library
Los Angeles
November 19, 2015–February 26, 2016
For more than 100 years, Typecraft has been working with artists and designers to create an astonishing variety of work that demonstrates the power and beauty of print design. This exhibition at the A+D Architecture and Design Museum will represent more than 15 years of work collected from Typecraft's collaborations. Visitors will explore a vast array of print processes, including split fountain, special die cuts, unusual bindings, unique papers, embossing, and multiple inks. For more information, visit aplusd.org.

Ongoing Exhibitions

Drawing Ambience: Alvin Boyarsky and the Architectural Association
New York City
Through November 25, 2015
This exhibition at Cooper Union highlights the collection of drawings assembled by the late Alvin Boyarsky during his pivotal tenure as chairman of the Architectural Association (AA) in London. It features formative works by several celebrated architects. Boyarsky argued that architecture was not only a profession but also an artistic venture—a practice that comprises drawing and publication as much as it engages design and construction. For more information, visit cooper.edu.

R. M. Schindler: The Prequel
West Hollywood, California
Through December 6, 2015
This exhibition at the MAK Center explores the intellectual climate in Vienna at the time of R. M. Schindler's architectural training, highlighting the trajectory connecting 19th-century Europe with 20th-century West Hollywood. *The Prequel* contextualizes Schindler's landmark Kings Road House (built in 1922) as a direct result of the debates playing out in Vienna Modernist circles from 1890 to 1914, when Schindler was a student and a young practitioner. For more information, visit makcenter.org.

David Adjaye: Architecture for Social Change
Chicago
Through January 3, 2016
With more than 50 projects constructed across the world, David Adjaye is rapidly emerging as a major figure in architecture and design. This first-ever retrospective, at the Art Institute of Chicago, spans from furniture and housing to public buildings and master plans; it features drawings, sketches, models, and building mock-ups. The exhibition also immerses viewers in Adjaye's distinct approach and visual language through a dynamic installation conceived by his eponymous studio. For more information, visit artic.edu.

Provocations: The Architecture and Design of Heatherwick Studio
New York City
Through January 3, 2016
Provocations showcases the imaginative work of British designer Thomas Heatherwick and his London-based studio. Heatherwick is known for his unique design concepts, which include products, infrastructure, temporary structures, and large-scale architecture projects around the world. Highlights include: the Learning Hub at Singapore's Nanyang Technological University; the 2014 Bombay Sapphire Distillery in Laverstoke, England; and the 2012 redesign of London's double-decker

buses, known as the New Routemaster. At Cooper Hewitt, Smithsonian Design Museum. For more information, visit cooperhewitt.org.

Chinese Style: Rediscovering the Architecture of Poy Gum Lee, 1923–1968
New York City
Through January 31, 2016
In this survey exhibition at the Museum of Chinese in America, architectural historian Kerri Culhane documents and explores Poy Gum Lee's (1900–68) nearly 50-year-long career in both China and New York and examines Lee's modernist influence on New York's Chinatown. This project has resulted in the first-ever comprehensive list of Lee's projects in New York. Lee's hand is visible in the major civic architecture of Chinatown after 1945, which blends Chinese stylistic details with modern technologies and materials. For more information, visit mocanyc.org.

David Adjaye Selects: Works from the Permanent Collection
New York City
Through February 14, 2016
Architect David Adjaye presents 14 West African and Central African textiles from the Cooper Hewitt Museum's permanent collection in the latest installment of the museum's Selects series. On view in the renovated Marks Gallery on the museum's first floor, the exhibition is the 12th of the ongoing series, in which prominent designers, artists, and architects are invited to mine and interpret the museum's collection. For more information, visit cooperhewitt.org.

Frank Gehry
Los Angeles
Through March 20, 2016
Frank Gehry's buildings have altered architecture's relationship to the city, both socially and aesthetically, and his pioneering work in digital technologies set in motion the practices employed by the construction industry today. This Los Angeles County Museum of Art exhibition begins with the early 1960s and runs to the present. Many of the 200 drawings on display have never been seen publicly, and 65 models illuminate the evolution of Gehry's thinking. For more information, visit lacma.org.

Lectures, Conferences, and Symposia

World Architecture Festival
Marina Bay Sands, Singapore
November 4–6, 2015
The World Architecture Festival features keynotes from industry leaders and live judging of more than 350 award finalists from around the world. Over 2,000 architects from 60 countries attend this symposium each year. For more information, visit worldarchitecturefestival.com.

Building Art: Paul Goldberger on Frank Gehry
Chicago
November 7, 2015
For many, Frank Gehry is the most important living architect. At this lecture in Main Hall C at the Chicago Humanities Festival, Paul Goldberger, a contributing editor on architecture at *Vanity Fair* and author of *Building Art: The Life and Work of Frank Gehry*, will look to Gehry's immigrant grandparents, his two marriages, and even his longtime therapist to provide a more substantial context for the architect's audacious designs and structures. Architecture critic Lee Bey will join Goldberger in conversation. For more information, visit tickets chicagohumanities.org.

