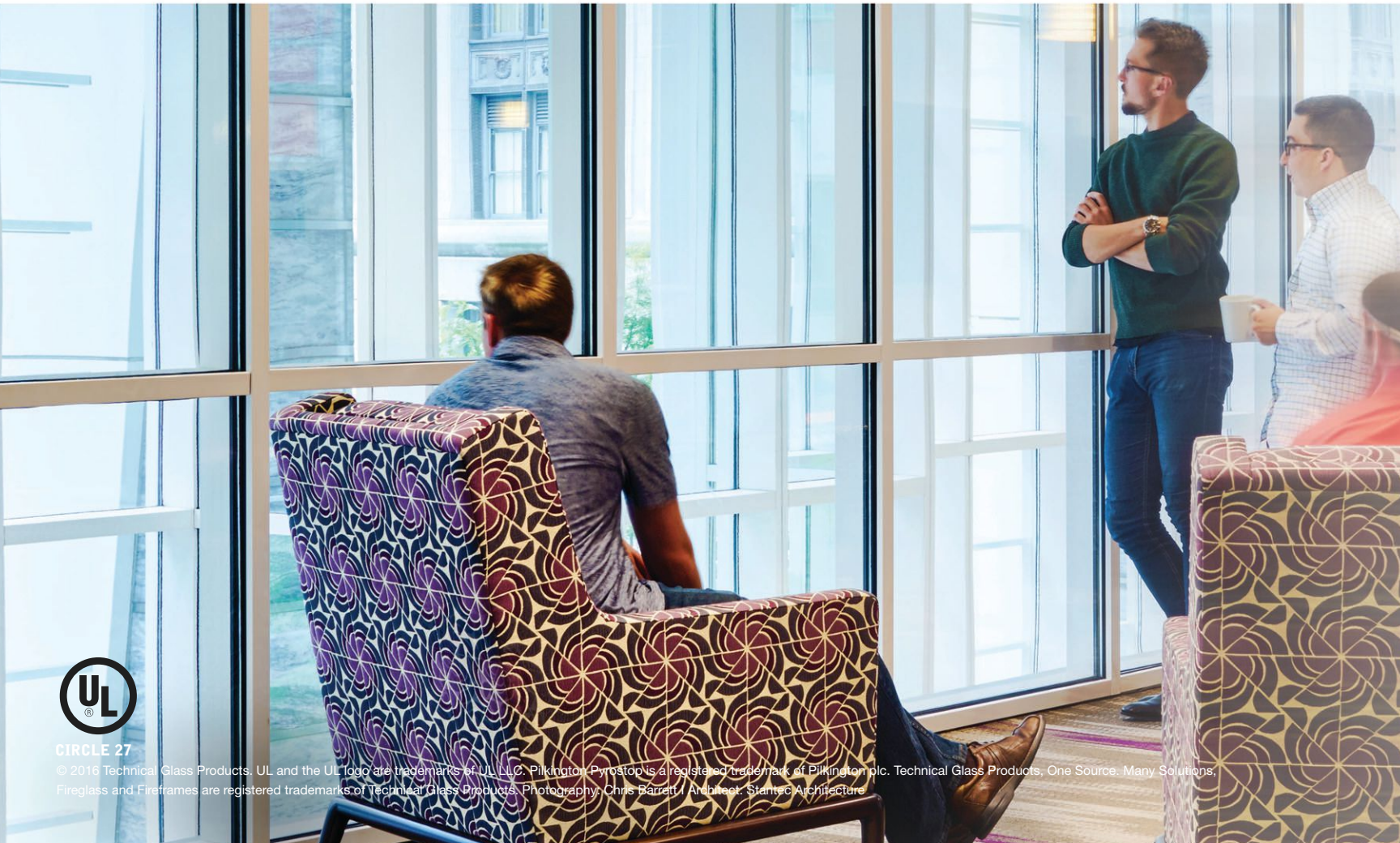
bnp media
12 2016
$9.95
www.architecturalrecord.com

ARCHITECTURAL RECORD

CELEBRATING 125 YEARS

Arts Centers

+ Design Vanguard 2016
Record Products



CIRCLE 27

BEUNCOMMON

BECAUSE WITH DISTINCTION COMES GREAT DESIGN.

Fireframes® fire-rated framing from Technical Glass Products is uniquely suited to help your designs stand out. The narrow profiles reveal a world of possibilities. Choose from the sleek designer series, heat barrier, hardwood, curtain wall, silicone glazed curtain wall, custom aluminum and even a fire-rated floor system. Fireframes products can be integrated with Pilkington Pyrostop® glass for impact resistance and a 2-hour fire-rating.

Ready to go beyond the expected?
Get to know Fireframes at **fireglass.com/fireframes**

fireglass.com | 800.426.0279

Pilkington Pyrostop® fireframes® | TGP FIRE RATED one source. many solutions.®

Quasicrystals by Alberto Adolfo Fernández González and Carlos Benjamin Fernández González, Architects - Santiago, Chile

sunbrella®

DESIGN + PERFORMANCE™

The world's most beautiful, innovative and versatile performance fabrics.

CIRCLE 18

FUTUREOFSHADE.COM

ARCHITECTURAL RECORD

ARCHITECTURAL RECORD (ISSN: Print 0003-858X Digital 2470-1513) December 2016, Vol. 204 No. 12. Record is published 12 times annually, monthly by BNP Media II, LLC., 2401 W. Big Beaver Rd., Suite 700, Troy, MI 48084-3333. Telephone: (248) 362-3700, Fax: (248) 362-0317.
ANNUAL RATE FOR PRINT, DIGITAL AND COMBO SUBSCRIPTIONS TO INDIVIDUALS IN THE U.S.A.: Print $72.00, Digital $18.00 and Print Digital Combo $81.00. Annual rate for subscriptions to individuals in Canada: Print $129.00, Digital $18.00 and Print Digital Combo $138.00 (includes GST & postage); Annual rate for individuals outside of U.S.A.: Print $199.00, Digital $18.00 and Print & Digital Combo $208.00. Payable in U.S. funds. All rates are in USD. Single Copy sales $9.95; Foreign $11.00.

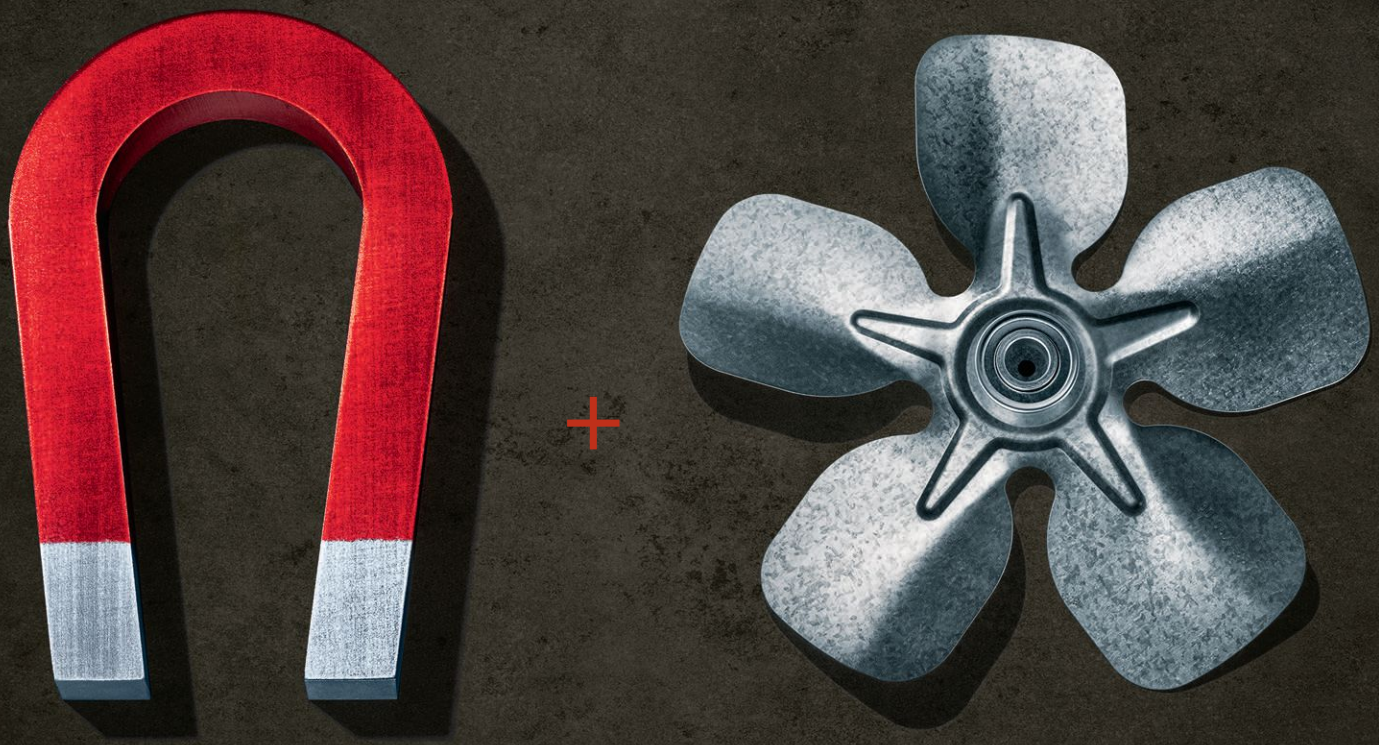
Periodicals Postage Paid at Troy, MI and at additional mailing offices.
FOR SINGLE COPY SALES OR BACK ISSUES ONLY: contact Ann Kalb at (248) 244-6499 or KalbR@bnpmedia.com.
POSTMASTER: Send address changes to: ARCHITECTURAL RECORD, P.O. Box 16387 North Hollywood, CA 91615.
CANADA POST: Publications Mail Agreement #40612608. GST account: 131263923. Send returns (Canada) to IMEX Global Solutions, P.O. Box 25542, London, ON N6C 6B2.
CHANGE OF ADDRESS: Send old address label along with new address to ARCHITECTURAL RECORD, P.O. Box 16387 North Hollywood, CA 91615.
FOR SUBSCRIPTION INFORMATION OR SERVICE, PLEASE CONTACT CUSTOMER SERVICE AT:
Phone: 877-876-8093 (USA only) or 818-487-2077 (outside USA).

EDITORIAL OFFICES: 646/849-7124. 350 Fifth Avenue, Suite 6000, New York, NY 10118. **WEBSITE:** architecturalrecord.com.

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

ABC MPA

PRINTED IN USA



TWO SIMPLE CONCEPTS, ONE BRILLIANT COMBINATION.

Introducing the Wolf Induction Range. We've added the precision and control of the induction cooktop to the even heat circulation of the dual convection oven. It's a foolproof formula for delicious results, and one that proves a brilliant range is, indeed, the sum of its parts. To learn more, visit ***wolfappliance.com.***

WOLF®

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: Wesley Loon
(859) 414-3795, Fax: (248) 502-9104, *loonw@bnpmedia.com*
MIDWEST (IA, IL, MN, MO, WI): Bruce Smith
(224) 216-7836, Fax: (248) 786-1390, *Smithb@bnpmedia.com*
MIDWEST (IN, MI, OH), TX, OK, EASTERN CANADA: Lisa Zurick
(513) 345-8210, Fax: (513) 345-8250, *zurickl@bnpmedia.com*
WEST, WESTERN CANADA: Bill Madden
(503) 260-9679, Fax: (503) 557-9002, *bill@maddenandassociates.net*
FL, KS, NE, ND, NY, SD: Risa Serin
(212) 904-6041, Fax: (212) 904-4652, *serinr@bnpmedia.com*

WORKFORCE/RECRUITMENT: Diane Soister
(646) 849-7137, Fax: (248) 502-2046, *soisterd@bnpmedia.com*

CONTINUING EDUCATION

CONTINUING EDUCATION GROUP MANAGER
Brittnie Wilson
wilsonb@bnpmedia.com

CONTINUING EDUCATION PROJECT COORDINATOR
Stephanie Costigan
costigans@bnpmedia.com

CUSTOM CONTENT EDITOR
Samantha Meux
meuxs@bnpmedia.com

CORPORATE DIRECTORS

PUBLISHING
John R. Schrei
CORPORATE STRATEGY DIRECTOR
Rita M. Foumia
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 MARKETING

AUDIENCE MARKETING PROJECT MANAGER
Cassandra Kerby
CORPORATE INTEGRATED MEDIA MANAGER
Megan Neel
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); 818/487-2077 (outside the U.S.). Subscriber fax: 712/755-7423. E-mail: *AR@pubservice.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, Suzanne Stephens; Lighting and Interiors, Linda C. Lentz; Architectural Technology, Joann Gonchar; News, Anna Fixsen. **REPRINTS:** *architecturalrecord@theygsgroup.com*.

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

ABC MPA

PRINTED IN USA

INTRODUCING SuperLite™ II-XLM

BY SAFTIFIRST

Fire resistive multilaminate in clear butt-glazed wall assemblies:

- Meets ***ASTM E-119 up to 2 hours*** with hose stream and CPSC Cat. II impact safety requirements.
- Can be used in interior and exterior applications, including ***clear butt-glazed walls for maximum vision and transparency.***
- Can be easily incorporated in ***GPX Architectural Series Framing, GPX SNAPCAP*** or ***GPX Builders Series Temperature Rise Framing*** for a complete fire resistive assembly.

CIRCLE 248

888.653.3333
www.safti.com

SAFTIFIRST™
SAFETY AND FIRE TECHNOLOGY INC.

LG Hausys

www.lghausys.com/us

Design is perfected through energy saving

From the beautiful visible exterior to the invisible energy savings, LG Hausys' high-durability curtain walls and glass technology perfect the value of the building that has never existed before

LG Hausys is making efforts for the expansion of green space and energy saving through the development of environment-friendly, energy-saving materials

Building Materials

- Curtain Wall / Window / Functional glass
- Wallcovering / Flooring
- Acrylic Solid Surface
- Interior Film
- Insulation Material for Building

High performance Materials

- Film Finishing Material (FFM)
- Vacuum Insulation Panel
- PSAA (Pressure Sensitive Adhesive Application)
- Sign & Graphic Materials

Automobile Part Materials

- Automotive Skin
- Lightweight Material
- Performance Tape & Wrapping Material

CIRCLE 254

ARCHITECTURAL RECORD 125 years

12 2016

DESIGN VANGUARD 2016

GO TO ARCHITECTURALRECORD.COM FOR EXPANDED COVERAGE

BUILDING TYPE STUDY 977 ARTS CENTERS

NEWS

DEPARTMENTS

ARCHITECTURAL TECHNOLOGY

RECORD PRODUCTS 2016

THIS PAGE: NATIONAL TAICHUNG THEATER, BY TOYO ITO & ASSOCIATES. PHOTO BY IWAN BAAN.

COVER: ELBPHILHARMONIE, BY HERZOG & DE MEURON. PHOTO BY IWAN BAAN.

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

SEE ONLINE CONTENT PAGE 11.

Smart design revolves around the entrance.

Interior Lobby

Main Entrance

One World Trade Center
285 Fulton St, New York, NY

Architect: David Childs
Skidmore, Owings & Merrill

Crane Series 4000
All Glass Revolving Doors

Trust dormakaba for contemporary entrance design solutions to express your vision simply and securely.

More than design solutions, dormakaba offers services including the preparation of detailed, non-proprietary, open and competitive architectural hardware specifications and schedules.

Whether the spec calls for manual or automatic revolving doors, automatic sliding doors or automatic swinging doors – Smart design begins at dormakaba.

Call 844-773-2669 for comprehensive project support.

DORMA and Kaba are now dormakaba.

CIRCLE 226

Visit dormakaba.com

dormakaba

architecturalrecord.com

VISIT US ONLINE FOR EXPANDED SLIDE SHOWS, PRODUCT SPECIFICATIONS, AND MORE.

FAENA FORUM CULTURAL CENTER BY OMA

SCENES FROM THE NEWS

PIERRE CHAREAU AT THE JEWISH MUSEUM
Read our review of the exhibition, designed by Diller Scofidio + Renfro, which focuses on the work of the French designer and architect. See photos of furniture, lighting fixtures, and other objects included in the show.

ARCHITECTURE CONFERENCES
Click through photos and watch recordings of the speakers from ARCHITECTURAL RECORD's two recent conferences: Innovation East, which focused on architecture and making in the post-digital age, and the Women in Architecture Forum & Awards.

HYPERLOOP ONE
View a short film about the portals designed by Bjarke Ingels Group for the high-speed transportation system in the United Arab Emirates.

HYPERLOOP ONE RENDERING BY BJARKE INGELS GROUP

HIGHLIGHTS

VIRTUAL VISIT TO FAENA FORUM
Watch our video from one RECORD editor's tour of the OMA-designed cultural center in Miami, Florida.

TOURING A TUXEDO PARK HOME
Peek into a 2015 Record House designed by Weiss/Manfredi while hearing from the architects and homeowners in our short film.

PHOTOS BY IWAN BAAN
In the span of 10 days, RECORD contributing photographer Iwan Baan traveled to Hamburg; Miami, Florida; and Davis, California, to shoot three of the arts centers featured in this month's Building Type Study. Visit our website to view these images as well as photos of the National Taichung Theater that Baan took exclusively for this issue.

ARCHITECT TOYO ITO VISITED WITH IWAN BAAN DURING CONSTRUCTION OF THE TAICHUNG METROPOLITAN OPERA HOUSE IN TAIWAN.

SUBSCRIBE TO ARCHITECTURAL RECORD TABLET EDITION. DOWNLOAD THE APP FROM iTUNES.

Follow us on Twitter at @ArchRecord
Like us on Facebook.com/ArchitecturalRecord
Join our LinkedIn group
Follow us on Instagram at @ArchRecordMag

IMAGES: © ARCHITECTURAL RECORD (TOP); FRANS SWARTE (MIDDLE); COURTESY HYPERLOOP ONE/BJARKE INGELS GROUP (BOTTOM)

THE NEW MULTIFUNCTION SURECOLOR® T-SERIES

- Produce presentation-quality 24" x 36" color copy in under 40 seconds*
- High productivity with color scanning speeds up to 6" per second*
- Advanced image processing hardware for superb image quality
- Scan to file, email and remote SureColor T-Series multifunction printers
- Single-roll or Dual-roll models available in 36" and 44" print widths

Epson® SureColor T-Series

MFP Configuration Starting at $7,140† Single Roll

EPSON
EXCEED YOUR VISION

Another Innovation from Epson® Business Solutions.

*Speeds are based upon print engine speed only. Total throughput times depend upon factors such as computer, file size, printer resolution, ink coverage, and networking. EPSON and SureColor are registered trademarks and EPSON Exceed Your Vision is a registered logomark of Seiko Epson Corporation. Adobe and PostScript are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries. Copyright 2016 Epson America, Inc.
†Estimated street price after instant rebate and dealer discount. Please visit epson.com/prorebates for details. Check with an Epson Professional Imaging Authorized Reseller for actual price, as dealer prices may vary.

Adobe PostScript 3

EPSON.COM/PLOTTERINFO

CIRCLE 59

Common Ground in Unsettling Times

In the aftermath of a contentious national election, the profession must come together on the foundation of its shared values.

WE WERE wrapping up this issue of ARCHITECTURAL RECORD in the days after the most divisive national election in living memory. Architects, among other citizens, began taking to the Web, to social media, and even to the streets to express their concerns. Protestors, pundits, the press, as well as the President-elect's own supporters, wondered how much the campaign truly reflected his vision. People began to parse his most outrageous comments: Did he really mean what he said about Mexican immigrants, women, minorities, Muslims, climate change? Were some remarks merely tactical—campaign promises as empty as a polling booth the morning after? Or do his words portend a radical shift in how women and minorities—and even the planet—will be treated?

No matter how you voted or how you think the country should move forward, there are core values that those in the profession of architecture share and must continue to embrace. Architects and designers have a profound responsibility to the public realm and to work for the public good. And these fundamental principles transcend politics.

1. Respect for human rights and dignity. A good place to start is with the simple words of the Universal Declaration of Human Rights, drafted in 1948 in the aftermath of the horror, genocide, and displacement of World War II. The United States was among the 48 nations that voted to adopt it. It reads, in part: "All human beings are born free and equal in human rights . . . Everyone is entitled to all the rights and freedoms set forth in the Declaration, without distinction of any kind, such as race, color, sex, language, political or other opinion, national or social origin, property, birth or other status." Is this ideal of tolerance under threat?

2. Support for diversity and inclusion. Architecture is a field dominated by white men but at least there's a growing and visible awareness of the inequities faced by women. What do the activism and struggle of women in architecture mean for the renewed wave of feminism sweeping the country—and gathering force since the election? Will architects join the Million Woman March planned for Washington, D.C., January 21, the day after Inauguration Day?

The fact that fewer than 2 percent of licensed architects are African American is a painful reminder that architecture doesn't reflect the world it serves. Yet small steps can begin to make a difference, including the handful of programs that promote architecture as a career option to young people of color. Last month, Harvard's Graduate School of Design announced the Phil Freelon Fellowship Fund, to offer financial aid to African American and other underrepresented students. It is supported by Perkins+Will and Freelon, one of the lead architects of the National Museum of African American History and Culture (RECORD, November 2016, page 70). But without serious government support for education at every level, it will be very tough to significantly increase minority participation.

Muslim American architects are part of the fabric of our architectural community, and to understand the role of Muslim designers everywhere, just look at the many recipients of the Aga Khan Award for Architecture (page 20). Our doors must stay open to the free flow of creative ideas that come to the U.S. from people all over the world.

PHOTOGRAPHY: © MICHEL ARNAUD

3. Commitment to sustainability and resilience. For decades, architects have been leaders in promoting ecological practices, researching green technologies, and incorporating such building products and technologies into new and retrofitted structures. Architects have been on the front lines in educating clients and the public about sustainability, and in planning for resilience in places threatened by flooding. Local laws are pushing green design even further: the City of Santa Monica just passed a law requiring all new residential construction to meet zero net energy standards (page 18). Many companies, too, have found that incorporating green objectives into their workplaces and products makes good business sense.

But now the future of the Environmental Protection Agency is threatened, and the President-elect claims to not believe in climate change. Will the U.S. live up to its promise to cut carbon emissions, as a signatory to the Paris Agreement on climate change? Architects must make their voices heard on this urgent issue.

4. Commitment to civic engagement and design for social change. Architects can expand their role in communities and government at every level, fighting to improve design in the public realm, advocating investment in infrastructure, pushing to create more affordable housing, and calling for excellence and equity in every type of civic architecture. All the populations left out of the economic recovery of the last few years deserve the best that architectural culture has to offer. But will a new administration see as a priority the investment in a broad range of building projects—yes, to create jobs but also to improve quality of life across the economic spectrum?

Architects are thinkers with unique skills and experience to bring to the larger platform of our democracy. This is a time for awareness and action—and for expanding, not narrowing, the concept of tolerance. Architects need to be recognized for their ability to effect positive change. Will our next government support and honor their work and their ideas?

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief

Terrazzo

THE SYMBOL OF QUALITY
THE NATIONAL TERRAZZO & MOSAIC ASSN., INC.
INCORPORATED 1931
NTMA®
NEW JERSEY
FOR FINE TERRAZZO PATRONIZE OUR MEMBERS

2016 Job of the Year

The Sky Beneath Our Feet

Pittsburgh International Airport

Clayton Merrell, Artist

Roman Mosaic & Tile, Terrazzo Contractor

LGA Partners, Architects

Allegheny County Airport Authority

Office of Public Art Pittsburgh PA

Mosites Construction Company

SAI Consulting Engineers

Craig Thompson Photography

www.ntma.com
800-323-9736

CIRCLE 186

DAILY UPDATES
architecturalrecord.com/news
twitter.com/archrecord

perspective

"We must carry on the struggle for a just and sustainable environment with redoubled strength, opposing the reactionary policies that so gravely threaten our most fundamental values."
—architect and critic Michael Sorkin in reaction to a controversial statement issued by the American Institute of Architects committing to work with president-elect Trump. The AIA later issued an apology.

BIG unveiled designs for proposed Hyperloop One stations across the United Arab Emirates, including one in Abu Dhabi (left). Levitating transporters will zip between cities at approximately 700 miles per hour in tubes (above).

BIG Reveals Hyperloop One Design

BY ANNA FIXSEN

YOU CAN'T take the hype out of the Hyperloop. In 2013, billionaire tech entrepreneur Elon Musk kicked off a 21st-century Space Race when he put forth an open-source vision for a transit system that could propel people and cargo at near supersonic speeds. Since then, Silicon Valley companies have been scrambling to be the first to unveil a viable prototype.

One start-up is breaking away from the pack. A Los Angeles–based company called Hyperloop One successfully shot a 1,500-pound aluminum sled down a 1,000-foot-long track in the Nevada desert this May, reaching 116 miles per hour in 1.1 seconds. ("I had tears mixed with sand," the company's cofounder, Shervin Pishevar, wrote in a blog post the next day.)

Hyperloop One is continuing to bet big on this emerging technology—in more ways than one. It's working to establish routes in California, Russia (billed as a "new Silk Road"), the United Kingdom, Finland, and the United Arab Emirates. And, immediately following the Nevada test, it began working with starchitect Bjarke Ingels and his firm BIG on the design of the stations and the user experience.

Last month, atop the Burj Khalifa, BIG and Hyperloop One unveiled renderings for gleaming stations along a route that would enable passengers to "hyperjump" the 90 miles between Abu Dhabi and Dubai in just 12 minutes.

BIG worked with Hyperloop One's engineers to devise a design that would nearly eliminate waiting. As with Uber, users could request a pickup by a self-driving "Hyperpod" on their mobile phones. These pods—pictured in renderings as reflective, square-shaped vehicles that could accommodate between six and eight passengers—would glide to docks at a centrally located station or "Hyperportal," where they would be inserted into a pressurized transporter capsule, elevated on skis. This levitating transporter will then glide through a low-pressure tube at nearly 700 miles per hour.

The designs for two of the proposed eight Hyperloop stations in the UAE are set at the base of the Etihad Towers in Abu Dhabi and the Burj Khalifa in Dubai, each a futuristic but elegant response to its context. The Abu Dhabi portal is a glazed, ring-shaped volume with a reflective roof. Meanwhile, the Dubai station at the base of the Burj Khalifa is a sunken, spiral-shaped volume. Inside the airy column-free interior, the pods are docked in circular terraces.

"We are heading for a future where our mental map of the city is completely reconfigured," promised Ingels in a statement.

But there are still plenty of challenges ahead for Hyperloop One, including cost, navigating red tape, and a highly publicized lawsuit between the company and its former CTO. Some have also pointed out that the high-speed ride inside the tube could be a terrifying experience. (*New York* magazine pointed to one transportation blogger who predicted such a concept would amount to a "barf ride.") But BIG plans to integrate openings in the low-pressure tube at even intervals, so that the landscape will flash by like a filmstrip, "a bit like waving your hand in front of your eyes," the firm explains.

In the coming weeks, Hyperloop One will work with BIG, Dubai's transit authority, and consultants from McKinsey & Company on a detailed technical study. Hyperloop One is hoping to achieve its "Kitty Hawk" moment—a test of a fully working prototype—early next year and aims to have constructed the world's first Hyperloop by 2020. ■

IMAGES: COURTESY HYPERLOOP ONE/BIG

Visit our online section, architecturalrecord.com/news.


Team Up for a Winning Bid
With the AIA's pre-drafted C102™-2015, Standard Form of Teaming Agreement between Team Manager and Team Member for the Purpose of Responding to a Solicitation and Pursuing a Project, you can collaborate with outside groups in different fields and with different expertise to form a cross-functional team capable of competing for the complex projects.
Get a free sample of the AIA's Teaming Agreement at www.aia.org/ar
AIA Document C102™ – 2015
Standard Form of Teaming Agreement Between Team Manager a
Member for the Purpose of Responding to a Solicitation and Pursuing
AGREEMENT made as of the day of
in the year
(In words, indicate day, month and year.)
BETWEEN the Team Manager:
(Name and address)
and the Team Member:
(Name and address)
To respond to a Solicitation for the following Project:
(Name, location and detailed description)
AIA Contract Documents®
THE INDUSTRY STANDARD.
Learn more at www.aia.org/ar
CIRCLE 209

Record's Innovation Conference Explores Craft

BY FRED A. BERNSTEIN

"THE POWER of the handmade shouldn't be taken for granted," said Michael Murphy, co-founder of MASS Design Group, a practice known for its humanitarian projects. Speaking at ARCHITECTURAL RECORD's 19th Innovation Conference in New York last month, Murphy recalled that, after the 2010 Haiti earthquake, many proposals for shelters and clinics there involved prefabrication. "That made sense," he said, "but the thing people needed were jobs." His firm's GHESKIO Cholera Treatment Center (RECORD, June 2015, page 104) incorporated custom metalwork by Haitian artisans. "It's not just about how we fabricate, but about how we fabricate with as many people as possible."

Maximizing use of local labor is just one idea that was explored in the daylong conference built around the theme "Architecture and Making in the Post-Digital Age."

Francine Houben, creative director of Mecanoo, showcased craftsmanship in her firm's Bruce C. Bolling Municipal Building in Boston (RECORD, August 2015, page 94), devising complex masonry patterns that engaged the bricklayers. Brad Cloepfil, principal of Allied Works Architecture, spoke of his efforts to produce imperfectly formed concrete walls for his Clyfford Still Museum in Denver. Similarly, architect Annabelle Selldorf described her use of terra-cotta for three Manhattan condo buildings.

"We are past the initial infatuation with the digital," argued Kieran-Timberlake partner Stephen Kieran. He described a series of models his firm built for a new building at Brown University. The models, he said, were "more wonderful, surprising, and compelling than any digital prototypes."

Nearly every speaker agreed that partnerships are essential for innovation. "Architects don't innovate alone," said Kasper Guldager Jensen, senior partner of the Danish firm 3XN. His firm's research division, GXN, is working with numerous partners on a house built of upcycled biowaste from agriculture and industry. Anna Dyson, founding director of the New York–based Center for Architecture, Science and Ecology, spoke of the partnership between Skidmore, Owings & Merrill and the Rensselaer Polytechnic Institute that brought her think tank into being. Among its projects is a hybrid biomechanical system that amplifies the air-cleaning capacity of indoor plants.

Japanese architect Sou Fujimoto also showed projects that bring nature and architecture into new relationships, such as a pinecone-like apartment building in Montpellier, France, with more than 200 projecting balconies. Tod Williams Billie Tsien Architects's Andlinger Center at Princeton

Francine Houben, creative director of Mecanoo (top) and Sou Fujimoto (above) gave addresses at Record's Innovation Conference in New York.

(RECORD, November 2016, page 96) connects to nature by nestling within a series of sunken gardens. Tod Williams joked, "There's very little innovation here." But, somehow, in a design culture fixated on the digital, the simplicity of the lush greenery juxtaposed with the strong materials and feeling of craft seemed the most inventive of all. ■

Women in Architecture Forum & Awards 2016

In tandem with its Innovation Conference in New York, ARCHITECTURAL RECORD hosted its third annual Women in Architecture Forum & Awards November 2. The program is intended to recognize leading female architects and spark discussion about issues facing women in the profession.

A panel on the theme of diversity in architectural education preceded the awards program. Deborah Berke, the first woman dean of the Yale School of Architecture; Donna Robertson, former dean of the College of Architecture at the Illinois Institute of Technology and one of this year's award recipients; and Winka Dubbeldam, chair of graduate architecture at PennDesign participated in a panel moderated by RECORD editor in chief Cathleen McGuigan.

The panelists kicked off the conversation by citing female enrollment statistics and faculty positions at their respective institutions ("The numbers are not encouraging," said Berke) and the ways in which they, as leaders in education, could enlist change. "I think that we could be more radical," said Berke. Dubbeldam noted, "As a university, it is important to support women in being more competitive."

From left to right: Cathleen McGuigan, Deborah Berke, Donna Robertson, and Winka Dubbeldam.

The discussion was followed by a ceremony honoring this year's award winners: Susan T. Rodriguez, Designer Leader; Amale Andraos, New Generation Leader; Jenny Sabin, Innovator; Donna Robertson, Educator/Mentor; and Roberta Feldman, Activist. *Alex Klimoski*

Santa Monica to Adopt Ambitious Zero Net Energy Requirements

BY DEBORAH SNOONIAN GLENN

Santa Monica–based firm Brooks + Scarpa is well prepared for the new ordinance. Colorado Court, an affordable-housing project it completed in 2000, became a national model for energy efficiency.

IN OCTOBER, the city council of Santa Monica, California, approved a sweeping ordinance requiring all newly built single-family homes, as well as duplexes and low-rise multifamily buildings, to have zero net energy (ZNE) consumption. According to the 2016 California Green Building Standards Code (CALGreen), whose definition was adopted for the ordinance, a ZNE home is one that produces as much renewable energy on-site as it consumes yearly. The ordinance is the first of its kind in the world, officials say.

The state of California already has an upcoming code requirement on the books for all new residential construction to achieve ZNE by 2020. But Santa Monica has often adopted its own ambitious policies on environmental issues as a way to drive change elsewhere, says Dean Kubani, the city's chief sustainability officer. "Many practitioners and cities in California aren't aware this code change is coming in 2020—or they don't believe the state will be ready," he says. "Taking this action now gives us a pathway toward this goal, helps raise awareness, and drives home the importance of the issue."

The ordinance must be given the green light by the California Energy Commission (CEC), a process that includes a public comment period. Kubani estimates that it could officially go into effect as early as late February 2017. Once it passes, all permit applications for new residential construction in Santa Monica will need to comply with ZNE. Projects that are in schematic design at the time the ordinance passes but not in compliance would need to be modified, while those with approved permits would be grandfathered in. The new measure will be enforced via Santa Monica's existing building code, the same process the state intends to use

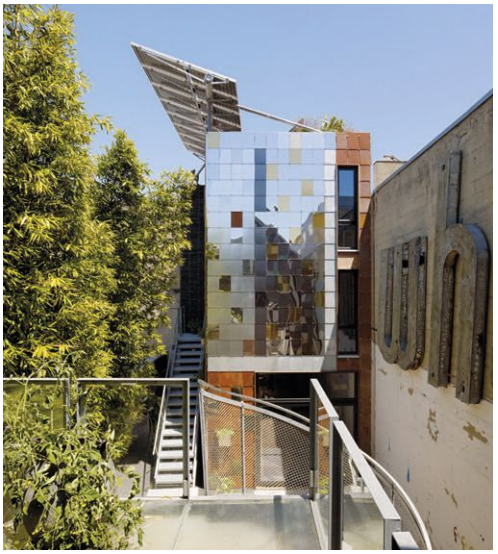
in 2020. “It will become a model for other cities,” says California asssemblymember Richard Bloom.

Attaining ZNE status for newly built homes in sunshine-abundant California is “absolutely achievable” by 2020, says Kubani. Solar electric and solar thermal systems have been steadily decreasing in price for several years, and as Santa Monica developed its ordinance, it worked closely with the CEC and local utilities, and collaborated with local design and construction firms to assess its technical and cost feasibility.

Even so, housing developers aren’t uniformly prepared for the code change. “Some forward-thinking companies are seeing ZNE homes as a market opportunity,” says Dominique Hargreaves, executive director of U.S. Green Building Council’s Los Angeles chapter. “But many others are lagging behind, convinced that the state will have to extend the timeline so the market can catch up.” She’s encouraged by research and planning efforts in and around L.A. County to retrofit existing housing communities to achieve ZNE status, another move that would curtail the effects of climate change.

But in Santa Monica itself, practitioners are used to being held to tough standards. “The city has always set the bar high for energy efficiency,” says Angela Brooks, principal of Los Angeles firm Brooks + Scarpa and 2018 president-elect of the AIA’s Committee on the Environment (COTE). Her firm has designed several energy-efficient affordable housing projects in Santa Monica, including Colorado Court in 2000 and Pico Place in 2014. “Sixteen years ago, we put solar panels on Colorado Court to prove the technology could power a multifamily building. Now the performance targets we achieved with that demonstration project are actually written into Title 24 [the state’s energy code].” And these stricter codes have helped the industry learn to design more and better energy-efficient homes and buildings, she adds.

The ZNE ordinance is just one of Santa Monica’s strategies for achieving its long-term goals for climate-change mitigation, including releasing zero carbon by 2050. “Ideally, we’ll show the country and world that ZNE buildings of all kinds are practical and affordable, and eventually they’ll become the new normal,” says Kubani. ■



The Santa Monica requirements would bolster an upcoming California requirement for all new houses to achieve ZNE by 2020. Architect David Baker’s Zero House, for instance, is a prime example in San Francisco. The cottage achieved ZNE certification in 2014.

PHOTOGRAPHY: © MATTHEW MILLMAN; COURTESY BROOKS + SCARPA (OPPOSITE)

Aga Khan Bestows Architecture Awards in Dubai

BY CATHLEEN MCGUIGAN

Leila Araghian (center, above) received the Aga Khan Award for Architecture from Sheikh Mohammed bin Rashid Al Maktoum, the Vice President and Prime Minister of UAE and Emir of Dubai (left of her), and the Aga Khan (right of her). Marina Tabussum (at the far right), designed the Bait Ur Rouf mosque.

ANYONE WHO attended the symposium for the Aga Khan Award for Architecture last month couldn't miss the irony that it was held in Dubai. Amidst the forest of ungainly skyscrapers in that city's instant downtown (the elegant Burj Khalifa is an exception), architects, jury members, and guests discussed the prize's six winners—projects of striking modesty, from Beijing to Bangladesh. The 40-year-old award, given every three years, has always stood quietly apart from such venerable prizes as the Pritzker and the Praemium Imperiale—honoring projects, not a singular architect, and acknowledging clients as well as designers. As it has matured, the awards have astutely reflected emerging trends in architectural culture.

This year's winners, for example, exemplified a strong interest in materials, in micro-urbanism, and in establishing new forms of public space, as jury member Mohsen Mostafavi, dean of Harvard's Graduate School of Design, put it. While the award has long looked favorably on restoration and adaptive reuse, it has increasingly recognized work with a social impact on underserved communities.

And though the criteria state that projects must be "designed for or used by Muslims, in part or in whole," the interpretation by the jury seems quite elastic. This year, the humblest winning project was a small children's library carved out of an old Beijing *hutong*, designed by Zhang Ke, of ZAO/standardarchitecture (a 2010 RECORD Vanguard winner). The Friendship Centre, an NGO training facility in rural Bangladesh, is a simple but elegant complex of sunken spaces and courtyards, built of hand-made bricks, designed by Kashef Mahboob Chowdhury/URBANA. The small Bait Ur Rouf mosque, also in Bangladesh, was designed by Marina Tabussum on the edge of Dhaka. Beautifully built, again in locally made bricks (and radically lacking a dome or minaret), it seems, in its timeless yet modern form, to nod to Louis Kahn.

On a dramatically a larger scale, the Tabiat Pedestrian Bridge in Tehran links two urban parks that were separated by a highway—but it has become an inviting public space in itself, where people gather and linger. Designed by the two young partners of Diba Tensile Architecture, Leila Araghian and Alireza Behzadi, the bridge had 4 million visitors its first year.

While the awards typically shine a light on little-known designers, this year, two famous architects took home a prize ($1 million, divided among all the winners). Bjarke Ingels of BIG led the team that designed Superkilen, a public space in a diverse immigrant community in Copenhagen. The late Zaha Hadid designed the Issam Fares Institute at American University in Beirut and was represented in Dubai by the firm's principal, Patrik Schumacher. "Each project crosses many boundaries and tells many stories," said architect Brigitte Shim, a jury member, at the symposium.

The next day, the Aga Khan echoed that idea at the formal ceremony to bestow the awards, held at a 19th-century fort in the city of Al Ain, once an oasis in the desert. "The spirit of pluralism has been central to the best of Islamic culture," he said, and added: "I am happy to underline that three of the awardees this year are women architects." ■

PHOTOGRAPHY: © AKDN/GARY OTTE

noted

Perkins+Will and Phil Freelon Establish Fellowship at Harvard

A new fund at the Harvard Graduate School of Design will provide financial assistance to African American and minority architecture and design students. Intended to expand academic opportunities for people of color, the fellowship is named in honor of Freelon, an AIA fellow and founder of the Freelon Group, which joined Perkins+Will in 2014.

Zaha Hadid Architects Opens Office in Dubai Design District

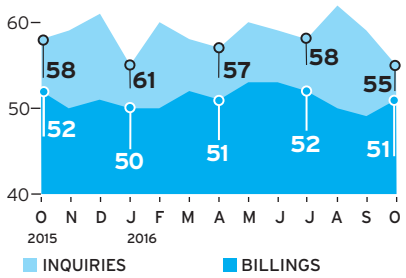
On November 7, ZHA opened its new Middle East office. The firm is currently undertaking 16 projects in the region, including the Abu Dhabi Performing Arts Centre. Its primary office is located in London.

Justus van Effen Preservation Wins 2016 World Monuments Fund/Knoll Modernism Prize

Three Dutch firms are being honored for rehabilitating a historic housing complex in Rotterdam. Molenaar & Co. architecten, Hebly Theunissen architecten, and landscape architect Michael van Gessel will receive the biennial award on December 5 at the Museum of Modern Art in New York.

Boy Killed in Tokyo Design Week Blaze

A 5-year-old child died after a fire broke out in a pavilion created for Tokyo Design Week. Two adult men, including the boy's father, were also injured. The 10-foot-tall jungle gym–like structure was part of a student display designed by Nippon Institute of Technology's Engineering Department. According to *The Japan Times*, an incandescent bulb probably started the blaze.



After Two Months in the Dumps, ABI Rebounds

The AIA's monthly Architectural Billings Index (ABI) saw a slight increase in demand in October, after a rare two-month period of decline. The AIA reported a score of 50.8 that month, up from 48.4 in September (any mark above 50 reflects an increase in billings). The new projects inquiry, however, tumbled four points to 59.4. According to AIA chief economist Kermit Baker, this was due to "a collective sense of uncertainty" in the lead up to the presidential elections last month.

PLASTIC LAMINATE MOISTURE GUARD™

Moisture Guard™ Edge Banding: *Available on all partition doors, panels, pilasters and urinal screens in 45 colors.*

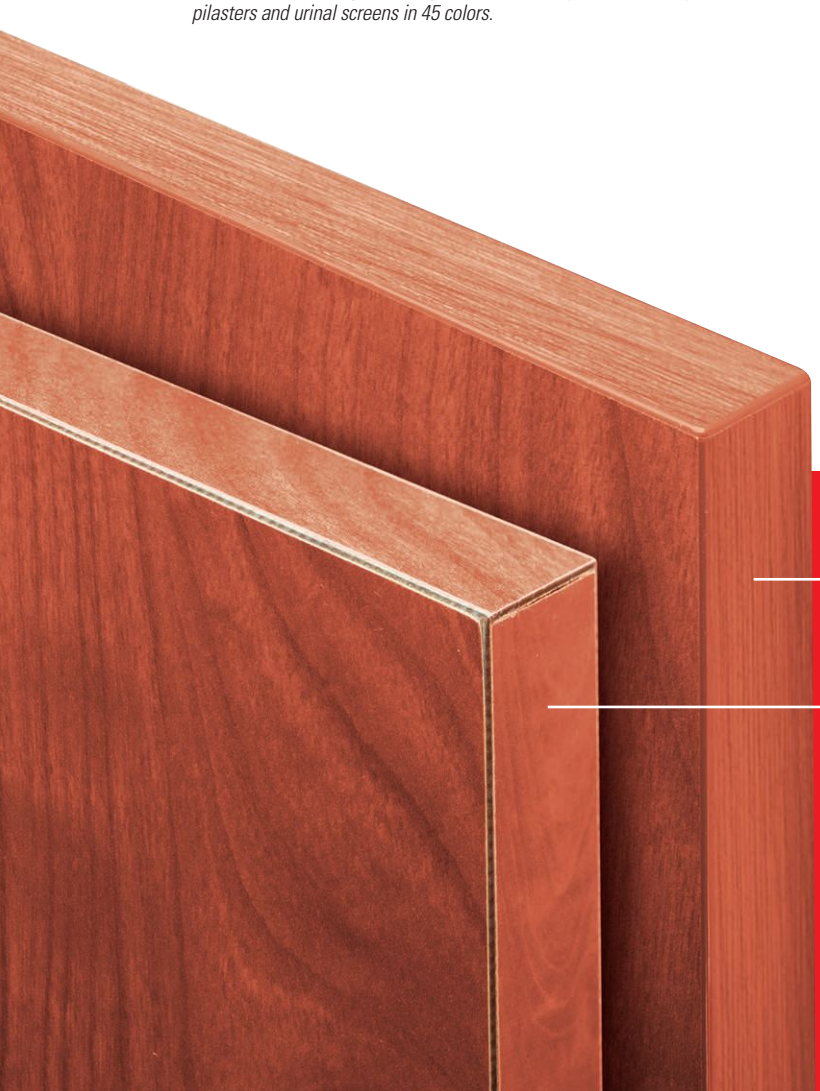
PLASTIC LAMINATE WITH AN ELEGANT EDGE

Introducing the new Plastic Laminate Partitions with Moisture Guard™ Edge Banding. Our Moisture Guard™ Edge Banding fuses with the substrate creating a seamless beveled profile that eliminates any unsightly black lines that appear in standard Plastic Laminate.

ASTM tests on Moisture Guard™ Edge Banding confirms 3X greater durability with increased resistance to moisture and humidity than standard Plastic Laminate. **Available in 45 colors/patterns** and our new **Easy Stall Shoe*** speeds up the installation process.

Our Plastic Laminate with Moisture Guard™ Edge Banding is now backed with an industry leading exclusive five-year warranty.
To see a sample, contact 706.827.2700 and ask to meet a sales representative.

**Floor Anchored/Overhead Braced Only.*



ASI Global Partitions

CIRCLE 72

LEARN & EARN

Earn your continuing education credits free online on ce.architecturalrecord.com or with *Architectural Record's* Continuing Education App!*

IN THIS ISSUE

Photo courtesy of W&W Glass, LLC

First Impressions

Sponsored by Cladiators; CRL-U.S. Aluminum; EXTECH/Exterior Technologies, Inc.; Longboard® Products a Division of Mayne Coatings Corp.; New Millennium Building Systems; Prodema; TAMLYN; TILE EZE; and W&W Glass, LLC

Credit: 1 AIA LU; 0.1 IACET CEU

Page 138

Photo courtesy of The Sherwin-Williams Company

Design Strategies for Optimal Well-Being in Health-Care Environments

Sponsored by AD Systems, Metl-Span, and The Sherwin-Williams Company

Credit: 1 AIA LU/HSW; 0.1 IACET CEU

Page 158

Photo courtesy of Soil Retention Products, Inc.

Designing for Landscape Architecture

Sponsored by Firestone Building Products, Soil Retention Products, Inc., and Tournesol Siteworks

Credit: 1 AIA LU/HSW; 1 PDH, LA CES/HSW; 0.1 IACET CEU

Page 166

© Agence Rudy Ricciotti

Designing with Concrete in the 21st Century

Sponsored by Vectorworks, Inc.

Credit: 1.25 AIA LU/HSW; 0.1 IACET CEU

Page 174

Photo courtesy of Huber Engineered Woods, LLC © 2016

Mitigating Water Leaks around Windows in Wood-Framed Walls

Sponsored by Huber Engineered Woods, Inc.

Credit: 1 AIA LU/HSW; 0.1 IACET CEU

Page 178

Photo courtesy of Whirlpool Corporation

Lifelong Housing

Sponsored by Whirlpool Corporation

Credit: 1 AIA LU/HSW; 0.1 IACET CEU

Page 183

Photo courtesy of John Durant

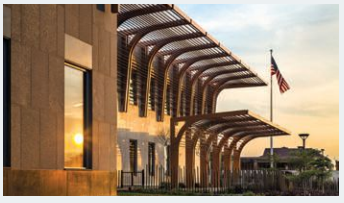
Horizontal Sliding Fire Doors: Architectural Design Freedom

Sponsored by Won-Door Corporation

Credit: 1 AIA LU/HSW; 0.1 IACET CEU

Page 188

Photo courtesy of the U.S. Department of State



Design to Protect

Sponsored by Ross Technology

Credit: 1 AIA LU/HSW; 0.1 IACET CEU

Page 193

Photo courtesy of Ceilings Plus

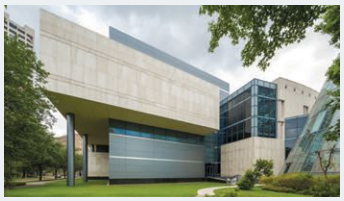
Revolutionizing Ceiling and Wall Surfaces with Parametrics and Digital Fabrication

Sponsored by Ceilings Plus

Credit: 1 AIA LU/HSW; 0.1 IACET CEU

Page 194

Photo courtesy of MIA+BSI: The Natural Stone Institute



Understanding Anchorage Systems for Natural Stone Cladding

Sponsored by MIA+BSI: The Natural Stone Institute

Credit: 1 AIA LU/HSW; 0.1 IACET CEU

Page 198

NEW ONLINE AT CE.ARCHITECTURALRECORD.COM

Photo courtesy of Paul Crosby Architectural Photography

Western Red Cedar

Sponsored by WRCLA: Western Red Cedar Lumber Association

Credit: 1 AIA LU/HSW; 0.1 IACET CEU

ALSO ONLINE AT CE.ARCHITECTURALRECORD.COM

Roofs and Condensation
Sponsored by Duro-Last®, Inc.

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

Looking Good: New Paper Towel Dispenser Systems Score in Appearance, Sustainability, and User Preference
Sponsored by KIMBERLY-CLARK PROFESSIONAL®

Smarter, Safer Hot Water: Digital Thermostatic Mixing Stations
Sponsored by Powers

Floodplain Design, Construction, and Impacts on Flood Insurance
Sponsored by Smart Vent Products, Inc.

Health and Transparency in Product Declarations
Sponsored by Forbo Flooring Systems

Lighting the 24-Hour Bathroom: Options for Health, Comfort and Sustainability
Sponsored by Duravit USA, Inc.

Sustainable Stone From Cradle to Gate
Sponsored by MIA+BSI: The Natural Stone Institute and the Natural Stone Council (NSC)

Code-Compliance Conflicts in the Exterior Wall Assembly
Sponsored by Laminators Incorporated

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

* 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, unless otherwise noted.

Park Chelsea, Washington, DC
Architect: Esocoff & Associates Architects

Golden Dawn (S27-28), in Econo, Saxon and Titan sizes.
Visit glengery.com/parkchelsea for full details.

Build beauty with us

Colors, textures, sizes, shapes and materials—Glen-Gery provides architects and designers the largest palette of hard surface options to bring visions to life. To learn what's possible call 610.898.3998 for our idea book or visit glengery.com

Glen-Gery

Timeless. Elegant. Durable.

CIRCLE 29

Many things have improved over the last 9,000 years.

Until now, brick wasn't one of them.

Introducing NewBrick. The most important innovation in the history of brick. NewBrick is superior to clay brick in weight, energy efficiency, speed of installation and environmental impact. NewBrick offers the same classic size and appearance of clay brick, but raises the bar with improved performance.

Visit dryvit.com/newbrick to see all of NewBrick's colors and textures. Contact us to request samples, and to learn how NewBrick can greatly benefit your next project.

newbrick@dryvit.com | 800-556-7752 x9

CIRCLE 35

NEWBRICK™ by dryvit

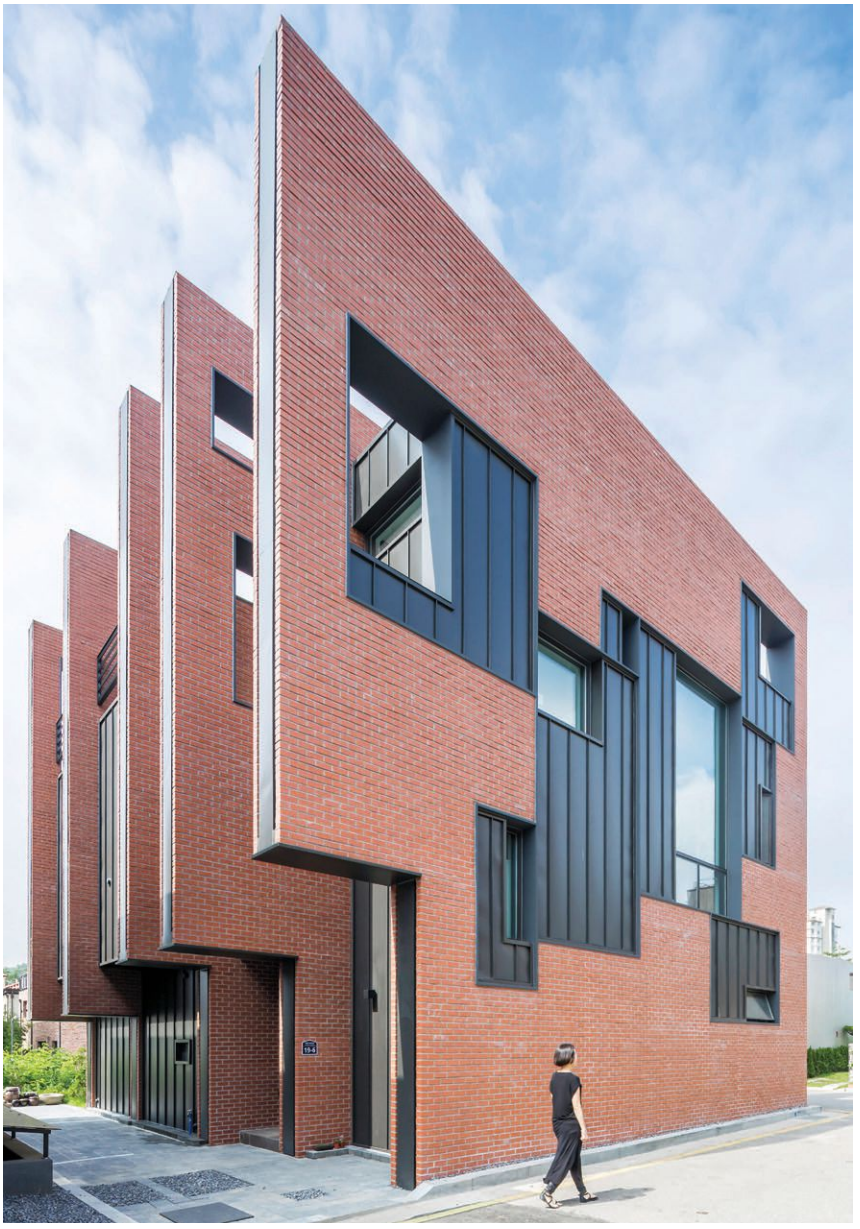
A HOUSE NEAR SEOUL USES A SERIES OF WALLS TO CREATE A DIALOGUE BETWEEN INSIDE AND OUT. BY CLIFFORD A. PEARSON

WHEN ARCHITECTS—or politicians, for that matter—speak of walls, they usually see them as boundaries dividing one place from another. UnSangDong Architects took a radically different approach at a new house outside of Seoul, punching openings through them, making them portals and creating unique opportunities to bring in light and frame views. Instead of barriers, they're thresholds.

UnSangDong, a RECORD Design Vanguard winner in 2006, has established a reputation for inventive designs that use folded, layered, and faceted forms to create striking identities for buildings. With Wall House, the firm defines the project's structure and image with a set of five parallel brick walls, each 35 feet high. Spaced at different intervals from one another, the imposing brick planes create a visual rhythm that modulates interior and exterior spaces—from generous living and dining rooms to narrower service areas.

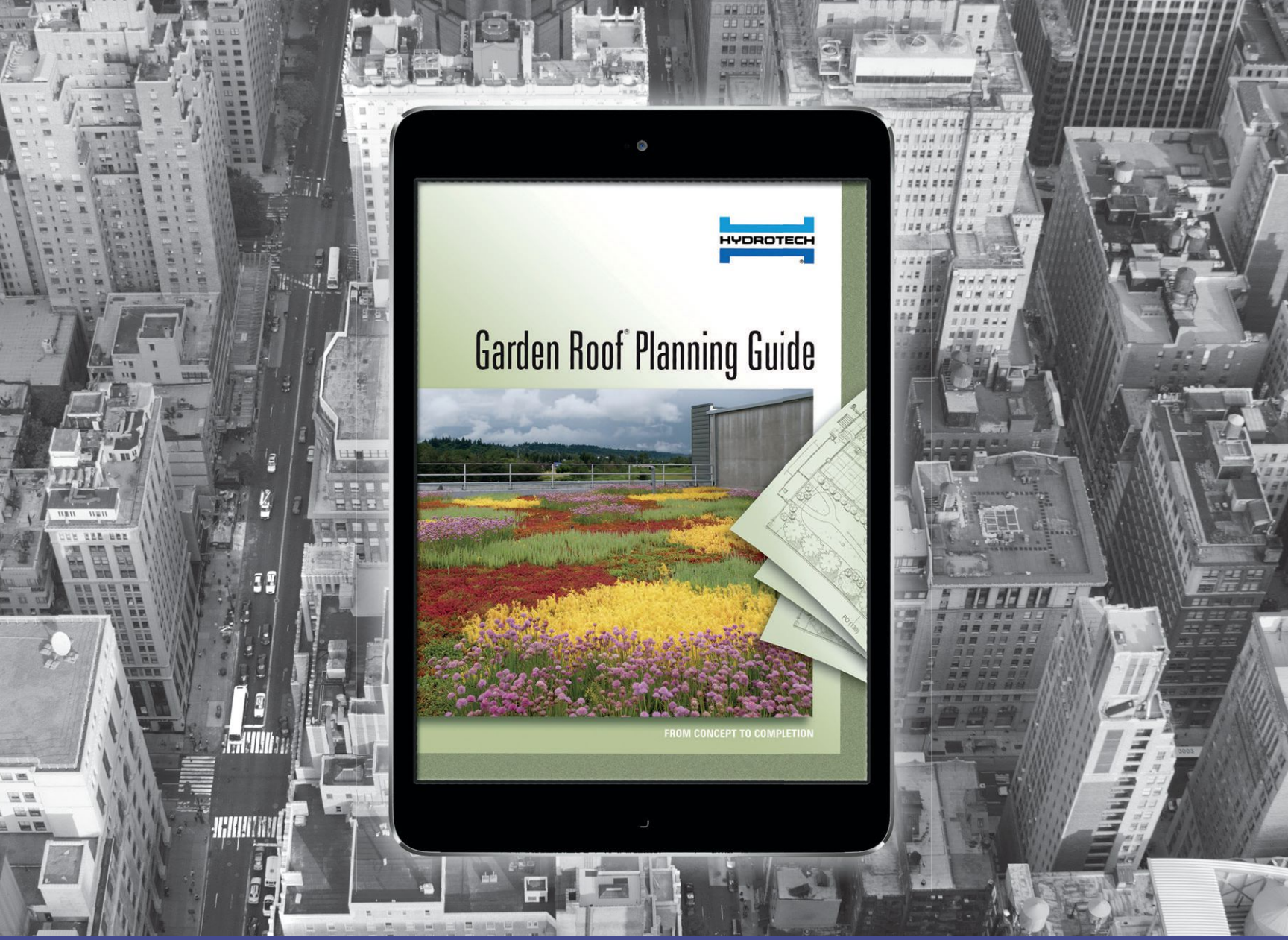
Designed by someone less skilled, such a scheme could have been overbearing or rigid. But UnSangDong partner Mijung Kim cut away much of the brick fabric, to give the house an open and spacious feel—with views through rooms and up to the second floor in certain places. By extending the walls horizontally beyond the enclosed portions of the house, Kim created outdoor rooms on the ground level and terraces or balconies for the bedrooms on the second floor. And by extending the walls vertically above the roof, she was able to define a garden that is open to the sky but shielded from sight of neighboring houses. A grassy courtyard on the ground level brings daylight deep inside and further blurs the distinction between inside and out. "We wanted nature to penetrate inside," says Kim. "The idea was to make people feel as if they're outdoors when they are inside, and inside when they are out."

The 2,500-square-foot house sits in Pangyo, a low-rise residential community, and serves three generations of a Korean family—a married couple, their two children, and a grandmother. An acquaintance of the grandmother recommended UnSangDong, and it was she who asked for a brick house, but a modern one. Encouraging communication between family members was important to the clients, so Kim and her team created



The Wall House features five 35-foot-high parallel brick walls (top). The perpendicular walls between them are clad in zinc (above). The distinctive design stands out among neighboring buildings in the low-rise residential community of Pangyo outside of Seoul (right).

PHOTOGRAPHY: © SERGIO PIRRONE



20 years of vegetated roof experience... brought to life in one app.

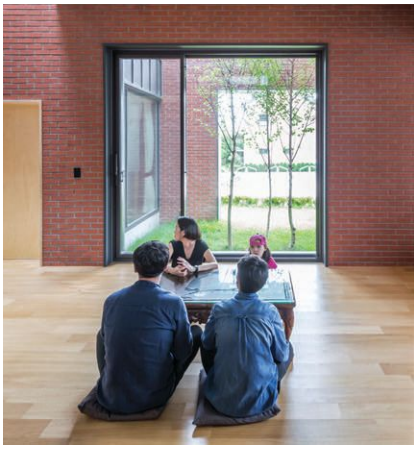
American Hydrotech introduces the Garden Roof® Planning Guide mobile app, a first-of-its-kind digital brochure that helps design professionals take a vegetated roof from initial concept to completion.

Packed with photography, technical information and videos, design professionals can explore assembly options and components, growing media and vegetation, and learn about topics such as design considerations, economic and sustainable benefits, installation and maintenance, and much more.

Download your copy today at **hydrotechusa.com/GRPG**

American Hydrotech, Inc.
303 East Ohio | Chicago, IL 60611 | 800.877.6125 | www.hydrotechusa.com

CIRCLE 25



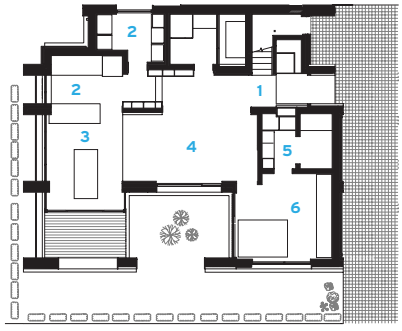
The rhythm of spaces is modulated horizontally but also vertically, with double-height spaces and views into different levels (above). A grassy courtyard between two of the brick walls (left) blurs the distinction between exterior and interior, seen from the dining area (below). Wider living spaces alternate with narrower service areas like this stairway that connects to the attic (right).

horizontal axes that, along with double-height areas, visually connect one floor to another. For example, the grandmother likes to watch the kids doing their homework in the second-floor study as she relaxes in the living room on the first floor. "Creating the right balance between privacy and communication was important," says Kim.

The architect sees the openings in the parallel walls as frames for sequences of spaces, creating an almost cinematic experience. Using the term "chrono-topic," Kim says she tried to "integrate time and space through a combination of varying surfaces and intersecting axes."

The husband, who works for Samsung, made sure the house was equipped with the latest technology, so everything from heating and air-conditioning to lighting and security is networked and automated. Solar panels on the roof provide most of the energy needed to power the house.

Although Wall House is modern in the way it functions and looks, its integration of indoors and out is a hallmark of traditional Korean houses, or *han-ok*, says Kim. Such a blurring of periods is another way Kim has integrated "time and space." ■



GROUND-FLOOR PLAN

0 10 FT. 3 M.

1 ENTRANCE
2 KITCHEN
3 DINING ROOM
4 LIVING ROOM
5 DRESSING ROOM
6 BEDROOM

Look beyond the surface. See the possibilities.

New dECOLeather™

RECYCLED LEATHER VENEER *by* FORMICA GROUP

5620-15 Fire

Introducing dECOLeather™ Recycled Leather Veneer

Richly-grained, recycled real leather veneer in distinctive textural finishes of crocodile, walrus and buffalo. A truly uncommon sense of luxury that draws the eye beyond traditional surfacing. Durable, desirable and unlike anything you've seen from us before.

Download the 2017 Formica® Specialty Collection Lookbook at formica.com/specialty2017.

Formica® Surfaces. **FOR REAL.™**

CIRCLE 99

perspective **interiors**

HENRI CLEINGE TRANSFORMS A LAVISH BEAUX-ARTS INTERIOR INTO A MODERN WORKSPACE. **BY ALEX KLIMOSKI**

A FORMER BANK in a 1928 neoclassical skyscraper in Old Montreal has found new life as a collective office and café for the young tech company Crew. Architect Henri Cleinge has created an elegant workplace through the skillful integration of the original architectural elements with a rich new material palette, adding contemporary flair to a historic space.

Crew wanted a casual, flexible environment with a variety of work spaces, both private and public. Cleinge, whose work embraces simple forms and the use of raw materials, designed a layered space that comprises a public café, conference rooms and desks for the Crew team, and rentable "V.I.P." desks and "quiet bunks" for freelancers.

One challenge was to create distinct areas that would also encourage interaction among all users. To accomplish this, the architect placed glazed conference rooms behind existing teller booths, using these historic cubicles as transparent buffer zones between the café and Crew's private work area. The "quiet bunks" lining the café on two sides, offering seclusion for up to four people, also separate the V.I.P. desks on the perimeter from the space open to the general public at the center.

The design team carefully selected materials and finishes to inject a modern yet subdued feel into the 12,000-square-foot café and offices. "The question was, what materials could we bring in that would have a dialogue with the historic architecture? We didn't want to do anything phony—we wanted it to blend in," says the architect. Echoing brass elements from the ornate suspended light fixtures and teller stands, Cleinge opted for the use of brass-plated steel throughout, most prominently to clad the conference rooms and work booths. The architect installed a white oak floor in the sequestered zone behind the former teller stands, a choice that complements the golden tinge of the original materials while providing noise control. To balance the lighting, the design team replaced incandescent bulbs with warm LEDs in chandeliers, and installed custom fixtures over the café, and small, discreet downlights in conference rooms and bunks.

The resulting intervention, which Cleinge likens to "a temporary installation," nods to the past while embracing tenets of 21st-century work life: community, collaboration, and creativity. ■

The architect accommodated a complex program by inserting private, semiprivate, and public zones into the yawning first floor of a neoclassical building (above), once home to the Royal Bank of Canada. Through the use of glazing and brass-plated steel, conference rooms are visually permeable while being acoustically private (left).

PHOTOGRAPHY: © ADRIEN WILLIAMS

Privacy is overrated.

Every project presents an opportunity for greatness. JELD-WEN® windows and doors enable you to bring your vision to life exactly as you imagined. Choose from an unrivaled array of styles, colors and hardware that add to performance, along with a warranty that we stand behind with conviction.

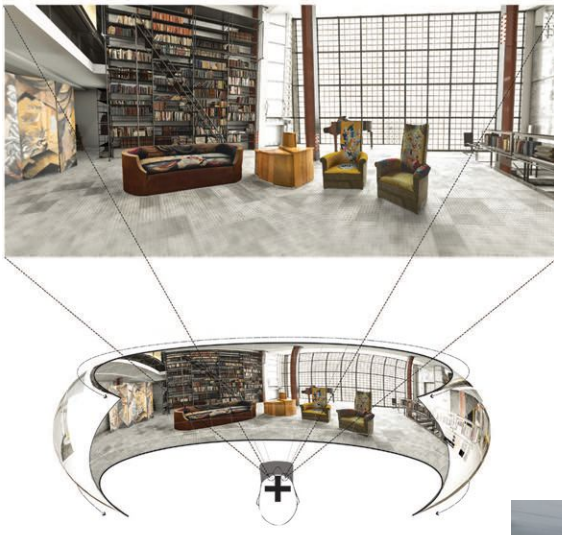
jeld-wen.com

CIRCLE 229

JELD-WEN WINDOWS & DOORS

Diller Scofidio + Renfro bring Pierre Chareau's work to life at the Jewish Museum in New York

BY JOSEPHINE MINUTILLO



Interiors were recreated in virtual reality (above). The Maison de Verre is shown in plan, section, and video (top, right). Lively silhouettes animate the furniture (right).

PIERRE CHAREAU made a lasting name for himself in the annals of architectural history with one seminal work, the Maison de Verre in Paris, completed in 1932. He did, of course, do other things. With the opening last month of *Pierre Chareau: Modern Architecture and Design* at the Jewish Museum in New York, we get a comprehensive look at his work for the first time in the U.S. But the exhibition does more than that. Its designers, Diller Scofidio + Renfro (DS+R), have taken on the challenge of displaying architecture in a groundbreaking way.

Organized by guest curator Esther da Costa Meyer, professor of the history of modern architecture at Princeton, the exhibition includes four distinct sections. The first is dedicated to Chareau's furniture designs—a peculiar mix of a decorative and machinelike aesthetic—including a coatrack, makeup table, daybed, side tables, armchairs, and lighting, displayed in several vignettes. In front of those arrangements are scrims of PVC-coated polyester weave that roll down from the ceiling. Scenes of shadowy silhouettes of people using the furnishings are projected onto those screens. It is surprising and playful, but also gives the viewer a feel for the Parisian interwar era in which the eclectic objects were created. "Part of our brief was to situate Chareau in the sociopolitical context," explains DS+R founding principal Liz Diller, who counts the architect—often pushed to the margins of the discipline—among her heroes from when she was a student of architecture at Cooper Union.

Chareau and his wife were avid art collectors, but were forced to sell some of their best pieces as they fled German-occupied Paris. The next section of the exhibit brings together for the first time artworks they kept and others that have been identified as once belonging to them. The most stunning of the group is a caryatid sculpture by Amedeo Modigliani, displayed in a protruding glass container embedded within a partition separating two display areas to expose its front and back.

The third section focuses on Chareau's interior design, featuring some of the work he did after arriving in the U.S., including a house for artist Robert Motherwell in East Hampton, New York. Built from an existing army-surplus Quonset hut, it was completed in 1947 and demolished in 1985. But the star of this part of the show is the virtual reality (VR) interiors. Four stations are set up around select pieces of furniture. Visitors take a seat on a swiveling chair at each to peer through VR glasses and get 360-degree views of those select pieces in their original settings. DS+R recreated the context around the furniture in the virtual environment using historical photographs and drawings for the interiors of the Chareau studio and a client's Paris apartment, which no longer exist, but gathered information from the Maison de Verre's interiors during a visit there earlier this year. Each piece of furniture in the gallery was digitally scanned, measured, and remodeled to a high degree of detail, then placed strategically within its historical context. In one case, smoke gently streams from a lit cigarette in an ashtray.

The exhibition culminates with Chareau's masterpiece, the Maison de Verre, and it is no exaggeration to say that DS+R's design for its display is a stroke of genius. Long before completing any buildings, Diller and partner Ric Scofidio first came to prominence in the early 1990s with a series of provocative art installations. Aside from their current design for the Jewish Museum, they've recently staged innovative exhibits at the Metropolitan Museum of Art's Costume Institute, the Cartier Foundation in Paris, and this year's Istanbul Design Biennial.

Chareau's touchstone house, somewhat hidden within a Paris courtyard and famously clad in square, textured glass bricks, is privately owned and not easily accessible to the general public. DS+R was given access to film the house, and has used that footage to great effect here—giving a real sense of the space to the many who will not be able to see it in person.

The house's plan is laid out on the floor of the exhibit's last room. Hanging above it, a screen offers CAT scan–like sectional views of the house, constantly moving to reflect different spaces as it scrolls over the layout illustrated beneath. When the screen stops moving, a red box highlights a specific area and a video of actors using that space appears on the wall beside it—climbing a stair, removing cleaning supplies from the broom closet, washing up in the bathroom, entering a sleeping chamber as an alluring female waits on the bed. Chareau did, in fact, conceive the highly transparent house as a venue for viewing and being viewed, and DS+R does voyeurism as well as anyone.

This isn't the only way to display architecture, but it makes a strong case for the artful combination of digital technology with beautiful objects and drawings. ■

Pierre Chareau: Modern Architecture and Design *is on display at the Jewish Museum through March 26, 2017.*

Creativity Begins. **Sto Finishes.™**

Architects as Artists.

Deliver the curated feel of atelier design with Sto Façade Systems. Use Sto couture finishes, ranging from ultra-smooth to deeply textured. Easy-to-apply Sto Façade Systems push the envelope of architecture with countless color options and character.

Create more at: **www.stocorp.com/ArchitectsAsArtists**

sto®

Building with conscience.

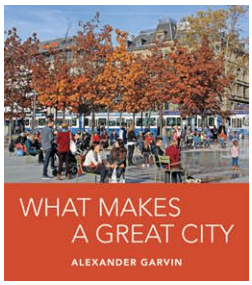
CIRCLE 233

The Right Strategies

What Makes a Great City, *by Alexander Garvin. Island Press, September 2016, 344 pages, $80.*

Reviewed by Alex Cohen

FOR URBANISTS, planners, and architects who appreciate well-designed public spaces, Alexander Garvin's latest publication delivers a carefully constructed tour of cities that accomplish this goal. He shows how they successfully created or enhanced parks, plazas, and squares or established a broader array of civic improvements to attract investment and enhance quality of life.



While surveying North American and European cities to which he has traveled, and including lavish photographs, Garvin delivers broad principles about how governments, businesses, and private citizens work over time to improve urban environments. Nearly all of the case studies explored are largely strategies to subjugate, or at least segregate, cars and traffic from places to play, work, or spend as these cities plan their post-industrial futures.

The author of three editions of *The American City: What Works, What Doesn't*, a textbook-like primer of major urban planning strategies and concepts, Garvin, who teaches urban planning at Yale and was a longtime New York City planning official, now has his own firm, AGA Public Realm Strategists. And he is the creator of the BeltLine plan to connect Atlanta's disparate neighborhoods via an urban greenway. In the tradition of social scientist William H. Whyte, who studied the behavior of users of public places, *What Makes a Great City* reflects the author's keen observations of why people gravitate to inviting parks and pedestrianized shopping districts. It fittingly provides the history of how these environments evolved and who planned them.

For those who believe Bilbao's resurgence was principally due to the reception of Frank Gehry's Guggenheim Museum, Garvin thoughtfully illustrates in this new book how the municipality's relocation of the region's declining manufacturing base away from the formerly contaminated Nervion river, and extensive investment in new public transportation systems, stemmed the city's depopulation and did as much as Gehry's successful intervention to spur economic development.

Perhaps most intriguing of these case studies is Garvin's depiction of the ongoing transformation of Houston's Post Oak neighborhood—including the introduction of public transit and pedestrian amenities—in a city long known for unzoned, car-dependent suburban growth.

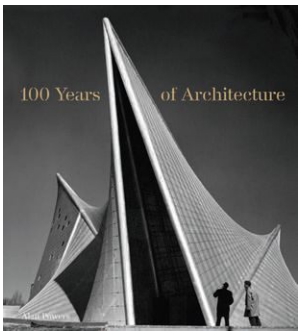
Surprisingly, the book omits discussion of New York's High Line, given its impact as an immensely popular park, driver of development, and clear precedent for the Atlanta BeltLine, which here gets its due. In contrast to European and Canadian cities, the transformation of American urban spaces analyzed by Garvin has generally depended on the imposition of extra-municipal special assessment or taxation districts (BIDS and TIFS), as traditional government financing of public improvements has waned. Some commentary on this difference would have enhanced an otherwise impressive look at successful Western public planning. ■

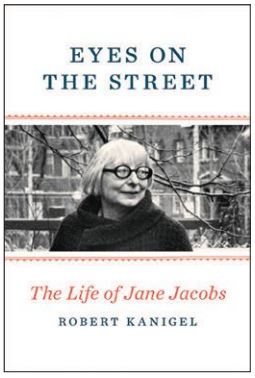
Alex Cohen, a graduate in urban planning at Princeton University, leads the commercial division for the New York real-estate firm CORE.

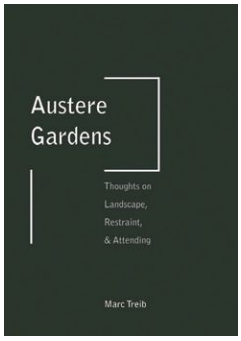
Holiday Roundup

Record's annual guide to gifts for colleagues, friends, and supportive clients.

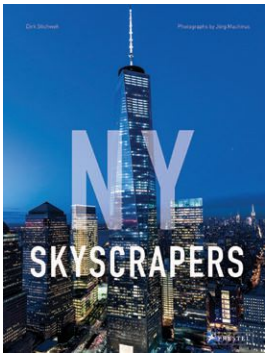
BY JAYNE MERKEL







RECORD'S HOLIDAY roundup highlights books that deal with urbanity in its many guises, from perspectives that embrace skyscrapers to those that see antidotes to density in low-rise planning and landscape design. Our purview takes us from the anti-urban development of the shopping mall to the precedents for civilization established long ago in the Middle East now endangered through political turmoil.

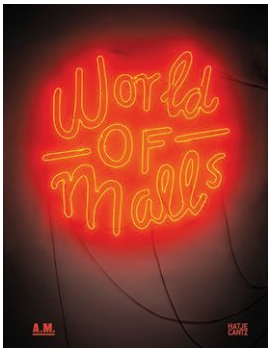


NY Skyscrapers, *by Dirk Stichweh, Scott Murphy, and Jörg Machinas. Prestel, August 2016, 193 pages, $39.95.*
A large-format (9.6 by 12.8 inches) celebration of the New York skyscraper, this book shows towers in clusters and from aerial and long-range views that provide perspectives that vary from the typical pedestrian's-eye experience. An expanded update of a 2009 publication, this edition includes images of skyscrapers under way now and planned for the near future.

Never Built New York, *by Greg Goldin and Sam Lubell. Metropolis Books, October 2016, 488 pages, $55.*
Ranging from the outrageous to the sensible, the 200 projects in this glossy and gargantuan (11.5 by 8.5 inches) volume prove that, as outlandish as built New York can sometimes seem, it could have been a lot more so. Among the fanciful and grimly pragmatic schemes are proposals to fill in the East and Hudson rivers and to extend Manhattan to Staten Island. The most sorely missed realization is probably Robert Moses's very reasonable plan to extend the subway to JFK Airport. Many of the works shown here will be displayed in a September 2017 exhibition at the Queens Museum in Flushing Meadows-Corona Park, New York.

Becoming Jane Jacobs, *by Peter L. Laurence. University of Pennsylvania Press, June 2016, 355 pages, $34.95.*
This biography of Jane Jacobs, who did more than anyone to save the character of New York from car-oriented modernization, places her work in the context of the urban thinking of the time. Peter Laurence, a Clemson University professor, shows how Jacobs's ideas related to and departed from modernist proponents and how colleagues such as *Architectural Forum* editor Douglas Haskell encouraged her development of original ideas that would become part of the international debate.

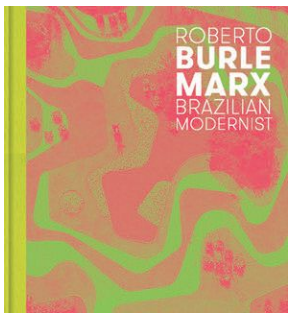
Eyes on the Street: the Life of Jane Jacobs, *by Robert Kanigel. Alfred A. Knopf, September 2016, 490 pages, $35.*
Robert Kanigel, a former science professor at MIT, concentrates mainly on the personality and background of Jane Jacobs, the courageous, self-educated, enormously influential journalist and activist. He shows how, as a wife and mother in Greenwich Village, she learned from everyday experience to argue, both in print and at podiums, for the preservation of traditional, small-scale, urban neighborhoods that were undervalued in mainstream urban thought.

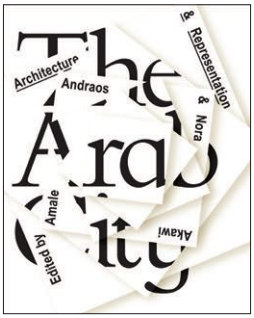


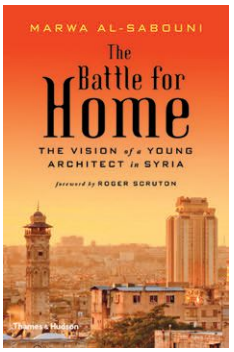
100 Years of Architecture, *by Alan Powers. Laurence King Publishing, August 2016, 304 pages, $50.*
This lively and original international journey through the last 100 years includes not only most of the classics of architectural history but also quirky and overlooked buildings that provide a fuller picture of what was actually new and unusual in every era. They include little-known projects such as Mario Botta's Church of St. John the Baptist in Magno, Switzerland (1996), and Imre Makowecz's Farkasréti Cemetery Chapel in Budapest of 1975, which could still inspire architectural ideas. Pairings of masterpieces such as Lawrence Halprin's work with Moore, Lyndon, Turnbull, and Whitaker at Sea Ranch, California (1964–72), and François Spoerry's Port Grimaud in Var, France (1966–69), encourage readers to see these developments in new ways.

World of Malls: Architectures of Consumption, *edited by Vera Simone Bader and Andres Lepik. Hatje Cantz, September 2016, 253 pages, $70.*
This fascinating catalogue of an American building type that, like the skyscraper, spread throughout the world, contains essays by an international group of scholars, which are illustrated by malls of every conceivable type. Early European shopping arcades and department stores are included as precedents—but not the American strip malls that led to this privatized, anti-urban phenomenon.

Austere Gardens: Thoughts on Landscape, Restraint, & Attending, *by Marc Treib. ORO Editions, May 2016, 107 pages, $19.95.*
This small, richly illustrated







essay uses modest insertions in landscapes, works of earth art, small Japanese gardens, and other examples to illustrate the value of restraint and careful custodianship of nature. Marc Treib, professor of architecture emeritus at the University of California, Berkeley, shows how ecological balance and a sense of place can be created in numerous subtle ways.

Roberto Burle Marx: Brazilian Modernist, *by Jens Hoffman and Claudia J. Nahson. Jewish Museum, with Yale University Press, May 2016, 208 pages, $50.*
There is nothing austere or subtle in the big, colorful landscape designs of Roberto Burle Marx (1909–94), the most famous modern Latin American landscape architect. The multi-talented Brazilian, who was also a painter, sculptor, and designer, first discovered the native plants of his home country at the Berlin Botanical Garden when he was studying abroad. He also became an early advocate for the preservation of rain forests. This catalogue of a traveling exhibition shows the full range of his work and chronicles its influence on seven contemporary artists.

The Arab City: Architecture and Representation, *edited by Amale Andraos and Nora Akawi, with Caitlin Blanchfield. Columbia University Press, June 2016, 272 pages, $39.*
Fascinating, well illustrated, and extremely timely, this compendium grew out of symposia that took place in Amman, Jordan, in 2013 and at Columbia University in 2014. In its essays, architects and scholars reflect on the ambitious buildings and skylines created in Arab cities during recent decades. Contributors consider issues of imagery, identity, religiosity, and of course the economies that fuel the ambitious building and rebuilding by many well-known and inventive architects such as Jean Nouvel, Bernard Khoury, and Mangera Yvars.

The Battle for Home: the Vision of a Young Architect in Syria, *by Marwa Al-Sabouni. Thames & Hudson, April 2016, 184 pages, $25.95.*
This deeply moving and unusually well-informed description of life today in Homs, Syria, by an architect, wife, mother, professor, and scholar of Middle Eastern architectural history is easily the most inspiring and poignant book of the season. It is pertinent today because of the horrific war in Syria, which surrounds the author. But it is also important because of her knowledgable explanation of the architecture and urbanism in the fountainhead of civilization, the Middle East, at a time when it is severely threatened. Al-Sabouni gives readers some hope as she makes us fully aware of the crucial value of the built world. ■

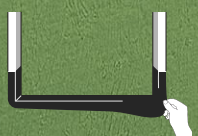
See more gift suggestions at architecturalrecord.com.

ZIPsystem™ STRETCH TAPE

STRETCH IT. STICK IT.

Seal tough jobs in a flash.

No matter how tough the flashing job, it's no match for ZIP System™ stretch tape. A single-piece installation easily stretches to cover sills, curves and corners for superior moisture protection. This high-performance acrylic tape even installs over mismatched surfaces, and it's easy to reposition and re-apply, helping you get a tight seal every time.



WINDOW SILLS

WALL PENETRATION

CURVED WINDOWS

STRETCHES IN ALL DIRECTIONS

ZIPSystemStretchTape.com

FOR THE ULTIMATE SEAL, TRY ZIP SYSTEM® SHEATHING.

CIRCLE 19

DESIGN VANGUARD 2016

Since 2000, Design Vanguard has showcased emerging architects from around the world. For this program, RECORD looks at firms established no more than 10 years ago that are demonstrating inventive approaches to shaping the built environment. Unlike some years past, when young architects were still coping with the economic downturn, this year's winners have a robust body of built work and are making a big impact on the places where they practice.

GO TO ARCHITECTURALRECORD.COM
FOR EXPANDED COVERAGE

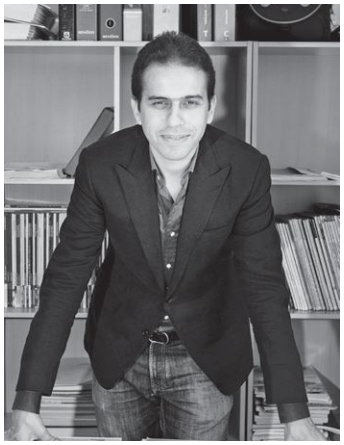
FEATURED FIRMS

MOHAMED AMINE SIANA
WAECHTER ARCHITECTURE
STUDIO AKKERHUIS
ABRUZZO BODZIAK ARCHITECTS
MAGÉN ARCHITECTS
FACET STUDIO
ALEXANDER JERMYN ARCHITECTURE
STUDIO ANDREA DRAGONI
YOUNG & AYATA
CUAC ARQUITECTURA

PHOTOGRAPHY: © DOUBLESPACE PHOTOGRAPHY

VILLA Z BY MOHAMED AMINE SIANA

Mohamed Amine Siana
Casablanca, Morocco



FOUNDED: 2007

DESIGN STAFF: 4

PRINCIPAL: Mohamed Amine Siana

EDUCATION: National School of Architecture, Rabat, M.Arch., 2004

WORK HISTORY: El Kabbaj Kettani Siana Architects, 2005-07

KEY COMPLETED PROJECTS: Villa F, Casablanca, 2015; Villa Z, Casablanca, 2014. With Saad El Kabbaj and Driss Kettani: Laayoune Technology School, 2014; Technology School of Guelmim, 2011; Taroudant University, 2010 (all in Morocco)

KEY CURRENT PROJECTS: Lycée Lyautey, Casablanca (with Saad El Kabbaj, Driss Kettani, and ANMA), 2018-19; IMM 3B Residential Building, Casablanca, 2016; Villa W, Casablanca, 2017; Villa K, Casablanca, 2018

Traditional architecture informs a young practitioner's beautiful and hypnotic contemporary forms.

DURING ITS 44 years under colonial rule, Morocco served as a petri dish for experiments in modernism by French architects and planners like Jean-François Zevaco and Michel Ecochard. Today, 38-year-old architect Mohamed Amine Siana attempts to reconcile traditional North African architecture with that movement's imposition on the built environment, in both public and residential buildings. "I try to find a solution to the schizophrenia of our culture in Morocco," he says. "We are forced to find a language to create a contextual modernism."

Siana did not intend to become an architect, but his father strongly encouraged him to apply to the National School of Architecture in Rabat, from which he graduated in 2004. For him, the discipline came to represent an expression of culture, people, and sociological behavior. At school, he met classmates Saad El Kabbaj and Driss Kettani, and, over a period of eight years, they pooled resources to work together on the design of three OPEC-funded universities located in Morocco's tertiary cities of Taroudant, Guelmim, and Laayoune. Each campus comprises a collection of low-rise cubic buildings arrayed around a central axis for the circulation of students and faculty. The schools also share a material palette—distinct rough-hewn ochre cement facades reference the rammed earth used in a medieval city wall at Taroudant, where the architects received their first joint commission.

Limited budgets and the extreme Saharan climate constrained their designs and forced the trio to explore how traditional Berber and Arab architecture contended with desert winds and heat. Research into Arabic medina city planning inspired their inclusion of courtyard gardens typical of the traditional Moroccan house, or *riad*, within cellular clusters of buildings grouped off the campus's main axis. To further defend against the sun's rays, classroom buildings are windowless on the east and west facades. Conversely, courtyard-facing ventilating windows on their north and south facades bring in the gardens' cooling air. Remarkably, the buildings possess no air-conditioning in a climate that sometimes reaches 118 degrees Fahrenheit. Siana maintains that use of brise-soleils and deeply inset porticos and windows help shield the buildings from sand and sun, and also encourage exploration, creating a sense of mystery through "a vocabulary of hidden spaces."

Siana established his own practice in 2007. He expands and contracts his staff to adapt the level of expertise and work needed to each commission. Villa Z, his recent residential project in Casablanca, incorporates the passive ventilation learned from the university projects but breaks with those buildings' rigorous right-angled formalism. Its street-facing blind wall facade undulates, folds in on itself, and juts out like a sharp shard, while windows on the opposite side open to a swimming pool through a double-story shaded portico—an expressive example of how the medina's inward-facing logic doesn't have to be closed off to new interpretations. —*Jordan Hruska*

Villa Z

A house for a doctor and his family on a busy street in Casablanca centers around the opacity of the main facade. The design combines principles of traditional architecture with a strong contemporary identity. Inside, a wall of Moroccan green onyx is a focal point of the living area.

PHOTOGRAPHY: © SAAD A. TAZI (TOP); DOUBLESPACE PHOTOGRAPHY (BOTTOM)

Technology School of Guelmim

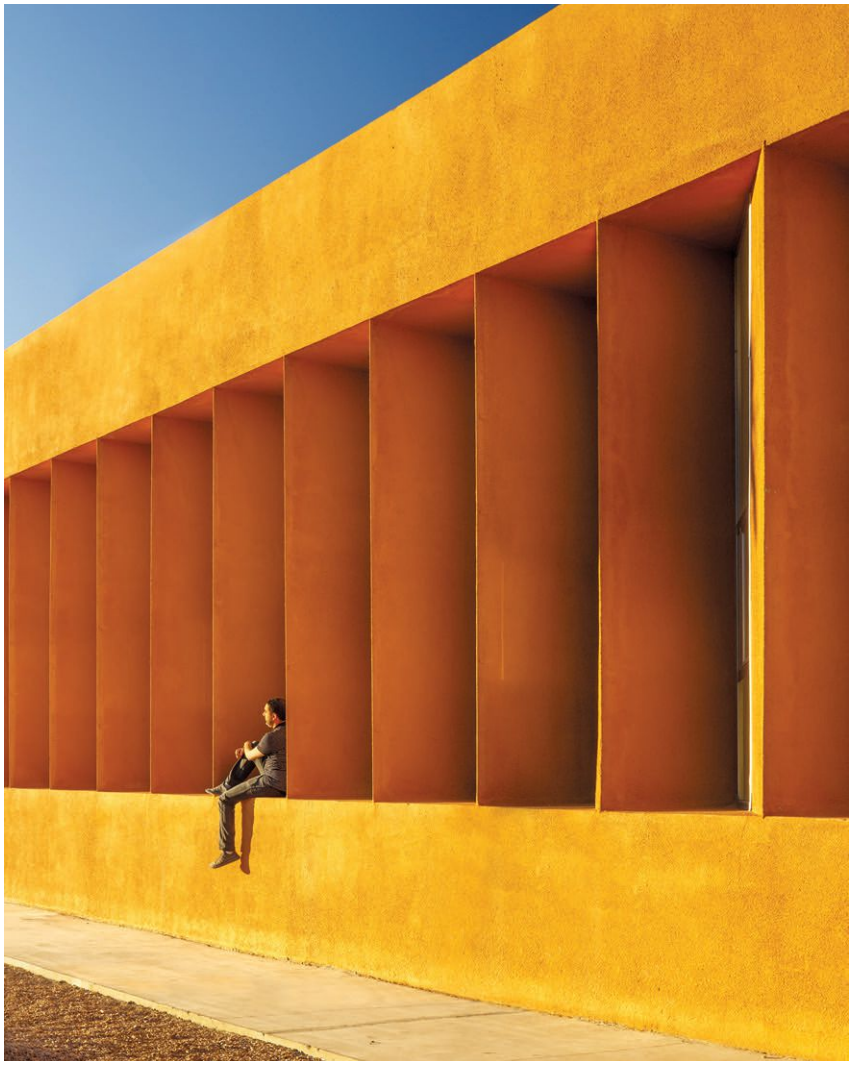
Organized along a north–south axis through a partly covered path, the various buildings of this 75,000-square-foot project consist of an amphitheater, library, classrooms, workshops, laboratories, teachers' offices, and staff housing. The architecture is deliberately massive and plays with the contrast between interior and exterior.

Villa F

For this 4,800-square-foot residence in Casablanca, the architect used local materials, including Moroccan marble and redwood, and designed some of the furniture. Eschewing air-conditioning, the design reinterprets the traditional patio on the first level to passively cool the house.

Laayoune Technology School

At this complex far from the city center, the various buildings are fragmented to allow maximum natural ventilation. They are connected by a series of exterior paths and covered squares and gardens. Different sun-protection devices, including brise-soleils, double skins, and protected walkways, are used.



PHOTOGRAPHY: © FERNANDO GUERRA FG+SG (TOP AND MIDDLE); DOUBLESPACE PHOTOGRAPHY (BOTTOM)

Waechter Architecture
Portland, Oregon

FOUNDED: 2010

DESIGN STAFF: 6

PRINCIPAL: Ben Waechter

EDUCATION: University of Oregon, B.Arch., 1995

WORK HISTORY: Allied Works Architecture, 1997–99; Renzo Piano Building Workshop, 2000–03

KEY COMPLETED PROJECTS: Milwaukie Way, 2016; Red House, 2015; Garden House, 2015; Pavilion House, 2014; Tower House, 2013; Oakley House, 2013; Cape Cod House, 2010; Z-Haus, 2008 (all in Portland, Oregon)

KEY CURRENT PROJECTS: Furioso Vineyards, Dundee, OR; multifamily housing, Portland, OR

WWW.BENWAECHTER.COM

Using traditional forms and basic materials, a firm refines the familiar to give it a brand-new look.

BEN WAECHTER isn't interested in designing something you've never seen before. Born in Eugene and based in Portland, the 47-year-old grandson of architect Heinrich Waechter would much rather refine something that already looks familiar to you—the "quintessential chair, room or garden, courtyard or alley"—in the hope of creating designs that are elemental and universal—architecture that's enduring rather than "merely novel."

While working for three years in the Genoa office of Renzo Piano Building Workshop, Waechter regularly took trips to Switzerland and steeped himself in Swiss modernism. From both experiences, he learned to balance simple form and spatial order with rich, materially driven construction techniques.

Waechter says his work is constantly evolving, at a slow, steady pace. "There's something deeply satisfying about seeing the lessons learned in one project subtly inform the next," he says.

Though reluctant to choose a favorite design, he will cop to having something of a "breakthrough revelation" while planning the Garden House, an 800-square-foot Accessory Dwelling Unit (ADU) in the backyard of a historic Portland bungalow. "There were just so many limitations on that project," he says. "Code, budget, size, site. But we were ultimately able to coalesce these restrictions into a project that's both striking and powerful."

The takeaway? "No matter how complex a problem is, a singular solution can always be found."

Waechter arrives at these solutions in a way that's reductive rather than additive: he starts by gathering as many "facts" about a project as possible, then cultivates a central organizational idea. That's when the real work begins: distilling, refining, whittling down.

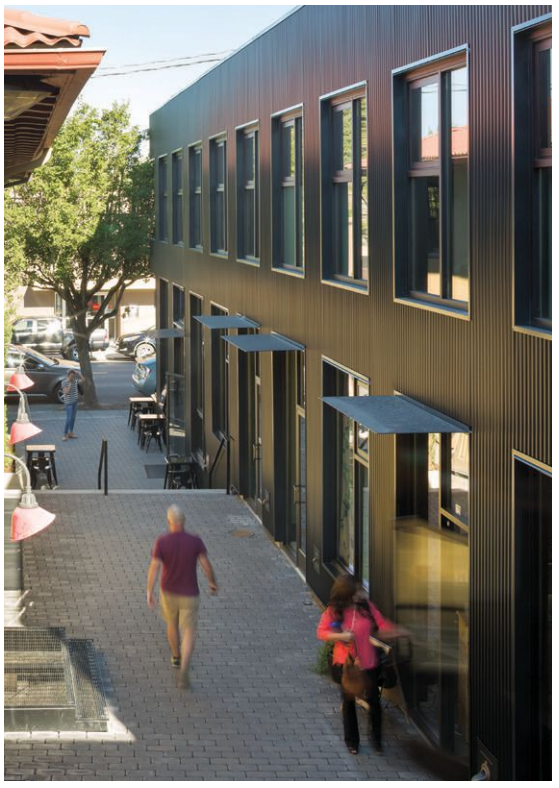
"We take and take until we can't take anything else without sacrificing function," he says. "That's our process, but also our philosophy. Sometimes the work is bold, and sometimes the moves are so subtle, the shift is almost imperceptible, hiding in plain sight."

His passion for simplicity and subtraction—and his adherence to a minimal material palette—is a deliberate response to the glut of technologies, materials, and influences at architects' fingertips nowadays. "Today we can achieve a kind of experimental complexity that was never possible before," he says, "but the results can feel very fragmented. What we hope to achieve is something that allows people to feel more grounded in the world."

Aside from building projects, Waechter has devoted his energies to documenting 10 of the firm's designs in 30 different models, each one depicted in a concept model, a cast figure-ground model, and a white compositional model. It's now only an internal project, but he eventually wants the series to be an exhibit: "We did this to better understand our own process through a documentation of the principles we aspire to, but also to see the body of work as a project in itself."

Finding out exactly what those principles are, and learning how to articulate them, is an ongoing process; "one that will probably never be completed," he says.

—Derek De Koff



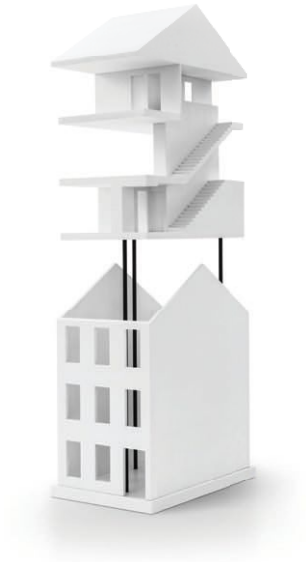
Milwaukie Way

In Portland's Westmoreland neighborhood, WA created a new pedestrian alleyway between its two new buildings and a 1929 Spanish Colonial Revival–style building across from them. The new buildings are clad in vertically ribbed black metal. A consistent pattern of 6-foot wide window and door openings were "cut" from this dark, textured surface to create a ribbon-like effect.

PHOTOGRAPHY: © DAVID PAPAZIAN (TOP); LARA SWIMMER (BOTTOM)

Garden House

Waechter took Portland's increased-density movement and used it as an opportunity to explore housing iconography, sculptural forms, and the maximizing of small-space regulations with this ADU. Garden House's exaggerated eaves cantilever 10 feet on both sides of the house, creating protected outdoor spaces below and two generous ceiling-height bedrooms and a second bathroom upstairs.



Pavilion House

For clients seeking a glass dwelling in a dense Portland neighborhood, Waechter strategically located large swaths of glazing so as to avoid unwanted views and maintain privacy. The rest of the exterior is clad in standing-seam white metal panels of varying width.

Claybourne Commons

For this 20-unit rowhouse project currently under construction, WA created a series of physical models, as it does for most projects, to test spatial hierarchy, compositional order, and concept.