Extreme Heat: Hot Cities–Adapting to a Hotter World
Brooklyn, New York
November 12, 2015
The last decade was the hottest on record worldwide; large cities are warming faster than the planet. Extreme Heat, held at the New York City College of Technology, invites architects, planners, and other stakeholders to discuss essential information and insights. The symposium will cover topics ranging from urban climatology to building materials, case studies, and recommendations for the future. For more information, visit cfa.aiany.org.

Greenbuild
Washington, D.C.
November 18–20, 2015
Featuring three days of uplifting speakers, networking opportunities, showcases, LEED workshops, and tours of green buildings in Washington, D.C., Greenbuild offers a place for thousands of professionals to gather and renew their commitment to the green movement. At the Washington Convention Center. For more information, visit greenbuildexpo.com.

Competitions

Sky Pool: Paris
Submission deadline: November 19, 2015
This competition challenges participants to design a hotel skyscraper in Paris's La Défense district that features a "sky pool." The hotel should contribute positively to the Défense skyline and take advantage of the district's views of Paris. The design should integrate a suspended, transparent swimming pool, adding to the hotel's the potential to become a contemporary city icon. For more information, visit superskyscrapers.com.

Varna Needs a Contemporary Library
Submission deadline: November 23, 2015
Bulgaria's Chamber of Architects and the Municipality of Varna invite architects worldwide to submit designs for a new Varna Regional Library building. Entries to this open competition should aim to house the library's entire collection of more than 860,000 books under one roof (the books are now spread among six different buildings). The proposed building should also be planned as a new and active public space in the center of the city. For more information, visit varnalibrary.bg.

World Design Capital Taipei 2016
Submission deadline: November 30, 2015
Taipei, 2016's World Design Capital, calls for proposals for at least six collaborative projects that will employ citizens in the design process. The proposed projects should resolve Taipei's various urban issues with innovative and practical designs, and involve local with international teams. For more information, visit wdc2016.taipei.

A Museum in the Making: Beirut, Lebanon
Submission deadline: January 4, 2016
The Association for the Promotion and Exhibition of the Arts in Lebanon has launched a design competition for a new museum in central Beirut. The yet-to-be-named museum is envisioned as a multidisciplinary hub of art and design dedicated to showcasing modern and contemporary Lebanese culture and set to open in 2020. For more information, visit amuseuminthemaking.com.

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

Statement of Ownership, Management, and Circulation (Requester Publications Only)

Publication Detail

1	Publication Name	ARCHITECTURAL RECORD/BNP MEDIA II, LLC
1	Publication Number	132650
2	ISSN	0003858X
3	Filing Date	09/17/2015
4	Issue Frequency	MONTHLY
5	Number of Issues Published Annually	12
6	Annual Subscription Price	72.00
7	Complete Mailing Address of Known Office of Publication	2401 W. BIG BEAVER 700
7		TROY, OAKLAND, MI 48084
7	Contact Person	WAFAA KASHAT
7	Telephone	(248) 786-1631
8	Complete Mailing Address of Headquarter or General Business Office of Publisher	"2401 W. BIG BEAVER RD., STE. 700"
8		TROY, MI 48084-3333
9	Publisher (Name and complete mailing address)	ALEX BACHRACH
9		"2 PENN PLAZA, 10TH FLOOR"
9		NEW YORK, NY 10121
9	Editor (Name and complete mailing address)	CATHLEEN McGUIGAN
9		"2 PENN PLAZA, 10TH FLOOR"
9		NEW YORK, NY 10121
9	Managing Editor (Name and complete mailing address)	BETH BROOME
9		"2 PENN PLAZA, 10TH FLOOR"
9		NEW YORK, NY 10121

Owner

10	*Line*	*Full Name*	*Complete Mailing Address*
10		1 BNP MEDIA II, LLC	2401 W. BIG BEAVER RD., STE 700, TROY, MI 48084-3333
10		2 TAGGART E. HENDERSON	2401 W. BIG BEAVER RD., STE 700, TROY, MI 48084-3333
10		3 HARPER T. HENDERSON	2401 W. BIG BEAVER RD., STE 700, TROY, MI 48084-3333
10		4 MITCHELL L. HENDERSON	2401 W. BIG BEAVER RD., STE 700, TROY, MI 48084-3333

Known Bondholders, Mortgagees, Other Security Holders

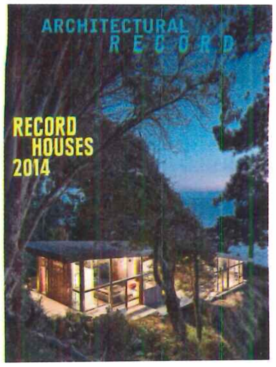
11	*Line*	*Full Name*	*Complete Mailing Address*