Furioso Vineyards

Waechter's design for this Dundee, Oregon, project expands and transforms an existing winery through a vertical screen of blackened wood and a cantilevering roof canopy.

PHOTOGRAPHY: © SALLY SCHOOLMASTER (TOP); JEREMY BITTERMANN (MIDDLE, RIGHT); COURTESY WAECHTER ARCHITECTURE (MIDDLE, LEFT, AND BOTTOM)

Studio Akkerhuis
Paris

FOUNDED: 2014

DESIGN STAFF: 17

PRINCIPAL: Bart Akkerhuis

EDUCATION: Delft University of Technology, M.Arch., 2004

WORK HISTORY: 1998–2000, Renzo Piano Building Workshop, Paris; 2005–06, HOK, London; 2006–14, RPBW, Paris

KEY COMPLETED PROJECTS: Bries Beach Club, Noordwijk, 2014; Vesper Hotel, Noordwijk, 2014; Gallerie Rabouan Moussion, Paris, 2015; Beach Theater, Noordwijk, 2015 (all in Netherlands, except as noted)

KEY CURRENT PROJECTS: De Meelfabriek, Netherlands; Minotti concept store, Netherlands; social housing, France; Palais de Justice, Paris (for RPBW); 750 Houses master plan, Netherlands

WWW.STUDIOAKKERHUIS.COM

An architect finds projects in his native Holland—and through a friendly collaboration with a former employer.

BART AKKERHUIS has come a long way since leaving his role as an associate with the Paris office of Renzo Piano Building Workshop (RPBW) to found his own studio. In two short years, Studio Akkerhuis has completed a beach club, a hotel, and a theater in the Netherlands, as well as two Paris galleries. Projects under way include the transformation of a neglected Leiden, Netherlands, industrial complex, the Meelfabriek, into a vibrant mixed-use community. "I started in September 2014 without any project or client but with the idea that this was always what I wanted," says Akkerhuis, 45, who is Dutch but has lived in Paris for more than a decade. Now a range of ongoing work has grown the one-man firm into an office of 17 young architects from 12 countries.

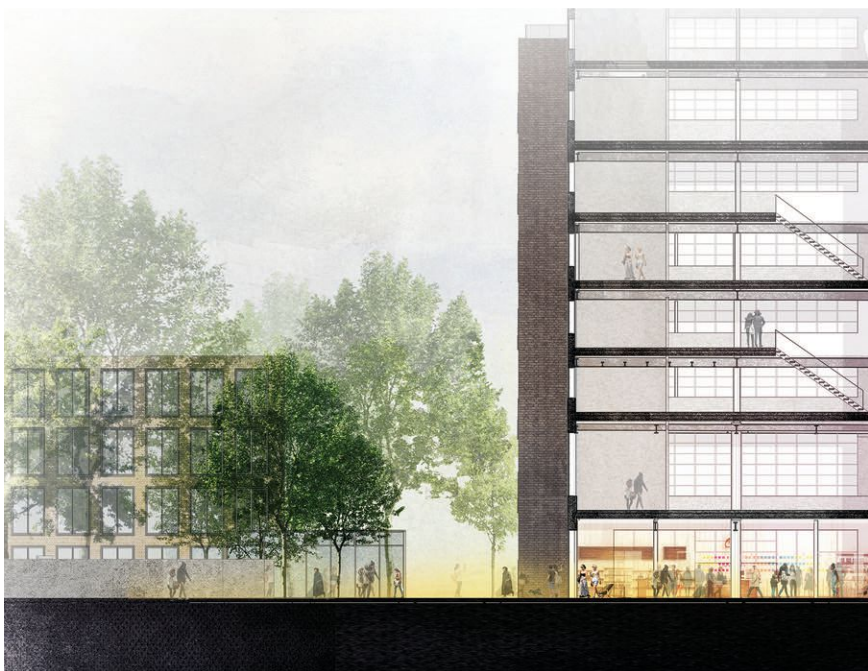
In the literal sense, the path to autonomy has been quite short—the studio is just several hundred yards from Piano's, a quick walk along the Rue des Archives. The proximity has made for a friendly *quid pro quo* between offices. "Their model-makers help me out if I need advice," says Akkerhuis. "We throw parties and they'll drink the champagne." In addition to opening up its happy hours, the office—which has embraced several Piano alums on its staff—collaborates with RPBW on some projects, including the new Paris Palais de Justice currently under construction.

It is neither the size of the firm nor the size of its projects that Akkerhuis uses to measure success, but rather the breadth of its work. "Diversity is important," he says. In France, firms are often siloed into one typology, like schools or social housing or theaters. Akkerhuis, on the other hand, lets anthropological and material research be a thread between projects.

"We do research in different ways," says the architect. For a residential building within the Meelfabriek master plan, the firm has performed extensive analysis of its design of an exterior concrete structure, cast in situ, to meet current building regulations and meld aesthetically with the site's existing patchwork of concrete and steel industrial structures. A new showroom for Italian furniture manufacturer Minotti has led the firm to study the future of shopping. In the same vein, a concept design for a futuristic shopping mall in Beijing won the firm an honorable mention in an ideas competition sponsored by a Chinese real-estate developer earlier this year.

To stay nimble and take advantage of the staff's diversity, Akkerhuis eschews a hierarchical approach to idea development. "How we attack a project depends very much on what the project is. There's not me handing over sketches to staff; it's more horizontal and collaborative." This may be a departure from his roots with RPBW, whose Italian leader is known for his project-defining concept drawings. But at least a couple of habits remain: innovative thinking, of course, and its necessary aid, caffeine. "I have an espresso machine—that's one thing I learned from the Italians," says Akkerhuis. Especially on late nights at the office, it's a lesson from the past that will inevitably help with the hard work ahead. —*Jennifer Krichels*

IMAGES: © PAUL HEUZEN (TOP); COURTESY STUDIO AKKERHUIS (2)

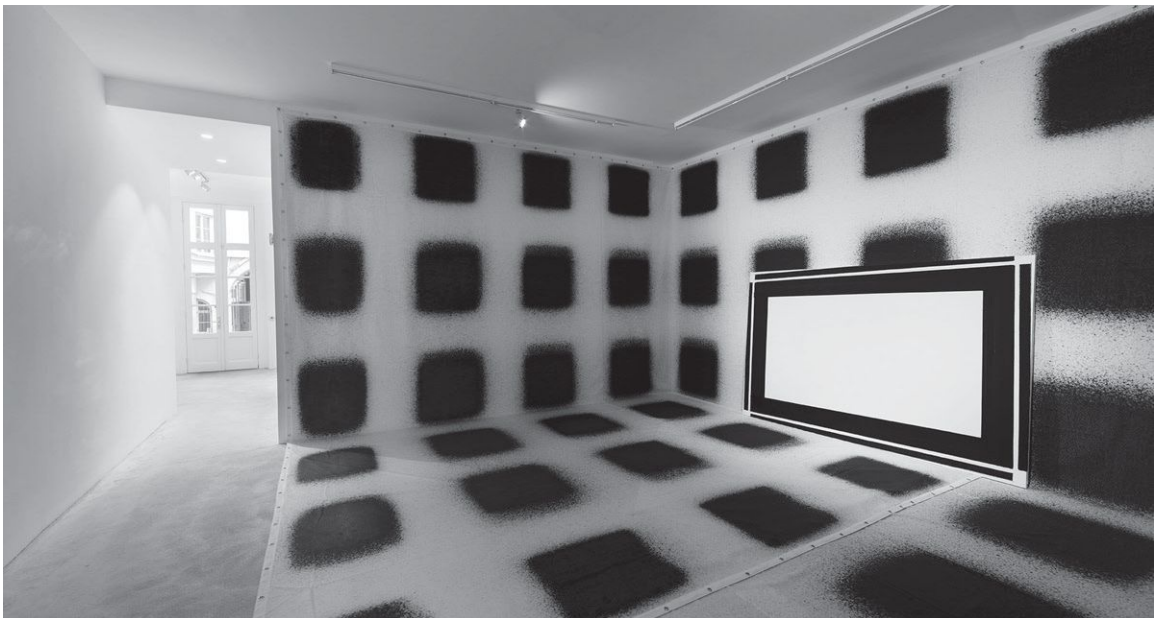


Meelfabriek

In addition to working on the master plan to reinvent this vast industrial complex in Leiden, Netherlands, Studio Akkerhuis is designing and restoring several of its buildings, which will include a 120-room hotel, loft apartments, shops, offices, and artist ateliers.

Galerie Rabouan Moussion

Using basic materials including untreated black steel, raw concrete, and glass, Studio Akkerhuis converted a former lampshade factory in central Paris into 3,700 square feet of exhibition space. It created a sequence of spaces that culminates in a 20-foot-high gallery for large installations.



Bries Beach Club

Two volumes comprise this prefabricated temporary structure, which is erected in the spring, then dismantled in autumn for winter storage. The main open space of the club faces the sea, and a series of modular units made from cross-laminated timber—for the kitchen, office, storage, and bathrooms—plug into it.

Water Tower

A disused water tower on the shores of the North Sea in Noordwijk, Netherlands, will accommodate a private house, public space in the reservoir, and a viewing platform on top.

IMAGES: © EDDY BOULARES (TOP); COURTESY STUDIO AKKERHUIS (MIDDLE, 2)

Abruzzo Bodziak Architects
Brooklyn, New York

FOUNDED: 2009

DESIGN STAFF: 4

PRINCIPALS: Emily Abruzzo and Gerald Bodziak

EDUCATION: *Abruzzo*: Princeton University, M.Arch., 2003; Columbia College, Columbia University, B.A., 2000. *Bodziak*: Princeton University, M.Arch., 2004; Taubman College of Architecture and Urban Planning, University of Michigan, B.S., 2000

WORK HISTORY: *Abruzzo*: Deborah Berke Partners, 2005–09; Balmori Associates, 2004–05. *Bodziak*: Gwathmey Siegel & Associates Architects, 2005–08; Morphosis Architects, 2001

KEY COMPLETED PROJECTS: *Unmeasurability*, Providence, 2015; exhibit design for FitNation, New York, 2013; *Landscape (Triptych)*, New York, 2009

KEY CURRENT PROJECTS: New York Public Library Castle Hill Branch, New York, 2018; Greenpoint Wood House renovation and addition, Brooklyn, 2017

WWW.ABA.NYC

A pair of architects reinvents the vernacular and creates work that resonates with a wide audience.

AS EMILY ABRUZZO and Gerald Bodziak were mounting their installation *Unmeasurability* at the Rhode Island School of Design in 2015, a fire alarm prompted a security sweep of the gallery. Before escorting the architects out of the building, a guard walked to one of the construction's five mirrored boxes, placed an eye to its arrowslit opening, and spent a few beats examining the infinitely reflecting grid within. The guard approved the project—the interior image is meant to symbolize the Internet's seemingly endless expansion—with a simple "Oh, cool," Abruzzo, 38, recalls with a smile. But the partners didn't need verbal validation. "Someone immediately knew how to use our design and take delight from it," she says.

As master of architecture students at Princeton, where they met in 2002, this moment did not seem inevitable. Coming of age alongside the rise of initiatives like the MoMA PS1 Young Architects Program or the Serpentine Pavilion, Bodziak, 39 says, "We felt a little disenfranchised by the culture of pop-ups." Instead of speaking to an in-crowd of digitally savvy designers, "we wanted to get inside the heads of people who are not architects." They earned their licenses and got married in 2008 and founded a Brooklyn-based studio the following year.

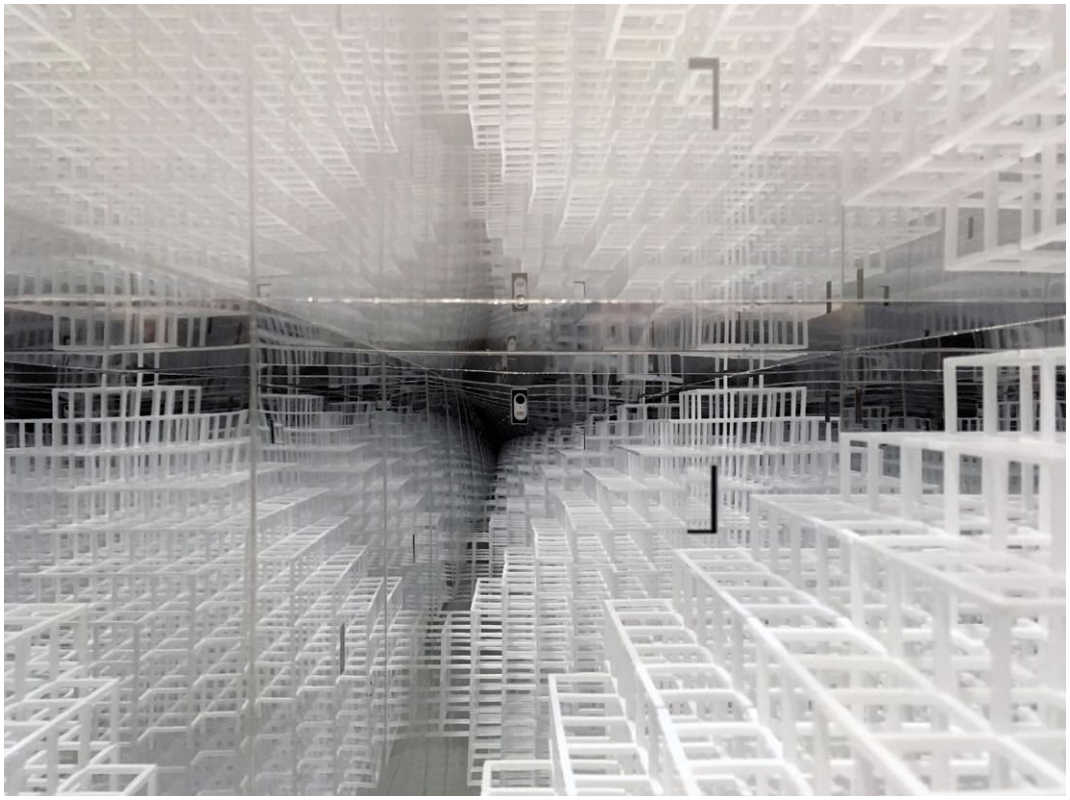
Reworking familiar forms is one way the architects connect to a wide audience. Their first executed commission, the 2012 *Landscape (Triptych)*, installed at the Center for Architecture in New York, fashioned technical rope and electroluminescent wire into mountainous terrain that glowed at night like the neon signs of nearby storefronts. In a 2014 Manhattan apartment renovation, a razor-sharp plaster bevel sits above walls and millwork where crown molding would be expected. A proposed residence in rural Michigan takes the form of a barn morphed to suit 21st-century domestic life. "Architectural history and typology build understanding into a project," Abruzzo says. "Something may resist categorization, but people will still have a sense of what they're seeing."

As their commissions grow in scale, the couple has begun combining typological reinvention with the appeal to intuition that so palpably moved that gallery security guard. For an overhaul of a single-family residence in Brooklyn, soon to start construction, they propose seating and planters embedded within the house's masonry base to encourage outdoor use and neighborly interaction. The studio also is working through the concept phase of a new branch of the New York Public Library: daylight streaming through curved rooftop monitors will evoke the soaring arched windows of historic Carnegie libraries, while trapezoidal tables will accommodate both collaboration and traditional reading-room study.

"We have made an effort to move toward civic work," Bodziak says of this latest project. A public building has to resonate with non-architects by its very definition. And Abruzzo and Bodziak are relishing the opportunity to fulfill everyday folks' myriad demands. "A library is a cooling center, it's a meeting spot, it's a place where people can find information they don't normally have access to. The program is inspiring." —*David Sokol*

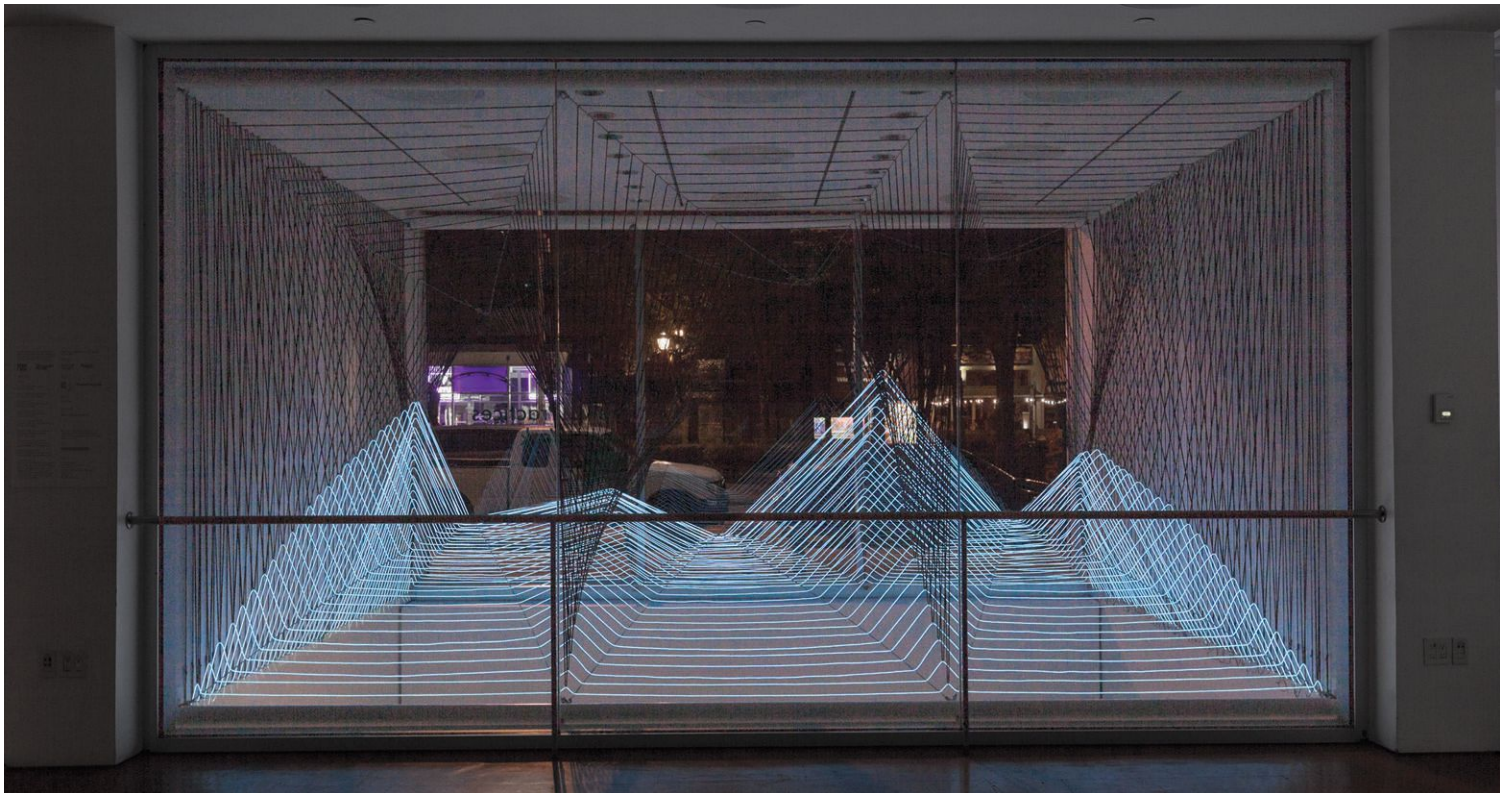
Irish Hills House

Abruzzo Bodziak's design for a gambrel-roofed house for a site in rural Michigan is informed by the agricultural buildings found throughout the region. The architects have tweaked the familiar form to include a sheltered porch, large windows, and an enclosed courtyard defined by a stone base and retaining walls.



Unmeasurability

This installation is made up of mirrored boxes that enclose infinitely reflecting objects viewed directly through arrowslit openings or through the lens of a digital camera. The constructions demonstrate that a space can be more than the sum of its constructed parts.



Landscape (Triptych)

This site-specific installation for New York's Center for Architecture was fashioned from technical rope and electroluminescent wire. Conceived as a sketch in light, the piece suggests mountainous terrain while mimicking the illuminated signage of nearby storefronts.

PHOTOGRAPHY: © NAHO KUBOTA (BOTTOM)

MAGÉN ARCHITECTS
Zaragoza, Spain

FOUNDED: 2006

DESIGN STAFF: 5

PRINCIPALS: Jaime Magén Pardo and Francisco J. Magén Pardo

EDUCATION: *Jaime Magén Pardo*: University of Navarra School of Architecture (ETSA), masters in Theory and History of Architecture, 2014; M.Arch., 1999. *Francisco J. Magén Pardo*: University of Navarra School of Architecture, postgraduate studies in Planning and Urban Development, 2005; M.Arch., 2004

WORK HISTORY: *Jaime Magén Pardo*: CM Architects, 2003–05; Basilio Tobías Architect, 2000–02; *Francisco J. Magén Pardo*: CM Architects, 2004–05

KEY COMPLETED PROJECTS: DG House, 2015; Escatrón Town Hall, 2014; Valdespartera Primary School, 2013; Bajo Martin County Council, 2012; Casa Julve Cultural Center, 2011; Tauste Social Housing, 2010; Ebro Environment Center, 2009; Zaragoza Social Housing, 2006 (all in Spain)

KEY CURRENT PROJECTS: Arcosur Primary School, 2018; Illueca Auditorium, 2018; Club House, El Olivar Sports Center, 2018; Utebo Secondary School, 2017 (all in Spain)

MAGENARQUITECTOS.COM

Materials, construction practice, and place inform the dynamic, sculptural buildings of two Spanish brothers.

A GOOD point of entry for understanding the complex designs of the brothers Jaime and Francisco J. Magén Pardo are the sculptures of the late Spanish artist Eduardo Chillida, with their play of dense solids and equally compacted voids. Take Magén Architects' Bajo Martin County Council building, for example, which was inspired by the alabaster quarries of the area west of Barcelona, with their haphazard geometric cuttings, as well as Chillida's own alabaster sculptures. The building is clad in alabaster and limestone, and is similarly eroded, as if cut from a solid block, with cantilevers and odd outcroppings. Inside, the main stair connects a sequence of double-height spaces on staggered floors, also finished in stone so that they read as excavations.

Another key to the duo's work is the relationship between their sculptural buildings and visitors' paths through them. In the Ebro Environmental Center in Zaragoza, the pitched roofs of the wood-and-glass pavilion create an accessible platform overlooking the Ebro River. The roofs are also the culmination of a series of switchback ramps that, together with a stepped amphitheater, are integral to the building.

Variations on these strategies appear in other projects. The corner entry of the architects' town hall for Escatrón, a compressed space chiseled out of the building mass, leads into another chain of overlapping double-height spaces. For the DG House, the Magéns surrounded the shell of an unfinished structure with porches, window nooks, and other protrusions, transforming it into an irregular, faceted assemblage. The idea, Jaime explains, was to add "the intermediate spaces between indoors and out" that the original design lacked.

In larger projects, the architects counter this taste for formal fragmentation with unifying themes, such as the oval central patio of the Valdespartera Primary School outside Zaragoza, where the ring of the roof covers both classrooms and a long entry ramp. In their competition-winning project for the Arcosur Primary School the roofs of single-story elements are broken up with diagonal sawtooths for clerestory lighting, creating a village-like cluster of volumes.

Jaime, age 42, and Francisco, 37, studied at the University of Navarra in Pamplona, where Francisco Mangado was an influential teacher. From Mangado they learned that "architecture has to do with place, material, and construction," Jaime recalls. "It's a physical act." Though they founded their studio just before Spain's economic crisis, their base in the provinces has supplied more opportunities than they'd find in competitive areas like Madrid and Barcelona. But citing Rafael Moneo, Jaime maintains that a vital practice must be based on "the three legs" of teaching, research, and building. The brothers now give classes at the new school of architecture in Zargoza and are working on their doctoral theses.

—*David Cohn*

Bajo Martin County Council

The facade of translucent alabaster, a local material, relates the project to its place in the absence of strong contextual cues from its roadside location. The sculptural massing is inspired by the excavated geometry of the alabaster quarries. The second-floor council chamber cantilevers over the recessed entry.

PHOTOGRAPHY: © PEDRO PEGENAUTE

DG House

A series of shallow additions around the shell of an unfinished house mediate between indoors and out, creating an irregular assemblage brought together by a multifaceted zinc roof. Two wings frame the patio of the U-shaped scheme (left), with the living areas on the left and the master bedroom to the right.

Ebro Environmental Center

The architects conceived the pavilion as a landscape form, with sloping volumes that rise from the banks of this riverside park in Zaragoza. Wood finishes inside and out blend in with the trees (right). Ramps with frameless glass balustrades ascend to a rooftop viewing platform and an outdoor amphitheater.

Valdespartera School

Set between blocks of new subsidized housing and a highway, the primary school focuses inward around an oval patio. The continuous roof flares up at each end to accommodate the cafeteria and multipurpose hall. A screen of colored metal tubes, "like colored pencils," according to the architects, enclose the perimeter.

Escatrón Town Hall

In a two-stage construction process, the council chamber on the right was built first, followed by the office block on the left, where the corner entry and upper balcony are chiseled out of the stone-clad volume. The building offers a dynamic, asymmetrical face to the town's church and main plaza.

Facet Studio
Osaka, Japan, and Sydney

FOUNDED: 2008

DESIGN STAFF: 4 (Sydney office), 3 (Osaka office)

PRINCIPALS: Olivia Shih and Yoshihito Kashiwagi

EDUCATION: *Shih*: University of New South Wales, B.Arch., 2000. *Kashiwagi*: Graduate School of Keio University, M.Arch., 1999; Keio University, Bachelor of Commerce, 1997

WORK HISTORY: *Shih*: Bates Smart, 2007–08; Nettleton Tribe, 2004–06; Francis-Jones Morehen Thorp, 2001–03. *Kashiwagi*: Bates Smart, 2008; Engelen Moore, 2000–07; Renzo Piano Building Workshop, 1999–2000

KEY COMPLETED PROJECTS: Doshisya Kyotanabe Chapel, Kyoto, Japan 2015; M House, Nigata, Japan, 2013; Higasa Lamp, 2013; Sneakerology, Sydney 2011

KEY CURRENT PROJECTS: Pokolbin House & Hunter Valley Cabin, 2018; Seatondale, Sydney, 2017; ExOD (Extraordinary Ordinary Day), 2017; Bellevue House, 2017

FACETSTUDIO.COM.AU

A bicontinental practice unearths hidden meaning to create refined architecture.

WHAT'S IN a name? For Facet Studio, the answer is: the firm's philosophy. Whether in their Sydney or Osaka office, Facet's directors, Olivia Shih, age 40, and Yoshihito Kashiwagi, 42, prioritize coming at a project from different angles to reveal the "gem," or essence, of every project. "Once we find it," says Kashiwagi, "we polish it and polish it until it becomes a diamond."

Today, 90 percent of the diamonds in the rough are in Australia, where the firm has several projects in process, including a Japanese restaurant in Canberra, multiple buildings for a winery in Hunter Valley, a tiny shoe store in a Sydney shopping mall, plus residential projects. To accommodate their growing practice, the duo will move their four-person Sydney office from the city's central business district to bigger digs in the 'burbs next June. In addition, their three-person office in Osaka keeps them poised to take on new work in Japan.

At the outset, the architects' practice wasn't quite so Australia-centric. Though the two met while working for Bates Smart, a corporate firm in Sydney, they came from different places. Born in Taipei, Taiwan, Shih moved to Australia at 13, while Kashiwagi grew up in Osaka, Japan. Because the fathers of both trained as architects, each was exposed to the building arts from a young age. The founder of a construction company, Shih's father designed the family's houses, engaging his daughter in the process even when she was in primary school. She also remembers visiting her father's Sydney projects, which were supervised by her mother. "After school, we would go to the sites to see how they were coming along," she remembers fondly. Kashiwagi has equally positive memories of his father's career: "My father really enjoyed his work. He practiced architecture because he wanted to."

Job satisfaction was part of the profession's appeal for Kashiwagi. Though he attended architecture school in Tokyo, he had no intention of going overseas. But after seeing a Renzo Piano exhibition, he sought work with the Italian designer. Piano's detail-oriented methodology influenced Kashiwagi's design approach, and he liked working alongside people of many nationalities in the studio environment in Italy. Returning to Japan was no longer a given. Instead, he went to Australia.

The start of Shih and Kashiwagi's own studio came about unexpectedly when the owner of a Thai take-out restaurant asked them to update her shop. Because she could not close during the day, the duo created the new components off-site and installed them at night. But Facet Studio's practice really took off after winning the competition for the Doshisya Kyotanabe Chapel in Kyoto, an ambitious project accomplished partly by coaxing Kashiwagi's father out of retirement to help them.

Today, Kashiwagi's father continues to mind Facet's Osaka shop. Yet nurturing practices in different countries can be challenging, admit Facet's principals. What plays in Japan might not in Australia. Says Kashiwagi, "Japanese architecture is more experimental and probably would not be so acceptable here in Sydney." But having access to different building practices is for Facet Studios the best of both worlds. —*Naomi R. Pollock, AIA*

Sneakerology

A specialty shoe store in a Sydney shopping mall, Sneakerology utilizes 281 sneaker-sized boxes to define the space and its storefront. This strategy enables store employees to fashion the displays as they see fit.

PHOTOGRAPHY: © JUSTIN FOX (TOP); KATHERINE LU (BOTTOM); TOMOHIRO SAKASHITA (OPPOSITE, TOP AND OPPOSITE, MIDDLE, LEFT); ANDREW CHUNG (OPPOSITE, MIDDLE, RIGHT); DAICHI ANO (OPPOSITE, BOTTOM)

M House

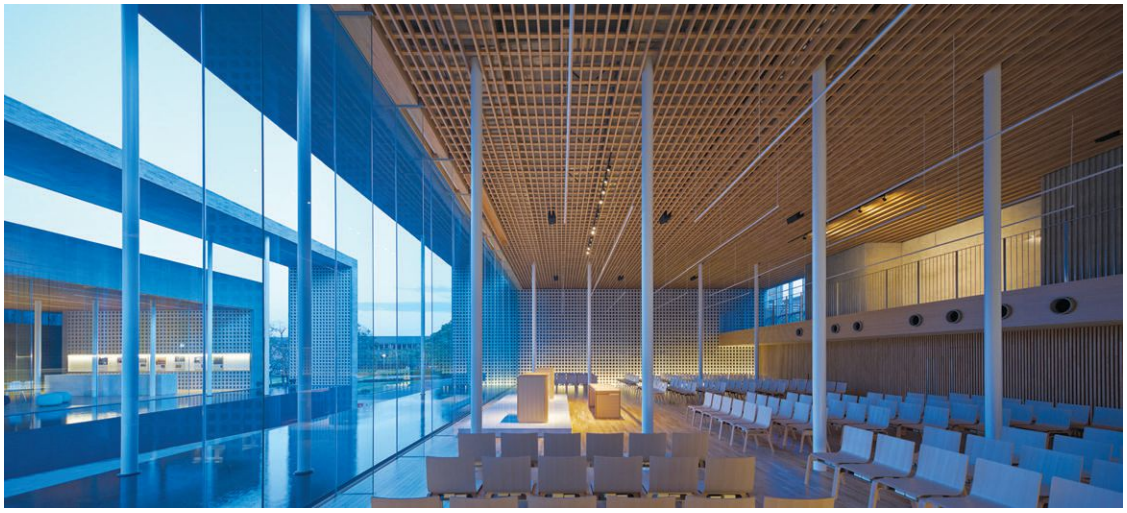
Located in Niigata, Japan, M House is a single-family home topped by an oversize roof supported by exposed rafters and columns embedded in a large bookshelf. In addition to storage, the shelves separate the home's public and private spaces.

Habitat Antique

Relying on the natural beauty of wood, this interior for a housewares shop in Osaka is based on a module system composed of stacked timber planks. Made of cedar, they serve not only as display shelves but also as columnlike vertical supports.

Blu

A hair salon in Sydney's bustling Chinatown, this interior project was envisioned as a sanctuary where clients can get a cut and color. Billowy, translucent curtains separate the reception and waiting areas from the various treatment bays.



Doshisya Kyotanabe Chapel

Linked by a 20-foot-wide outdoor passageway, the building consists of two independent pieces, one containing the chapel and the other an exhibition space. Glass walls knit the two halves together and open the activity inside to students walking by.

Alexander Jermyn Architecture
Berkeley

FOUNDED: 2010

DESIGN STAFF: 5

PRINCIPAL: Alexander Jermyn

EDUCATION: Yale School of Architecture, M.Arch., 2002; Wesleyan University, B.A., 1997

WORK HISTORY: Architecture Research Office (ARO), 2008; Pickard Chilton, 2005–08; Jaklitsch / Gardner, 2002–05

KEY COMPLETED PROJECTS: Convert, 2016; Lamprich Center, 2015; WeWork Berkeley, 2015; Knoll San Francisco (in association with ARO), 2013; TP-H Residence, 2013; Sonoma barn, 2011; The Edible Schoolyard, 2010 (all in California)

KEY CURRENT PROJECTS: Medical Concept, 2017; KT Residence, 2017; RK Residence, 2018 (all in California)

WWW.AJ-A.CO

A Bay Area design studio distills projects to their essence, using details to tell a story.

WHEN HE was a French Studies major at Wesleyan University, Alexander Jermyn considered becoming a diplomat. But after writing his senior thesis on Le Corbusier's Unité d'Habitation, he was inspired to pursue architecture instead. "I couldn't write about Le Corbusier without understanding modernism, so it was sort of a crash course in the field, which I enjoyed a lot," he recalls. In 2010, Jermyn established his own practice—a five-person Berkeley design studio doing work ranging from residential to retail, health care, and office projects.

Jermyn, 41, received his M.Arch. from Yale and then worked for East Coast firms Architecture Research Office (ARO), Pickard Chilton Architects, and Jaklitsch / Gardner Architects, mostly in the realm of high-rises and high-end retail, before realizing he was more interested in pursuing midscale projects for mission-driven clients instead. Moving to California in 2009 provided an opening for the Pennsylvania native to delve into this type of work. "It was a clean break," he says. "I found different opportunities here."

After practicing for about year, he won a project to design a 7,400-square-foot barn in Sonoma County. From there, word of mouth and repeat clients offered more commissions, prompting him to tap into his network at UC Berkeley's School of Architecture—where he taught an introductory studio course in 2010—to recruit additional staff.

Jermyn's design philosophy draws on the perspective he gained in 2007 on a fellowship to study economic development in a village in southeastern India. "Being there inspired me to integrate a social narrative into my practice," he says. "I'd like to find work that might have great social value, even though it might not have the right fee structure." Striking a balance between projects such as the Edible Schoolyard, a 300-square-foot educational garden done pro bono, and more standard commissions—such as the 16,000-square-foot Lamprich Medical Center or the offices for the start-up WeWork—is important for maintaining the practice. At any given time, the studio has between three and six active projects.

Though the firm's work is diverse, a common thread runs through it: a narrative can be read from the larger scale down to the details. "Every project has its own story, and our job is to develop that story," says the architect. "Our process is about distilling things down to their essence." Eliminating the intrusion of window frames in a Palo Alto residence, for example, was a way to emphasize a dialogue between the inside and outside.

Jermyn wants to sustain the collective spirit characteristic of his small studio. He also hopes to be more proactive and carve out commissions where they do not yet exist. "I would like for us to be stable enough and strategic enough to identify problems and create projects," he says. "That's where architecture is really valuable." *–Alex Klimoski*

PHOTOGRAPHY: © LUCAS FLADZINSKI

Lamprich Center

Jermyn wanted to avoid the labyrinth feeling of many health-care facilities, so he reduced a complex program, comprising a clinic, rehabilitation center, pharmacy, and office space, to two bars in an L, placing the pharmacy and offices in one and the patient clinics in the other.

TP–H Residence

A robust connection to the outdoors was this project's overall concept. In this renovation of a 1,000-square-foot Palo Alto home, plus a new addition, the design team played on the use of apertures to communicate the connection.

Edible Schoolyard

Sited on a former vacant lot adjacent to a Berkeley middle school, an "edible nest" made from interwoven steel rods signals a passageway and serves as a framework for kiwi vines to grow.

WeWork Berkeley

"Office projects are really informative for us—we like to see how people work and collaborate," Jermyn says. For WeWork, the firm adapted the client's planning model for a 7-story, 40,000-square-foot renovation of an existing building. The new space employs glazed offices, colorful conference rooms, and rustic, laid-back common areas to create a dynamic work environment suitable for a wide variety of businesses.

PHOTOGRAPHY: © LUCAS FLADZINSKI (TOP; MIDDLE, RIGHT); COURTESY ALEXANDER JERMYN ARCHITECTURE (MIDDLE, LEFT); CHRIS STARK (BOTTOM)

Studio Andrea Dragoni
Perugia, Italy

FOUNDED: 2006

DESIGN STAFF: 4

PRINCIPAL: Andrea Dragoni

EDUCATION: Faculty of architecture, University of Florence, M.Arch., 1997

WORK HISTORY: Metex, 1998–2001; Mapa (founding partner), 2001–04

KEY COMPLETED PROJECTS: Lesa House, 2015; Manrico Headquarters, Corciano, 2015; Vidrala Expansion, Milan-Corsico, 2014; Images Theater, Milan, 2013; Moena Parking, 2013; Gubbio Cemetery Expansion, 2011; Government Palace Public Spaces, Udine, 2010; Faculty of Pharmacy Laboratory, Perugia, 2009; Private Sacred Space, Perugia, 2006 (all in Italy)

KEY CURRENT PROJECTS: social housing, Perugia, 2016; residence, Assisi, 2016; industrial complex renovation, Corciano, 2016; movie theater adaptive reuse, Perugia, 2016; Vidrala warehouse, Milan-Corsico, 2015; Senago complex, Milan-Senago, 2013 (all in Italy)

WWW.ANDREADRAGONI.IT

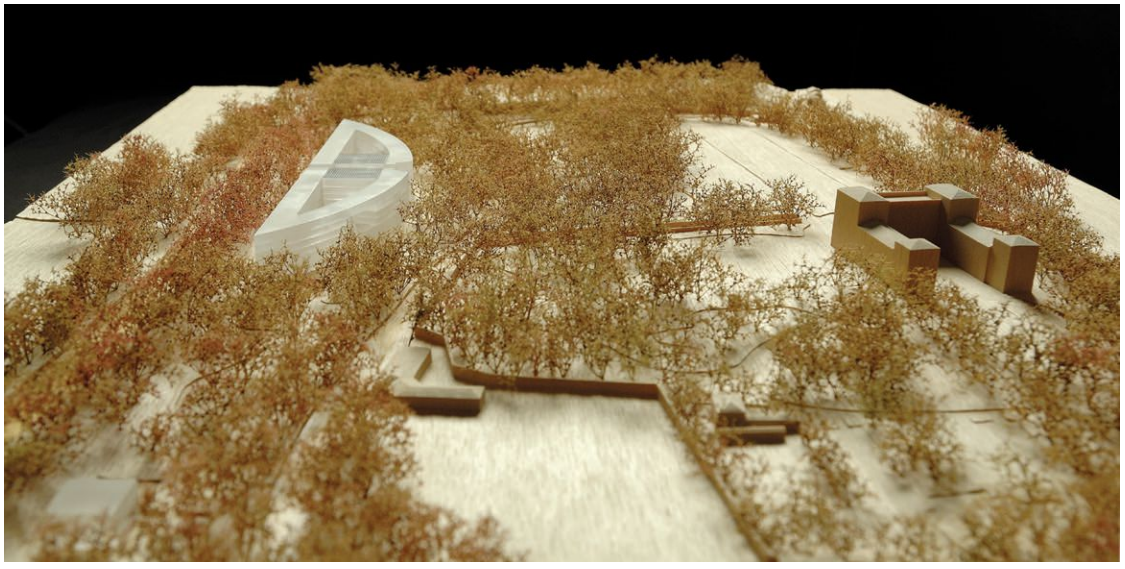
An architect deploys stripped-down, bold geometry to design dreamlike buildings.

TWO OF ITALY'S greatest modern architects are known for their cemeteries. The Brion Cemetery near Treviso, carried out between 1968 and '78, may be Carlo Scarpa's most admired work. The San Cataldo Cemetery (1971) in Modena is, likewise, considered Aldo Rossi's masterpiece. But now there is another notable Italian cemetery, outside of Gubbio, by architect Andrea Dragoni. In his extension of an existing cemetery, Dragoni, 47, who practices in nearby Perugia, created a series of buildings, walkways and public plazas that echo the rhythms of the medieval town less than a mile away. Four of the buildings are cubic "squares of silence," meant for contemplation (and topped by openings inspired by the work of James Turrell). The travertine-clad volumes are so devoid of extraneous detail that they suggest fantasies of buildings, as if experienced in a dream.

The architect, who founded Studio Andrea Dragoni in 2006, often collaborates with artists. Asked to rethink the courtyard of a government building in Udine, he cut a square opening in the pavement to bring daylight and sky views to the lower level, and then, with sculptor Nicola Renzi, he introduced a paving pattern that makes what's underfoot appear celestial. Now Dragoni is working on projects as formally pure as the cemetery, but with very different programs. With architects Alessandro Bulletti and Marco Palazzeschi, he proposed a public parking facility for Moena centered on a large covered walkway that reads as a kind of idealized loggia. In Perugia, he has designed social housing with a large front porch that overlooks a wooded park; the seemingly random distribution of the columns is a nod to the forest. All his projects, he says, create "dialogue between the accuracy of science and impressionism of poetry, between the real and the ideal."

Dragoni has several projects in Milan. One is a warehouse for the Spanish glass company Vidrala, facing the Naviglio Grande canal. The building's water-facing elevation of glass bricks was inspired by the gridded backdrops of many Eadweard Muybridge stop-action photographs, according to the architect. It is intended, he says, as a commentary on the different speeds at which pedestrians, cyclists, boaters, and motorists move past the building.

Also in Milan, Dragoni has designed several structures in an extension of the historic Villa San Carlo Borromeo Park. They include a 250-room hotel and a small contemporary art museum. The half-moon shape of the hotel is generated by a river and canal that bracket it. Its glass front facade will be shaded by a stone brise soleil that Dragoni says will resonate with the surrounding tree canopy. In renderings, the hotel and its guest rooms look as minimally detailed as the structures at the Gubbio cemetery, part of Dragoni's quest to translate "the suggestions from collective culture and imagination into habitable reality." For Dragoni, that is the challenge as well as the promise. —*Fred A. Bernstein*



Senago Complex

For an extension of the historic Villa San Carlo Borromeo Park in Milan, Dragoni has designed a complex that includes a 250-room hotel. The building's half-moon shape is generated by a river and a canal that bracket it.

PHOTOGRAPHY: COURTESY STUDIO ANDREA DRAGONI

Government Building Public Spaces

In collaboration with artist Nicola Renzi, Dragoni revamped the courtyard (left) of a government building in Udine. The pair cut an opening in the floor slab to bring daylight and sky views to the lower level, and introduced a graphic pattern into the paving.

Gubbio Cemetery Expansion

For the expansion of a cemetery (left), Dragoni created a series of blocklike enclosures that echo the rhythms of the medieval town less than a mile away. Several of the structures are topped by openings that frame the sky and are reminiscent of the work of James Turrell.

Moena Parking Facility

With architects Alessandro Bulletti and Marco Palazzeschi, Dragoni designed a parking facility (above) for the city of Moena. Because the site is one of great natural beauty—it sits between a mountain ridge and a river—the architects centered the structure on a loggia that provides pedestrian access to the water's edge.

Young & Ayata
Brooklyn, New York

FOUNDED: 2008

DESIGN STAFF: 4–8

PRINCIPALS: Michael Young, Kutan Ayata

EDUCATION: *Young*: Princeton University, M.Arch., 2005; California Polytechnic University, B.Arch., 1997. *Ayata*: Princeton University, M.Arch., 2004; Massachusetts College of Art, B.F.A., 1999

WORK HISTORY: *Young*: Reiser-Umemoto, 2004, 2006; Stan Allen Architects, 2005; Pfau Architecture, 1997–2003. *Ayata*: Resier + Umemoto, 2004–08; Agrest & Gandelsonas, 2003; Friedrich St Florian Architect, 1998–2002

KEY COMPLETED PROJECTS: Exquisite Corpse Cone (with Harmen Brethouwer), London, 2016; Wall Reveal, SCI-Arc Gallery, L.A., 2016; "Donkeys & Feathers" vessels, 2014; Light Hive (with Young Projects), New York, 2010

KEY CURRENT PROJECTS: DL1310 Apartments (with MAPmx), Mexico City, 2017; Study, Westchester County, NY, 2017–18

YOUNG-AYATA.COM

A two-man firm plays with architectural representation—and how we perceive it.

IT'S HARD to categorize the work of Michael Young and Kutan Ayata. Their projects are genre-defying—boomeranging between art and architecture, structure and ornament, reality and trompe l'oeil—and range in scale from a globular scheme for a new Bauhaus museum to a posy of mutant 3-D-printed flowers.

Weird? Maybe. Cerebral? Definitely. But it's these sorts of aesthetic and intellectual juxtapositions that make you want to look twice.

Young & Ayata's work is also turning heads in the profession at large. Since establishing their Brooklyn practice eight years ago, the pair has achieved a good deal of recognition in spite of having little built work, including a prestigious prize from the Architectural League of New York and several honors in international competitions.

Young, sums up the studio's approach this way: "Instead of architecture being the single art object, how do you begin to disturb the background? How do you make the familiar unfamiliar?"

Young, 43, and Ayata, 41, met in graduate school at Princeton. Both were enrolled in a course given by architect J. Robert Hillier to teach budding professionals how to start a practice. At the end of the course, students would pitch a proposal and Hillier—as the formidable mock client—would pick a winner. That year, Ayata and Young tied.

In spite of the clairvoyant pairing, it wasn't architecture firm at first sight. "We were like, 'What do you mean, *tie*?'" recalls Young.

The two went their separate ways after graduation but later reconnected in the office of Reiser + Umemoto in New York, where they worked on a Dubai high-rise project. They decided to form Young & Ayata in 2008, at the dawn of the Great Recession. The timing was terrible, but it allowed them to develop a set of studio principles, including interrogating the way architecture is represented and perceived.

For example, in a mock-up they created for an exhibition at SCI-Arc last year, they inserted gold-colored 3-D-printed reveals at the juncture of the miniature ceiling and walls. This simple gesture causes the corner to dematerialize, obscuring where one plane ends and another begins.

The pair is employing a similar move in an apartment complex in Mexico City by manipulating the angles of windows and their insets. The effect creates the illusion of movement across the board-formed concrete facade, as if viewed from a speeding car.

Young and Ayata have found academic institutions to be ideal labs for their ideas. Between them, they teach at half a dozen schools—Ayata at Penn and Pratt; Young at Cooper Union, Yale, Princeton, and SCI-Arc. As they do each summer, they will invite between four and eight student interns to join their team.

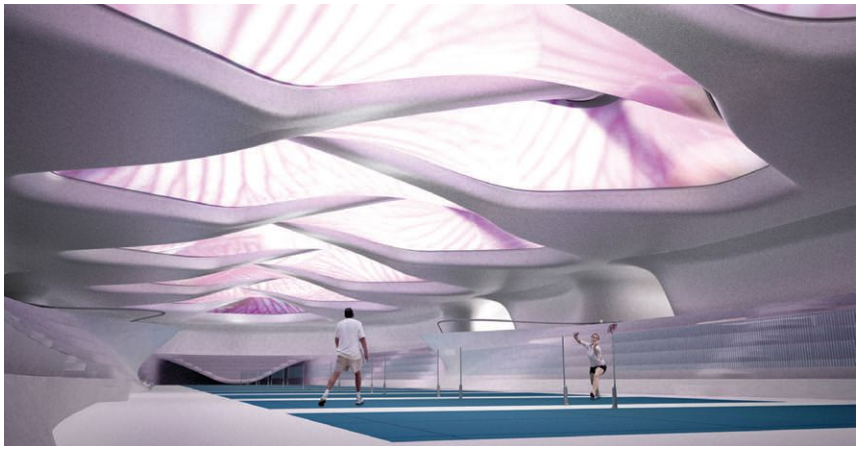
The architects recently found themselves in another tie. This time, it was a competition to design a new museum in Dessau, Germany, for the Bauhaus's centennial in 2019. Young & Ayata's bold design (a series of interconnected vessel-like forms) beat out 815 entries to end up coming in first—along with a more traditional scheme by a Spanish firm. Young & Ayata lost (the jury cited cost), but they are using the design as a jumping-off point for future work.

"A project starts with a competition and then takes on a life of its own," says Ayata. "It's never finished."

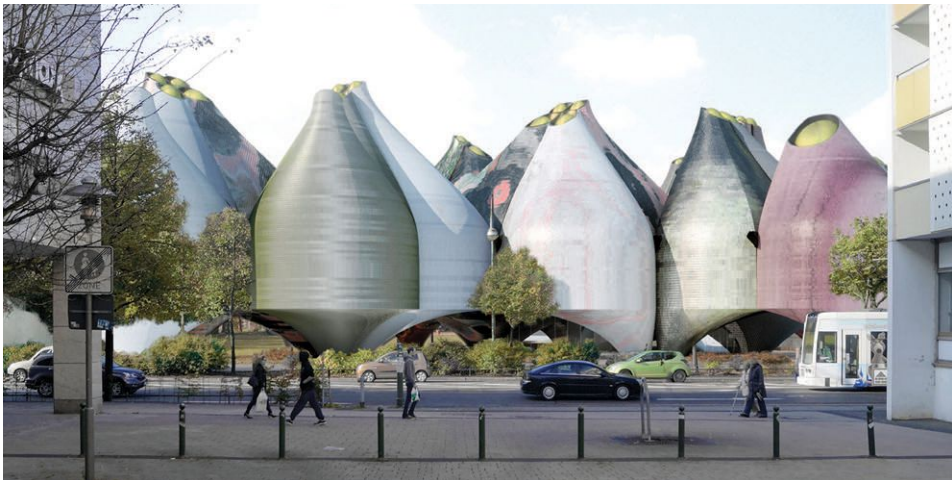
—*Anna Fixsen*

Dalseong Gymnasium

Young & Ayata received an honorable mention in a 2014 competition for a design for a below-ground athletic complex in South Korea that dissolves into the hilly landscape. An exercise in symmetry, the facility positions athletic courts along a central carapace-like axis. Pathways weave over and through the building, which features a printed ETFE-membrane roof.



IMAGES: © YOUNG & AYATA, EXCEPT AS NOTED

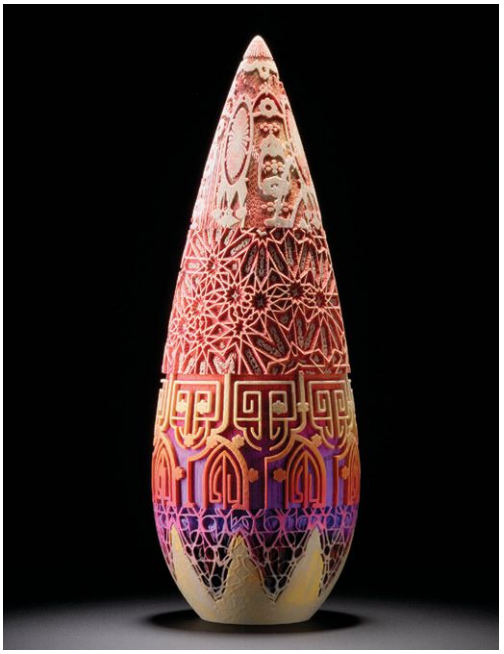


Bauhaus Museum

One of the firm's most ambitious designs was for a new Bauhaus Museum in Dessau (above), Germany. The timber lattice–framed "vessels" would touch at their concrete bases to create a unified floor plate (left). The volumes would be clad in glass tiles, patterned like Bauhaus textiles. "We didn't look to represent Bauhaus as an aged ideology, so we speculated on where the movement could go," says Ayata. The design tied in an international competition but was ultimately unbuilt.

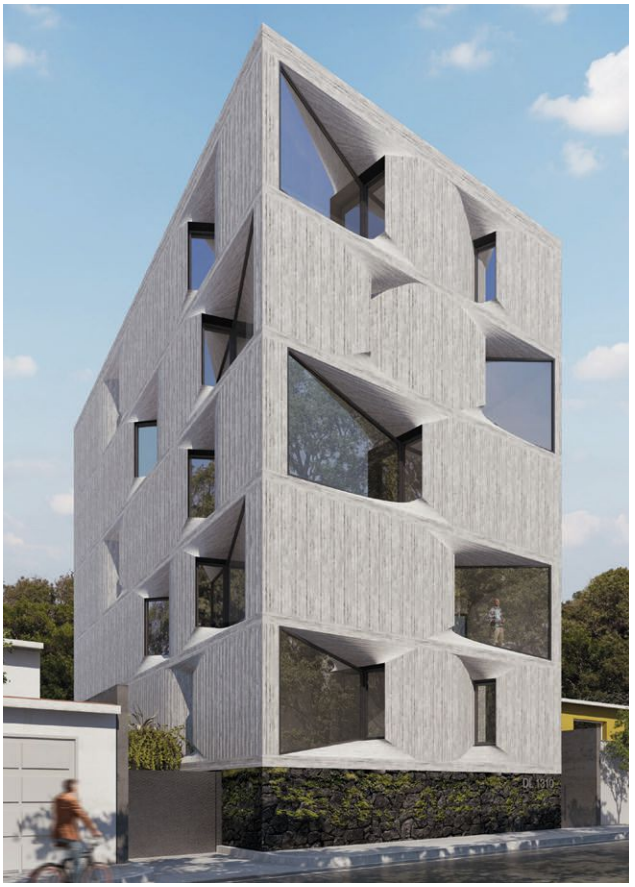
Cône de Cadavre Exquis

Young & Ayata teamed up with Harmen Brethouwer—a Dutch artist who creates square- and teardrop-shaped objects exclusively—to design a conical 3-D-printed sculpture inspired by the surrealist parlor game, the Exquisite Corpse. The architects asked four designers each to select a pattern from Owen Jones's 1856 book *The Grammar of Ornament*; the patterns were then programmed into the digital fabrication of a 17-inch-tall cone (right) using full-color sandstone powder.



Base Flowers

In their work, Young & Ayata are interested in the interplay of fact and fiction. For a set of repositionable 3-D-printed vases, they developed a species of hyperreal 3-D-printed flowers. These mutant blooms are barely perceptible within the larger bouquet (left). "We sought to create a tension between the container and what's contained, what's alive and what's not alive," says Ayata.



DL1310 Apartments

The studio is collaborating with the Mexico City–based practice MAPmx on a 10-unit apartment building in that city. Though the building is a simple rectangular volume, the design plays with the geometry of the facade and the traditional application of board-formed concrete by manipulating the wedge-shaped window insets (above). The project will be completed next year.

PHOTOGRAPHY: © JORIS LUGTIGHEID/HIDDE VAN SEGGELEN GALLERY (MIDDLE)

CUAC Arquitectura
Granada, Spain

FOUNDED: 2008

DESIGN STAFF: 10

PRINCIPALS: Javier Castellano Pulido, Tomás García Píriz

EDUCATION: *Castellano Pulido*: Escuela Técnica Superior de Arquitectura de Granada (ETSAGR): Ph.D., 2015; Advanced Studies Diploma, 2005; M.Arch., 2001. *García Píriz*: ETSAGR: Ph.D., 2016; Advanced Studies Diploma, 2006; Universidad Politécnica de Madrid, Advanced Studies Diploma, 2005; ETSAGR, M.Arch., 2003

WORK HISTORY: *Castellano Pulido*: Instituto del Patrimonio Turístico, Universidad Central de Chile, 2011–12; Escuela Técnica Superior de Arquitectura de Málaga, 2010–present; City of Salobreña, Granada, 2005–07; Studio Mesones-57, 2001–07. *García Píriz*: Tsukamoto Lab (Atelier Bow Wow), Tokyo Institute of Technology, 2007–08; ETSAGR, 2005; Studio 4:33, 2003–07

KEY COMPLETED PROJECTS: Physical Therapy Clinic, 2016; San Jerónimo 17, 2015; GABBA HEY, 2015; Harvest House, 2014; Biodiversity Centre, 2011; Magdalena's Fountain, 2009; ARENA, Madrid, 2007 (all in Granada, Spain, except as noted)

KEY CURRENT PROJECTS: Planta Baja Music Club, Granada, 2016; "CUAC Arquitectura: San Jerónimo y Alrededores" (exhibition), Colegio Oficial de Arquitectos de Jaén, 2017; Beas Rural House, Granada, 2017 (all in Spain)

WWW.CUACARQUITECTURA.COM

With a penchant for adaptive reuse, a firm pulls inspiration from the history of sites and existing structures.

BORN-AND-BRED *GRANADINOS*, Javier Castellano Pulido, 41, and Tomás García Píriz, 38, first met in the early 2000s while studying at the Escuela Téchnica Superior de Arquitectura de Granada. Now they are professors, practitioners, and Ph.D.s, and the influence of their historic home base is evident in their built work and research. "Granada shapes our way of looking at the world," says García Píriz. "It's not Madrid or Barcelona; it belongs to the periphery, and gives us both distance from and perspective on the rest of the architecture scene." Referencing Italo Calvino's *Invisible Cities*, which represents Venice as the perfect distillation of all cities, Castellano Pulido explains, "We like to think the same of Granada. We find many layers of different cultures, different histories, mixed together here."

The duo established CUAC in 2008—the same year they participated in the 11th annual Venice Architecture Biennale. For the Spanish Pavilion, they exhibited plans (created prior to formally joining forces) for an adaptive reuse project: the headquarters of ARENA Media in Madrid, which was built in 2010. "Introducing a new trendy office in an old building was a fairy tale for us," says Castellano Pulido. "We love doing work over work—that is, work in already built structures," adds García Píriz. Since then, the firm's designs have consistently taken a thoughtful approach to examining and showcasing the heritage of each project, utilizing existing structures, materials, or histories to enhance the program.

When it comes to their firm's name, Castellano Pulido and García Píriz are hard pressed to give a straight answer: "The concept of CUAC is related to serendipity or coincidence—the unseen surprises of architecture," says Castellano Pulido. "And it's the sound that a duck makes," he adds. García Píriz tries out another explanation: "It's related to memory, to childhood tales . . . and it's sort of an inside joke," he says. Finally Castellano Pulido concedes, "It's a secret."

The architects point to their own offices as an example of their namesake concept in action. Originally a mortuary and later an internet café, the old brick building on San Jerónimo street in the historic center of Granada offered myriad histories and materials for the architects to incorporate. They reused broken bricks and chunks of plaster, salvaged painted wood for shelving, and brought in a heavy metal door from their previous office to spiritually link their new and old workspace. It was only after completing the project that Castellano Pulido and García Píriz recognized the uncanny resemblance between their new office and a Baroque painting they had shown many times to their students as an example of "creating one space inside another." The painting? *Saint Jerome* (or, in Spanish, San Jerónimo) *in His Study*, by Hendrick van Steenwijck the Younger. "*That* is CUAC," they agree. —*Miriam Sitz*

GABBA HEY

CUAC Arquitectura renovated an industrial building in Granada on a shoestring budget to create a music school named after the Ramones' punk rock catchphrase "gabba gabba hey!" The designers inserted a concrete box into the raw interior, creating an acoustically isolated recording studio.

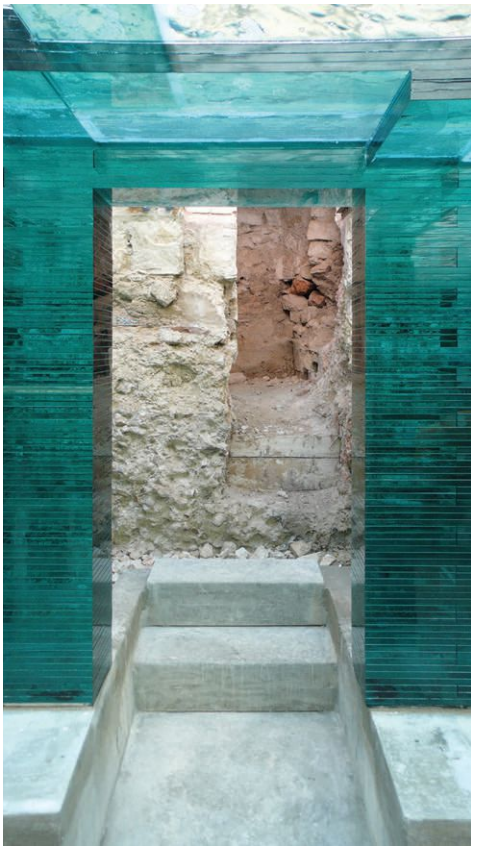
PHOTOGRAPHY: COURTESY CUAC ARQUITECTURA (TOP); © FERNANDO ALDA (BOTTOM, AND OPPOSITE, TOP)

San Jerónimo 17

CUAC moved into their new offices (above), which they share with a graphic designer and videographer, earlier this year, bringing a tall metal wall panel from their old studio and repurposing it as a long conference table. Only after completing construction of their new space did the architects realize the colors and materials echo those in a painting by Hendrick van Steenwijck the Younger of *Saint Jerome in His Study* (left) that they frequently show to students during lectures.

Harvest House

Working with Javier Moreno del Ojo, CUAC designed the Harvest House in Granada for a retired couple who had owned the property—and cultivated gardens there—for three decades. The architects built a low-lying structure that hugs the slope of the site, and added a green roof and pool reminiscent of an agricultural water reservoir.



Magdalena's Fountain

CUAC collaborated with architects Rubens Cortés Cano and Noelia Martínez Martínez to renovate a fountain in the historic district of Jaen, Spain. A below-grade blue-glass-walled chamber offers visitors a unique perspective up through the clear bottom of the water tank.

PHOTOGRAPHY: © JAVIER CALLEJAS (BOTTOM, LEFT); JAVIER CASTELLANO PULIDO (RIGHT)

EnergyShield®
Continuous Wall Insulation

TRUST ISN'T BOUGHT, IT'S BUILT.

You can count on EnergyShield® Continuous Wall Insulation products. With thirty years of industry expertise in polyiso manufacturing, Atlas is your partner for every stage of your build. Let's talk about technical solutions for you, today.

BEFORE YOUR BUILD
As an industry leader in facer technology, Atlas EnergyShield® offers the industry's widest product range and solutions for every project type.

DURING YOUR BUILD
We keep costs and stress down. Our unrivaled supply chain reduces the inefficiencies of product shortages.

AFTER YOUR BUILD
We deliver confidence. Our EnergyShield® Continuous Wall Insulation products have proven and lasting thermal management performance.

2000 RiverEdge Parkway, Suite 800, Atlanta, Georgia 30328 **Atlasroofing.com**

CONNECTING FUNCTION WITH FACILITY™

ATLAS®

CIRCLE 74

ARTS CENTERS

In this issue, RECORD has gathered six new museums and performance spaces from around the globe—most completed within the last month—that represent truly sublime works of architecture. Some are highly contextual, drawing inspiration from their very different settings, natural or urban. Others are jaw-dropping spectacles more than a decade in the making. Each is an inventive architectural expression of its own distinctive material, from concrete, glass, metal, and wood to terra-cotta (as seen on this page).

PHOTOGRAPHY: © JEREMY BITTERMANN

NATIONAL MUSIC CENTRE OF CANADA BY ALLIED WORKS ARCHITECTURE

National Taichung Theater | Taichung City, Taiwan | Toyo Ito & Associates

Grand Opera

More than a decade in the making, Toyo Ito's masterwork redefines the relationship between form, space, and structure.

BY NAOMI R. POLLOCK, AIA

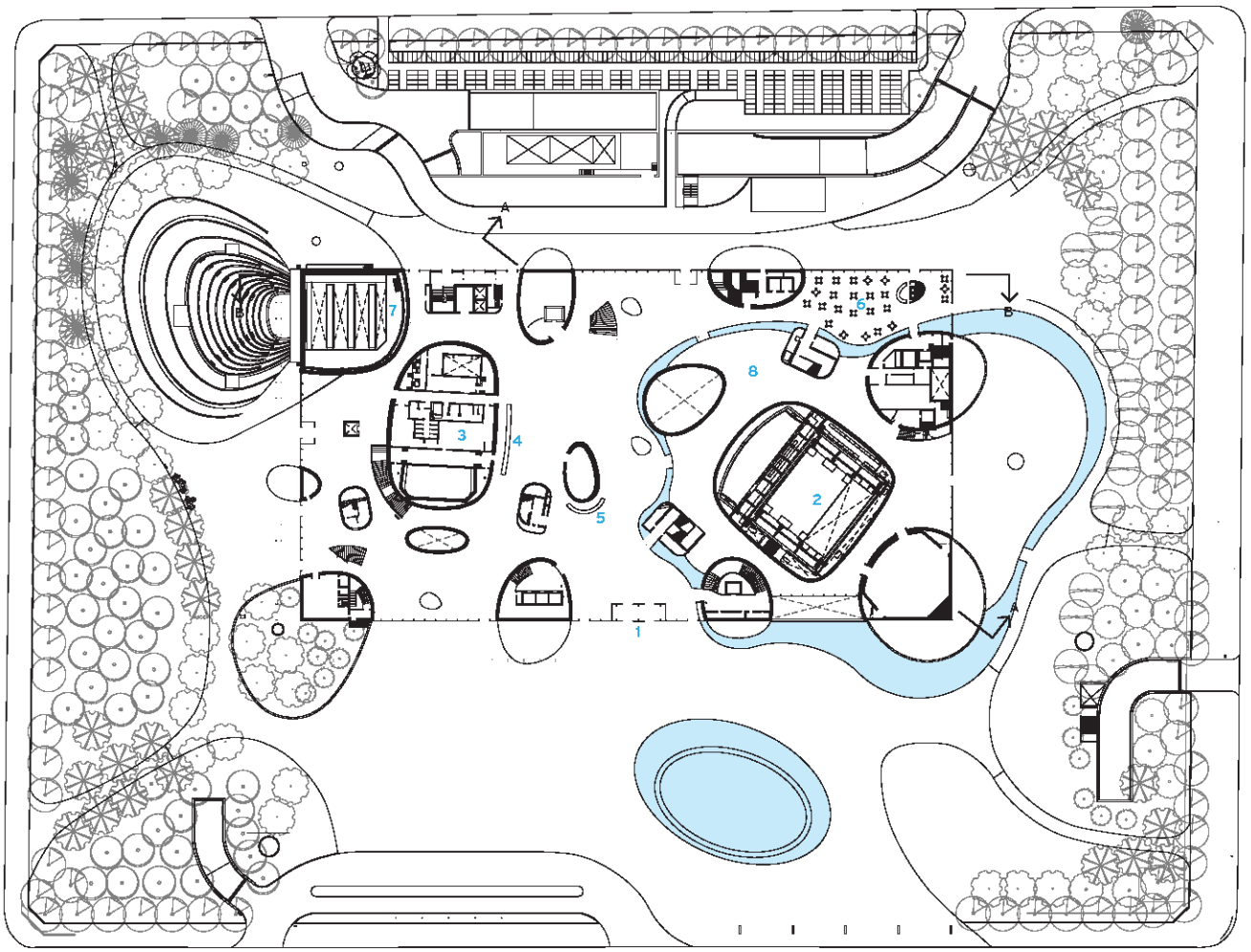
PHOTOGRAPHY BY IWAN BAAN

When it comes to structural daring, few architects can top the Tokyo-based designer and 2013 Pritzker laureate Toyo Ito. After 11 years and $135 million, his most ambitious work to date has finally opened in Taichung City, a metropolis of 2.75 million people in central Taiwan. Situated majestically at the end of a tree-lined parkway, the 551,000-square-foot National Taichung Theater (NTT) is the city's new center for opera and theater of all sorts. Though the NTT's main attractions are its three theaters, these are upstaged by the drama of its architecture everywhere in between. Barely contained by the boxy enclosure of its concrete-and-glass skin, hourglass-shaped volumes define the interior of Ito's building. These sinuous forms cinch in and balloon out with remarkable plasticity, the inside wall of one doubling as the outer surface of the neighboring space. Together these tubelike elements create a spectacular interior dreamscape of deep caverns and soaring canyons within the building.

In elevation, Ito expresses these tubes in silhouette, which accounts for the structure's bold appearance. Conceptually, the building shell simply contains the interior, as if the system of tubes would continue were it not for the enclosure. In theory, says Ito, the four facades are not really facades: "They are sectional cuts." And while the serpentine shapes dominate the otherwise rectilinear exterior, it is indoors where visitors are immediately swept up by the experience of Ito's architecture, with dynamic, curving surfaces that pull you in, and a mysterious play of light and dark that makes you stop and wonder.

Picking up where the landscaped boulevard leaves off, a monumental plaza leads to the NTT's main entrance, but additional doorways draw visitors from multiple directions. All open onto the lobby, a vast hall that seems like an extension of the city in scale and

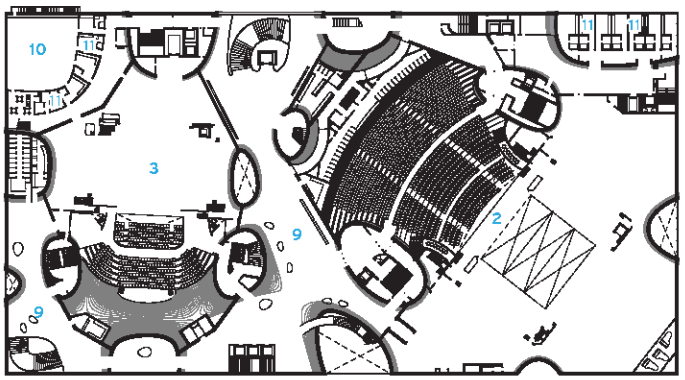
EBB AND FLOW Approached from a parkway in front, an open plaza leads up to the National Taichung Theater's main entrance. The building's hourglass-shaped glazed and concrete inserts create an intriguing sequence of solids and voids on its four elevations (left). In addition to a pond-like fountain, the plaza contains a rivulet that continues inside the building (above).



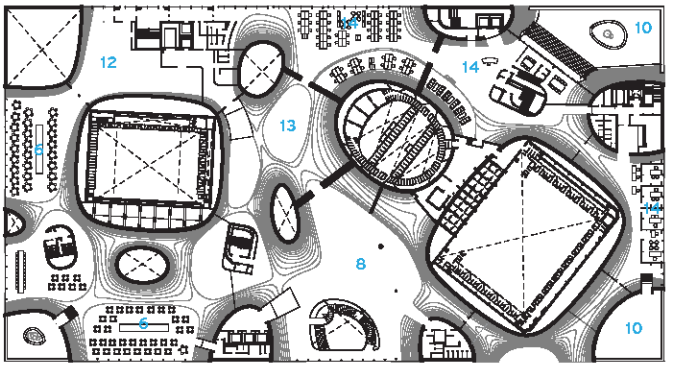
GROUND FLOOR PLAN

0 100 FT. 30 M.

1 MAIN ENTRANCE
2 GRAND THEATER
3 PLAYHOUSE
4 TICKET COUNTER
5 INFORMATION
6 CAFÉ/RESTAURANT
7 BLACK BOX THEATER
8 RETAIL
9 FOYER
10 TERRACE
11 DRESSING ROOM
12 KITCHEN
13 GALLERY
14 OFFICE
15 ROOF GARDEN
16 PARKING
17 WORKSHOP
18 REHEARSAL ROOM
19 EVENT SPACE
20 LOADING DOCK



SECOND-FLOOR PLAN

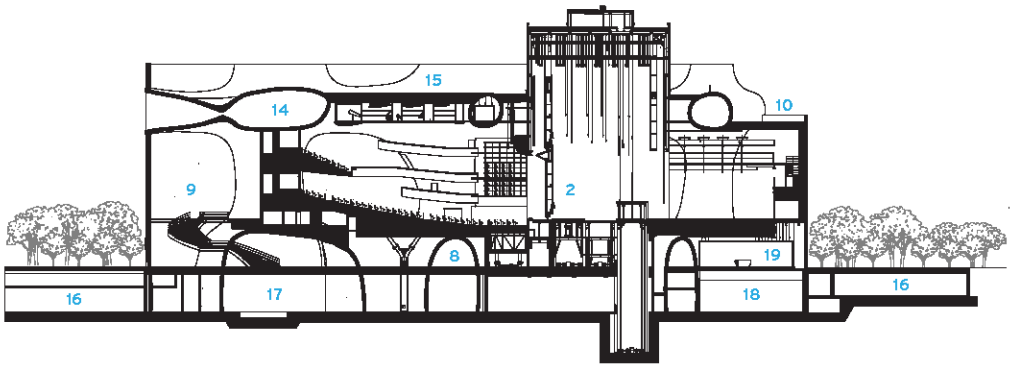


FIFTH-FLOOR PLAN

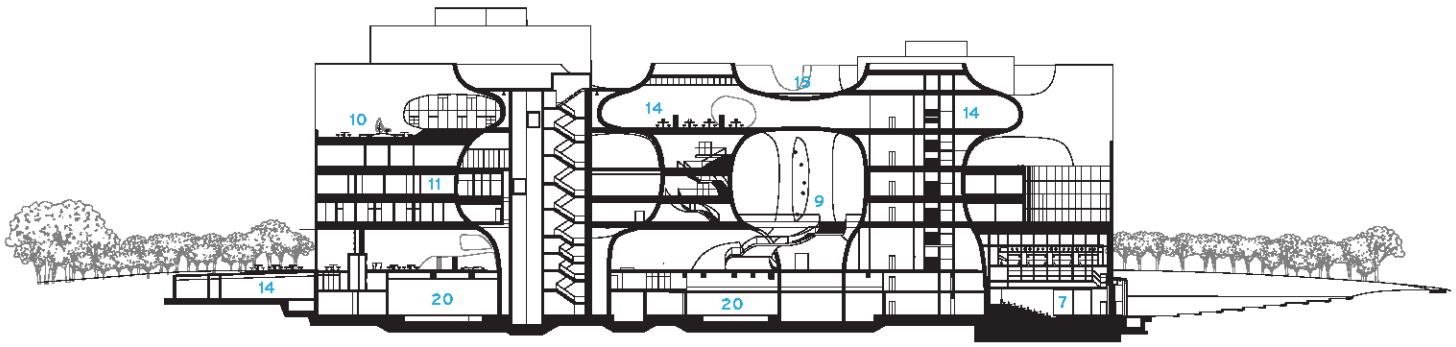
A CUT ABOVE Surrounded by newly planted greenery, the building may be approached from all sides (right). A circular drive at the rear enables cars to pull up to one of the entrances. Encased in glass on two sides, a ground-floor café occupies the corner of the building.

function. Filling the entire ground level, its tunnel-like spaces segue from one to another. Furniture designates administrative and commercial areas, including the ticket desk, café, and an open marketplace. Separate stairways lead to each of the building's three venues: the 2,000-seat Grand Theater and 800-seat Playhouse, both entered from second-floor foyers, or the basement-level Black Box, a 200-seat theater that opens to an outdoor amphitheater via sliding doors. On the fifth floor, there is a gallery, restaurant, retail area, and office space, topped by the roof garden, where the tubular forms, some holding HVAC equipment, poke out from the building.

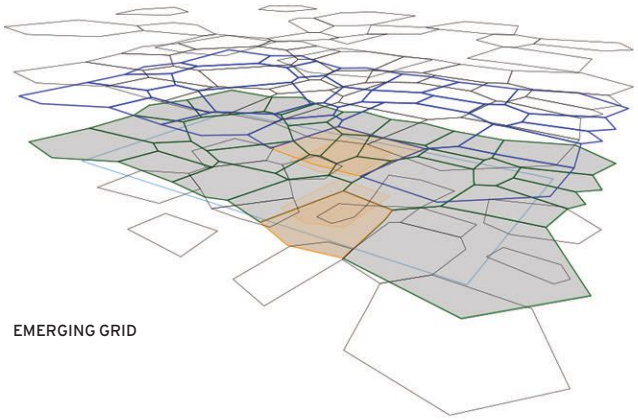
Behind this structure's bold expression is a complex story, one that began in 2004 when Ito entered a competition for the Ghent Music Forum. Inspired by the texture of that medieval Belgian city, he proposed a labyrinth of caves composed of a continuum



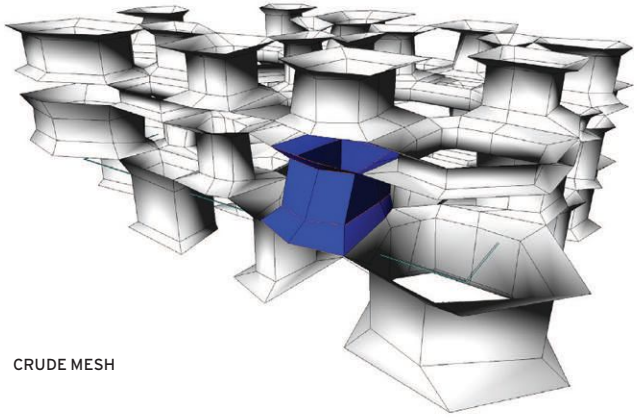
SECTION A - A



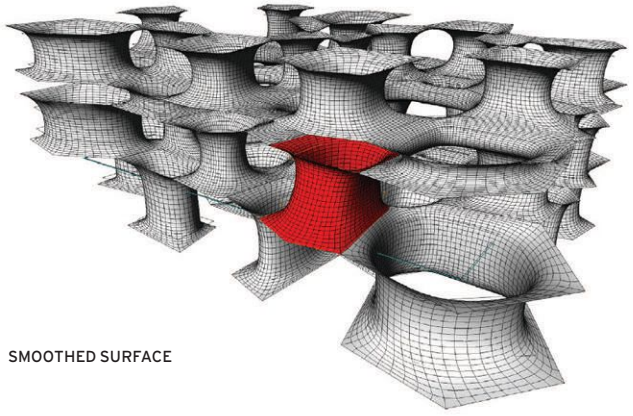
SECTION B - B



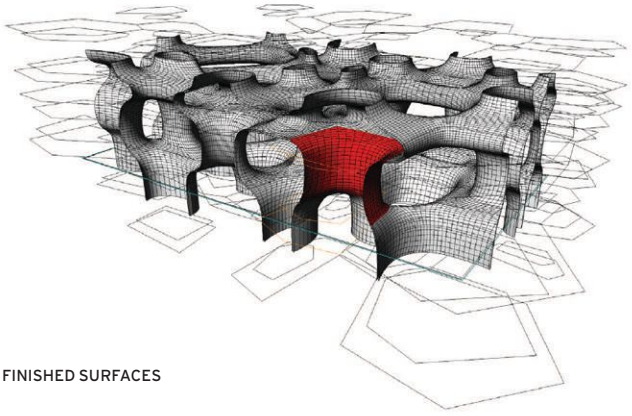
EMERGING GRID



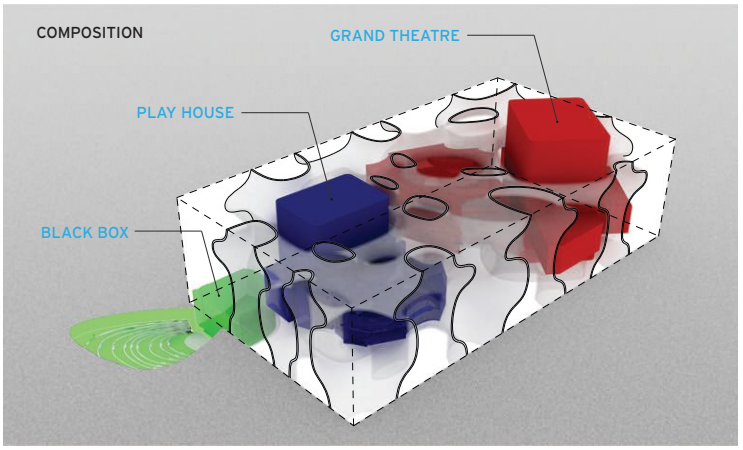
CRUDE MESH



SMOOTHED SURFACE



FINISHED SURFACES

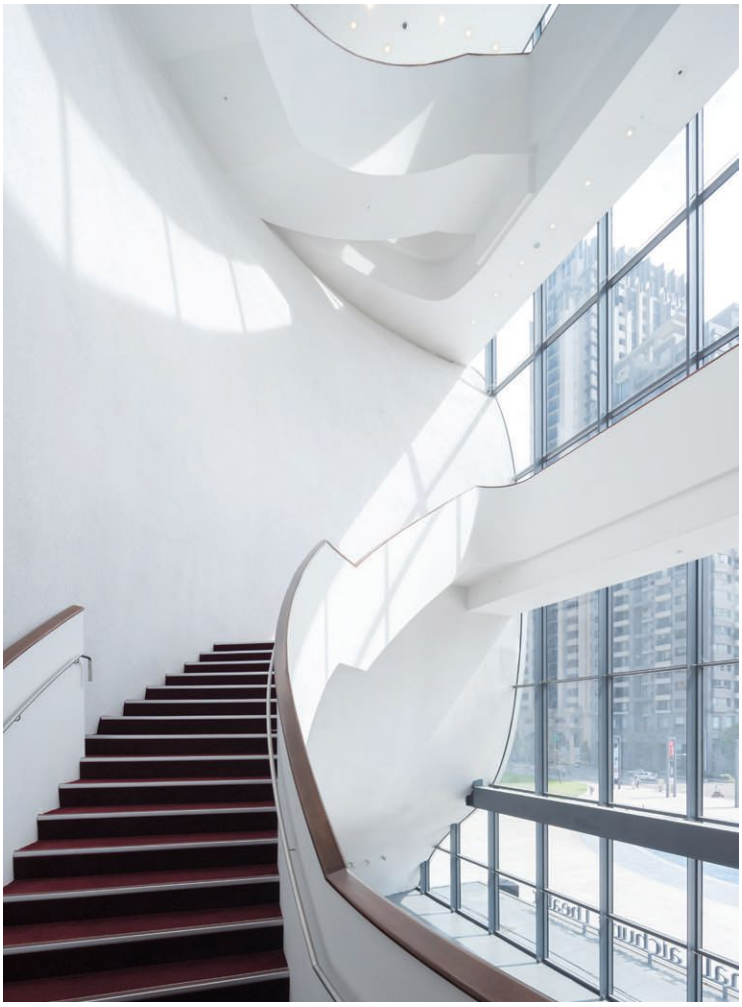


BUILDING BLOCKS The diagrams (left) illustrate the basic conceptual steps taken to configure the catenoids that organize the building. Inserted within the catenoids, the green, blue, and red cores (above) denote the Black Box, Playhouse, and Grand Theater, and their related spaces.

of spaces, both horizontal and vertical. Though Ito lost that commission, he won the NTT competition the next year with a scheme based on the same visionary strategy.

Ito and his team adapted the Ghent concept for the NTT's complex program, utilizing a malleable matrix of metal mesh tubes to devise a study model. They manipulated these tubular forms by hand to incorporate the spatial needs of the program. The final result of this study was a composition of 58 irregularly shaped tubes, which Ito calls catenoids, that eventually became the building's curvaceous volumes. To translate these catenoid shapes into a quantifiable form, Ito's team

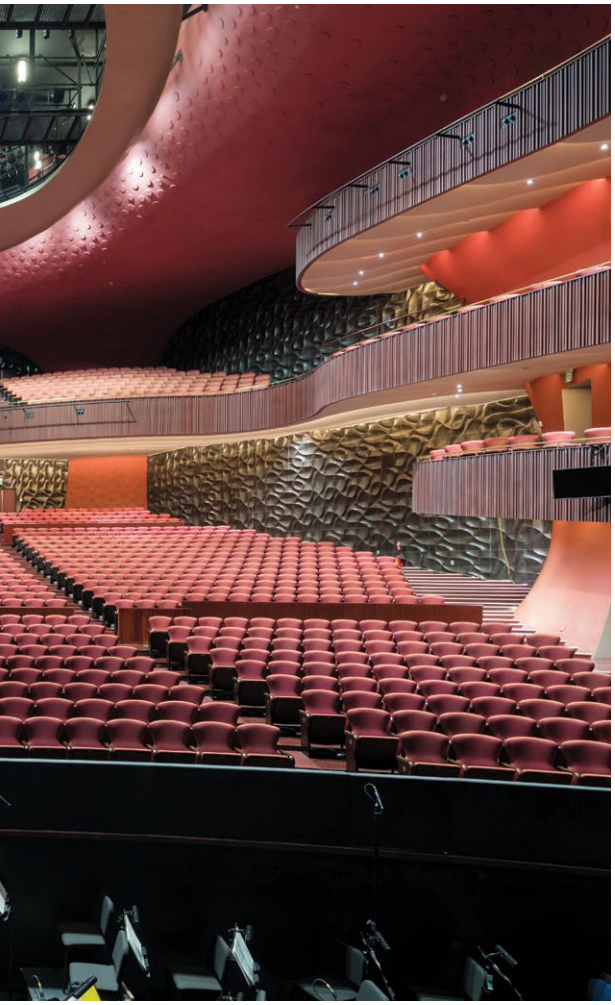
TUNNEL VISION
Within the ground-floor lobby, one cavernous space segues into the next (opposite, bottom). Red and blue cores aligned with the Grand Theater and Playhouse help orient visitors as they move through the space (left and above), while benches designed by Fujie Kazuko Atelier give them somewhere to pause and reflect (above).



FULL HOUSE Adorned with colorful murals, the foyer preceding the Grand Theater soars to 56 feet (oppposite). From the foyer, curving stairs lead up to the retail, office, gallery, and restaurant spaces on the fifth floor (above and top, left). A standard horseshoe shape, the Grand Theater contains 2,000 seats upholstered with red fabric designed by Yoko Ando (top right).

created what the architect terms an "emerging grid," which consisted of five two-dimensional grids overlaid on each other, each one shifted slightly. This enabled the team to identify 423 control points. They then used these points to formulate a 3-D matrix that defined a planar shape and a position for each catenoid, breaking them down into connected flat planes. The architects then rounded the flat sides of the hollow forms and the whole confluence blended together. "The geometry came first, and then we forcibly introduced the theaters," explains Ito.

Just finding a willing contractor took a year and a half. "No one wanted to do it," laughs Ito. The construction team began to build the catenoids using a truss wall system, developed in Japan by the Asahi Building Wall Company, to provide the reinforcement. First they created two-dimensional trusses, each one curved differently. These ribs were upended, spaced 8 inches apart, and tied together into three-dimensional units that were joined. The assemblies were then sandwiched between layers of steel mesh, which replaced the typical concrete



formwork. After a period of partial curing, the mesh forms were removed to minimize surface irregularities. Also intended to mask flaws, thin layers of mortar and textured white paint were applied to finish the 18-inch-thick walls on each side. Serving as both the building's support and space-articulation systems, the walls are a complete integration of architecture and structure.

To maximize floor area, horizontal plugs made of steel deck and concrete were placed within the resulting volumes. Since the cross-sections of the tubular elements are variable, the desired ceiling heights and floor area determined the locations of the inserts, which are supported by supplemental beams. Vertical concrete plugs were also used to add walls where needed and to fortify the weakness inherent in the cut edges visible on the elevations. Plugs within the plugs—circular glass disks set into the exterior concrete panels—admit a modicum of daylight, while downlights embedded in the suspended ceilings softly illuminate the interior.

A direct reference to Ito's design for the Ghent Music Center, the NTT is also an

INS AND OUTS The tubular spaces contained within the building poke out from the roof (top) as well as from the elevations. On the fifth floor, one tube leads out to a balcony shielded by a low glass partition (opposite). Inside, a glass wall and doorway separate the offices (above).

extension of the architect's earlier built work. Both the cut elevations and the catenoids are reminiscent of his Sendai Mediatheque (RECORD, May 2001, page 190) whose undulant, hollow columns revealed by the building's glass elevations made big waves when the project opened in 2001. Yet the National Taichung Theater pushes all of those ideas to much greater extremes. So, if an over-the-top operatic performance of *Carmen* or *Rigoletto* dosn't transport patrons to another world, the building's architecture surely will. ■

credits

ARCHITECT: Toyo Ito & Associates, Architects – Toyo Ito, principal in charge

ARCHITECT OF RECORD: Da-Ju Architects & Associates

CONSULTANTS: Arup, Evergreen Consulting Engineering (structural); Nextekco (air-conditioning); Long Cheng Co. (electrical/plumbing); Takenaka, I.S. Lin & Associates, Handar (equipment); Shozo Motosugi (theater); Izumi Okayasu (lighting design); Nagata Acoustic, National Taiwan University of Science and Technology (acoustics); Kazuko Fujie Atelier (furniture design); Yoko Ando Design (textile design)

GENERAL CONTRACTOR: Lee Ming Construction

CLIENT: Taichung City Government, Republic of China (Taiwan)

SIZE: 551,000 square feet (gross square footage); 614,000 square feet (site)

COST: $135 million

COMPLETION DATE: September 2016

SOURCES

CURTAIN WALL: Sanunity

LIGHTING: Innotek Photoelectric Technology

SEATING: Top Design Futurity International (theater)

CARPET: Tang Lun Industrial

WALL TREATMENTS: Kikusui Chemical Industries

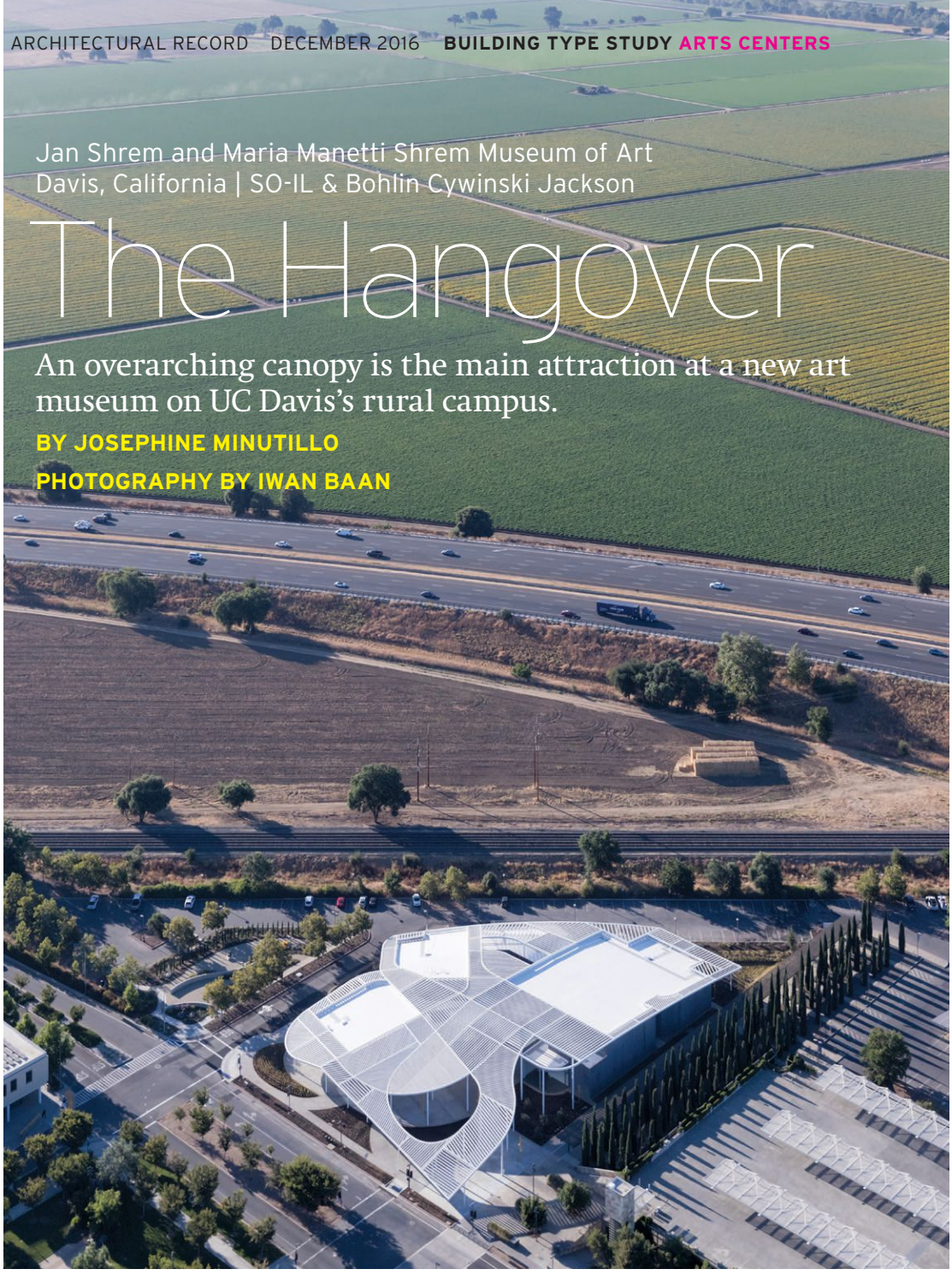
Jan Shrem and Maria Manetti Shrem Museum of Art
Davis, California | SO-IL & Bohlin Cywinski Jackson

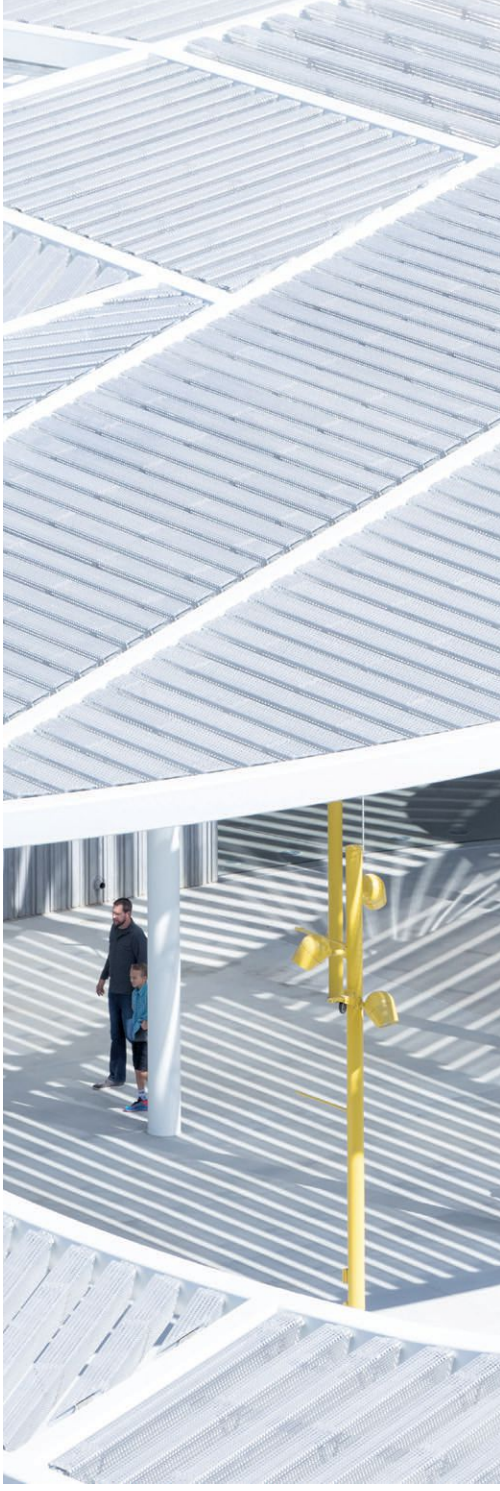
The Hangover

An overarching canopy is the main attraction at a new art museum on UC Davis's rural campus.

BY JOSEPHINE MINUTILLO

PHOTOGRAPHY BY IWAN BAAN



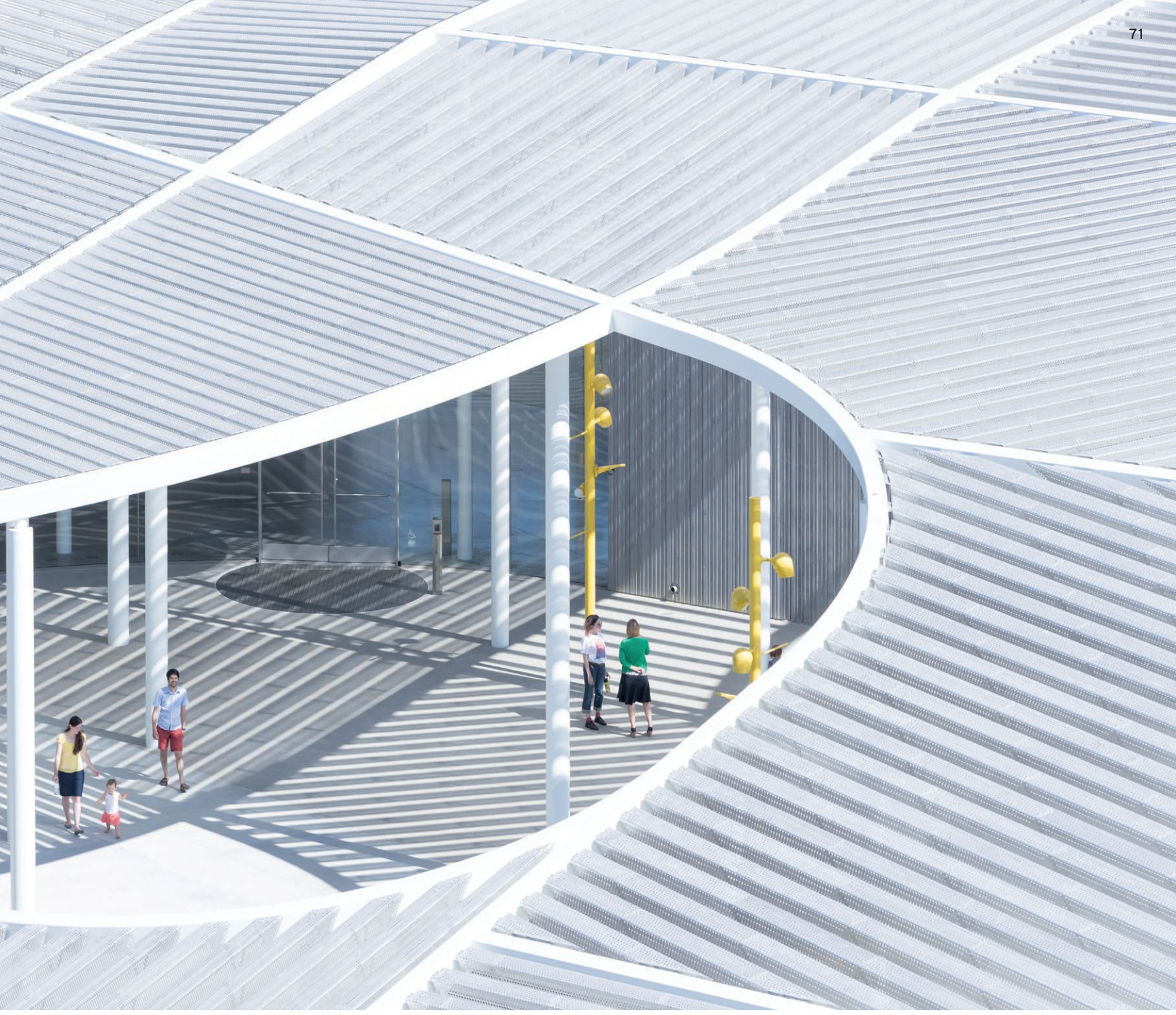


Beginning in the early 1960s, the University of California at Davis became home to a thriving academic art scene, with influential figures Wayne Thiebaud, known for his colorful paintings of everyday objects, and Robert Arneson, father of the Funk movement, among its diverse faculty. In recent years, the university has sought to reignite the creative energy of that era. A 2013 competition for the school's first purpose-built art museum—it previously exhibited work in a handful of galleries in existing buildings—called for a structure that would be a magnet on the sprawling campus. But the budget was extremely tight, and the client mandated a contractor-led design-build team.