13	Publication Title	ARCHITECTURAL RECORD/BNP MEDIA II, LLC
14	Issue Date for Circulation Data Below	09/01/2015

15	*Extend and Nature of Circulation*	*Average No. Copies Each Issue During Preceding 12 Months*	*No. Copies of Single Issue Published Nearest to Filing Date*
15a	Total Number of Copies (net press run)	99636	98543
15b1	Outside County Paid/Requested Mail Subscriptions stated on PS Form 3541. (Include direct written request from recipient, telemarketing and Internet requests from recipient, paid subscriptions including nominal rate subscriptions, employer requests, advertiser's proof copies, and exchange copies.)	57534	59955
15b2	In-County Paid/Requested Mail Subscriptions stated on PS Form 3541. (Include direct written request from recipient, telemarketing and Internet requests from recipient, paid subscriptions including nominal rate subscriptions, employer requests, advertiser's proof copies, and exchange copies.)	0	0
15b3	Sales through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid or Requested Distribution Outside USPS	7068	6299
15b4	Requested Copies Distributed by Other Mail Classes Through the USPS (e.g. First-Class Mail)	14	11
15c	Total Paid and/or Requested Circulation	64616	66265
15d1	Outside County Nonrequested Copies stated on PS Form 3541 (include Sample copies, Requests Over 3 years old, Requests induced by a Premium, Bulk Sales and Requests including Association Requests, Names obtained from Business Directories, Lists, and other sources)	30100	28176
15d2	In-County Nonrequested Copies stated on PS Form 3541 (include Sample copies, Requests Over 3 years old, Requests induced by a Premium, Bulk Sales and Requests including Association Requests, Names obtained from Business Directories, Lists, and other sources)	0	0
15d3	Nonrequested Copies Distributed Through the USPS by Other Classes of Mail (e.g. First-Class Mail, Nonrequestor Copies mailed in excess of 10% Limit mailed at Standard Mail or Package Services Rates)	6	3
15d4	Nonrequested Copies Distributed Outside the Mail (include Pickup Stands, Trade Shows, Showrooms and Other Sources)	1359	356
15e	Total Nonrequested Distribution	31465	28535
15f	Total Distribution	96081	94800
15g	Copies not Distributed	3555	3743
15h	Total	99636	98543
15i	Percent Paid and/or Requested Circulation	67.25	69.9

16	***If total circulation includes electronic copies, report that circulation on lines below***		
16a	Requested and Paid Electronic Copies	153	135
16b	Total Requested and Paid Print Copies (Line 15c) + Requested/Paid Electronic Copies	64769	66400
16c	Total Requested Copy Distribution (Line 15F) + Requested/Paid Electronic Copies	96234	94935
16d	Percent Paid and/or Requested Circulation (Both print & Electronic Copies)	67.3	69.9
	I Certify that 50% of all my distributed copies (Electronic & Print) are legitimate requests.		

17	Publication of Statement of Ownership	Publication of this statement will be printed in the 11/01/2015 issue of this publication
18	Signature and Title of Editor, Publisher, Business Manager, or Owner	WAFAA S. KASHAT
18	Title	Audience Audit/Postal Specialist
18	Date	09/17/2015 12:44:04 PM
Version	PS Form 3526, September 2007	



2016 CALL FOR ENTRIES Record Houses

The editors of **ARCHITECTURAL RECORD** announce the **2016 RECORD HOUSES** awards program. Entry is open to any architect registered in the U.S. or abroad. Of particular interest are projects that incorporate innovation in program, building technology, materials, and form. Projects must be built and inhabited. They may be new construction or renovated and adaptive-reuse projects.

The fee is US$75 per submission. Download the official entry form at architecturalrecord.com/call4entries. E-mail questions to arcallforentries@bnpmedia.com. Please indicate **Record Houses** as the subject of your e-mail. **SUBMISSION DEADLINE: JANUARY 8, 2016**

Good Design Is Good Business

CALL FOR ENTRIES

The editors of **ARCHITECTURAL RECORD** are currently accepting submissions for the **2016 ARCHITECTURAL RECORD GOOD DESIGN IS GOOD BUSINESS** awards program. Good design is a priority for leaders of business and industry looking to boost productivity, rebrand, and attract customers. The Good Design Is Good Business awards honor architects and clients who best utilize design to achieve such strategic objectives. Winners will be published in the June 2016 issue.

The fee is US$150 per entry and $50 for each additional project. Download the official entry form at architectural record.com/call4entries. E-mail questions to arcallforentries@ bnpmedia.com. Please indicate **GDGB** as the subject of your e-mail. **SUBMISSION DEADLINE: FEBRUARY 1, 2016**

snapshot

PROJECT HOUSE OF DIOR
LOCATION SEOUL
ARCHITECT CHRISTIAN DE PORTZAMPARC

ELEVEN BILLOWING white fiberglass panels, each stretching more than 65 feet high, fold around the front of Christian de Portzamparc's flagship store for Christian Dior in Seoul. A narrow gap in the draped facade reveals the glazed entrance framed by a delicately perforated metal skin. The French architect pulled inspiration from the fashion designer's body of work, expressing the movement and texture of fabric in the molded fiberglass. "He sculpted his toiles," says de Portzamparc, who also captured the designer's spirit in the building's rectilinear back portion, which bears Dior's geometrical *cannage* motif on its anodized aluminum cladding. Located in the heart of the Gangnam District, the boutique also houses a lounge, café, and numerous artworks, including a commanding chandelier-like installation in the entryway by Korean artist Lee Bul. *Miriam Sitz*