Paired with contractor Whiting-Turner, architects SO-IL, based in New York, and the San Francisco office of Bohlin Cywinski Jackson (BCJ) offered an unconventional solution. Rather than create a presence with building height, as the other shortlisted entries did, they proposed a one-story structure—thereby saving money on elevators, egress stairs, and other associated costs—with a dramatic canopy reaching far beyond the building's footprint. It was a very smart move.

The strategy won the competition for SO-IL and BCJ, but the design and detailing of that critical component had to be developed over the course of the next couple of years. "The canopy is essentially Pole Dance made solid," says Florian Idenburg, founding partner of SO-IL with wife Jing Liu. Idenburg is referring to SO-IL's 2010 installation at MoMA PS1 in Queens, New York, where a large net supported by a series of pivoting poles covered that museum's courtyard—an exploration, according to the firm, of sensorially charged environments rather than finite forms.

At Davis, the inspiration for the canopy's simple construction and sensuous design—reaching as high as 34 feet and dipping as low as 12



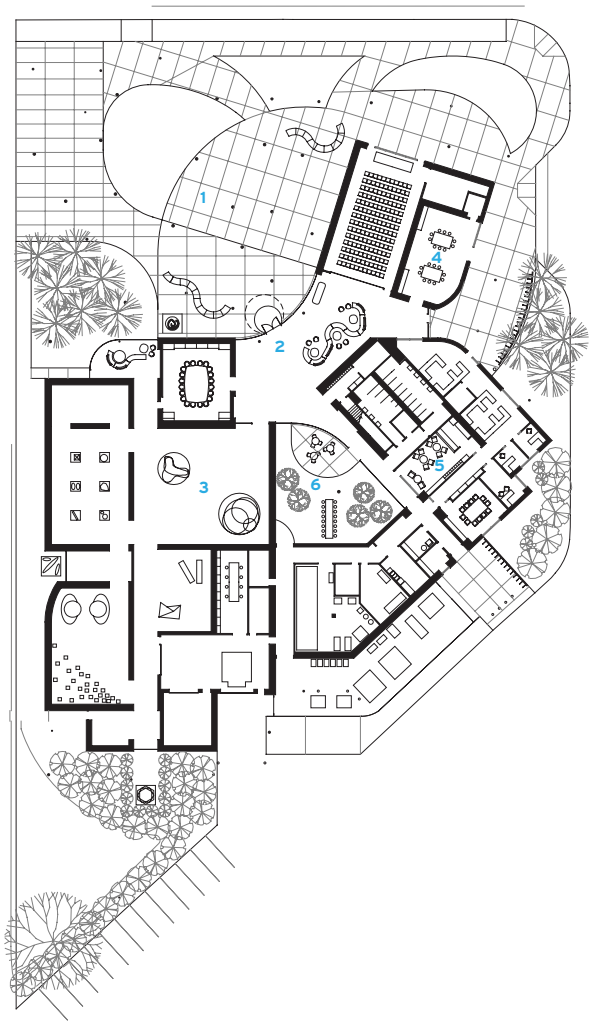
THROUGH THE ROOF The form of the museum's sensuous canopy was inspired by the nearby fields (opposite). Supported by circular columns, the canopy covers a 50,000-square-foot area to create a generous entry plaza in front of the building (above).

feet—came from the surrounding farmlands and their greenhouse structures. Coming into the Sacramento airport en route to Davis, the view from the plane over California's Central Valley—with its patchwork of cultivated plots of land—is stunning. The architects beautifully recreated that tapestry in metal with the orthogonal sections of the canopy, interrupting it with sweeping curves, a reference to the Sacramento River that meanders across the fields.

Initial ideas for the canopy called for a steel frame and subframe connecting perforated sheets of aluminum. But the design team determined that it would be more cost-effective, and indeed more interesting, to give dimension to the aluminum and allow it to span the main frame, eliminating the need for the secondary steel.

The resulting triangular infill beams are dense in some sections and sparse in others, casting an array of intriguing shadow patterns onto the walls and ground beneath it. "We were able to dial it up or dial it down as we wanted," explains Michael Ra, principal in charge at Front, the canopy and glazing consultants on the project. Idenburg and Ra have developed custom metal solutions together before, with the expanded aluminum mesh that clads the New Museum in New York, when Idenburg was with SANAA (RECORD, March 2008, page 132) and on SO-IL's Kukje Gallery in Seoul (RECORD, July 2012, page 68), which is draped in a blanket of stainless-steel rings.

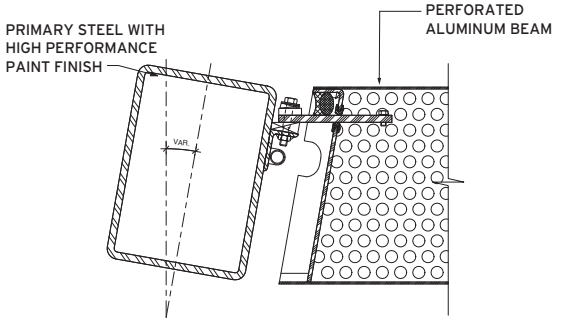
While the aluminum at the New Museum was anodized, a corrosion-resistant, marine-grade alloy was used for the beams at the Davis museum, allowing them to be left uncoated, exposing the natural material. The three-dimensional treatment of the aluminum, coupled with its raw metallic finish, gives the canopy a softness, according to



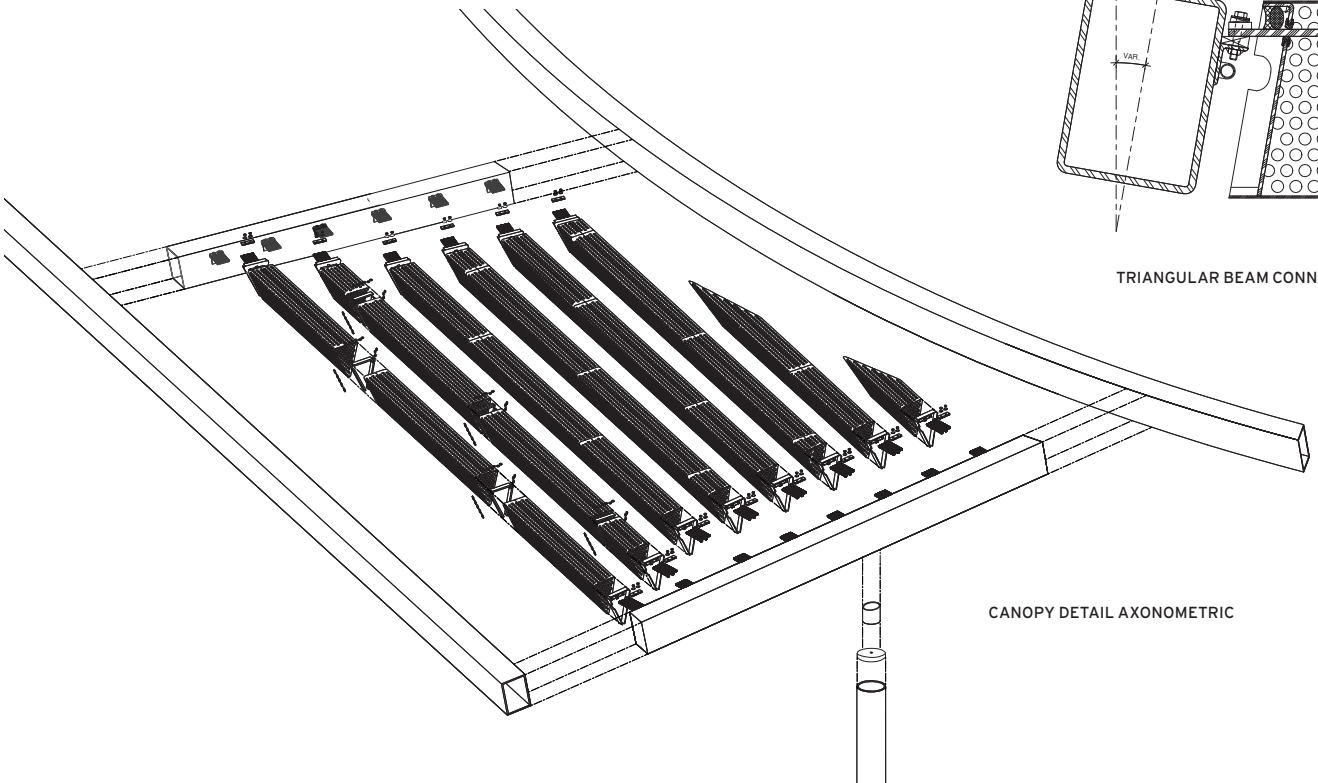
1 EVENT PLAZA
2 LOBBY
3 GALLERY PAVILION
4 EDUCATION PAVILION
5 ADMINISTRATION PAVILION
6 COURTYARD

GROUND-FLOOR PLAN

0 50 FT.
15 M.



TRIANGULAR BEAM CONNECTION DETAIL



CANOPY DETAIL AXONOMETRIC

CAST A SHADOW Above the main entrance, a large circular disc protects visitors from infrequent rain (left). The canopy's array of perforated triangular beams creates alluring silhouettes on the exterior wall of the building and floor of the entry plaza (above).

credits

ARCHITECT: SO-IL – Florian Idenburg, partner in charge; Ilias Papageorgiou, Jing Liu, partners; Danny Duong, project architect. Bohlin Cywinski Jackson – Karl Backus, partner in charge; Sergei Bischak, project manager; Ryan Keerns, project manager/project architect; Helene Gregoire, interior designer

ENGINEERS: Rutherford + Chekene (structural); Cunningham Engineering (civil)

CONSULTANTS: Lutsko Associates (landscape); Fisher Marantz Stone (lighting); WSP | Parsons Brinckerhoff (sustainability); Front (canopy and glazing)

GENERAL CONTRACTOR: Whiting-Turner

CLIENT: University of California, Davis

SIZE: 30,000 square feet (building); 50,000 square feet (canopy)

COST: $30 million

COMPLETION DATE: November 2016

SOURCES

METAL PANELS: Reynobond

PRECAST CONCRETE: CTU Precast

CURTAINWALL: Oldcastle BuildingEnvelope

CUSTOM STAINLESS-STEEL PORTALS: Front

LOCKSETS: Schlage

EXIT DEVICES: Blumcraft

CEILING AND SUSPENSION GRID: Armstrong

OFFICE FURNITURE: Steelcase

CHAIRS: Vitra

CUSTOM FURNITURE: BCJ with Northwood Design Partners

INTERIOR AMBIENT LIGHTING: Flos, Litecontrol

DOWNLIGHTS: LSI

EXTERIOR LIGHTING: Selux

CONTROLS: Lutron

BUILDING AUTOMATION SYSTEM: Siemens

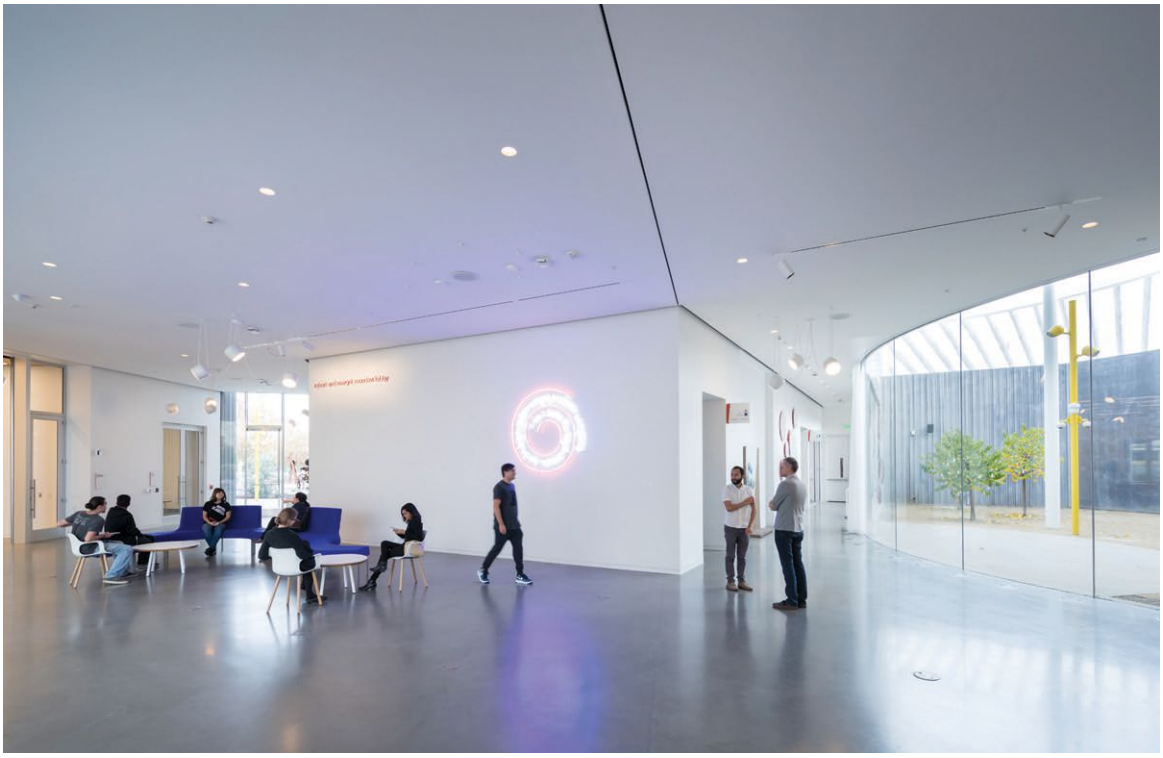
Idenburg: "There is the hard box with a more delicate veil."

The hard box, of course, is the building itself, which can't help but take a back seat to the canopy. More like a pavilion, the highly transparent 30,000-square-foot container, whose roof follows the arc of the canopy, features three main areas—for galleries, offices, and classrooms—that pinwheel around a central lobby and interior courtyard. Its exterior walls feature elegantly corrugated precast concrete panels, some as high as 32 feet, and straight and curving glass, the biggest sheet of which is 10 feet by 14 feet.

Like SANAA's Glass Pavilion at the Toledo Museum of Art, which Idenburg and Ra also worked on together, the glazing here is mullionless. Since it is taller than Toledo, it is also slightly thicker, with two lites of 0.59-inches apiece separated by a very clear interlayer. "Using a principle similar to a glass balustrade, we clamped the laminated panels at the bottom so they essentially cantilever off the ground," explains Ra.

The 8,000 square feet of galleries feature polished-concrete floors, and ceilings of aluminum-mesh grilles, allowing views up to the sloping roof above. With works on paper comprising nearly three-

CAMPUS DRAW
Polished concrete covers the floors of the galleries, lobby, and auxiliary spaces (above; right; and opposite, bottom). The arcing canopy dips as low as 12 feet at the front of the building (opposite, top).



quarters of the collection, the lighting within galleries, entirely LED, is controlled by occupancy sensors, turning off when galleries are empty. An off-site PV array satisfies some of the energy demand. The building is on track to achieve LEED Platinum and would be one of only a handful of museums in the U.S. to do so.

Whether one approaches the campus from the freeway or just walks around it, the $30 million museum is a sight to behold. Architects often talk about constraints' encouraging creativity. This is a real example of a tight budget leading to truly innovative design. More than that, SO-IL and BCJ have designed a building appropriate for the size and scope of UC Davis's collection and audience, avoiding the costly mistake UC Berkeley made with its art museum and film archives, opened in January. It spent nearly four times as much on what was, primarily, a renovation of an existing building (RECORD, March 2016, page 60). At UC Davis, the university certainly got its money's worth, and then some. ■

Elbphilharmonie | Hamburg | Herzog & de Meuron

Show Boat

After 13 years of planning and construction, a concert hall opens to great fanfare.

BY SUZANNE STEPHENS

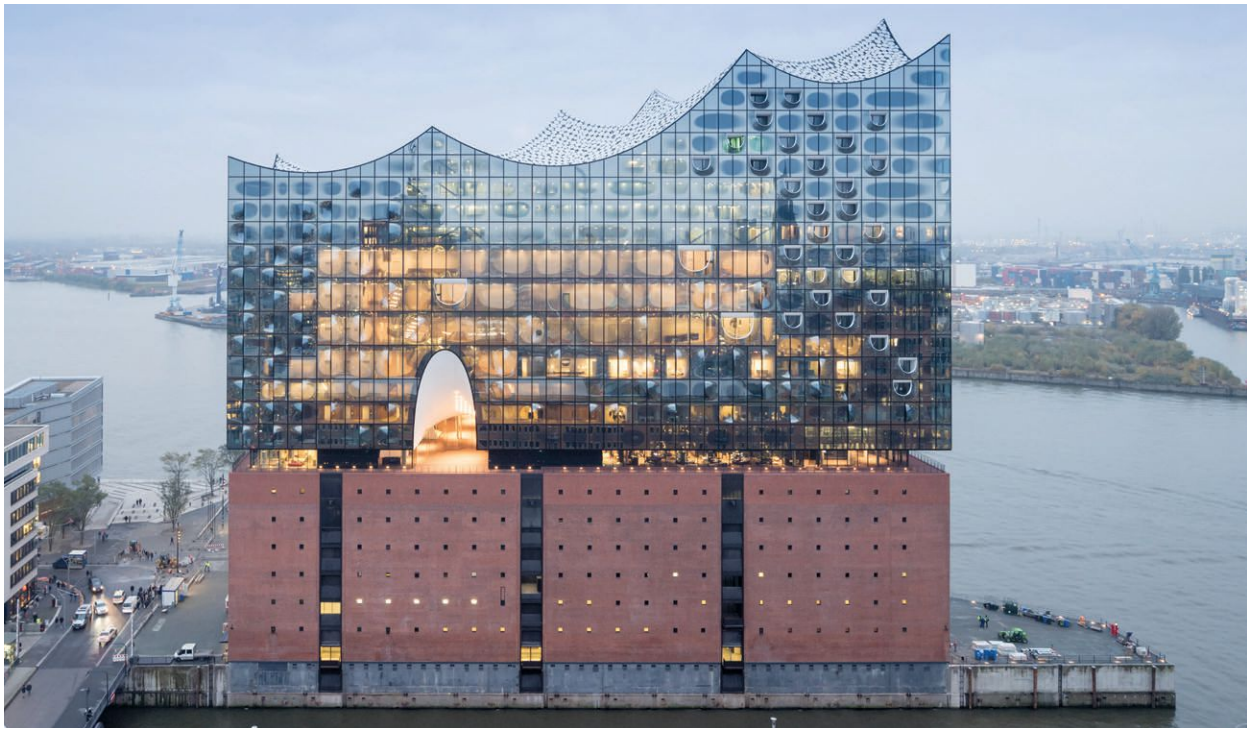
PHOTOGRAPHY BY IWAN BAAN

Like a giant seafaring ship with rippling sails of glass instead of canvas and a brick base instead of a wood hull, the new Elbphilharmonie commands the harbor of Hamburg's still-active port in northern Germany. The concert hall, hotel, and apartment building designed by the Swiss firm of Herzog & de Meuron (as well as local architects Hohler + Partner) sits at the western tip of HafenCity. There it functions as a glittering beacon for this 390-acre residential and commercial waterfront redevelopment under construction along the Elbe River. While Elbphilharmonie's grand 2,100-seat concert hall and its 550-seat recital hall don't open until January 2017, already there is plenty of hubbub. The "plaza," an elevated public space eight stories above ground—between the brick base and the new glass structure on top—was inaugurated early in November. "We feel the enthusiasm of the people," says founding partner Jacques Herzog. "Outstanding buildings are key for successful urban planning."

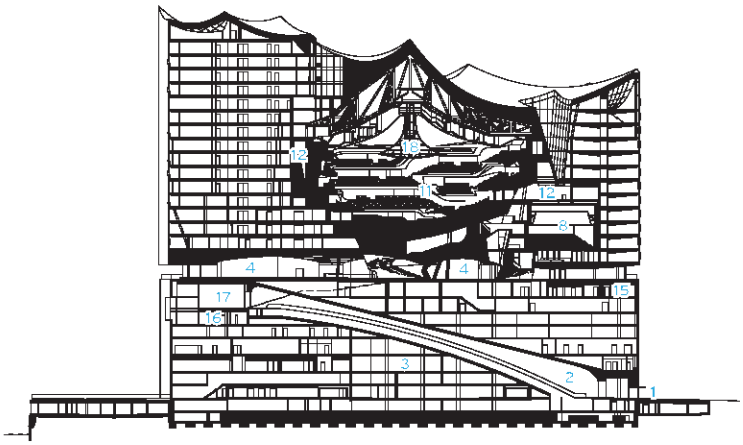
Fascination with the multiuse 26-story, 1,292,000-square-foot structure has burgeoned since the building's conception in 2003, when the city of Hamburg saw an opportunity to provide a state-of-the-art home to the NDR Symphony Orchestra (now NDR Elbphilharmonie Orchestra). Herzog & de Meuron had been asked previously by a private developer, Alexander Gérard, to renovate a brick storage house, Kaispeicher A, protected by law, on this site for a concert hall. When the city took it over from Gérard, the architects were retained, even though it was at this point a public project, in which the designer is usually chosen through competition. Moreover, it was the firm's first foray into this acoustically challenging building type. Yet the Pritzker Prize–winners' idea to place the two concert halls in a 668,000-square-foot glass structure atop the existing brick base, had captivated the public. "Both people and the press found it seductive," says Herzog. "We wanted to keep the integrity of the warehouse, with its heavy, rocky base, for parking and other uses. And because so many people were behind it, the city adopted it."

The project also includes the 224-room Westin Hamburg hotel on the east end, with interiors by Tassilo Bost of Berlin. The hotel is expected to open by the year's end, while 45 apartments on the west end are now being marketed by a local developer, with separate design firms involved in its interior architecture. The base, into which Herzog & de Meuron inserted a concrete frame, contains a third music hall, as well as studios, plus the parking and support services.

If Elbphilharmonie were a ship it might be named the Billion Dollar Baby. Mushrooming costs brought construction to a halt for almost two years, beginning in 2011, but problems among the city, the architects,

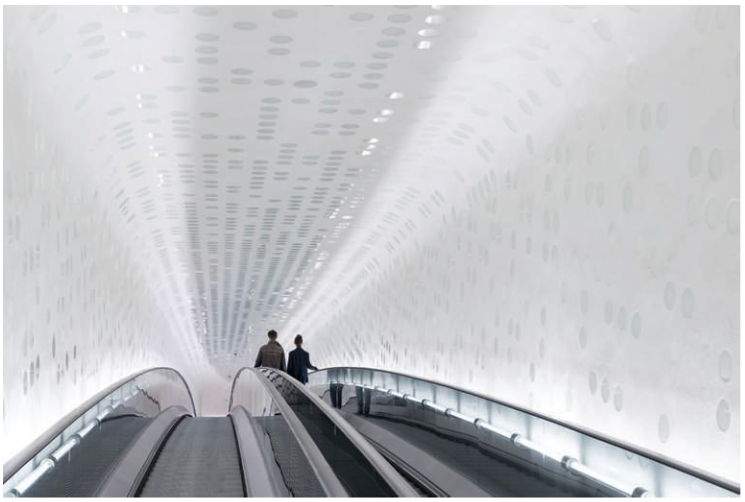


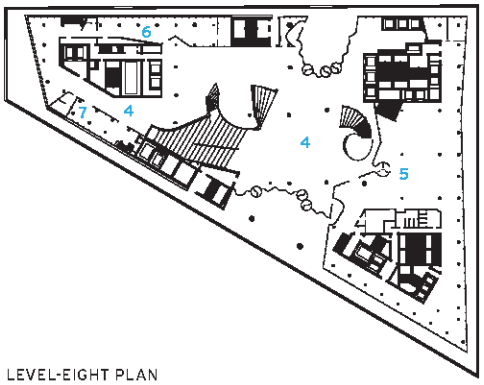
HARBOR LIGHTS
The Elbphilharmonie sits at the western end of HafenCity (opposite), a waterfront redevelopment in the active port of Hamburg. The brick base, dating to 1966, was a warehouse for cocoa, tea, and coffee. Herzog & de Meuron renovated it, adding a plaza level and a rippling glazed top that encloses two concert halls, a hotel, and an apartment complex (left).



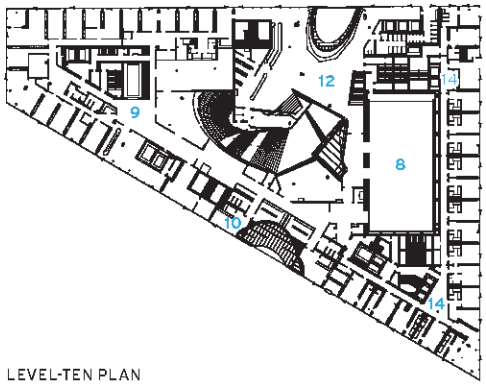
SECTION

0 50 FT.
15 M.

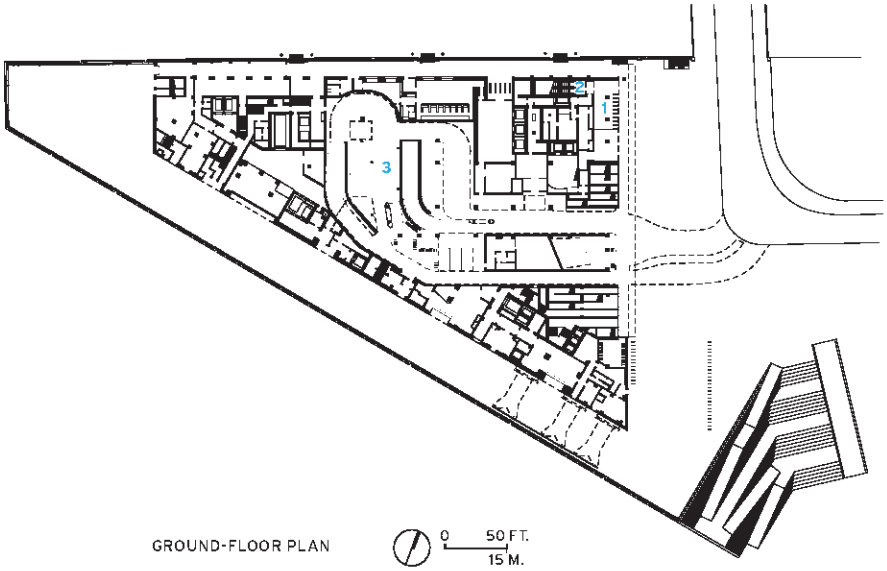




LEVEL-EIGHT PLAN

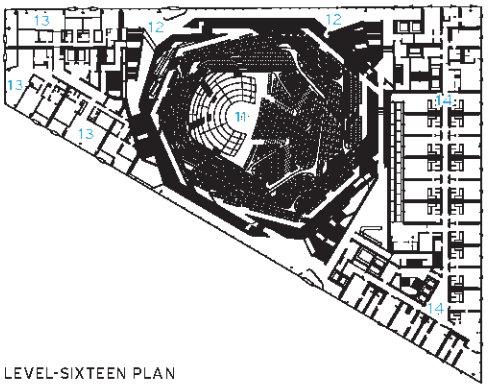


LEVEL-TEN PLAN



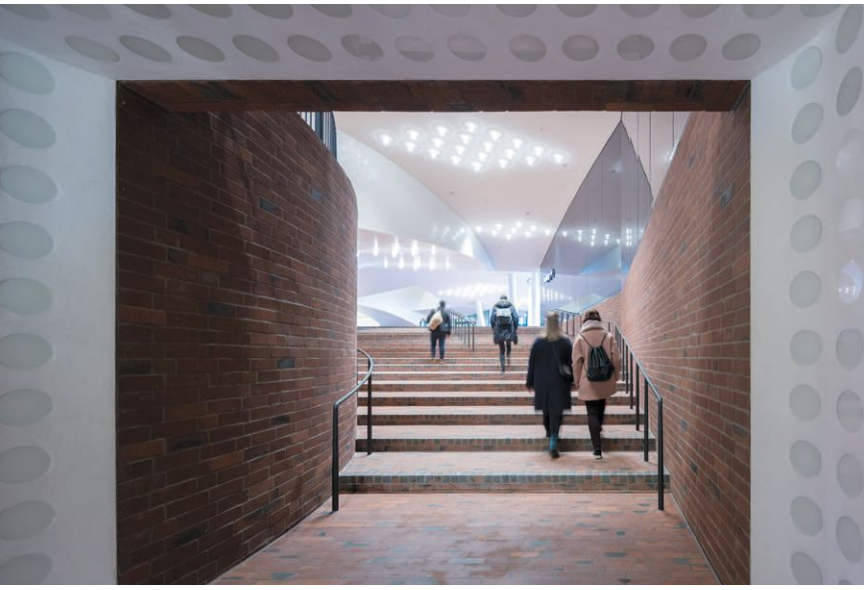
GROUND-FLOOR PLAN

0 50 FT.
15 M.



LEVEL-SIXTEEN PLAN

1 ENTRANCE
2 ESCALATOR
3 PARKING
4 PLAZA
5 HOTEL LOBBY
6 SHOP
7 CAFÉ
8 RECITAL HALL
9 BACKSTAGE
10 SOLOISTS ROOM
11 MAIN CONCERT HALL
12 FOYER
13 RESIDENTIAL
14 HOTEL
15 CONFERENCE ROOM
16 RESTAURANT
17 LOOKOUT
18 CANOPY



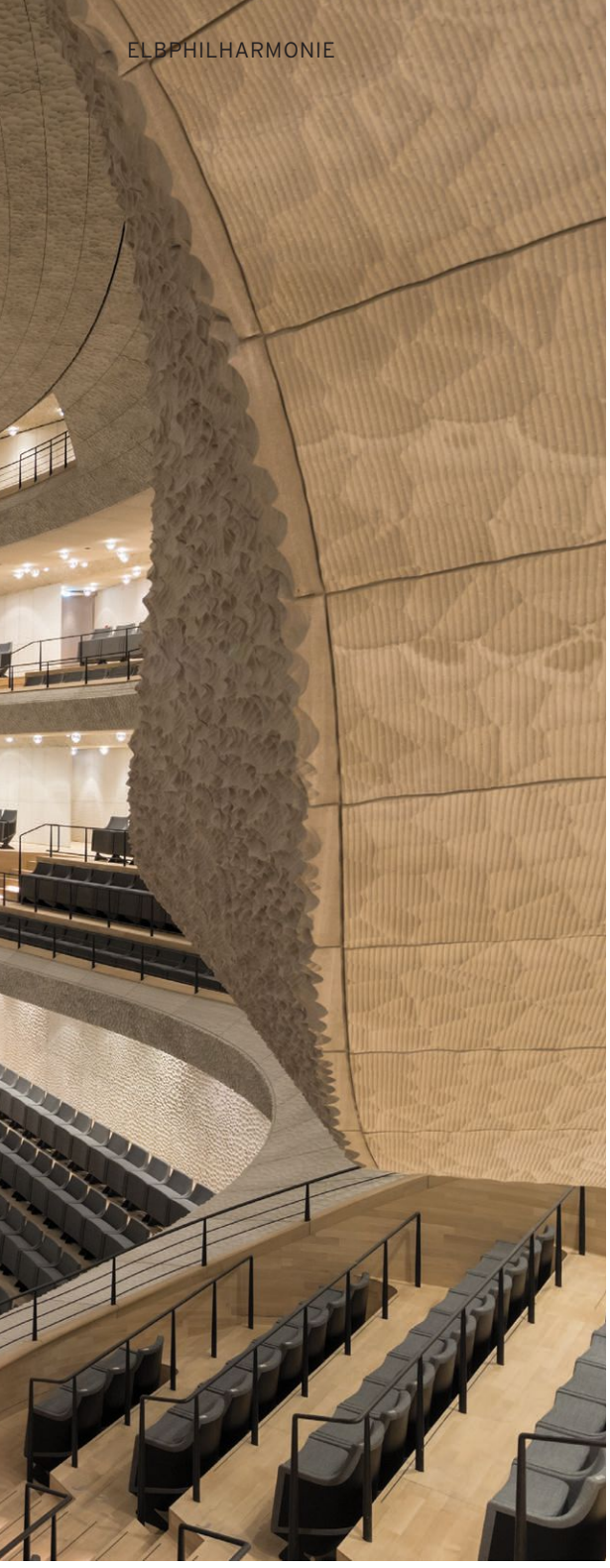
SHIMMER AND SWIRL An escalator dramatized by reflective disks embedded in white stucco walls (opposite) rises on a gentle curve to the upper levels. At the top, a brick stair takes visitors to the main plaza on the eighth floor (above). A large balcony is backed by rippled glazed panels (right), to protect against the wind while offering expansive views of the city and harbor. Broad, spiraling stairs lead up from the plaza (below) to the two auditoriums.

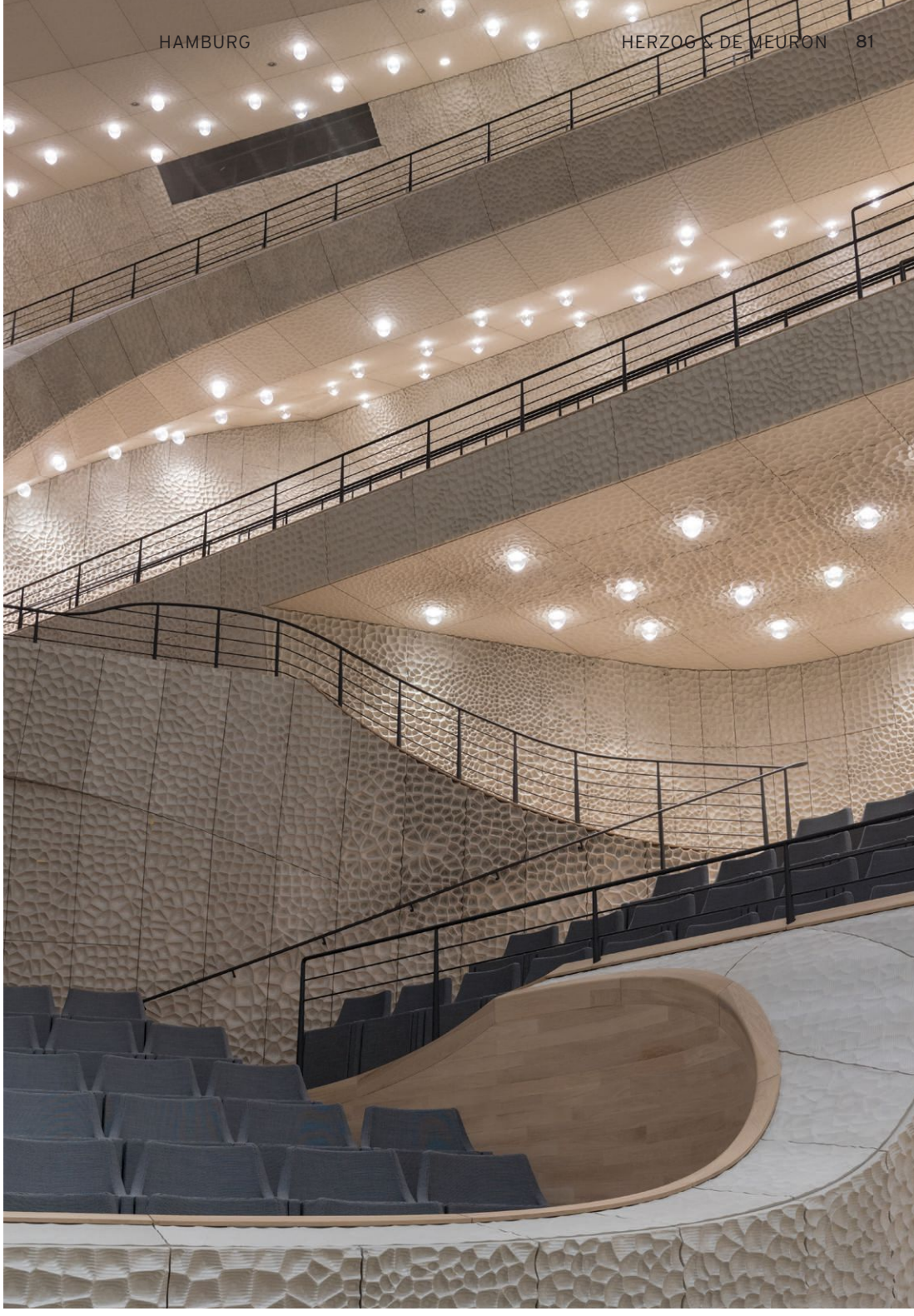
ORGANIC WORLD With the help of acoustician Yasuhisa Toyota, Herzog & de Meuron designed the 2,100-seat concert hall (above), where tiers of gray-upholstered chairs loop around the orchestra under a mushroom-shaped canopy. The team also covered walls and ceilings (opposite) with a biomorphically contoured gypsum fiberboard.

and the construction company, Hochtief Solutions, were resolved by putting a new management process in place. Nevertheless, the price tag increased tenfold, from an estimated $86 million at the start to $880 million today.

The complex design owes its "wow" factor first to the shimmering, evanescent surface that cloaks its top. Herzog & de Meuron made its name with inventive glass skins, as shown in Eberswalde Technical School Library and the Hospital Pharmacy Institute in Basel (RECORD, August 1999, page 82). With this project, the architects have taken curtain walls to a new level: the glass of the upper portion drapes and ripples like a real curtain. The exterior membrane is formed of flat and bent insulated glazing units that reflect light and change hue according to the weather and time of day. Concave and convex glass meet at perpendicular slots, where swiveling ventilation panels are inserted. To cut glare, the architects fritted two surfaces of laminated lites, which adds to the richly layered translucency of this enclosure. Another aspect of the skin game is the way the glass droops around U-shaped fiberglass elements framing the balconies.

The undulating glass floats above the sturdy reddish-brown brick of the base, once a warehouse for coffee, cocoa, and tea. While it fits in





with the 19th-century vernacular of the port structures, its severe solidity and punched windows (à la Aldo Rossi) offer a clue that it was actually completed in 1966, by Hamburg architect Werner Kallmorgen.

Visitors enter this dark bunker from the east side, where an escalator, perpendicular to the entrance facade, moves up in an arc to the plaza level. It is enclosed in a white tube that glistens with the bounced light of numerous circular discs embedded in its stuccoed interior. “We were thinking of the grand staircases of the older concert halls in Europe,” says Herzog & de Meuron partner Ascan Mergenthaler.

At the top of the escalator, visitors ascend broad brick steps leading to the public plaza. At this point in the architectural procession, they’re drawn to the view of the city through a high, arched portal that opens onto a balcony, which continues as a walkway around the building. Large swooping sheets of glass separate the space from the interior: since the plaza is intended to convey a sense of being open to the outdoors, the architects decided to create these billowing elements without mullions, leaving gaps between the glass folds so that the transparent “draperies” can be mechanically shut or opened.

Large, round, slanted concrete columns of different diameters punctuate the plaza and indicate a shift in structural forces between the brick base, with its regular grid of columns, and the upper glass portion, where loads must be carried differently because of the irregularly formed concert hall.

Swirling staircases, “like auditory canals,” Mergenthaler says, are

finished in lustrous white Venetian plaster and lead up to the two auditoriums. The main hall's steel-framed structure is separated from the rest of the building for acoustical reasons, balanced on 362 large spring assemblies. Working with famed acoustician Yasuhisa Toyota of Nagata Acoustics, the architects came up with a vineyard seating plan, following the example of Hans Scharoun's 1963 Berlin Philharmonie. Here the architecture assumes a limpid, organic fluidity to surround the orchestra with the audience. To help achieve the right resonance for concerts, the team came up with an acoustical CNC-milled gypsum fiberboard surface that is pleated, puckered, and pocked.

The cap of this remarkable journey is unexpected. By going up to the top of the complex, you find an indoor event space adjoining a small outdoor terrace, where you can see up close the white perforated-metal disks that animate the roof's wavelike contoured peaks. Here, above the halls, hotel, and apartments, you feel as if you are on a futuristic deck. It will offer a panoramic view of the city once the floor is, as promised, raised. And so at long last the ship, stunningly redeeming the effort, expense, and reputations of all involved, has come into the harbor. ■

credits

ARCHITECT: Herzog & de Meuron – Jacques Herzog, Pierre de Meuron, partners; Ascan Mergenthaler, David Koch, partners in charge; Jan-Christoph Lindert, associate, project manager; Nicholas Lyons, Stefan Goeddertz, associates, project architects

ASSOCIATE ARCHITECT: Hohler + Partner

GENERAL CONTRACTOR: Adamanta and Hochtief Solutions

CONSULTANT: Nagata Acoustics (acoustics)

CLIENT: ReGe Hamburg, for Free and Hanseatic Hamburg

SIZE: 1,292,000 square feet

COST: $880 million

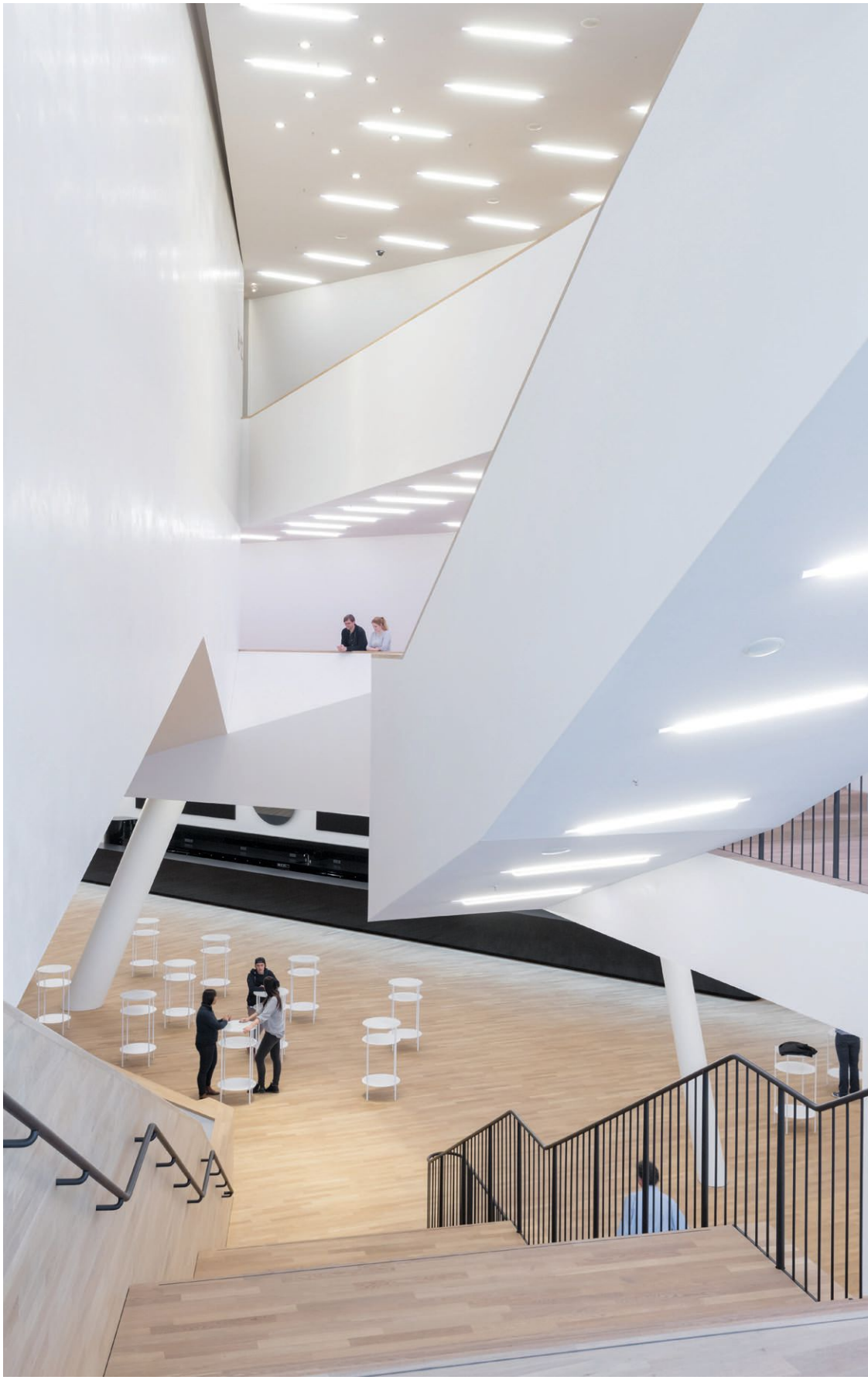
COMPLETION DATE: November 2016–January 2017

SOURCES

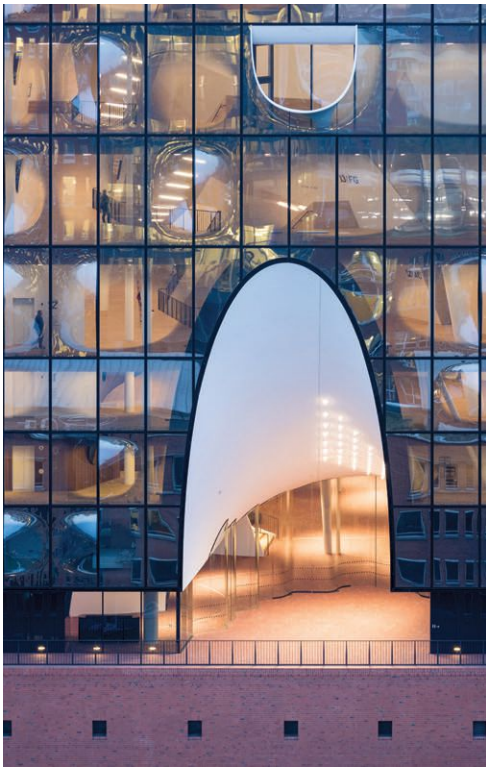
GLASS FACADE: Gartner

FLOAT GLASS: Guardian

GYPSUM FIBER PANELS, MAIN CONCERT HALL: Gifatec



AT EVERY TURN The twisting plan offers unexpected glimpses of the concert hall foyer (right). Visitors look out at the working harbor through fritted glass with bent profiles and swiveling ventilation panels (opposite, top, left). Multiple views of interior spaces are on display from outside (opposite, top, right). On the roof, white metal perforated disks add to the optical pleasure (opposite, bottom).



Audain Art Museum | Whistler, British Columbia | Patkau Architects

Lightly on the Land

A new art museum, like the work it houses, takes its cues from nature.

BY ADELE WEDER

PHOTOGRAPHY BY JAMES DOW

The new Audain Art Museum in Whistler, British Columbia, is the antithesis of the throbbing ski town around it, with its chain stores fashioned as folksy alpine chalets. The highly abstract structure, designed by Vancouver-based Patkau Architects, defers to the surrounding terrain and its wooded site. Whistler's civic leaders have long been trying to diversify their resort economy and its correlated theme-park architecture, and this museum of regional art could be the catalyst that brings a new crowd and a layer of sophistication to the city.

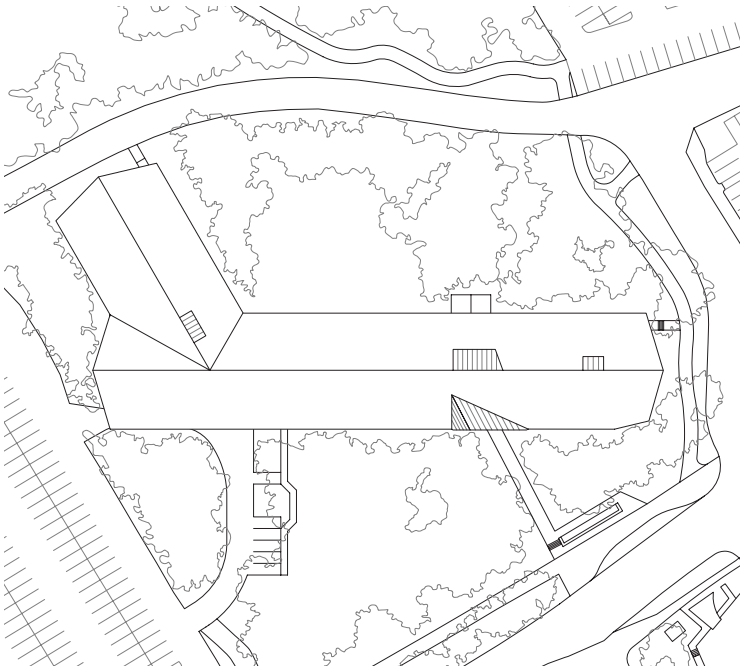
The museum's primary mandate is to display the personal collection of Vancouver developer and arts patron Michael Audain, whose holdings range from northwest coast art from the early 20th century to cutting-edge contemporary works. The municipality provided the land for the museum in the hopes that the building would serve as a cultural oasis and an enclave for quiet contemplation within the bustle of a sporting town. Their hopes are well-placed.

Led by principals John and Patricia Patkau and project architect David Shone, the museum was partly inspired by two existing museums: the Louisiana outside of Copenhagen, and the Valkhof in Nijmegan, Netherlands, by UNStudio, both of which have main circulation paths overlooking natural settings. But the conceptual prototype was the firm's own 2011 Linear House, which is a slender bar flanked by rows of trees on nearby Salt Spring Island. But for the museum, the architects added a second bar, creating a 56,000-square-foot structure with a splayed L-configuration that includes a discrete wing for temporary exhibitions.

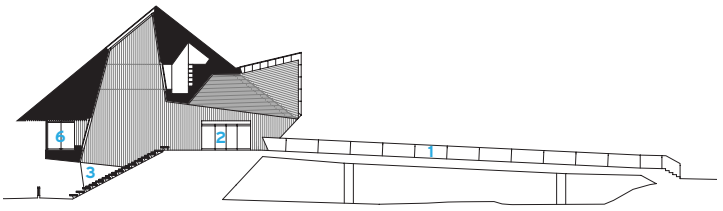
Although John Patkau modestly refers to this plan as "simple," the logistical and programmatic requirements were in fact daunting. Chief among these challenges was a budget of only $400 per square foot—roughly half the typical budget of a world-class museum. The project team also had to contend with a design brief stipulation that the permanent collection not be exposed to any daylight, a problematic restriction for a building that would display artwork heavily informed by the regional landscape. In addition, the client insisted on preserving as many trees as possible, which limited the footprint to a naturally occurring void within the forested lot. But this void was a sluiceway that carries melting snow, uprooted trees, and other debris during the annual spring thaw, sometimes at great velocities.

The solution is a bridgelike structure with a sloped roof and walls

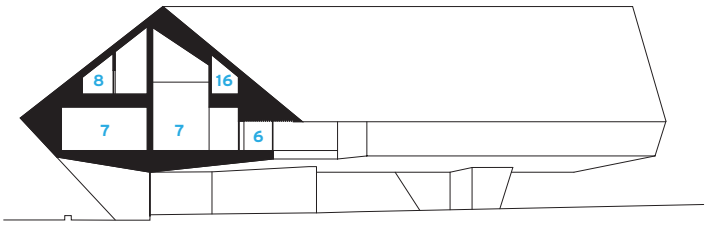
CAREFUL INSERTION
The strategic placement of the museum's narrow wings (opposite) allowed the architects to preserve almost every tree on the site while providing a wide path for the stream of melting snow that flows under the building every spring. A stair that also functions as terraced seating (this page) on the building's east side is one of two ways visitors can enter the museum.



SITE PLAN

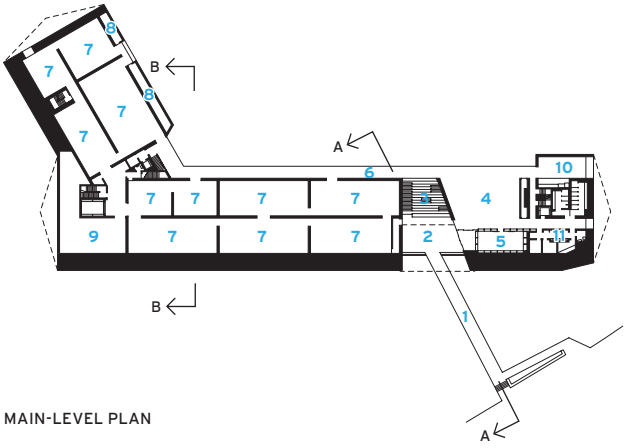


SECTION A - A

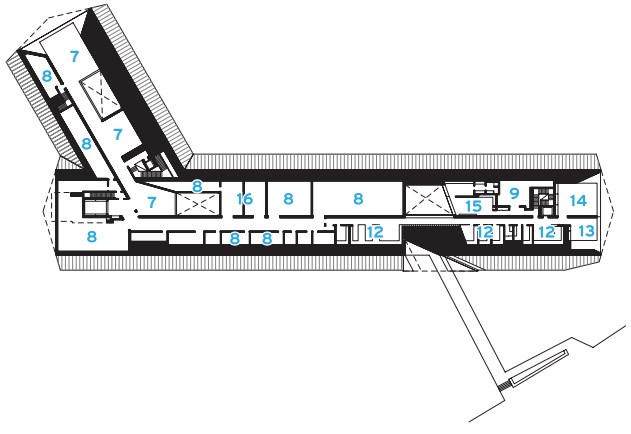


SECTION B - B

0 30 FT.
10 M.



MAIN-LEVEL PLAN



UPPER-LEVEL PLAN

0 50 FT.
15 M.

1	ELEVATED WALKWAY	6	GLAZED HALLWAY	12	ADMINISTRATION
2	COVERED PORCH	7	GALLERY	13	TEAROOM
3	TERRACED SEATING/ STAIR	8	STORAGE	14	BOARDROOM
		9	MECHANICAL	15	CARETAKER SUITE
4	LOBBY	10	CLASSROOM		
5	MUSEUM SHOP	11	COAT ROOM	16	WORKROOM

clad in dark steel. At each end, a section is anchored to the ground, generating two small lower-floor areas for services and storage, but most of the structure comprises two stories floating over the site, supported in the middle by two triangular concrete monoliths that look and act like bridge abutments. ("We've been described as an 'art ark,'" says Darrin Martens, the museum's chief curator.) Its steeply pitched roof, designed to shed snow in winter, also minimizes its bulk within the forest: this is a building that projects serenity.

The main entrance, approached from an elevated walkway, is defined by wings of slatted hemlock, crafted by local carpenters with the precision of fine joinery; it feels like walking into a giant origami volume. Once inside, the visitor beholds a window-wall tableau of trees, highlighting the strong ties between nature and the collection. From there, the foyer and circulation path allow museumgoers to instantly reconnect with the building's verdant setting. The main route through the building has on one side a series of galleries and on the other side a panoramic view of the dramatic landscape that has informed or inspired much of the artwork within.

The gallery sequence begins with historic aboriginal art. This room is characterized by subdued lighting and dark-gray walls, the somber hue conveying the spiritual, organic context of this work. From there, the visitor has the choice of either stepping back into the glazed corridor or continuing onto a series of interconnected white-walled galleries focusing on recent and contemporary British Columbian work.

The upper floor contains galleries, back-of-house areas, and administrative space. Though largely windowless, these staff areas are made congenial by strategic skylighting, an all-white palette, and sloped walls (generated by that steeply angled roof), which gives them

MAKING AN ENTRANCE
Visitors typically approach the museum by traversing a bridge (above) over a sluiceway, onto what the design team calls a "porch." This sheltered outdoor space is framed by planes of slatted hemlock and anchored by a large cylindrical sculpture by Squamish artist Xwalacktun. The wood slats are also used on the ceiling of the building's main circulation corridor (left), which affords a view of the wooded landscape.

VIEW FINDER Visitors can see into the main corridor and take in the landscape beyond through the glass doors of the ground-floor galleries, including one that focuses on historical aboriginal art (bottom). The folds of the ceiling in a loftlike upper-level space (left) for traveling exhibitions follow the cant of the roof.

the feeling of high-end artist's lofts. On the two lower-floor sections—the building's "feet" straddling the sluiceway—are utilitarian rooms of exceptionally generous size, for packing, unpacking, storing, and restoring works of art. "These are the spaces that we as curators fought tooth and nail for," says Martens.

Built on the historic lands of the Squamish-Lillouet aboriginal peoples, the museum seems as though it has always stood here, respectful of the land and of the culture of its original inhabitants. Its rich conceptual underpinnings, elegant proportions, and careful detailing raise it to the level of a landmark. ■

Adele Weder is a Vancouver, B.C.–based architectural journalist, critic, and curator, and the coauthor of several anthologies and monographs.

credits

ARCHITECT: Patkau Architects – John Patkau, Patricia Patkau, David Shone, Michael Thorpe, Mike Green, Marc Holland, Com Koroluk, Dimitri Koubatis, Tom Schroeder, Luke Stern, Peter Suter, David Zeibin, project team

ENGINEERS: Equilibrium Consulting (structural); Integral Group (m/e); Creus Engineering (civil); Spratte Emanuel Engineering (envelope); Mountain Resort Engineering (snow management); Kerr Wood Leidal (flood-proofing); LMDG (code); Geopacific Consultants (geotechnical)

CONSULTANTS: PFS Studio/Tom Barratt (landscape); HLB Lighting Design (lighting); Lord Cultural Resources (museum consultant); Bricault Design (exhibition design)

GENERAL CONTRACTOR: Axiom Builders

CLIENT: Audain Art Museum

SIZE: 56,000 square feet

COST: withheld

COMPLETION DATE: March 2016

SOURCES

METAL CLADDING: Pocklington Building Systems

CURTAIN WALL/SKYLIGHTS: Kawneer

GLASS: Guardian Industries

STRUCTURAL STEEL: Cast Connex

FLOOR TILE: Lea Ceramiche

INTERIOR AMBIENT LIGHTING: LSI; Element; MP Lighting; Soraa; Erco; Dasal Industries; B-K Lighting; LED Linear; Twice Bright

HARDWARE: Sargent; Dorma; Von Duprin; CRL; Canadian Builders Hardware; Cobra Integrated Systems

ART ARK
The sloped roof and angled facades help diminish the museum's bulk and make it appear as though it floats above its site.

THREE'S COMPANY OMA New York designed the Faena Forum, Faena Bazaar, and Faena Park along Collins Avenue. The round-fronted Forum is the centerpiece for the new six-block Faena District in Mid-Beach (this image and right).

Faena Forum | Miami Beach, Florida | OMA New York

White Hot

A trio of buildings anchored by a cultural center aims to reenergize a neglected beachside district.

BY BETH BROOME

PHOTOGRAPHY BY IWAN BAAN

A Miami Beach vacation usually has more to do with the fulfillment of hedonistic pleasures than sating an appetite for the arts. But the Faena Forum, a cultural center designed by OMA New York, has been charged with bringing enlightenment to a new development in the midst of this famous Florida resort city.

In 2011, Argentinian hotelier and developer Alan Faena, with his partner Len Blavatnik, purchased a six-block parcel in Miami Beach. Bisected by Collins Avenue, the property occupies a sliver of land in Mid-Beach, squeezed between the Atlantic Ocean and Indian Creek—an area that had struggled as the adjacent South Beach underwent its renaissance. With the Argentine economy suffering, the developer's eponymous Faena Group embarked on a plan to create the Faena District in Miami. Modeled after his recently completed development in Buenos Aires's Puerto Madero Waterfront, the project aims to breathe new life into the precinct by creating a "neighborhood" centered on art and culture.

As he had done in Argentina, Faena brought in a diverse group of collaborators. He recruited Foster + Partners to design a swoopy luxury condominium tower, Faena House (2015), and called on producer/director Baz Luhrmann and his partner and wife, film producer and designer Catherine Martin, to conceive interiors for the 1948 Saxony Hotel in its new incarnation as the Faena Hotel Miami Beach. For the

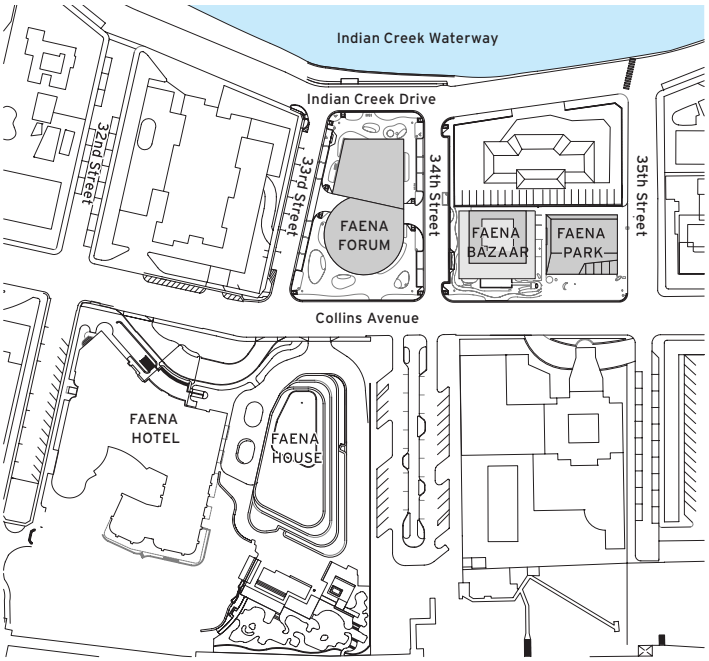
SLICE OF LIFE The architects extracted a wedge from the cylinder to create a protected entry next to a reflecting pool (left). A pink-concrete stair curves up to events spaces, which start on the second level, addressing rising water concerns. A garage (opposite, bottom) is animated by its perforated precast panels and exposed vehicle and passenger lifts, and links to the Bazaar.

final three lots, on the Indian Creek side, Faena wanted to make a special cultural center as the heart of the complex and enlisted OMA New York to create the Faena Forum, with programming by the nonprofit FAENA ART. The commission included reinventing the low-slung 1939 Atlantic Beach Hotel to the north and designing a parking garage next to that. "We got the great minds of the world working together to push the envelope for how this utopian place should be," says Faena. By bringing in OMA, there was "no doubt that the Forum would make a strong statement, not only in Miami Beach but also to the world."

The beach side and Indian Creek side of Collins Avenue have distinctly different personalities, with high-rise luxury hotels and condos lining the former, and more modest, lower-scale construction the latter. Rather than conceiving the Forum as a single, monolithic building, the architects subdivided it into two connected volumes—a cylinder and a cube—avoiding a hierarchy by bringing its scale down to that of the Atlantic Beach Hotel. As they intended, the curved form of the Collins Avenue-facing cylinder resonates with the surrounding Art Deco vocabulary, while the more prosaic creekside box speaks to the residential zone across the water. Removing a wedge from the cylinder's base, the architects fashioned a grand arrival area shaded by the cantilever above.

Of course, says Shohei Shigematsu, partner and director of OMA New York, creating the heart of the complex on the "wrong side" of Collins Avenue was a challenge, but one the architects were able to turn to their advantage: "It enabled us to make this jewel of a cultural building at an intimate scale embedded in the residential area," he says. The team employed structure-stress diagrams to determine the distinct fenestration for the structural facade. A series of arches and catenary curves in combination with a row of vertical columns—spaced as widely as possible while still meeting hurricane requirements—imbues the squat building with a strong street presence. While white concrete proved impractical, the architects covered the concrete-framed Forum with a lime-based stucco, achieving a Miami gleam. "We made it of the place," says OMA partner and project manager Jason Long.

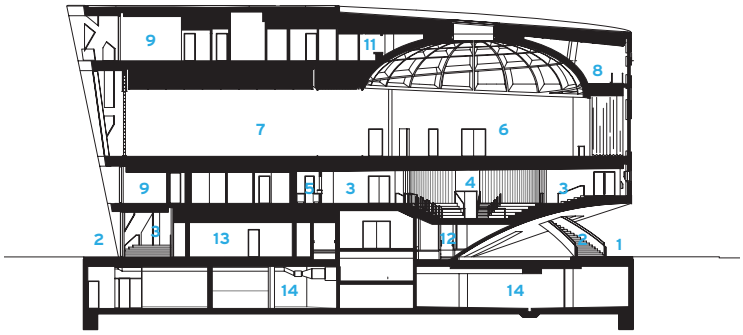
To comply with 100-year flood requirements, the team used the ground floor



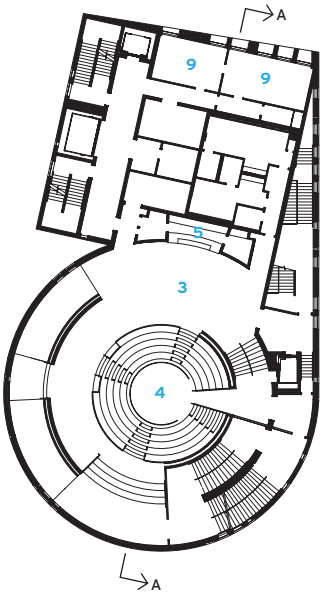
SITE PLAN

0 100 FT. 30 M.

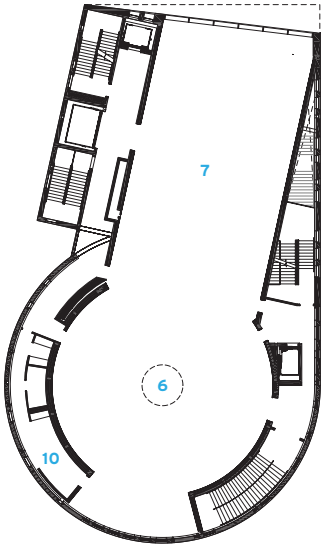
1 PLAZA
2 ENTRANCE
3 LOBBY
4 AMPHITHEATER
5 CHECK-IN/BAR
6 DOME
7 BLACK BOX THEATER
8 SPIRAL BALCONY
9 MEETING ROOM
10 GREEN ROOM
11 CONTROL ROOM
12 BACK OF HOUSE
13 KITCHEN
14 PARKING



SECTION A - A



LEVEL-TWO PLAN



LEVEL-THREE PLAN

0 20 FT. 6 M.

principally for back-of-house functions and employed flood doors at this level. The municipality is in the process of raising the road that runs alongside Indian Creek, which will add a buffer in the event of rising water. Visitors enter the building up a curving stair leading to the second level, and the first of three main venues, which will support a wide variety of events, from dance to music productions to art exhibitions, weddings, and corporate gatherings.

Here the architects carved out a pre-function area and an amphitheater clad in Rosa Portugal marble. Above is the Assembly Hall, occupying both the cylinder and cube volumes, which can seat about 750 people or be divided in two by large, sound-insulated panels. The cylinder portion rises 40 feet to a coffered dome (with a central oculus), which mirrors the amphitheater below. The venue "helped accentuate the concept of two distinct spaces, with the dome side being more classical," notes Long, adding that the clients referred to the Belle Epoque when articulating their

vision. A ramp coils around and up the concave side of the dome, offering different vantage points on the performance space below, views out through the arrhythmic openings to Collins Avenue and the ocean, and a somewhat awkward glimpse of the dome's top, where it bumps into the sloping ceiling plane. The path comes to an abrupt conclusion where it connects to the cube at its upper level, which was originally designed as guest rooms for visiting artists but will be converted to meeting rooms. The black box theater within the cube looks out to the creek through large expanses of glass.

Overall, the interiors lack a strong personality. It may have something to do with the varied programming they must accommodate or hint at the building's former intent: the Forum was originally conceived in part as an extension of the Faena Hotel, with its ample event and function spaces. When construction was under way, the district received a new zoning designation, allowing for uses beyond hospitality and residences on the west side of Collins. While this shift will help the Faena Forum achieve its ambitions as a cultural center, it seems unlikely the event spaces will be able to shake the hotel ballroom aura.

The two buildings to the north were part of the package deal for OMA. While restoring the former Atlantic Beach Hotel proved impractical, the architects laser-surveyed, razed, and replicated it (with a few contemporary interventions), according to historic preservation mandate. The program for this nondescript building has shifted over time, though as the Faena Bazaar it will, when completed, house retail

PHOTOGRAPHY: © KRIS TAMBURELLO (BOTTOM)

UP AND AWAY
A coffered dome (opposite) rises 40 feet to an oculus. The open space here can host a range of events, from concerts to exhibitions. A balcony (above), topped with a pink perforated-metal ceiling, spirals up and around the dome, offering new vantage points for activity below. The second-level amphitheater (left) provides a venue for more intimate events.

and dining. OMA's chunky parking garage next to it is a handsome bookend to the development. It connects to an underground facility and, with its elegant punctured precast-concrete facade and exposed vehicle and passenger lifts, continues the local tradition of elevating this mundane building type.

While right at home in Miami Beach, the three new buildings do not share the same fearless spirit of much of OMA's work. As the centerpiece, the Faena Forum raises its voice through its forms and fenestration without being outspoken. ■

credits

ARCHITECT: OMA New York – Shohei Shigematsu, Jason Long, partners; Jake Forster, associate in charge; Clarisa Garcia Fresco, Paxton Sheldhal, project architects

ARCHITECT OF RECORD: Revuelta Architecture International

CONSULTANTS: Kimley-Horn (civil); DeSimone (structural); Hufsey Nicolaides Garcia Suarez (m/e/p/fp); Raymond Jungles (landscape); Tillotson Design Associates (lighting); Electro-Media Design, Stages (acoustic)

CLIENT: Faena Group

SIZE: 42,565 square feet

COST: withheld

COMPLETION DATE: November 2016

SOURCES

CURTAIN WALL, WINDOWS: Giovanni Monti & Partners, Schüco

LIMESTONE PLASTER: Thermocromex

ALUMINUM CEILING: Hunter Douglas

LIGHTING CONTROLS: Lutron

National Music Centre of Canada
Calgary, Alberta | Allied Works Architecture

High Note

A spectacular new building celebrates Canada's musical heritage.

BY JOSEPHINE MINUTILLO

PHOTOGRAPHY BY JEREMY BITTERMANN

Allied Works Architecture (AWA) doesn't enter open competitions often. The Booker T. Washington High School for the Performing and Visual Arts in Dallas (RECORD, January 2010, page 100) was a rare exception for the firm. Just as that school project was finishing up, AWA principal Brad Cloepfil found the brief—and site—for the National Music Centre of Canada (NMC) in Calgary, Alberta, too intriguing to pass up. Cloepfil had visited Calgary as a teenager, making a stop in the city's infamous King Edward Hotel, which housed a seedy but much-loved blues bar. It is around that century-old landmark that Cloepfil's spectacular new building for NMC, called Studio Bell, takes shape.

By the time the "King Eddy" closed in 2004, not much was left of its East Village neighborhood. The area was decimated, with blighted buildings and vacant lots. Cloepfil was faced with a challenge: "How do you hold the site when there's nothing there?"

Instead of looking to the urban context, AWA drew inspiration from the unique Canadian Rockies landscape just outside Calgary, particularly its hoodoos, or rock formations. Cloepfil first learned about them from Clyfford Still's paintings when he was designing the Denver museum dedicated to the artist's work (RECORD, January 2012, page 70). Still had painted the hoodoos near his Bow Island home in southern Alberta in the late 1930s.

Like those rocky outcrops, the 181,000-square-foot building rises five stories as a grouping of distinct earthen-colored towers, clad in dark terra-cotta tiles. Nine variously shaped volumes rest on two pieces of property, on opposite sides of a street. A 65-foot-high bridge spans just over 100 feet across the road to connect those volumes to each other, and to the completely restored King Eddy hotel, which now houses NMC's offices, recording studios, broadcast center, and spaces for artists-in-residence and pop-up performances. The bridge was also meant as a gateway to this newly revitalized area—several condo buildings and a Snøhetta-designed library are currently under construction within blocks of Studio Bell.

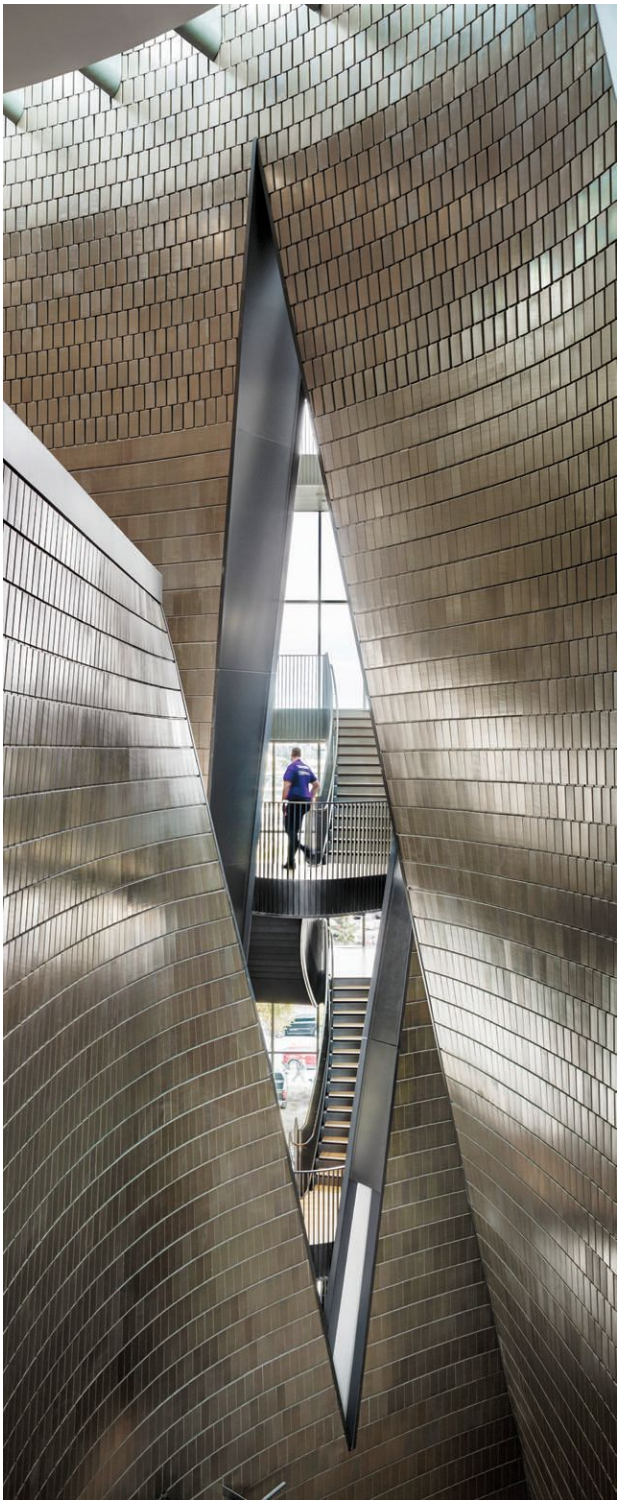
Erected with steel columns and linked with transfer beams, the nine interlocking volumes—which come together in a rectangular plan—feature orthogonal walls at the exterior perimeter and curving walls to form the bridge and the spaces between the soaring lobby, the second-floor performance hall, and galleries that wrap around it. The architect calls these interstitial spaces "moments of silence separating the resonant vessels," but it is there that the building sings.

Cloepfil actually refers to the building as an instrument, and one of the early concept models for it resembles an odd combination of strings and percussion—the towers as drums and the bridge as the neck of a mandolin connecting to the elliptical body of the lobby. While he was developing his initial design, Cloepfil was influenced by a performance of "Playing the Building," a 2008 sound installation where musician and artist David Byrne turned Manhattan's Battery Maritime Building into a giant musical instrument.

From the white limestone floor of NMC's main lobby, one can not

only see into the open 300-seat performance hall above and across it—its ceiling of hanging aluminum tubes arranged in wavy patterns is a striking scene—but listen to live concerts staged on the second level. In fact, views into that theater are possible, and sounds from it audible, throughout many of the spaces in the eastern side, or museum portion, of the building, including its helical staircases, a small interior bridge opposite the theater, and dark galleries that

MUSICAL GATEWAY The complex, known as Studio Bell, connects two properties on opposite sides of a street at the threshold of Calgary's newly emerging East Village neighborhood. It incorporates a squat century-old brick building that once housed the King Edward Hotel, the site of a legendary blues club.



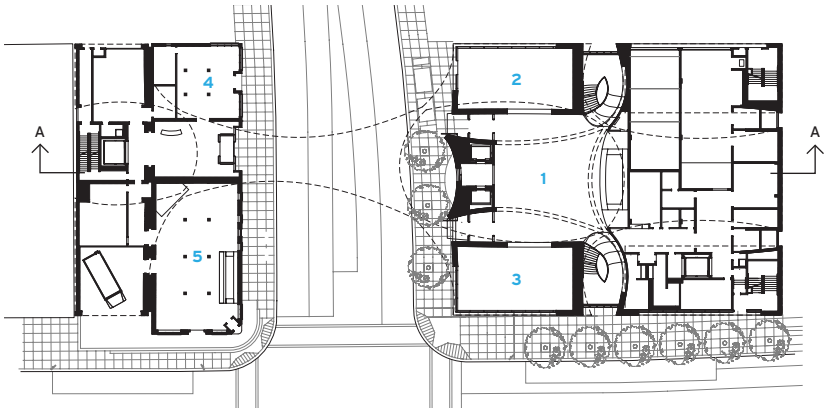
feature end-grain oak floors, and ceilings of black-painted aluminum grilles. (A movable acoustic wall to close off the performance space when desired will be installed at a later date.)

"The artists we work with embrace this idea of performing in new and innovative spaces," says Andrew Mosker, president of NMC and the driving force behind the project, who developed the program for this building as it was being designed. To fine-tune the acoustics within the multilevel open space, AWA worked with Jaffe Holden on modulating one of the design's key features. Over 200,000 terra-cotta tiles, each 15 inches by 5¾ inches and clipped onto an aluminum frame, cover much of the building. Inside, platinum-colored tiles are spaced several inches apart in certain spots and backed with black acoustical insulation for sound absorption. (Sounds from interactive galleries and daily performances on a large theater organ from the silent movie era—part of the institution's 2,000-piece collection of instruments, technology, and musical memorabilia—also animate the building.) Outside, slate-colored tiles act as a rainscreen, with looser spacing at curves and in front of windows. The only weak aspect of

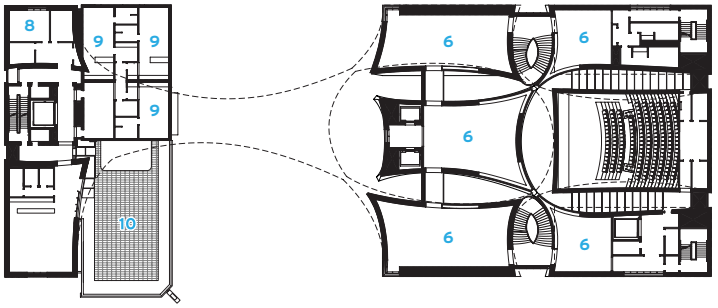
EARTHENWARE The building, inside and out, is covered in over 200,000 terra-cotta tiles. A connecting bridge rises 65 feet above the street (opposite, left). The interlocking volumes allow views between and across interior spaces (opposite, right). Music from the 300-seat performance hall on the second floor spills out to other spaces, including the main lobby below it (right). The theater's ceiling features an array of hanging aluminum tubes (above).

this strategy is where the gaps between tiles are too wide at eye level, exposing their unfinished edges and backing.

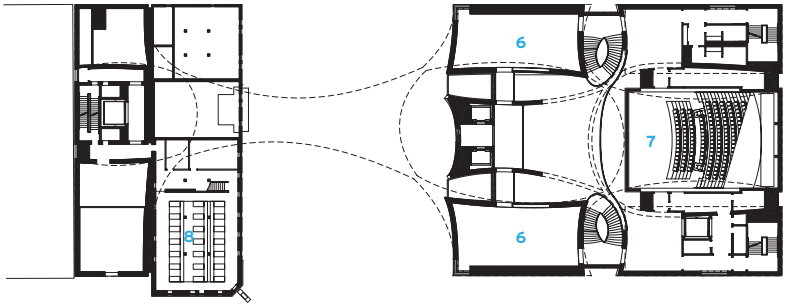
The tiles are similar to the ones AWA used to clad the Museum of Arts and Design in New York (RECORD, February 2009, page 81), but their color is closer to that of the dark brick used at Booker T. Washington High School. Here, however, the iridescent glaze



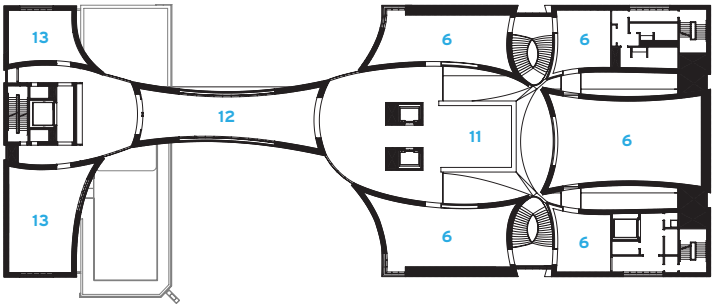
GROUND-FLOOR PLAN



THIRD-FLOOR PLAN



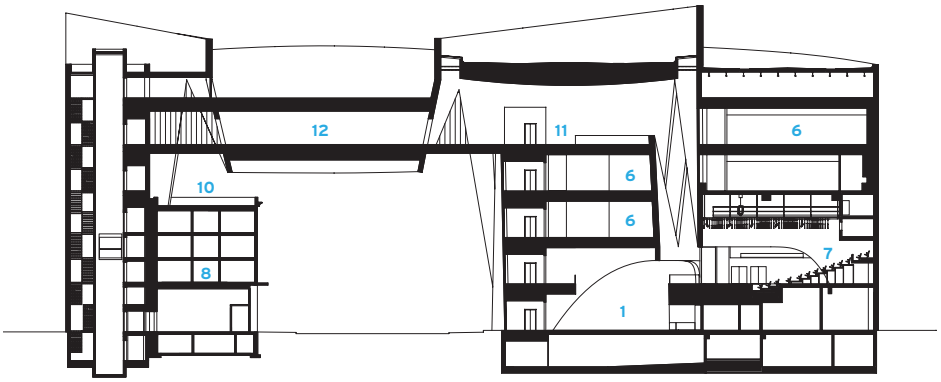
SECOND-FLOOR PLAN



FIFTH-FLOOR PLAN

0 30 FT.
9 M.

1 MAIN LOBBY
2 GIFT SHOP/CAFÉ
3 EXHIBITION SPACE
4 RADIO STATION
5 RESTAURANT/BAR
6 GALLERY
7 PERFORMANCE HALL
8 OFFICE
9 ARTIST IN RESIDENCE
10 TERRACE
11 LOUNGE
12 BRIDGE
13 CLASSROOM



SECTION A - A

0 30 FT.
9 M.

credits

ARCHITECT: Allied Works Architecture – Brad Cloepfil, design principal; Kyle Lommen, principal in charge; Chelsea Grassinger, project manager; Dan Koch, project architect; Daniel Richmond, job captain

ENGINEERS: Read Jones Christoffersen (structural); Watt Consulting Group (civil); Stantec (mechanical); SMP Engineering (electrical)

CONSULTANTS: Fischer Dachs Associates (theater); Haley Sharpe Design (exhibit design); WSP (envelope)

GENERAL CONTRACTOR: Cana Construction

CLIENT: National Music Centre of Canada

SIZE: 160,000 square feet (new construction); 21,600 square feet (renovation)

COST: withheld

COMPLETION DATE: October 2016

SOURCES

ELEVATORS: Fujitec

WOOD DOORS AND WINDOWS: Pella

LOOKING UP
The curving volumes and helical staircases combine for a dynamic spatial experience (above and left).

AT THE SUMMIT The fifth-floor lounge, known as "the Cloud," is an open space that invites reflection and offers stunning views of the interior (top). Galleries feature end-grain oak floors and ceilings of black-painted aluminum grilles (above).

(developed after much research and testing with the centuries-old Dutch ceramists Royal Tichelaar Makkum) glistens in the changing light, both on the exterior and—dramatized by a large skylight above the rounded edge of the atrium that splashes daylight on the swooping wall—on the interior.

Cloepfil counts Louis Kahn as a major influence on his work—several of the master architect's former employees taught at the University of Oregon, where Cloepfil received his architecture degree—and one can't help but be reminded of Kahn, especially his citadel at Dacca in Bangladesh, when walking through Studio Bell. AWA's new building attempts to amplify the spatial experience, bringing it to another level, with a rare quality that goes beyond any classical or parametric architectural reference. Cloepfil said that one of the best things about this project is that "we got to invent an institution," but he has done more than that. With this building, he has invented a new kind of space. ■

Look to VIRACON for **BIG** architectural glass.

Whether your project is 1-story or 101-stories, contact Viracon, the only fabricator offering a million custom options and a single-source warranty.

Glass sizes up to 130” by 236”

VIRACON®

GLASS IS EVERYTHING™

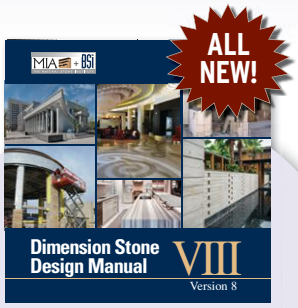
To learn more go to www.viracon.com/bigglass

CIRCLE 95

MIA + BSI
THE NATURAL STONE INSTITUTE

Your Trusted Partner for Natural Stone Information

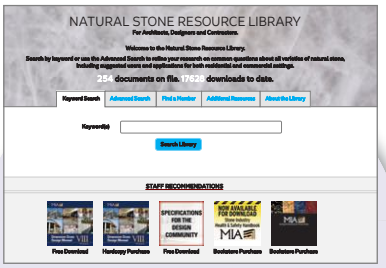
MIA+BSI is now the world's largest natural stone association, serving over 1900 member companies in 55 countries around the world. Our association is your connection to the world's most comprehensive natural stone resources.



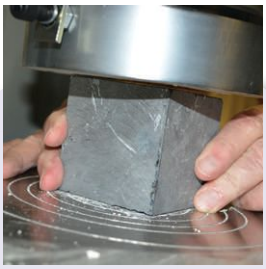
Dimension Stone Design Manual 8.0
The single-source manual for stone design and construction facts and details. Spanish, Arabic, and Mandarin translations available soon.

UseNaturalStone.com PARTNER

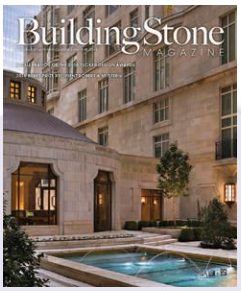
UseNaturalStone
Natural Stone Promotional Campaign
Online research often occurs before contacting or visiting a natural stone supplier. Here, articles and images answer the question of "Why Use Natural Stone?"



Natural Stone Resource Library
Find answers to common questions about suggested uses and applications of natural stone. More than 250 documents available.

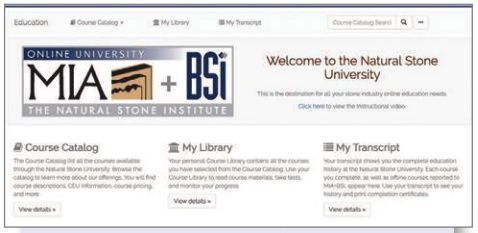


Stone Testing
Eight major ASTM and coefficient of friction (DCOF) tests performed in our state-of-the-art lab.



Building Stone Magazine
Reaching over 275,000 architect, landscape architect, interior designer and other specifier impressions in print and online.

Natural Stone Supplier-to-Buyer Manual
Assisting suppliers and buyers of stone by providing standards, guidelines, and procedures for communicating and executing supply agreements.



Natural Stone University
60+ FREE safety classes are available to enhance industry employee's knowledge. New CEU courses being added each year.

WOMEN IN STONE
POWERED BY MIA+BSI

Women in Stone
Recruit, retain, and advance women in the stone industry through mentoring, awards, and education.

Awards
The Pinnacle and Tucker Awards honor projects for the creative use of natural stone in commercial and residential applications.

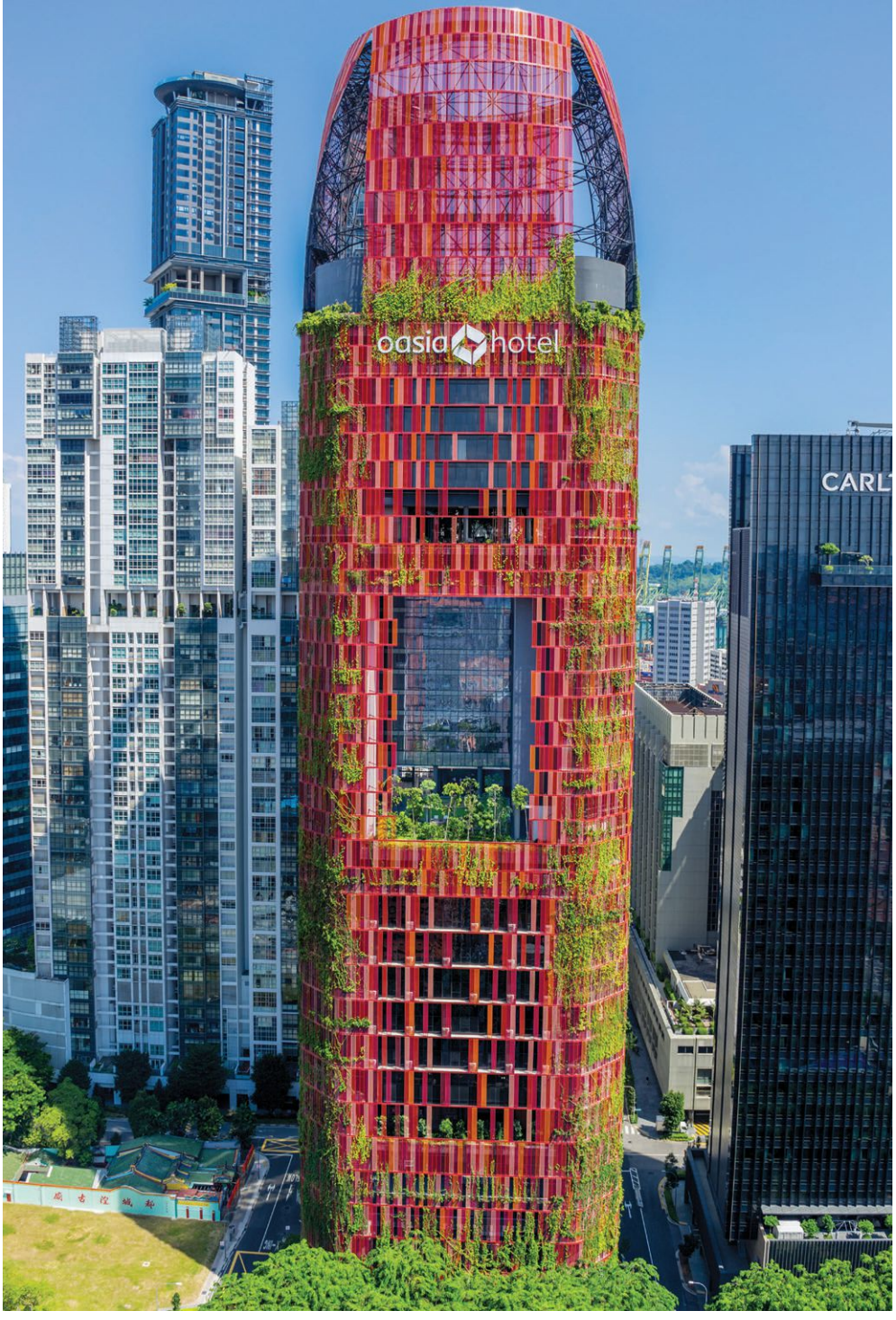
naturalstoneinstitute.org | 440-250-9222 | usenaturalstone.com

CIRCLE 166

Suite Life

Biophilic design and the hospitality sector are a natural fit.

By Katharine Logan



PHOTOGRAPHY: © K.KOPTER

IN DOWNTOWN Singapore, where high-rises are built to their lot lines, Oasia, a new 27-story hotel and office building, introduces some leafy green respite from the dense urban setting. Creeping plants of 21 different species climb across the tower's red mesh facades, hummingbirds and insects feed on nectar, and the petals of spent flowers spin down into the streets below.

New research and industry trends suggest that hotels making room for nature can reap significant advantages. "A hotel's product is its environment," says Richard Hassell, a principal at Singapore-based WOHA, architects for Oasia. When biophilic design—design that accounts for humankind's innate need for connection to nature—adds an extra level of comfort or promotes relaxation, it affects prospective guests' choices. And when, as in the case of Oasia, the hotel's facade can also serve as a marketing tool, "it's an easy sell," says Hassell. "Hospitality projects are advance soldiers in the fight to have more greenery on buildings."

The lush expression of Oasia, which opened last April, is not difficult to achieve, especially in tropical Singapore. There have been plants on buildings for centuries, and there's nothing really innovative about the technology used at Oasia. The hotel's envelope consists of an outer layer of expanded aluminum mesh, powder-coated in five shades of red, orange, and pink. Behind the mesh, painted precast-concrete panels serve as the weather barrier. Between these two layers, the creepers that climb Oasia's facades grow in giant fiberglass tubs, with a passageway for maintenance access. There's some additional expense, but according to WOHA, the cost isn't prohibitive, and may even be offset by savings elsewhere, on aluminum mesh and painted concrete cladding, for example, the combined cost of which is less than curtain wall.

What is different are the maintenance requirements. "As architects, we're trained to think that you design a building, it's made, and then it's there," says Hassell. But for a design that integrates living, growing nature to succeed in the long term, there needs to be a champion within the organization operating the building. "It can be more or less labor-intensive, depending how it's designed," says Hassell, "but it does require that someone care about it."

The biophilic design that characterizes Oasia (and WOHA's work in general) stems

VERTICAL GARDEN Creeping plants cover WOHA's Oasia, a 27-story hotel and office building in Singapore. The greenery climbs the building's outer envelope of expanded aluminum mesh, powder-coated in shades of red, orange, and pink.

from three complementary rationales. The first is stewardship of nature as cities expand: the need to create places for nature at the same time we create floor area. With increasing urbanization, to have any kind of connection to nature, we need to wrap it into our buildings.

The second rationale is "just that selfish delight that comes from living a more beautiful, peaceful, centered, and calm life when you're surrounded by nature," says Hassell. A wealth of research from many disciplines demonstrates that this effect is genuine. Since a landmark study in 1984 documented improved recovery rates and reduced requests for pain medication in hospital rooms with a view of nature, hundreds of additional studies have demonstrated the positive impacts of biophilic environments, including reduced stress, improved cognitive performance, and enhanced creativity.

The third rationale is ecosystem services—the multitude of ways natural systems support humankind. Biophilic features can often help with stormwater management, heat island reduction, and pollution mitigation, for example. Specific to the the hospitality sector, a 2014 study from the Cornell School of Hotel Administration (SHA) found that eco-certified hotels recorded higher resource efficiency for both operations and customer activities.

Another 2014 study from the Cornell SHA found that LEED-certified hotels achieved superior financial performance, with higher daily rates, compared to their noncertified competitors, for at least the first two years after certification. Although LEED doesn't explicitly require the inclusion of biophilic elements, a finding that customers will pay higher rates for a green hotel suggests economic benefits from an approach that integrates nature.

Building on the Cornell financial-performance report, a forthcoming study from Terrapin Bright Green, a New York–based green building research and consulting practice, suggests that biophilia plays a role in customer preferences. Comparing guest comments across a sample of biophilic and conventional hotels, Terrapin's researchers found the most frequent point of praise from guests who had stayed at a biophilic hotel was its design (whereas praise from guests who had stayed at one of the conventional hotels pertained most frequently to maintenance and service). This matters: according to a recent report from Deloitte, a global financial consultancy, in "the race for guest loyalty," basics like cleanliness and comfort are no longer enough for hotels to differentiate themselves from their competitors.

PHOTOGRAPHY: © PATRICK BINGHAM-HALL, EXCEPT AS NOTED; SKYSHOT PTE. LTD. (TOP)

Millennials, in particular, who will make up three-quarters of frequent business travelers by 2025, are looking for a more memorable experience.

The Park Royal on Pickering, another WOHA-designed building, which has achieved Singapore's highest environmental certification, provides an example of what the biophilic effect can mean from a marketing perspective. The 300,000-square-feet hotel and office building includes 160,000 square feet of sky gardens, so that an adjacent park appears to be stepping up and through the building. Since the Park Royal on Pickering's 2013 opening, it has enjoyed close to 100 percent occupancy, room rates double the original

URBAN JUNGLE Curvilinear gardens (above and opposite, top) are integrated into the facade of WOHA's Park Royal on Pickering hotel in Singapore. Guests can enjoy the lush greenery while walking through the outdoor corridors (opposite, bottom) and from their rooms (right).

projections, and free publicity with its image appearing on travel-related Web pages as an icon of Asia's hospitality sector. Park Royal has even seen bookings spill over to its other Singapore hotels through their association with it.

Exuberant greenery, although a dramatic expression, is not the only way to achieve biophilic effects. In a previous study, Terrapin identified three categories of biophilic design—nature in the space (the direct, physical presence of nature), natural analogs (nonliving evocations of nature such as organic sequences or shapes in artwork, ornamentation, or furniture), and nature of the space (spatial configurations that

SOFTENING THE CITY Extensive greenery that covers terraces and vertical fins on the facade of Marvel Architects' 1 Hotel Brooklyn Bridge merges the building with the adjacent park.

RENDERING: COURTESY MARVEL ARCHITECTS

resemble conditions found in nature, including those that seem to provide refuge). Together, they comprise 14 types or patterns. To identify the strongest correlations to lowering stress, improving cognitive performance, and elevating emotion and mood, Terrapin cross-checked more than 500 reports and academic publications pertaining to biophilic response, and then ranked the patterns by the strength of research supporting their effects on health and well-being.

In a post-occupancy case study of the Park Royal on Pickering, Terrapin's researchers found examples of all 14 biophilic patterns, but identified four as predominant. "Visual Connection with Nature" (the extensive greenery, both outside and in) correlates strongly to lowered blood pressure and heart rate, improved mental attentiveness and engagement, and positively affected attitude and overall happiness. "Biomorphic Forms and Patterns" (the abstracted landscape contours of layered precast concrete and interior curvilinear forms in wood) have been identified in some studies as a preferred view. "Risk/Peril" (cantilevered human-scale birdcages, perched at the end of narrow bridges and providing views of the city), when coupled with reliable safeguards, is associated with strong dopamine or pleasure responses. "Complexity and Order," in which intricate geometric patterns provide rich sensory information adhering to a spatial hierarchy similar to that encountered in nature, appears in the hotel's interior detailing (examples include a complex wood and metal lattice enclosing a spiral staircase, and wall, ceiling, and partition treatments consisting of thin slats of timber layered in a matrix); the pattern is associated with improved perceptual and physiological stress responses.

Another way of saying all this, of course, is that these patterns make the hotel's guests feel better. And when guests feel better, they stay longer and come again.

Although "selling beds" is the main source of revenue for hotels, there are others: "It used to be that the hotel lobby was the living room of a community," says Bill Browning, a partner at Terrapin. "Many of the brands are now rediscovering that lobbies can be fantastic social spaces and sources of additional revenue." To investigate the role of biophilic design in that trend, Terrapin's researchers monitored occupancy patterns in the lobbies of six Manhattan hotels, three of which had biophilic features. In the nonbiophilic lobbies, about 25 percent of users were making extended use of the lobby—buying food or drink, meeting people, working, or relaxing. In the biophilic lobbies, the proportion of extended users rose to 36 percent. In one of the biophilic hotels—one that had been designed deliberately to encourage extended lobby activities—they found that its users also included residents from the surrounding neighborhood. This provided additional revenue without the need to sell another bed.

One of the hotel brands in the lobby study, Starwood Capital Group's 1 Hotel, has put biophilic design at the center of its identity. The hotel's first ground-up new building, 1 Hotel Brooklyn Bridge, designed by Marvel Architects, with interior architecture by Incorporated, is scheduled to open in February 2017 at the edge of the East River across from Lower Manhattan.

The architecture of the 194-key-hotel/106-unit-condominium building makes these connections literally and figuratively. Extensive greenery on roofs and terraces

The NAFEM Show 17 | Booth #263 ▸ February 9-11, 2017 ▸ Orange County Convention Center ▸ Orlando, FL

the **complete** *solution*

FORTY YEARS OF INNOVATION

A Comprehensive, Integrated System from Floor to Roof.

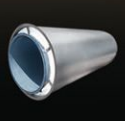

Utility Distribution System


Self-Cleaning Hood


CORE Fire Protection


Captrate© Filter


Demand Control Ventilation


Grease Duct


Exhaust Fan


Pollution Control Unit


Dedicated Make-Up Air

CAPTIVEAIRE

CIRCLE 213

www.captiveaire.com | 1.800.334.9256

CONNECTIVE TISSUE Public passageways (right) cut through the 1 Hotel building to tie the city in with Brooklyn Bridge Park and the waterfront. The interiors, designed by Incorporated, including the guest rooms (above), have rustic finishes, such as salvaged and weathered wood.

integrates the building with Brooklyn Bridge Park. The terraces, together with building-height vertical fins, evoke eroded geological formations, a reference to the bluffs in this part of Brooklyn.

The architects use this concept to make a transition between the park in front and the established neighborhood close behind. "The idea was that the building would become embedded on the neighborhood side, and riff off the bluffs on the river side," says Dennis Vermeulen, a director at New York–based Marvel. Connecting the neighborhood and park, four public passageways cut through the building. Always open, these portals include boulders, trees, plantings, and art, and are lined with yellow pine recycled from the warehouses that used to occupy the site. In creating these transition areas from the buzz of the city to the calm of the park, says Vermeulen, the architects wanted the public to feel that the building is part of the park, and part of their experience.

The interior architecture continues the use of biophilic elements to connect guests to nature, and also to Brooklyn. "In the world of hospitality now, there's an anticorporate, anti-brand approach to developing spaces," says Adam Rolston, a partner at Incorporated, also based in New York. "People want an authentic experience that connects them to the place culturally, visually, and physically."

One of the project's primary interior design strategies is to use natural and highly tactile materials that are relevant to the locale, as well as those that reference natural processes. Drawing inspiration from the history of Brooklyn's waterfront, the project uses salvaged and weathered woods throughout—as a ceiling treatment evocative of the former warehouses, as a lining for elevator cabs, and as millwork in guest rooms. Board-formed concrete complements the wood. Stone for a massive white granite stair in the lobby comes from the same quarry as the Brooklyn Bridge. Carpet patterns throughout the hotel are generated from photographic images of rusted-steel ship hulls and digitally printed onto the carpet. "Almost every material had to have some effect of weathering, oxidation, or being somehow wrought," says Rolston. To elaborate the material connection to nature and place, Incorporated collaborated with local fabricators, inviting them to suggest materials and methods and allowing these suggestions to influence the development of the hotel's aesthetic.

Starwood Capital had experience with incorporating natural materials into 1 Hotel's two other locations. Waad El Hadidy, a designer with the company, predicts people will connect with the highly textured and narratively rich finishes of the 1 Hotel Brooklyn Bridge. "We get asked all the time, 'What does this come from?'" she says. "Not only guests, but hotel staff too are genuinely interested. People are drawn to touch things that have a story." ■

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

Continuing Education

To earn one AIA learning unit (LU), including one hour of health, safety, and welfare (HSW) credit, read "Suite Life," 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 Outline the ecosystem services that biophilic elements can provide.

2 Describe some of the impacts that biophilic elements can have on the health and well-being of building occupants.

3 Identify the approaches to biophilia that are most appropriate to the hospitality sector.

4 Describe how biophilia was incorporated into the Park Royal on Pickering and the Oasia, both in Singapore, and the 1 Hotel Brooklyn Bridge, in New York.

AIA/CES Course #K1612A

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

RENDERINGS: COURTESY STARWOOD CAPTIAL (LEFT); MARVEL ARCHITECTS (RIGHT)

Sweetstakes

Enter to win an Eames® Lounge Chair & Ottoman at Sweets.com

Sweets

Building Product Selection Made Easy

CIRCLE 172

ARCHITECTURAL RECORD

2016

BEST IN CATEGORY

SoftFold® Acoustical Ceiling System

Chosen as the 2016 best product in the finishes and surfaces category, Arktura's SoftFold® ceiling system offers an award winning combination of modular scalability, ease of installation, dynamic design, and high performance acoustical attenuation. This acoustic quality is achieved through its folded geometric design made of Arktura's Soft Sound® material, primarily sourced from recycled post-consumer bottles, and providing an NRC rating up to 0.75.

ARKTURA

arktura.com/softfold | info@arktura.com

Fueling Possibilities®

CIRCLE 139

FABRIK ARCHITECTURAL MESH SYSTEM, PAGE 114

Record Products 2016

Products incorporating sensors and connected systems, as well as those that benefit from engineering breakthroughs and that are produced via digital technologies, dominated ARCHITECTURAL RECORD's Products of the Year competition. Foreseeing this trend, we have added a ninth category – Hardware, Software & Control Systems – to the annual contest. We also ensured that the jury of architects, lighting designers, and interiors experts had extensive knowledge of engineering and production methods. Each of the six jurors rated this year's 425 entries according to usefulness, aesthetics, and degree of innovation. The winners and their flashes of genius are showcased on the following pages.

BEST IN CATEGORY *BEST IN CATEGORY denotes the winner that received the highest total score in the group from the jurors.*

EDITORS' CHOICE *EDITORS' CHOICE denotes the RECORD staff's selection from among the category's top-scoring entries.*

Written by **Linda Lentz, Rita Orrell, and Julie Taraska**
Edited by **Julie Taraska**
Jurors' portraits by **Jenna-Beth Lyde**

Jurors *All jurors are based in New York City*

Taylor Aikin, AIA
As senior project architect and associate at Murphy Burnham & Buttrick, Aikin leads the firm's efforts in design, presentation graphics, and digital technologies. His many awards include Honors for Excellence in Design from his alma mater, Columbia University's Graduate School of Architecture, Planning and Preservation.

Carrie Bobo
A project architect at Selldorf Architects, Bobo has served as an architectural designer and manager at A+I Design, Walsh and Purdy, and Eight, Inc. The Oklahoma native, who received an MFA from the New York Academy of Art, also is an accomplished figurative painter whose work has been exhibited around New York City.

Melissa Goren, PE, LC, LEED AP BD+C
A licensed professional engineer, Goren has over 15 years' experience creating lighting designs for research, corporate, and health-care facilities including the NYU Langone Medical Center's Emergency Department and Columbia University's Butler Library. She serves as the studio manager for LightBox Studios.

Meena Krenek, IIDA, LEED AP
Krenek is the interior design director of Perkins + Will's New York office, where she specializes in using visual storytelling – including text, graphics, and experiential design – to strengthen a sense of place. She is also the winner of three ASID Annual Design Excellence Awards from the Georgia Chapter.

Enrique Peiniger, Assoc. AIA, CLD, IES
Peiniger is an engineer, architect, and founding principal of OVI (Office for Visual Interaction), a New York–based firm specializing in lighting design for architecture. Projects include Zaha Hadid's 520 West 28th Street residential building in New York and the Scottish Parliament in Edinburgh.

Barry Richards
Richards is a principal and studio leader at Rockwell Group, where he focuses on products, productions, and playgrounds. A trained architect, he oversees the firm's furniture, lighting, and textile collections. He also creates stage sets, including those for the 81st Annual Academy Awards and the Broadway version of *Hairspray*.

Facades

Cladding | Glazing | Moisture Barriers | Roofing

BEST IN CATEGORY

Fabrik

This dry-joint architectural mesh system comprises a flexible steel framework into which component materials—such as terra-cotta, glass, or wood—can be woven horizontally, vertically, or in a pattern. The large-scale sheets may be shipped folded or rolled in coils and erected via crane to accelerate construction. The mortarless Fabrik may also be easily repaired and recycled. shildan.com

CIRCLE 36

Houdini Channel Glass

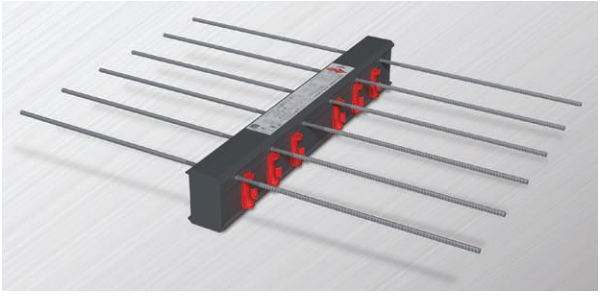
Featuring 40% recycled content, Bendheim's micro-fluted low-iron glass provides privacy, reduces glare, and allows for up to 85% light transmission. The channels can be installed horizontally or vertically; face widths range from 9" to 19" and lengths span to 23'. A tempered form of the ¼"-thick glass is available for higher wind loads. bendheim.com

CIRCLE 37

Poplar Wall Covering

These handcrafted coverings are made from repurposed poplar bark, a waste by-product in furniture and plywood manufacturing. Interior and exterior options include panels up to 12' long x 8' wide and shingles in three standard lengths. All the pieces can be treated with finishes, sanded to reveal their grain pattern, and laminated to numerous substrates. barkhouse.com

CIRCLE 38



HIT MVX Thermal Connection

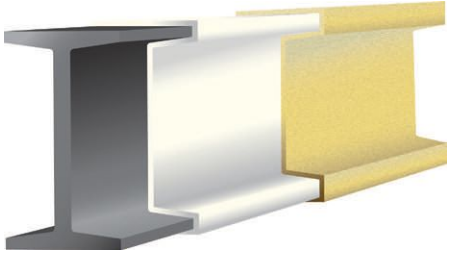
An insulated connection for cantilevered balconies, the HIT MVX utilizes a double-symmetrical compression shear-bearing pad made of mortar—rather than the typical steel—to eliminate cold bridges and lower overall thermal conductivity. Element heights range from 6¼" to 12", while widths run from 10" to 39". All pieces have a two-hour fire rating. halfenusa.com

CIRCLE 39

Series 4500 SSG Unit-Glaze Window Wall

This aluminum-frame system has a split-mullion design and gravity-loaded sill flashing that allows its preglazed sections to snap together on the jobsite, saving construction time. Its double thermal system with 1" insulating glass also offers superior protection against air and water infiltration. The extruded frames come in two sizes and in an array of coatings and finishes. crl-arch.com

CIRCLE 40



Aerolon Series 961

Tnemec's new formulation of its water-based acrylic coating uses aerogel to create a non-structural thermal break in building envelopes. The spray-on formula—which offers a K-Value of 35mW/mK—makes shims and break pads on exterior-to-interior incursions unnecessary. A Class A fire retardant, the low-VOC coating is compatible with a variety of primers and topcoats. thermalbreak.tnemec.com

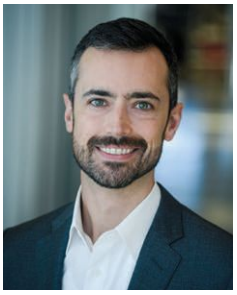
CIRCLE 41

Engineered Cedar Shake

Made with recycled resins, these roofing tiles mimic the look of weathered wood but are more durable, resisting fire, moisture, insects, and impact. The tiles, which can be cut and scored with a utility knife, attach with nails and do not require additional framing. They are available in multiple width sizes, staggered or straight exposure, and in a gray or brown color family. plygem.com

CIRCLE 42

"The diversity of applications, range of infill materials, and quality of aesthetics make Fabrik a very exciting product."
Taylor Aikin



Timber End Connectors

Balancing engineering with aesthetics, these cast-steel fittings for architecturally exposed areas connect the ends of heavy timber or glue laminated structural elements. The units are suited for a building's primary or secondary structural framing and come in both a standard clevis-type fitting and custom designs. castconnex.com

CIRCLE 82

InsulTech

A combination of three products, InsulTech comprises a preassembled structural masonry unit, a molded high-performance Neopor EPS insulation insert, and a thin veneer face. The 12" x 8" x 16" blocks are water-repellent and offer an effective R-value of 16.2 at 75°; they also come in over a dozen veneer colors. echelonmasonry.com

CIRCLE 43

EDITORS' CHOICE

FibreC Formed Parts

Formerly produced only in flat sheets, this glass-fiber-reinforced concrete cladding now comes in U- and L- shapes as well as curved parts. These ½"-thick pieces—available in sizes up to 4' x 15'—may be mounted directly onto a curtain wall, saving construction time. Noncombustible and 100% recyclable, the parts may be specified in 12 colors and three textures. rieder.cc

CIRCLE 83

Finishes & Surfacing

Ceilings | Flooring | Textiles | Wall Treatments

BEST IN CATEGORY

SoftFold

This modular acoustical ceiling with a parametric design is scalable, easy to install, and offers an NRC of 0.75. It is constructed of Soft Sound—a proprietary material made of 100% PET plastic with up to 50% recycled content—and has a Class C fire rating. arktura.com

CIRCLE 84

Paper

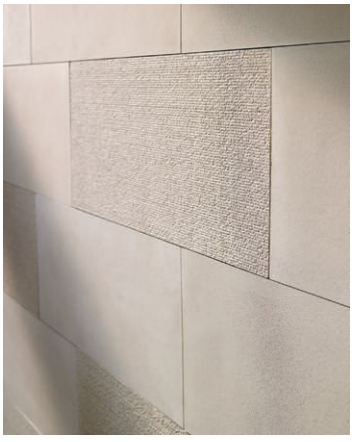
Featuring a graph-paper pattern, Ornamenta's 24"-square rectified tiles feature a special glaze that allows them to be written and drawn upon like a chalkboard. The porcelain grès tiles come in three colors and can be used on floors and walls in residential and commercial settings. ornamenta.com

CIRCLE 86

Zen24

Zen24 is a concrete aggregate that is half the weight and one third the cost of the real thing. The stone surfacing offers a texture reminiscent of raked sand and comes in three neutral colors. Its large format (12" high x 24" long x 1" deep) makes it suitable for sizable interior and exterior applications. eldoradostone.com

CIRCLE 85



Plaid

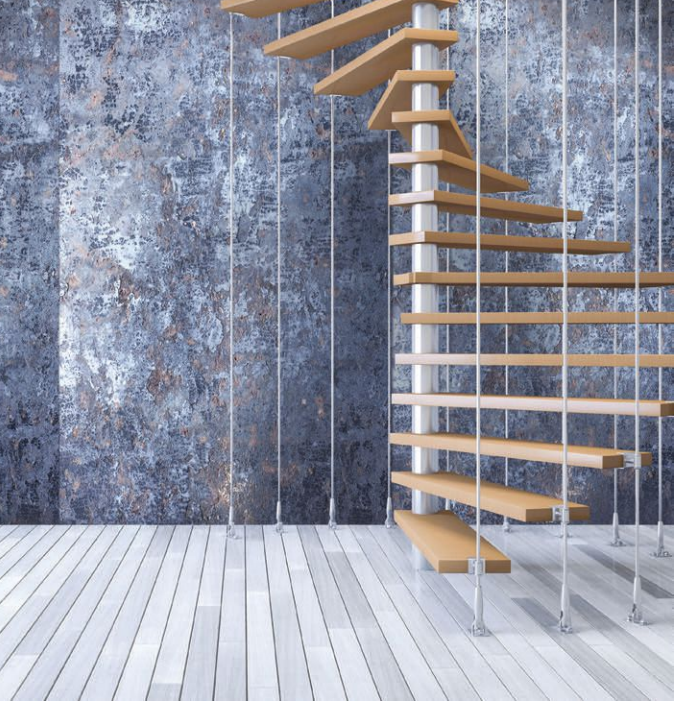
The woven-vinyl textile uses 14 different colors of thread to create a bold pattern that does not need to be aligned. Made of TerraStrand yarn, which contains phthalate-free renewable vegetable compounds, Plaid is available in plank and square tiles as well as wall-to-wall flooring. Its Microban antibacterial protection also inhibits the growth of bacteria, mold, and mildew. chilewich.com/contract

CIRCLE 87

Extraordinary Collection

This offering includes three 12" x 48" designs that can be used alone or together to generate varying degrees of texture. The collection, which is Cradle to Cradle Silver–certified, utilizes a special process whereby stray ends of yarn that are typically sheared after tufting are left on the carpet face to serve as a design feature. shawcontract.com

CIRCLE 88



Blenz Patina

Blending color and texture, this metal surfacing collection features variegated earth tones suitable for use on walls, columns, and facades. The lightweight, solid-core aluminum material is available in 48" x 96" and 48" x 120" sheets; it is easy to clean and install. Custom options are also available. mozdesigns.com

CIRCLE 89

"Sculptural and faceted, SoftFold is beautifully crafted. Its acoustic properties are excellent too."
Meena Krenek

Christiane Müller Collection

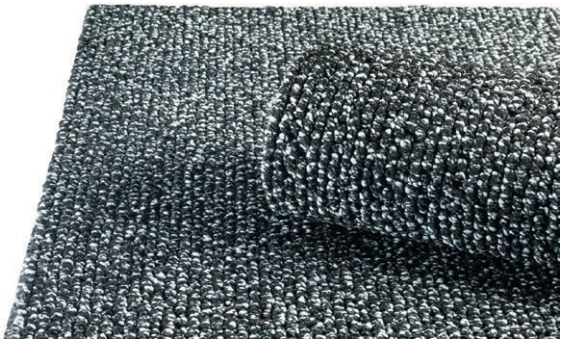
For her eponymous HBF Textiles collection, Amsterdam-based designer Christiane Müller drew inspiration from the abstract paintings of Dutch artist Jan Schoonhoven and the minimalist architecture of Peter Zumthor. The line's seven designs (Smart, pictured) play with texture and pattern and come in a range of 45 colorways. hbftextiles.com

CIRCLE 100

Dekton Trilium

Made of 60% recycled material, this Dekton ultracompact surface replicates the texture and color variation of aged and oxidized stainless steel, with hues ranging from deep grays to rusty undertones. It can be used for both indoor and exterior surfaces and is impervious to stains, UV rays, and temperature shock. cosentino.com

CIRCLE 90



OverStitch

Part of the Open Archive Collection, OverStitch woven carpet features interlaced backing yarns and face fiber; the combination creates an inseparable unit that resists delamination, moisture, and yarn zippering. The 100% solution-dyed carpet is available in 12 palettes and comes in a 9" x 36" plank size. tarkettna.com

CIRCLE 102

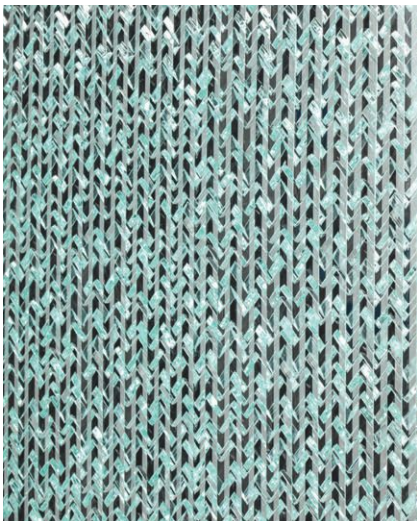
Bespoke Surfaces

Designtex's custom surfaces for branded environments comprise artwork from contemporary artists and photographers digitally printed on a choice of 15 substrates. The images can appear on textiles, wallcoverings, magnetics, glass film, ceramic steel, and decorative rigid panels. designtex.com

CIRCLE 101

Paint Shield

After two hours of contact, this EPA-registered microbicidal paint kills greater than 99.9% of bacteria, including staph, E.coli, and MSRA. The interior coating may be applied on nonporous ceilings, walls, doors, and trim. It comes in an eggshell finish in a choice of 590 colors.
swpaintshield.com
CIRCLE 103



Jali S Glass

Sensitile Systems expands the material palette of its light-filtering Jali panels with this line of slim, lightweight options that contain 20% recycled cullet. Available in PMMA acrylic resin as well as annealed or tempered glass, Jali S comes in 19 patterns and over a half-dozen colors; custom filters may also be inserted to create unique hues. Each panel is custom-manufactured, with thickness and shape defined by the customer.
sensitile.com
CIRCLE 104

La Bohème

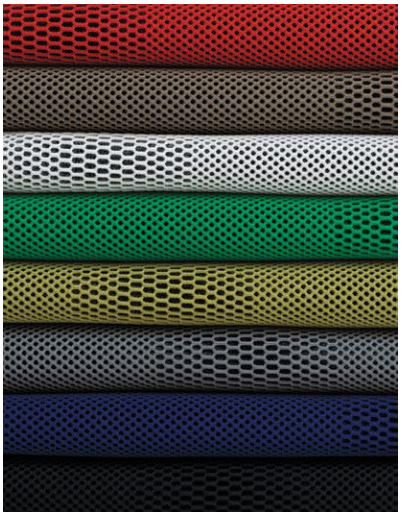
Neolith created this wood-look composite surfacing material using a combination of its proprietary technology and sintering techniques. Inspired by the trunk of the Lebanese cedar tree, La Bohème can be placed directly on existing surfaces, reducing cost and installation time. neolith.com
CIRCLE 105

MA's Concrete

Used in Europe for over 20 years by architects including Jean Nouvel, MA's concrete is now available in the United States. This ultrathin cement finish is less than ⅛" thick when applied and exceeds European requirements for mechanical and chemical resistance. Available in 72 colors, it can be applied on walls, flooring, and countertops, among other uses.
abcworldwidestone.com
CIRCLE 106

Lift

This piece-dyed textile by product designer Konstantin Grcic utilizes a network of interlocking ovals to form large vertical stripes. The polyester fabric has a 3-D structure, with its standing center fibers bonding its two outer layers. Offered in neutral and bright hues, the fabric is Greenguard-certified.
maharam.com
CIRCLE 107



YOU ASKED FOR QUIET.
WE HEARD YOU.

XLERATOReco®
High Speed. No Heat.
500 Watts.

XLERATOR®
Original. Patented.
Still The Best.

ThinAir®
Surface Mounted.
ADA Compliant.

Want to turn down the volume? Now you can. In addition to adjustable speed and sound control for quieter operation, Excel Dryer's expanded product line comes fully equipped with many other enhanced features, including adjustable heat settings, multi-voltage options and an externally visible service LED. With new enhanced features and the most options and accessories in the industry, you can create the best hand drying solution for any restroom environment.

When You Spec, Spec The Best.

BuildingGreen APPROVED

TIME TO THROW IN THE TOWEL®

CIRCLE 92

888.755.7410
exceldryer.com
sales@exceldryer.com

EXCEL

Furnishings

Casegoods | Drapery | Seating | Upholstery

BEST IN CATEGORY

Alu Net

This see-through window covering with an open-net weave and aluminum metalized backing controls heat and glare by absorbing, filtering, and reflecting light. The lustrous polyester textile is 100% flame retardant and comes in seven colorways (including 104, shown). carnegiefabrics.com

CIRCLE 108

Meety

Aluminum L-shaped legs unite the offerings in the Meety family of customizable tables. Tabletop shapes include round, square, and trapezoid, while the material palette ranges from glass to wood veneer to laminated HPL. arper.com

CIRCLE 109

Parentesit Freestanding

Inspired by minimalist art and classic Japanese interiors, these movable modular screens with black metal frames come in multiple square and circular motifs. Each is available in Arper's full range of Kvadrat and Fidivi fabric options. arper.com

CIRCLE 110

Rhythm

Mixing materials and textures, the Rhythm system of wooden casegoods supports meeting-hosting and solo use. Options include storage containers, wireless charging, and sliding trays. All pulls are inset, allowing cases to be opened from any angle. Porcelain, metal, and black-glass finishes personalize the look. geigerfurniture.com

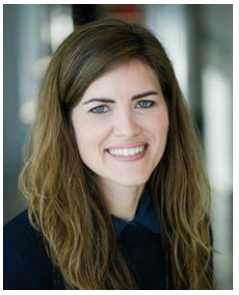
CIRCLE 111

Avila Twilight

This blackout shade eliminates at least 96% of light, glare, and shadows from entering a space; it also can improve the Solar Heat Gain Coefficient of a standard glass unit by up to 58%. The PVC-free polyester/acrylic fabric comes in nine hues, with three of the darker options featuring a matching color on the textile's street-facing side. mermetusa.com

CIRCLE 112

"Parentesit Freestanding are minimal frameworks that direct space, create scale, and humanize an environment."
Carrie Bobo



Printstool

With a body made of lignin, a renewable plant-based material, this dynamic 3-D-printed stool can be customized in over 150 ways. Vegetable-tanned leather tops the plywood seat, which is cushioned with CFC-free foam. Printstool comes in two heights, three seat hues, five designs, and five body colors. wilkhahn.com

CIRCLE 114

Caravan

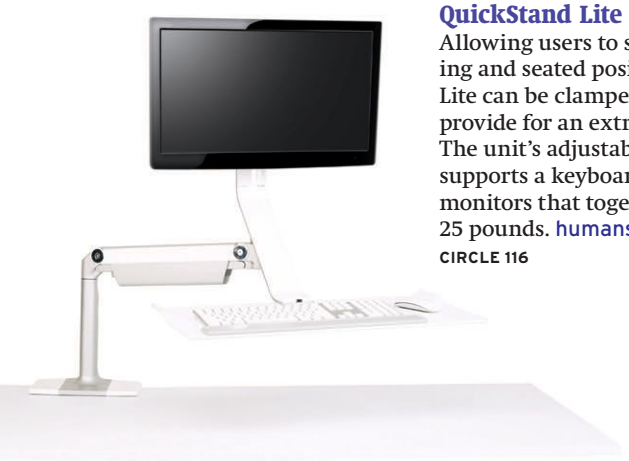
Vintage Moroccan rugs inspired these outdoor textiles that are part of the Richard Frinier Collection for Sunbrella. The two base-cloth constructions and five coordinating patterns are bleach-cleanable and fade- and stain-resistant; all are woven from Sunbrella's patented acrylic fiber. pindler.com

CIRCLE 113

Traverse

Thanks to its aluminum honeycomb skeleton, this wooden table by HOK Product Design can cantilever up to 20′ without center support. Tech cradles beneath the inch-thick top house power receptacles, charging ports, and audio and visual hookups. Traverse comes standard in two widths, four lengths, and five woods. okamura-us.com

CIRCLE 115



QuickStand Lite

Allowing users to switch between standing and seated positions, QuickStand Lite can be clamped onto a desk to provide for an extra 20" of height range. The unit's adjustable articulating arm supports a keyboard and up to two monitors that together weigh up to 25 pounds. humanscale.com

CIRCLE 116

Trea

The shell of a lobster inspired Todd Bracher's design for this multipurpose chair that automatically adjusts to a user's weight and position. The sloping seat edge reduces pressure on the back of the knees, while the three base choices allow the piece to serve as a desk, side, or occasional chair. humanscale.com

CIRCLE 117

Hardware, Software & Control Systems

AV Equipment | Connected Devices | Controllers | Sensors

"Life Space pushes the boundaries of light and sound to become an element of its own."
Enrique Peiniger

BEST IN CATEGORY

Wireless Daylight Sensor

This solar-powered peel-and-stick sensor for automated shade management requires no batteries; it sits in a window frame or jamb measuring daylight and wirelessly communicating the data to a nearby ceiling- or wall-mounted controller. This controller, which can host up to 20 wireless devices, then sends the data to a MechoNet hub, which issues the commands to move the shade as prescribed. mechosystems.com

CIRCLE 118

EDITORS' CHOICE

Life Space UX

This collection of tabletop hybrids combines sound and visuals. Capable of being brightened or dimmed to mimic candlelight, the Glass Sound Speaker, pictured, has actuators that vibrate on the glass to deliver clear, high notes and a powerful midrange. The 4K Ultra Short Throw Projector provides four times the clarity of full high definition, is 3-D capable, and can serve as a laser light source. sony.com

CIRCLE 119

Best Shelter

This scalable commercial security setup uses a combination of wireless technology and code-compliant mechanical hardware for lockdown of a specific door, hallway, or entire building in the case of an emergency. The system comprises a gateway and repeater that sends signals to initiate lockdown; a fob that manages which sections are to be affected; a solid brass lockset; and an electric exit device. bestaccess.com

CIRCLE 120

Equinox 73 LCD Touchscreen

Thanks to its larger-than-average 7" touchscreen, this home-management device can display up to three customizable widgets simultaneously, allowing immediate access to building subsystems including lighting and temperature. The user can toggle between full-screen and edit mode and manage up to 12 subsystems in total. vantagecontrols.com

CIRCLE 122

DW-311

As the first dual-technology wall-switch occupancy sensor on the market, the DW-311 uses passive infrared and ultrasonic technologies to detect movement in a space. The specification-grade solution, which provides building and energy-code compliance for small- and medium-sized applications, offers 0–10-volt dimming control for LED lighting systems. It's available for 120, 277, and 347 voltages and is UL- and cUL-listed. legrand.us

CIRCLE 121

SMOOTH. SEAMLESS. SPECTACULAR!

Why specify Thermocromex™?

This direct-applied limestone plaster cladding combines the classic look of stone with 21st century performance. Design possibilities are absolutely limitless!

- Create a rich, smooth, monolithic appearance without joints or trim
- Specify a color... which will never need re-coloring
- Apply to virtually any substrate
- Naturally weatherproofs without moisture barriers
- Exceptional vapor permeability, will not trap moisture
- Air permeability exceeding ASHRAE standard for air barriers
- Experience the confidence offered by a 20-year performance warranty

Why has Thermocromex been specified on signature architectural projects for the last 30 years? Visit www.Thermocromex.com and find out!

Faena Arts Center / Hotel Complex – Miami, FL
Architect: OMA, New York, NY
GC: Layton Construction, Orlando, FL

THERMOCROMEX™
LIMESTONE PLASTER ULTRA-HIGH-PERFORMANCE CLADDING

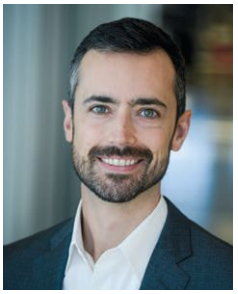
CEU Program Available on our website
www.Thermocromex.com

CIRCLE 26

HVAC

Cooling | Heating | Plumbing | Ventilation

"Thanks to its pump-control sensor and variable speed, the Scala2 adapts to demand."
Taylor Aikin



BEST IN CATEGORY

Art Cool Gallery for VRF

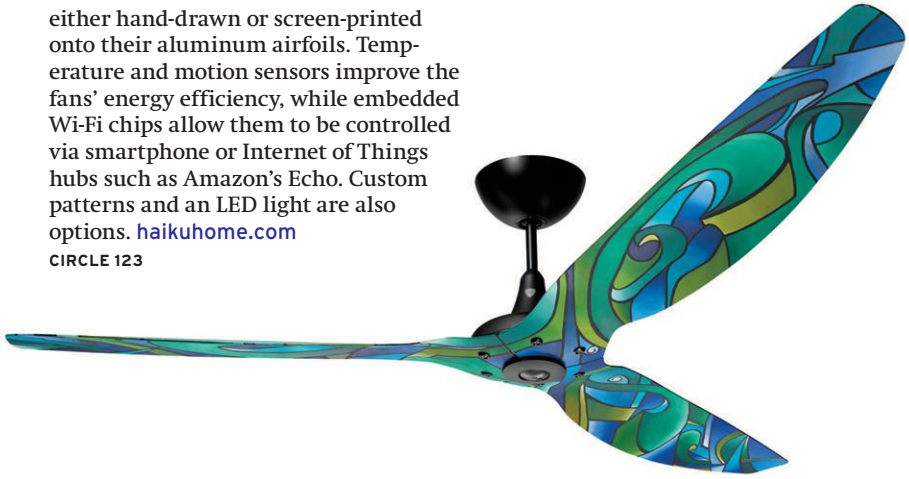
LG's Multi V line of outdoor variable refrigerant flow (VRF) systems now comes with the company's Art Cool option, whereby users can personalize a unit by mounting a framed picture over its opening. Behind the artwork, the 33-pound VRF machines feature motorized oscillating guide vanes, airflow from three directions, and 11 cooling and heating settings. lghvac.com

CIRCLE 124

Artisan Collection

Adding aesthetics to airflow, these fans feature a choice of seven artworks either hand-drawn or screen-printed onto their aluminum airfoils. Temperature and motion sensors improve the fans' energy efficiency, while embedded Wi-Fi chips allow them to be controlled via smartphone or Internet of Things hubs such as Amazon's Echo. Custom patterns and an LED light are also options. haikuhome.com

CIRCLE 123



Q Series Fan

Suitable for up to 50' ceilings, this destratification fan has a motor-mount system that provides an exceptionally large space for air to enter. This increased room reduces the amount of noise created upon air intake, making the 23" high by 15¼" wide device quiet to operate. The unit also features an energy-efficient EC motor. airiusfans.com

CIRCLE 125

RLM Small Systems UV Lamp Kit

This remote lamp-mount kit utilizes ultraviolet energy to destroy microbial growth in fan coil units and heat-pump systems. It includes a CU2 sensor for local or remote lamp/ballast monitoring and a 120-volt–277- volt input power supply. Sizes range from 12" to 33", with the single-ended T5 diameter lamp offering 8,760 hours of lamp life. uvresources.com

CIRCLE 126

EDITORS' CHOICE

Scala2

Suitable for residential buildings with up to three floors and eight taps, Grundfos's self-priming pump boosts water pressure from city mains, shallow wells, and storage tanks. A sensor within the machine compares the measured and desired pressures and adjusts the pump's speed accordingly; a control panel on the Scala2 allows users to communicate with the sensor and onboard frequency converter. us.grundfos.com

CIRCLE 127

NEOLITH®

ARCHITECTURAL RECORD 2016 WINNER

Extraordinary Surface

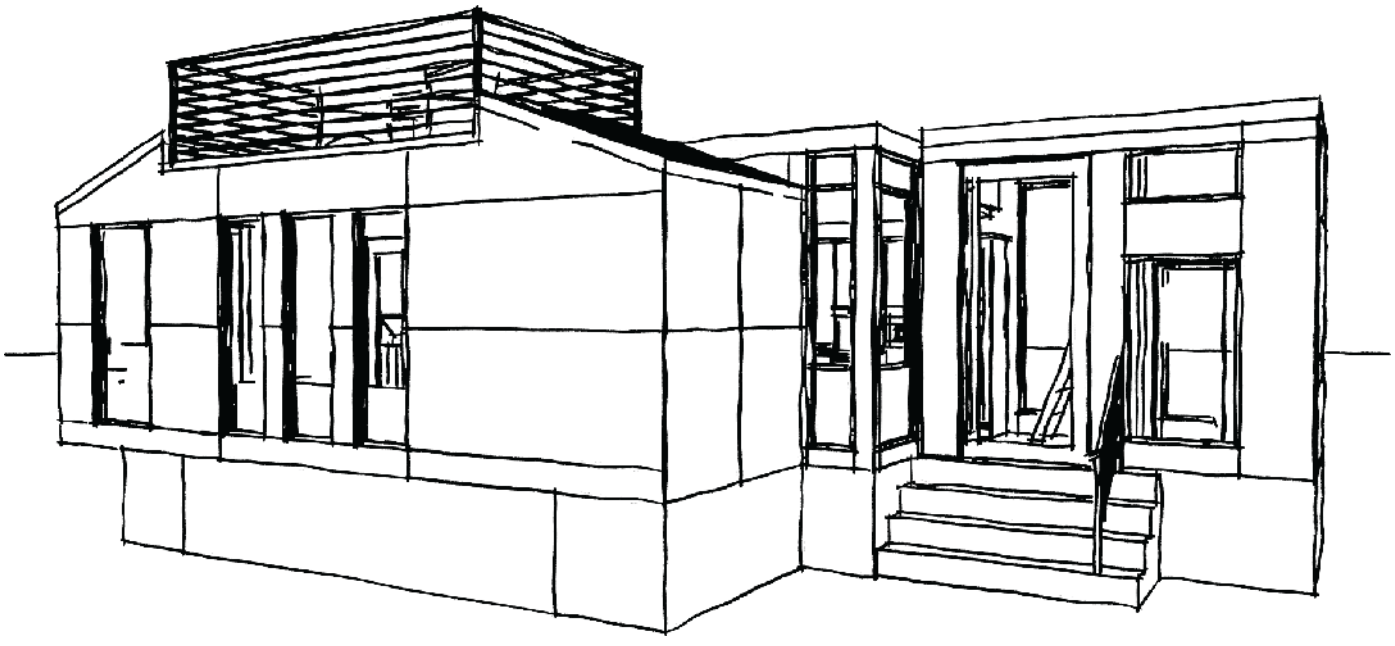
Interior and exterior applications: Cladding, Flooring, Countertops, Furniture, Facades.
Resistant to stains, scratches, chemicals, extreme temperatures and UV rays exposure.
Maximum format, minimum thickness. Different finishes. More than 50 available models.

Design, Durability, Versatility, Sustainability.

Visit the NEOLITH

Tiny House On-Wheels

on **KBIS (Orlando)**, from **January 10-12th** 2017; **Booth W137**.



Partners:

STONE CENTER · SUB-ZERO · WOLF · TOTO · JEFFREY BRUCE BAKER · Miele · WILLIAMS TILE AND MARBLE COMPANY · ASC · CHOATE CONSTRUCTION · Bell KITCHEN & BATH STUDIOS

CIRCLE 160

Kitchen & Bath

Appliances | Cabinets | Fittings | Fixtures

Container C-BOX

These stainless-steel wall niches provide storage solutions for bathrooms and wet areas, sitting either flush with the wall or projecting from the surface. Depth-adjustable from 0.25" to 2", the containers come in three sizes and are suitable for both dry- and solid-wall construction. easydrainusa.com

CIRCLE 128

Align Pre-Rinse Spring

Featuring Moen's Power Clean technology, this single-handle, ADA-compliant kitchen faucet offers 50% more spray power than comparable models, as well as four times the reach of its competitors' hoses. Align comes in a chrome finish and may be mounted on a sink or countertop. pro.moen.com

CIRCLE 129

BEST IN CATEGORY

LG Styler

Featuring a glass touch-screen door and aluminum handles, this clothing-care system for bedrooms, laundry rooms, and walk-in closets refreshes items without detergents to reduce wrinkles, odors, and allergens. A portable water container enables the appliance to supply hot steam at the touch of a button to treat up to four articles of clothing at a time. lg.com

CIRCLE 140

44 dBA Dishwasher

This stainless-steel dishwasher with a tinted exterior window performs at an exceedingly quiet 44 decibels thanks to a built-in insulation system. The Energy Star–qualified appliance, which has six wash cycles, uses KitchenAid's Clean Water microfiltration technology to flush out food particles as small as a pinhead, reducing active time. kitchenaid.com

CIRCLE 141

WIDE Vanity

Inspired by Bauhaus design, the WIDE vanity base features two UL-approved electrical outlets and two USB ports in the uppermost of its three soft-close drawers. Available in heights of 28" and 54", the piece has a solid-wood frame and comes in two finishes. ronbow.com

CIRCLE 142

Tay
Set on a rippling plinth, Tay is a double-ended roll-top bathtub made of solid cast iron. The tub's exterior can be primed and painted; left raw and black with a rough-textured surface; polished to a shine; or clad with copper (shown) or brass. Made by hand, the tub measures 76" long, 34" wide, and 21½" high. drummonds-uk.com

CIRCLE 143

"The LG Styler would be a wonderful amenity for a business traveler to find in his hotel room."
Barry Richards

Talis Select S 100
This basin mixer's water flow and temperature are controlled by a cartridge rather than by a conventional lever. This technology requires no electricity to function or additional devices to be situated in the base cabinet. The faucet, which has a conical spout, also offers a water-saving flow rate of 1.2 gpm. pro.hansgrohe-usa.com

CIRCLE 144

TruFlush Flushometer
Designed for water accuracy and conservation, this flushometer for commercial restrooms in South American, Middle Eastern, and Asia Pacific markets works on wash-down and siphon-jet fixtures with water pressures ranging from 10 psi to 100 psi. It offers two flush volumes for closet flushometers (1.28 and 1.6 gpf) and three for urinal models (0.125, 0.25, and 0.5 gpf). Manual (pictured) and sensor-activated versions are available. sloan.com

CIRCLE 145

EDITORS' CHOICE

Transpara
This frameless shower-door system eliminates all visible door hinges, wall clamps, and framing units that hold glass panels together or against supporting walls. A pivoting four-component fitting uses the door's weight to close it from within, allowing for a floor-to-ceiling shower enclosure with a striking all-glass profile. crl-arch.com

CIRCLE 147

Eurocube
Mounted on a spring hose that offers 360° movement, this semipro faucet's pull-out spray head allows for seamless switching between regular water flow and spray. The single-lever mixer has a ceramic cartridge, adjustable flow-rate limiter, and a scratch- and tarnish-resistant surface. grohe.com

CIRCLE 146

Lighting & Electrical

Commercial | Contract | Outdoor | Residential

Soleil Noir

Paris-based architect Odile Decq is known for designs that are assertive and futuristic. Her pendant for Luceplan is no exception. Molded from polyurethane foam, Soleil Noir has a fluid, triangular shade that hovers above a black disc housing the LEDs. The light is diffuse and indirect, with the effect reminiscent of a solar eclipse. luceplan.com

CIRCLE 148

BEST IN CATEGORY

Mesh

Designed by Francisco Gomez Paz, Luceplan's 21st-century take on a chandelier features dozens of LEDs spaced to optimize their spread of light. The striking steel fixture is dimmable, provides 3400 lumens of illumination, and offers a warm 2700K color temperature. It measures 39⅖" wide x 35⅖" high with a standard drop of 39⅖". Extension kits for more dramatic installations also are available. luceplan.com

CIRCLE 149

LiniLED Illuminated Handrail

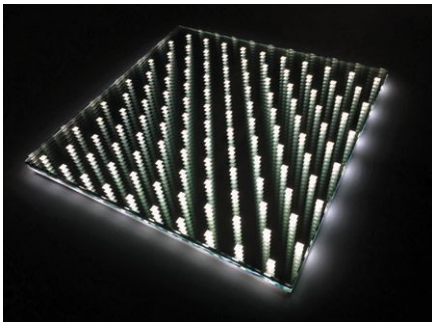
Organic Lighting's stainless-steel handrail system gently illuminates stairs, ramps, and walkways with integrated, specification-grade LED strips. Available in four color temperatures (2700K to 5600K), the indoor/outdoor liniLED can be installed in uninterrupted runs up to 33' long. Five light colors, including blue, orange, and red, are also available. organiclighting.com

CIRCLE 151

i402 LED Luminaire

Electrix Illumination's LED fixture features a pair of independently aimable luminaires that provide uniform coverage on walls over 10' high. Measuring 6½" wide x 3" tall, the i402 comes in 2' or 4' lengths. It has an integral driver, output of 84.5 lumens per watt, and an 80+ CRI. Custom finishes are available upon request. electrixillumination.com

CIRCLE 150



Celeste Glass

These fully customizable annealed glass panels achieve an illusion of infinite depth when backlit by natural or artificial light sources. Available in ½" and ¾" thicknesses and in sizes ranging from 4' x 8' to 5' x 10', they come packaged with an LED kit in white color temperatures or programmable RGBs. They are also offered in standard or bespoke designs and in all-glass configurations. sensitile.com

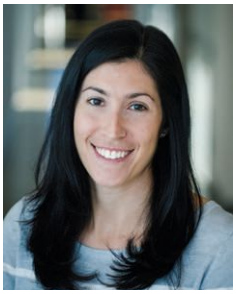
CIRCLE 152

Mirel LED

Advanced optics are responsible for the superior glare control and generous batwing light distribution of this louver fixture. Distinguished by a minimalist aesthetic, the Mirel LED luminaire comes in three popular sizes—1' x 4', 2' x 2', and 2' x 4'—and in pendant, recessed, surface-mount, and lay-in configurations. Color temperature options include 3000K, 3500K, and 4000K. zumtobel.us

CIRCLE 153

"A light fixture that works as a piece of art, Mesh has a different presence during the day and at night."
Melissa Goren



Geode

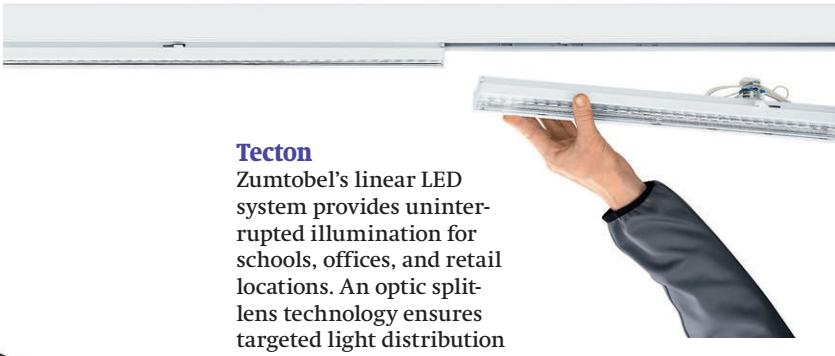
Made of 3-D-printed ceramic, this compelling pendant appears to have no light source at all. This is because its LEDs are discreetly concealed in the luminaire's hollow body, with the illumination reflecting off the hard surfaces to radiate a vibrant, indirect glow. Geode comes in a variety of shapes, sizes, and colors. two.parts

CIRCLE 154

Axiom Light Coves

These pre-engineered direct and indirect light coves provide fully concealed plug-and-play illumination that integrates with Armstrong's acoustical and drywall suspension systems. Luminaire options for the direct system include XAL's LENO zero plenum LED fixture; Axis Lighting's CovePerfekt, Litecontrol's 17L-CC, and Vode's ZipWave LED 707 are choices for the indirect one. armstrongceilings.com

CIRCLE 155



Tecton

Zumtobel's linear LED system provides uninterrupted illumination for schools, offices, and retail locations. An optic split-lens technology ensures targeted light distribution in wide, narrow, shelf, and asymmetric beam patterns and in a range of color temperatures. Made of steel painted with polyester-resin enamel, Tecton comes in two lengths and delivers 5500 to 11000 lumens. zumtobel.com

CIRCLE 193

Fraxion 2.0

Lucifer's recessed LED downlights, accents, and wall washers are some of the slimmest on the market, measuring roughly 2" to 3" thick. Available with a 3" round or square aperture, the fixtures come in four color temperatures (2700K to 4000K) with three CRIs (80, 90, or 97). They are suited for wet or dry locations and offer field-changeable optics ranging from 15° to 60°. luciferlighting.com

CIRCLE 192

EDITORS' CHOICE

Cu-Beam

This 5⅛" wide x 23⅜" long x 1¾" deep luminaire from Dyson utilizes a proprietary technology to move heat away from the light source, allowing it to dissipate along the wings of the fixture. A single high-power LED chip and custom-designed lens provide a precise pyramid of illumination over a task area in the downlight model, or a wide ambient glow across the ceiling in the uplight version. dyson.com

CIRCLE 194

LS Pro Durabulb

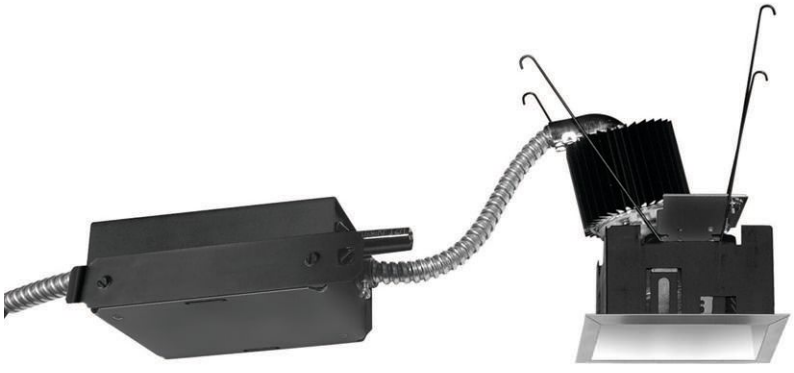
Lighting Science's LED A19 lamp has a shatter-resistant polycarbonate plastic shell that makes it ideal for use in factories, schools, and indoor construction sites. The 60W replacement has an output of 700 to 710 lumens and comes in a choice of a warm 2700K or cool 5000K color temperature with a CRI of 80 or 83, respectively. It is also compatible with electronic low-voltage (ELV) dimmers. lsgc.com

CIRCLE 195

L280W Linear LED Luminaire

Manufactured to withstand extreme conditions, this IP67-rated, continuous-linear fixture provides dimmable 3000K white light for washing building facades or accenting architectural features. The low-profile luminaire, which features a microlinear acrylic lens, can be specified in four lengths. Lighting designers also can choose among five drivers and four mounting configurations, with beam spreads ranging from 15° to 90°. electrixillumination.com

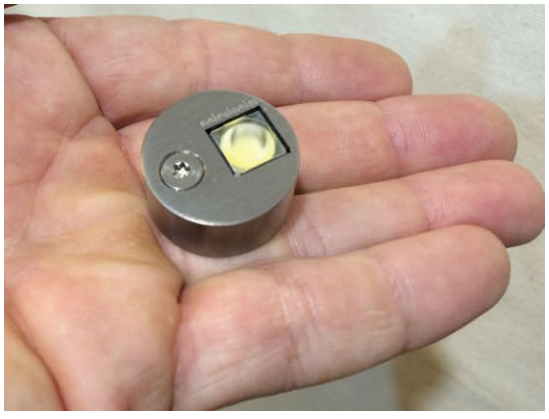
CIRCLE 196



3" Round & Square LED

This recessed Kurt Versen luminaire, offering a discreet 3" round or square aperture, installs in new and existing ceilings. Available with black, gold, wheat, and pewter trim, the fixture is accessible from below to simplify maintenance and upgrades; it features a 0-10V dimmable Xicato XTM LED module providing 1100 to 2100 lumens at a 2700K to 4000K color temperature. Options include flush-mount installation and a choice of three optical systems. hubbelllighting.com

CIRCLE 197



Iris LP

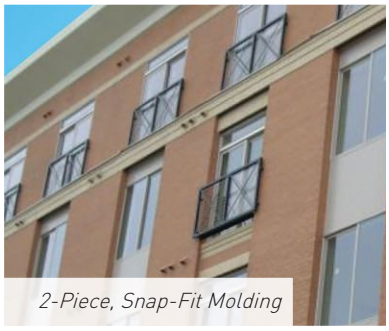
Manufacturer Minimis claims this tiny recessed LED—which measures less than 1" in diameter and features a .35" square aperture—is powerful enough to uplight a single-story wall. The IP67-rated fixture suits flush horizontal or vertical installations; it may be used indoors or out in dry or nonsubmersible wet locations. Available in 3050K and 4800K, the Iris LP operates via 12-volt DC power. minim.is

CIRCLE 198

GO BEYOND THE PANEL...

...AND GO TO THE NEXT LEVEL.

1-Piece, Tight-Fit Molding



2-Piece, Snap-Fit Molding

Clip & Caulk™

Dry Seal

Rout & Return

Omega-Lite® ACM Panel Systems

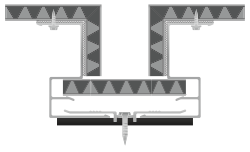
Laminators Incorporated does more than manufacture today's premier ACM panels—we provide engineering assistance, custom fabrication, tested installation systems, and all associated support services.

1-Piece, Tight-Fit Molding

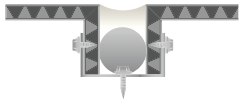
2-Piece, Snap-Fit Molding

Clip & Caulk™

Dry Seal



Rout & Return



GoBeyondThePanel.com

See how we can take your ACM project to the next level.

CIRCLE 137

OMEGA PANEL PRODUCTS Ω

LAMINATORS INC.

800.523.2347

NFPA FLORIDA PRODUCT APPROVAL MIAMI-DADE COUNTY APPROVED

Openings

Doors | Elevators | Hardware | Windows

Oden Architectural Door System

Krownlab upgrades its Oden sliding door hardware by adding its patented Tru-Level System, which enables a full ¼" of adjustment, both vertically and horizontally, at each mounting point. Made of brushed stainless steel, Oden is available in lengths up to 13' and can be used with metal beams as well as framed, concrete, and glass walls. krownlab.com

CIRCLE 199

BEST IN CATEGORY

Weco W2C

Mounted on a narrow frame made of laminated Spanish chestnut, this double-paned window works structurally with a hidden aluminum profile to create a transparent plane that maximizes the view. The operable window comes in pivoting, sliding, and tilt-and-turn options; it also can be incorporated into glazed window walls as well as curved, angled, and irregular openings. It comes in sizes up to 9' high and 19⅔' wide. wecowindows.com

CIRCLE 200

View Dynamic Glass

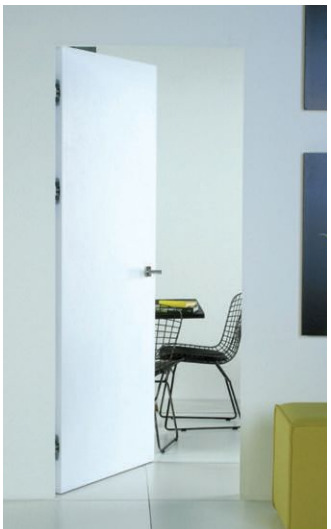
View now manufactures a 6' x 10' panel size of electrochromic glass to enable greater applications of the technology in commercial buildings such as airports, hospitals, schools, and hotels. The first and only manufacturer to develop electrochromic glass to this degree and size, View eliminates the need for blinds and reduces HVAC costs by an average of 20%. viewglass.com

CIRCLE 202

Invisible Sill

Though invented over 20 years ago, Vitrocsa's Invisible Wall system still features one of the slimmest profiles out there, a fact that's made the product the choice of architects like Tadao Ando, Thom Mayne, and Richard Meier. This option, available on the TH+ profile, hides the sill underneath continuous flooring, minimizing slots and creating an almost seamless look. vitrocsaUSA.com

CIRCLE 201



EZYJamb Inswing

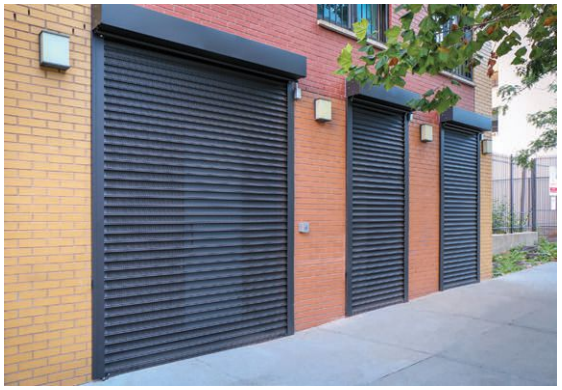
This 18-gauge frameless jamb system enables the door to open inward yet, when closed, remain flush to the exterior wall. The completed jamb also can be painted with the whole wall area. The frame features reinforced edges to prevent door damage, can accommodate any door size, and offers a range of concealed and mortised hinges. ezyjamb.com

CIRCLE 203

PrivaSEE
A special interlayer allows this movable glass-wall system to achieve a sound transmission class (STC) of 36—better than that of most fixed-glass partitions. Panels for the frameless, single-track PrivaSEE are offered in heights up to 10' 6" and widths up to 4' 1". nanawall.com

CIRCLE 204

"A smartphone app that can customize your experience as you move through a building? MyPort is the Holy Grail."
Barry Richards



Allura Shutter
This space-saving rolling door provides security for high-traffic pedestrian areas and suits installations with limited headroom and side room. Various perforation and fenestration options provide for light and air filtration. The door comes powder-coated in a range of hues and with a choice of manual, crank, or tube-motor operation. overheaddoor.com

CIRCLE 205

DRS 1202
Requiring no top or bottom rail, the DRS 1202 swinging glass door system utilizes an innovative hydraulic closing mechanism concealed in the vertical rail. This mechanism eliminates the need for door closers in the floor; it also can be specified in three spring tensions to accommodate doors up to 96" high. The system comes in a variety of transom and sidelight configurations. crl-arch.com

CIRCLE 206

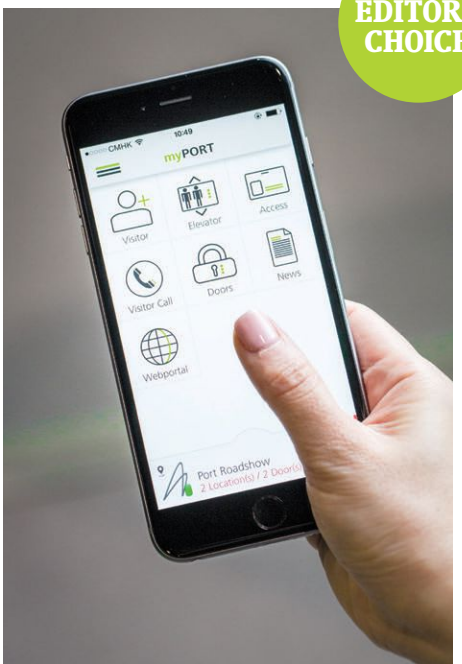
Vinyl Folding Door System
LaCantina's energy-efficient, low-maintenance door system matches numerous vinyl-window packages. Offered configurations include up to six panels, with the maximum panel size 96" x 35". The standard double-glazed models offer a .34 U factor and .20 Solar Heat Gain Coefficient, while the triple-glazed ones provide a .25 U factor and .17 SHGC. lacantinadoors.com

CIRCLE 207

MyPORT
This app-based smartphone service for Schindler products communicates with a base station to identify building occupants and send an elevator to them. The technology—which works via Bluetooth—also can be used to authorize visitors and lock and unlock doors. schindler.com

CIRCLE 208

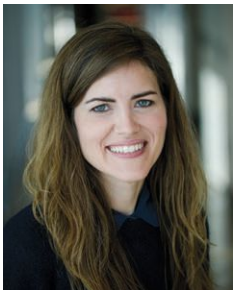
EDITORS' CHOICE



Outdoor & Recreational

Play Structures | Railings | Shelters | Site Furnishings

"Sculptural in form, PlayCubes encourage free play and spatial experimentation."
Carrie Bobo



Shift

Designed to be mixed and matched, the six patterns in this Sunbrella outdoor fabric collection play with opposing forces: light to dark colors, shiny to matte finishes, and natural to constructed motifs. The 100% acrylic textile comes in 54" widths and is highly fade-resistant. sunbrella.com

CIRCLE 217

BEST IN CATEGORY

9BL Glass Railing System

CRL-U.S. Aluminum adds Safety Seal technology to its popular railing system, eliminating the need for a glazer to roll in the drop-side rubber seal during installation. A universal setting block and hollow base shoe secure the laminated tempered-glass panels instead, offering increased safety and a lower cost. The railing comes in six architectural finishes with three cladding options for the base shoe. crl-arch.com

CIRCLE 218

Knight Bench with Aluminum Slats

Previously available only with hardwood slats, the Knight bench now comes in an all-aluminum option on its backed and backless 6' and 8' offerings. The solid aluminum slats, which are made of recycled material, may be specified in 20 standard powder-coat colors. forms-surfaces.com

CIRCLE 219

Traverse

This outdoor gateleg table can accommodate two people when half-folded and six when fully open. The powder-coated aluminum frame is rigid but lightweight, while the slats made of fully grown teak wood have a high level of natural oils that prevent moisture absorption, warping, and rot. royalbotania.com

CIRCLE 220

PlayCubes

Created in the 1960s by architect Richard Dattner, these colorful geometric playground elements have been updated for the times, now featuring varying planes, handholds, and recesses that encourage climbing and exploration. The roto-molded plastic cubes come in single models suited to kids ages 2 and up and four preset configurations for ages 5 and older. playworld.com

CIRCLE 221

EDITORS' CHOICE

Let's GO

Design Trends
Professional Growth
Product Launches
Networking • Events
Industry Speakers
Innovation • Inspiration
Learning Opportunities
Kitchen • Bath

We're ready. Are you? Kick off 2017 with the ultimate destination for everything kitchen and bath. Register now at kbis.com.

NKBA NATIONAL KITCHEN+BATH ASSOCIATION

Kitchen & Bath Business

KBIS ORLANDO JANUARY 10-12 2017

it all **starts** here!

CONTINUING EDUCATION

In this section, you'll find 10 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 credits.

Photo courtesy of W&W Glass, LLC

First Impressions

Sponsored by Cladiators; CRL-U.S. Aluminum; EXTECH/Exterior Technologies, Inc.; Longboard® Products a Division of Mayne Coatings Corp.; New Millennium Building Systems; Prodema; TAMLYN; TILE EZE; and W&W Glass, LLC

BE PM ST

CREDIT: 1 AIA LU; 0.1 IACET CEU

Photo courtesy of Soil Retention Products, Inc.

Designing for Landscape Architecture

Sponsored by Firestone Building Products, Soil Retention Products, Inc., and Tournesol Siteworks

LS PM SU

CREDIT: 1 AIA LU/HSW; 1 PDH, LA CES/HSW; 0.1 IACET CEU

Photo courtesy of Huber Engineered Woods, LLC © 2016

Mitigating Water Leaks around Windows in Wood-Framed Walls

Sponsored by Huber Engineered Woods, Inc.

BE PM SU

CREDIT: 1 AIA LU/HSW; 0.1 IACET CEU

Photo courtesy of John Durant

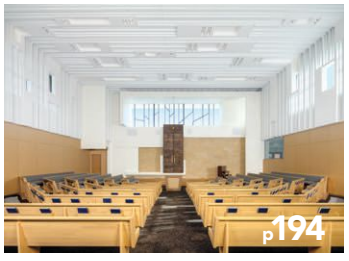
Horizontal Sliding Fire Doors: Architectural Design Freedom

Sponsored by Won-Door Corporation

IN LS PM

CREDIT: 1 AIA LU/HSW; 0.1 IACET CEU

Photo courtesy of Ceilings Plus



Revolutionizing Ceiling and Wall Surfaces with Parametrics and Digital Fabrication

Sponsored by Ceilings Plus

AC IN SU

CREDIT: 1 AIA LU/HSW; 0.1 IACET CEU

Photo courtesy of The Sherwin-Williams Company

Design Strategies for Optimal Well-Being in Health-Care Environments

Sponsored by AD Systems, Metl-Span, and The Sherwin-Williams Company

AC IN PM

CREDIT: 1 AIA LU/HSW; 0.1 IACET CEU

© Agence Rudy Ricciotti

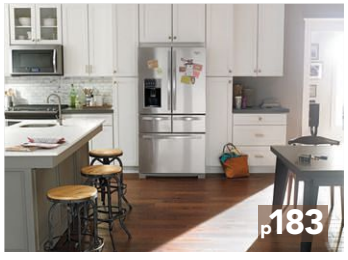
Designing with Concrete in the 21st Century

Sponsored by Vectorworks, Inc.

LS PM ST

CREDIT: 1.25 AIA LU/HSW; 0.1 IACET CEU

Photo courtesy of Whirlpool Corporation



Lifelong Housing

Sponsored by Whirlpool Corporation

ACC IN RE

CREDIT: 1 AIA LU/HSW; 0.1 IACET CEU

Photo courtesy of the U.S. Department of State

Design to Protect

Sponsored by Ross Technology

BE LS PM

CREDIT: 1 AIA LU/HSW; 0.1 IACET CEU

Photo courtesy of MIA+BSI: The Natural Stone Institute

Understanding Anchorage Systems for Natural Stone Cladding

Sponsored by MIA+BSI: The Natural Stone Institute

PM ST SU

CREDIT: 1 AIA LU/HSW; 0.1 IACET CEU

CATEGORIES

AC ACOUSTICS
ACC ACCESSIBILITY
BE BUILDING ENVELOPE DESIGN
IN INTERIORS
LS LIFE SAFETY AND CODES
PM PRODUCTS AND MATERIALS
RE RESIDENTIAL
ST STRUCTURAL
SU SUSTAINABILITY

CIRCLE 130

EXTECH
EXTERIOR TECHNOLOGIES, INC.

This dramatic installation at Massport's Logan Airport Central Parking Garage was a design collaboration between Arrowstreet Architects and EXTECH. The facade incorporates nearly 50,000 customized aluminum flappers assembled into nearly 400 distinct units.

KINETICWALL™

DYNAMIC FACADE SYSTEM

EXTECH designs and manufactures a variety of wall and window systems that combine beauty, durability and economy. The KINETICWALL™ system incorporates movable flappers arranged in easy to install, preassembled units. KINETICWALL™ responds dynamically to changes in the wind, providing a dramatic visual representation of this natural phenomenon. Contact EXTECH to learn how we can custom design a KINETICWALL™ system for your project.

Visit extechinc.com/kineticwall to see KINETICWALL™ in action!

WWW.EXTECHINC.COM
800.500.8083

CREATIVE EXTERIORS
FOR DEMANDING APPLICATIONS

CONTINUING EDUCATION

First Impressions

The latest in glass, aluminum, aluminum composite, structural steel, and wood present an extensive design palette of opportunity for building facade designers

Sponsored by Cladiators; CRL-U.S. Aluminum; EXTECH/Exterior Technologies, Inc.; Longboard® Products a Division of Mayne Coatings Corp.; New Millennium Building Systems; Prodema; TAMLYN; TILE EZE; and W&W Glass, LLC

A high-span glass cube entrance and curtain wall system clads the IBI Group-designed Rio-Can Yonge Eglinton Centre Complex in Toronto.

Photo courtesy of W&W Glass, LLC

Serving as the very first impression to both building entrants and passersby, the building facade not only plays a major architectural and aesthetic role, but it significantly factors into a facility's energy performance and sustainability.

Essentially serving as a building's wrapping—be it glass, aluminum, aluminum composite, structural steel, or wood—an extensive array of shapes, colors, styles, and textures combine to present the building's entry.

"The facade is of paramount importance in terms of building performance and is an important architectural element, ranking alongside building site and form," confirms Mikkel Kragh, Ph.D., MSc, CEng, chairman, Society of Facade Engineering, Copenhagen, in an *Intelligent Glass Solutions* article titled "Facade Engineering & Design Teams of the Future."

Shielding the building from the elements—i.e., rain, snow, wind, UV rays, insects, birds, etc.—the facade also serves as the building's main protective layer, further underlying its importance within the overall building design.

CONTINUING EDUCATION

1 AIA LU

BNP MEDIA IS AUTHORIZED BY IACET TO OFFER 0.1 CEUS FOR THIS PROGRAM

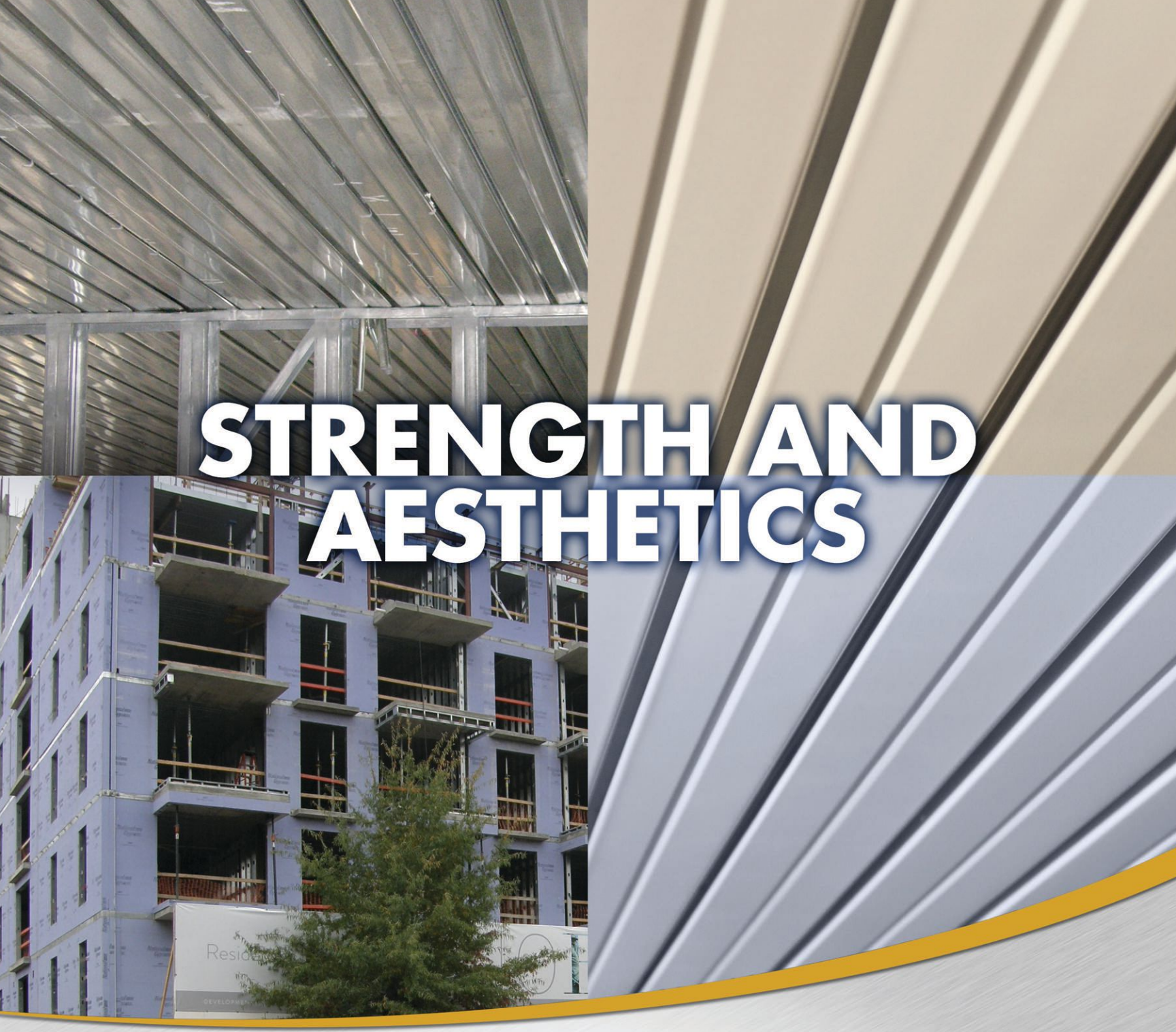
Learning Objectives

After reading this article, you should be able to:

1. Identify the various roles that the facade ideally plays within a well-designed building.
2. Describe the main benefits and applications of aluminum, aluminum composite material, and structural steel cladding.
3. Differentiate between the various glass facade systems, including stick-built curtain wall, unitized facades, point-supported structural systems, storefront, window wall, and entry systems.
4. Explain how kinetic facade systems work and the benefits they bring.

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

AIA COURSE #K1612N



STRENGTH AND AESTHETICS

Versa-Floor™ multi-story residential composite floor systems

Versa-Floor™ for mid-level multi-story residences is a shallow-plate composite-floor system featuring Versa-Dek® dovetail deck. Ideal for managing floor height while providing design aesthetics and acoustical noise reduction. Engineered floor-openings, sleeves, hanging devices and deck chase-way spaces streamline MEP installations. Versa-Floor™ integrates with any beam and column or bearing wall frame.

- Spans up to 28 ft. with lowest total floor depth
- Dovetail profile allows exposed architectural finishes
- Cellular and cellular-acoustic design options

Learn more at: newmill.com/expand

NEW MILLENNIUM
BUILDING SYSTEMS
Building a better steel experience.

CIRCLE 9

Photo courtesy of EXTECH/Exterior Technologies, Inc.

A wood-faced operable paneled kinetic facade delivers an old New England aesthetic, along with high-quality superior insulation and ventilation, for the Anmahian-Winton Architects-designed Community Rowing's Harry Parker Boathouse and Ruth W. Somerville Sculling Pavilion in Brighton, Massachusetts.

"The facade of a building is its first line of defense," states Howard Zimmerman, owner and principal, Howard Zimmerman Architects, New York, in a *Cooperator New York* article, "Facades 101: The Partnership of Form and Function."

"It is a raincoat for the building," he continues. "It keeps the elements out and insulates, while at the same time serving a decorative purpose."

Furthermore, Kragh points out that the facade can make up between 15 and 25 percent of total construction costs, in addition to accounting for a large percentage of a project's technical and commercial risks.

That said, it's essential to dedicate sufficient time to the design, development, fabrication, and installation of the facade system and all of its components.

For example, close coordination between the trades must occur in order to ensure a weathertight facade and high-performance thermal systems. Furthermore, the facade must successfully integrate with numerous building systems, including the structural design, daylighting systems, HVAC design, and the building's overall energy efficiency, particularly in light of increasingly stringent energy codes.

"The facade is the filter between the climate outside and the conditioned space inside. It determines the appearance of the building, and its performance relies on appropriate specification, design, and delivery of a multitude of components and systems," adds Kragh.

Embarking upon a new design, architects have a multitude of cladding options to choose from to meet these performance objectives while delivering an attractive aesthetic.

ACM IN THE MIX

Among these assorted choices, aluminum composite material (ACM) panels are a viable option, known for their sleek aesthetic. The once pricey material, formerly relegated to high-end products, is now affordable, thanks to advancements in product technology, manufacturing efficiencies, and installation techniques. In fact, initial construction costs are often lower than some other exterior materials due to a faster installation process.

Good-quality ACM products also incorporate a finish so that the cladding requires virtually no maintenance for as long as 30 years. Other benefits include rainscreen protection and the material's light weight, supporting reduced structural steel requirements.

A partially recycled material, ACM's are 100 percent recyclable. If manufactured domestically, they can be sourced to within 500 miles of the installation site, thereby contributing to LEED credits.

While many ACM facades are flat panels laid out in a symmetrical grid, the more trendy designs are taking advantage of the ability to fabricate the panels into 3-D shapes, thereby lending a high-tech, modern look. ACMs can also be bent, curved, and joined together in just about any geometric configuration and are offered in a large assortment of colors and finishes.

In terms of attaching the cladding, manufacturers offer various options, such as a dry-seal gasket joint, wet-seal caulked joint, and a painted aluminum finishing cap that covers the panel joints.

For 3-D designs, some fabricators utilize an attachment system capable of thermally isolating the aluminum attachments and panel surface from the building wall, thereby limiting the amount of thermal transfer of energy into the building from the outside.

"Our goal was to create the easiest and least-expensive ACM solution to install, period. Based on the feedback from architects, owners, and installers on 3-D wall panel systems with thermal performance, we feel that we have succeeded," says Goran Glumac, vice president, Acpexpress, North Bergen, New Jersey.

Because the thermal isolation and insulation capabilities of ACM systems are often a function of the attachment system, these performance ca-

Photo courtesy of Cladiators

Featuring aluminum composite concave panels, The Bank of America headquarters in San Antonio presents a wood appearance.

Modern Architectural Lines

Sustainable, durable, non-combustible, lightweight, easy to use, for interior or exterior use—that's XtremeTrim®.

XtremeTrim®

www.xtremetrim.com 800-334-1676

XtremeTrim® profiles are available to match multiple panel siding systems. XtremeTrim® has thousands of design and color options, allowing architects and users to dramatically improve their building aesthetics and create modern architectural lines.

CIRCLE 34

pabilities may also be available with flat systems. Some systems can also be fitted with thermal-break pads and insulated channels to further limit the transfer of energy.

A strong example of ACM concave panel ability is exemplified at The Bank of America headquarters in San Antonio where the curved lobby walls mimic the look of wood. With a rectangular attachment profile, the panels easily align across a vertical or horizontal space. The panels also integrate seamlessly into the mixed-material wall and provide a unique aesthetic to the modern design.

On another project, Pablo M. Ipucha, associate AIA, senior project manager, Gene Kaufman Architect PC, New York City, specified the panels for performance and functional benefits.

"Incorporating ACM panels into our building envelope has benefited us in drastically reducing the width of the exterior wall while meeting the R-value requirements. We were able to add 6 inches of usable real estate to the floor plans all around," he says.

Photo courtesy of TAMLYN

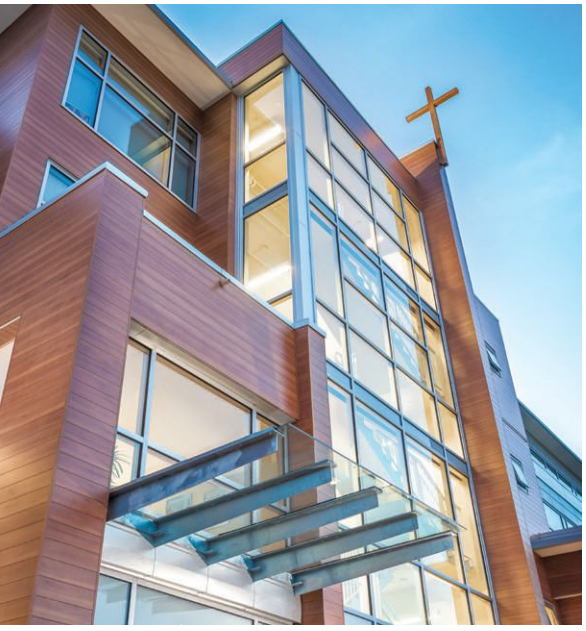
Extruded aluminum trim creates reveals in the panel and lap, inside and outside corner conditions, and between materials at the New Hope Housing project in Houston.

FAUX WOOD À LA ALUMINUM

Combining the durability and maintenance of aluminum with the richness and beauty of wood, faux wood aluminum cladding is another viable facade option available to architects.

Exposed to the elements, prefinished aluminum for soffits and siding in particular effectively wards off rot, mold, and the challenges associated with cold weather. Because the color is baked into the material, owners can avoid the issues of flaking, peeling, and warping.

Photo courtesy of Mayne Coatings Corp.



V-groove light cherry aluminum siding and soffit at the John Paul II Pastoral Centre's Campus of Care in Vancouver deliver a beautiful wood appearance without the maintenance hassle thanks to aluminum composite material.

To produce an authentic wood appearance, some wood grain technologies utilize an advanced powder coating system and machinery to manufacture the material. The result is an attractive wood aesthetic without the maintenance hassle and cost associated with wood cladding products.

Showcasing the beauty of faux wood and the benefits of aluminum, John Clark, principal, John Clark Architect Inc., Burnaby, British Columbia, Canada, specified 10,000 square feet of 6-inch, V-groove light cherry aluminum siding and soffit for the John Paul II Pastoral Centre's Campus of Care in Vancouver.

While aluminum composite, cementitious plank, and steel cladding were all considered, a wood-grained aluminum siding material turned out to be the best option for its aesthetic compatibility to a wood finish and noncombustibility. Clark was also pleased with the cladding's no shrinkage and no staining benefits, and the fact that the system he specified utilized a hidden fastening system.

Located in a residential area rich in trees and greenery, the facade's wood appearance blends in well with the locale.

"The scale and color of the 6-inch plank material, relative to the volume of the wall areas and feature elements, informs and strengthens the relationship of the forested southwest edge of the property, its tall trees and adjacency to the residential neighborhood, and the neighboring health-care facilities," Clark says.

In particular, the light cherry color was selected for its red tones, creating a nice contrast with the nearby Douglas fir and yew trees.

Sharing some lessons learned from the project, Clark advises building teams to preplan where the boards will be cut to avoid waste, knowing where the expansion channels and flashing details for windows and other openings will be placed, and extensive mockup training for the sub trades before installation.

THE BEAUTY OF ALUMINUM TRIMS

Another popular aluminum cladding choice is the application of extruded aluminum trims for assorted panel systems. Enhancing aesthetics and the creation of modern architectural lines, these trims are lightweight, durable, sustainable, noncombustible, easy to install, and available for both exterior and interior use.

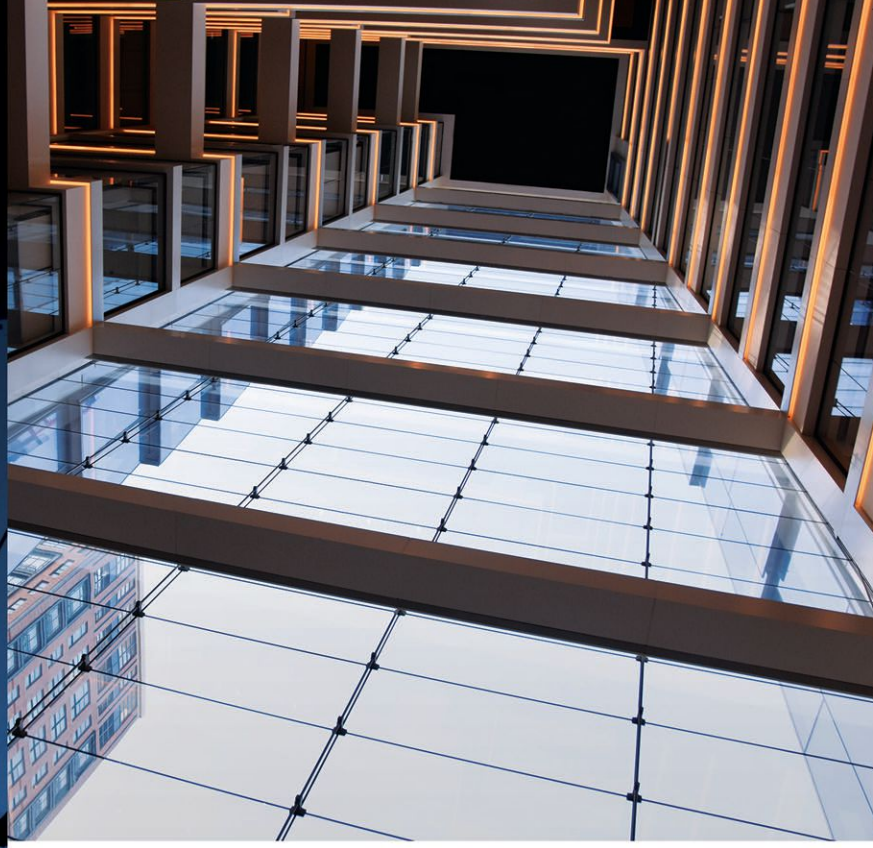
Architects can choose from a wide variety of exterior detailing options, such as wide horizontal breaks, verticals that are accented or fade into a monolithic form, and corners that offer open reveals or closed sharp angles.

While galvanized trims frequently offer a lower first cost, aluminum delivers longer-term longevity and ultimately a better life-cycle cost, particularly when powder coated, anodized and/or primed, and ready-to-accept paint finishes are applied.

"Using extruded aluminum trim between panel joints becomes an architectural element and is a way of expressing the joints and defining their deliberate placement. It adds a level of architectural refinement," says Russell A. Hruska, AIA, principal and co-founder, Intexure Architects, Houston. "In our climate, stucco often requires additional oversight to be correctly executed. Aluminum trim, when used with fiber cement panels or lapped siding, is more cost effective than stucco and provides long-term durability while achieving our design aesthetic."

Design Assistance

Creating a 207-foot tall point-supported structural glass cable tension façade is no easy task.



Couple this with engineering an 82-foot tall cable tension lobby wall, with two 10-foot wide structure-less glass corners along an existing elevated train trestle park in the heart of Manhattan's newest neighborhood... a whole new level of difficulty. How do you manage your design risk, optimize materials, make sure the structure is strong enough to take loads of the system, and stay in budget?

Find out how **W&W Glass / Pilkington** can help manage the process with preliminary upfront review and coordination on structural glass projects like **10 Hudson Yards**, bringing countless complex designs to life on Pilkington **Planar™** projects throughout North America.

Learn more at wwglass.com/pilkington-planar or call us at 1.800.452.7925 for assistance.

W&W GLASS, LLC

Pilkington **Planar** ™

The World's Leading Structural Glass System

CIRCLE 24

For example, Houston architect Val Glitsch, FAIA, selected extruded aluminum trim to create reveals in the panel and lap, inside and outside corner conditions, and between materials for the city's New Hope Housing project.

Glitsch chose not to go with wood trim, as it is a bulkier product and for water infiltration purposes can only be used for vertical joints. The panels themselves are a mix of fiber cement panel and lap, stucco, and brick.

Sharing some project details, Glitsch states, "We could have had a metal shop make up the trim pieces, but that's not always a good way to get a quality, consistent, and cost-effective product. And the heavier-weight trim we used makes it easier to install the product properly.

Another recent example in the Lone Star State is Texan26, off-campus living for University of Texas students in Austin. For this project, in addition to the fiber cement panel and extruded aluminum used to create a reveal system, the building team added a drainable wrap to create a micro-rainscreen effect. The particular product chosen effectively maintains a 1½-millimeter gap between the wrap's primary surface and the cladding material thanks to an integrated filament. As a result, the wrap can remove 96 percent of the moisture that accumulates on the facade.

The omni-directional wrap also offered the Texan26 contractors an easier installation process. Together with a double-sided tape, as opposed to typical seam tapes, this enabled the installers to maintain a positive shingle installation throughout, which is best practice preached by the building science community.

As a side note, the codes are starting to catch up with accumulating research and building science expertise, stressing the importance of a building's ability to effectively drain its walls in order to protect the integrity and performance of the building envelope. As a result, it is anticipated that housewraps will increasingly be judged by how effectively they provide positive drainage of water from the wall.

THE STRUCTURAL STEEL DECKING OPTION

Architectural metals, such as aluminum and aluminum composite, are a frequent choice for building facades because they are included in the Construction Specifications Institute's Division 7, which addresses thermal and moisture protection.

However, an often over-looked option, tucked away in CSI's Division 5 Metal Construction section, is exposed structural steel decking systems, which offer the distinct advantage of doubling as a structural system, thereby addressing form and function. By transferring load forces into the structure, this directly contributes to the building's integrity, thereby reducing the overall project cost.

Available in curved, smooth, ribbed, or lineal plank patterned to create attractive exteriors, the exposed design also supports spacious interiors. With the open plenum design, lighting, electrical, plumbing, and fire suppression can be readily integrated, and by taking advantage of coated and textured options, such as bold fluted and smooth lineal textures, longevity is enhanced. Acoustical treatments are also available to help absorb sound energy.

With all these benefits, architectural decking is increasingly used as ceiling and cladding solutions for stadium exteriors and roofs, natatorium ceilings, open-air walkways, screens, and canopies.

Putting this into practice, the architect Populous chose an exposed architectural steel deck for the Minnesota Twins' Target Field's exterior cladding system, breaking away from the application of high-end, high-cost architectural metal exteriors.

"Populous was looking for an alternative, lower-cost cladding system," recalls Marty Williams, design development manager, New Millennium Building Systems. "They were surprised to learn that an exposed structural steel deck system would address their aesthetic needs and more."

Ultimately, a 2-inch-deep, dovetail-shaped steel decking system not only optimized design and cost, but the system added to the structural integrity of the canopy.

Looking for an alternative to high-cost architectural metal exteriors, Populous specified exposed architectural steel deck for the new exterior cladding system at the Minnesota Twins' Target Field, capturing cost savings and adding to the canopy's structural integrity.

Photo courtesy of New Millennium Building Systems

Longboard®

longboardproducts.com

We love architecture as much as you do.

CIRCLE 138

Architect: Henriquez Partners Architects
Project: Immigration Services Society, Vancouver B.C .Canada
Product: LONGBOARD® 6" V Groove in Dark Fir, Moonstone & Light Grey

Photo courtesy of Prodema

At the Owensboro Medical Health System in Owensboro, Kentucky, a natural wood rainscreen panel was designed to help support the image of a healthy, sustainable hospital.

The installation crew closely coordinated with the fabricator to provide detailed drawings and scaled structural models showing how the customized trim sections would integrate with the dovetail steel decking system. Installation was then efficiently directed with the steel decking arriving in staged deliveries. Deck sections spanning up to 15 feet were protected by a strippable film, enabling the installers to position, strip, and install each section without mars or scratches.

The trim pieces, brake formed by the installer, utilized the same steel coil as the decking. Furthermore, PVDF factory-finished, galvanized steel coil provided a 20-year protection rating to the finished system.

Ultimately, selecting a structural steel cladding system delivered key form and function benefits, an outcome derived from getting off of the Division 7 beaten path.

THE WARMTH OF NATURAL WOOD

While the offerings of cladding materials abound, the beauty and warmth of natural wood evokes a special feeling, making it a desirable facade option.

Of course, the typical maintenance requirements associated with real wood is often a stumbling block for design teams. Fortunately, these concerns are greatly minimized with the availability of high-pressure laminate (HPL) panels finished with natural wood, delivering the aesthetic of real wood without the hassle of maintenance. While other wood materials require a high level of regular maintenance (i.e., varnishing, sanding, cleaning, etc.), these rainscreen HPL panels now afford architects a high degree of imaginative design and offer clients a maintenance-free facade dressed in a genuine wood aesthetic.

More so, these materials are designed as a ventilated facade, contributing to the building's performance, energy efficiencies, and sustainability. These panels are prefinished, ready to install with conventional woodworking tools, and meet code fire requirements for any building height and construction type. These systems are primarily specified for facades but are often used as soffits or as a louver system and screen walls. And because the panels can be cut to any size and curved and supplied with the wood veneer on both faces of the panel, this affords architects boundless design freedom.

Looking to showcase the allure of wood, architect Jean-Marc Bonfils was actively looking for a wood cladding product to symbolically serve as the door to the city of Beirut for his East Village condo project (not pictured). Looking to retake the language of the traditional 1920s wooden houses surrounding the neighborhood, Bonfils selected HPL wood-faced panels to clad the facade, which was also decorated by vertical gardens.

"Suddenly, we found ourselves with the possibility to have a very vivid building with a very natural material and use it in a very contemporary way," says Bonfils, Jean-Marc Bonfils & Associates, Lebanon. "That vivid feature of wood is absolutely extraordinary."

Incorporating wooden brise-soleil panels into the design, the East Village facade texture changes with the sun and rain, creating a dynamic look.

Offering some perspective on the trend, Lourdes Hidalgo-Gato, sales manager, Prodema North America, relates that building envelope design has seen a significant transformation, especially in the United States and Canada, over the past decade. "Building science has taken a prominent role in response to higher standards for R-value requirements, resulting in a focus and growth of high-performance facade systems."

ANCHORING IT DOWN

One importwant aspect of installing the various cladding materials available to the architect is the application of an effective anchoring system. While there are many choices in the market, not all offer a fully concealed system, which can be key to supporting the project's aesthetics.

It's also import to select a system that supports the positioning of undercut anchor on the back of the panel without constraints. Of course, these anchors must also pass required testing for facade panel attachment, ultimately supporting a high load capacity without stressing the facade panel by lateral bracing. Fortunately, some concealed anchoring systems are capable of delivering a safety factor that is much higher than traditional mortar, dowels, or visible clips.

Finding a system that can support thin facades—even as thin as 6 millimeters—is an added bonus in terms of supporting a higher level of design creativity. This capability was key for Daniel Libeskind's Vanke Pavilion exhibition designed for the 2015 Milan Expo. The striking free-form metallic facade is a flowing organic shape, originating from the architect's free-hand sketch.

More than 4,200 tiles—a mixture of clays, quartzes, and feldspars—produce a dynamic, metallic glaze which creates an iridescent three-dimensional effect. Depending on time of day, light incidence, and viewing angle, the facade shifts from deep red to shimmering gold.

But in order to attach this sculptural creation to the facade, invisible and secure anchors were essential. To achieve this, steel squares are anchored to the pavilion structure and welded to round calendered steel rods. Positioned on the back of the tiles, a special drill bit was used to produce the cylindrical hole and conical undercut in one step. This created the basis for the attachment of the undercut anchor—an anchor sleeve and a hex screw.

Vanke Pavilion
Milan, Italy

KEIL®

CONCEALED ANCHORING SYSTEM FOR RAINSCREEN FACADES

TILE EZE | EXCLUSIVE SALES PARTNER | 1.800.476.3737 | KEILANCHOR.COM

Upon inserting the screw, the anchor sleeve successfully settled into the undercut hole with a positive fit and free from stress. The various diameters of hole and undercut ensure a secure hold without loading the tile, thereby avoiding stress cracks.

THE ALL-GLASS FACADE

In addition to aluminum cladding and siding, steel decking, and specialized cladding attachment systems, glass curtain wall is an increasingly popular facade option, promoting daylighting, views, and a high-end aesthetic.

Whether it's stick-built curtain wall, unitized facades, point-supported structural systems, storefront, or window wall, these transparent systems deliver a modern, inviting entry point to any building.

"Today's glazing system designs are pushing the envelope in many ways. From energy and acoustical performance, blast resistance, and ever increasing glass panel sizes," states Jeff Haber, managing partner, W&W Glass, Nanuet, New York. "It is critical to stay on top of the latest trends in technology and manufacturing and marry these to the engineering of the products themselves to ensure the highest level of performance and quality."

It's important to understand some key differences and applications between the different glass facade systems. Unitized curtain wall is made up of large factory-glazed glass units. The panels can be erected in a third of the time of a stick-built system, making it well suited for taller structures, where higher field labor costs exists, higher performance is needed, or where a large volume of repetitive prefabricated panel sizes are required.

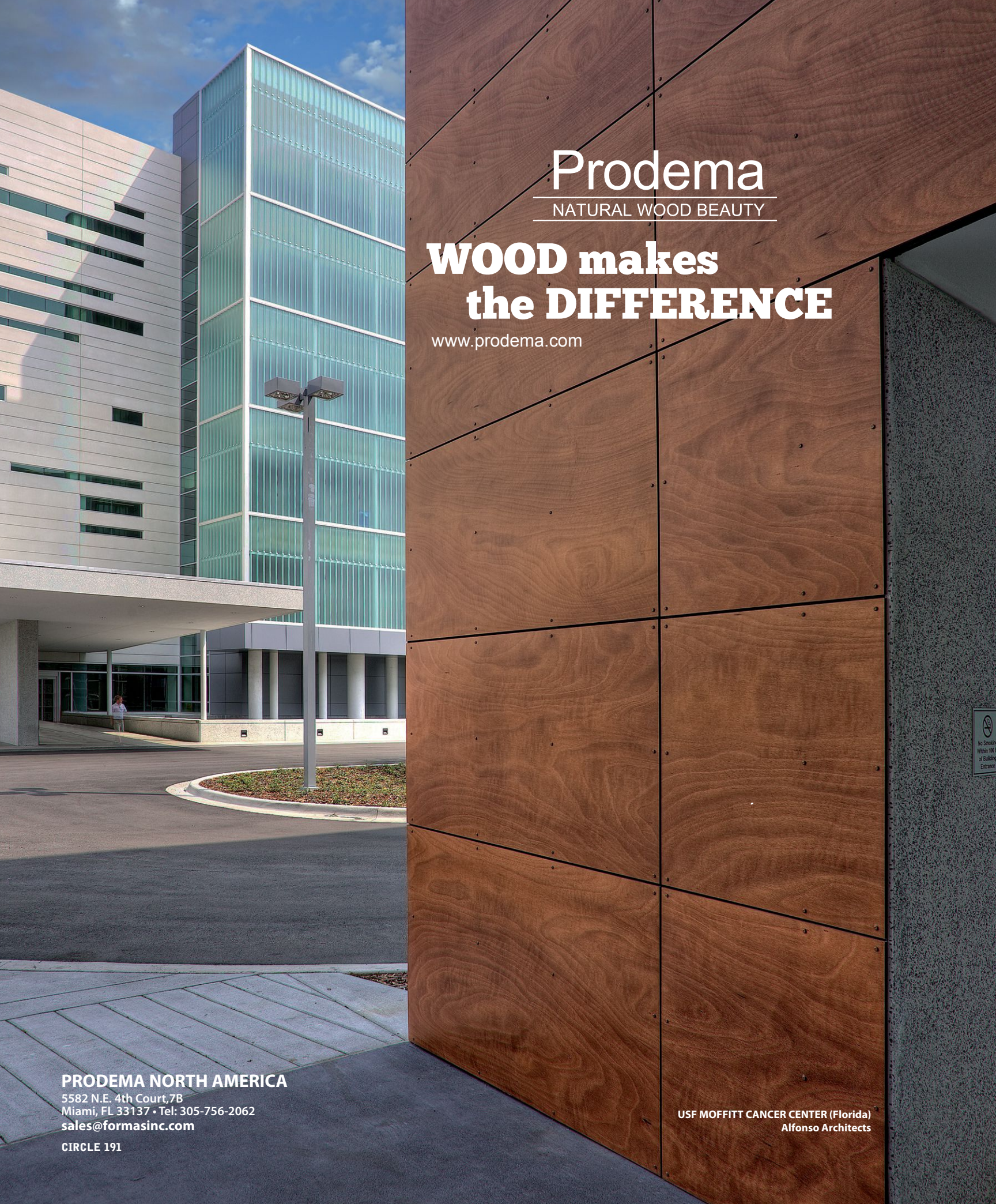
Otherwise, the vast majority of low to mid-rise curtain walls utilize stick-built systems, which have long vertical pieces of aluminum spanning in front of floors with horizontal members spanning between vertical members to support and transfer the load of the glass back to structure. Unlike fabricated unitized curtain wall, most of the glazing and erection must be done on-site. However, the lead time is much shorter, less up front staging is required, and stick-built systems are a good fit for facades with lower required volumes and complicated conditions.

Meanwhile, window wall is an aluminum facade system that spans in between slabs, making it a good choice for small- to medium-height buildings with window sizes at 10 feet or less. Because window walls can be glazed from the floor slabs on the inside of the building, this is helpful for speed and ease of installation, as a head track and sill track is mounted to the slabs and the preassembled window wall panels are set into place. Any moisture in the system then drains out at the sill track at the base.

A less-expensive alternative to curtain wall and window wall, storefront systems are typically used for lighter-duty applications at the base of buildings. Glazed on the interior or exterior, these one-floor systems create a storefront at the retail level or entrance to a building.

Photo courtesy of TILE EZE

For Daniel Libeskind's Vanke Pavilion exhibition designed for the 2015 Milan Expo, invisible structural anchors were used to attach more than 4,200 tiles made from clay, quartz and feldspar within the free-form metallic facade.



PRODEMA NORTH AMERICA
5582 N.E. 4th Court,7B
Miami, FL 33137 • Tel: 305-756-2062
sales@formasinc.com

CIRCLE 191

USF MOFFITT CANCER CENTER (Florida)
Alfonso Architects

Point-supported structural glass systems—a popular choice for highly transparent facades, entrances, atriums, and lobbies—are made from tempered glass panels (with or without holes) attached with bolted or clamped fittings to the structure. The face glass is usually hung off of the backup structure, which can be glass fins, steel members, or stainless steel cables.

The biggest difference between these systems and a typical structurally glazed aluminum curtain wall system is the way the point-supported systems are supported, which is anchorage at specific points. This requires that the glass support a greater temporary deflection and resistance to uneven loading at edges and stress at hole/clamp locations, but it also requires thicker glass than standard curtain wall.

When specifying point-supported systems, it's important to consider a fully tested system and bringing in a sole-source provider with a turnkey package, as opposed to amalgamated parts and pieces of tempered glass with holes, spider fittings, etc. Some of these manufacturers can also tighten specific fabrication tolerances and minimize roller-wave distortion tolerance to produce flatter tempered glass sometimes required by higher-end projects.

When submitting design plans to these fabricators, it's important to include details on the wind loading, live load deflection, backup structure, renderings, plans, elevations, sections, inelastic seismic drift (to determine what panel sizes may work based on movement during an earthquake), glass performance requirements (i.e., low-e, silk-screen, tint), and special requirements, such as hurricane-impact or blast resistance.

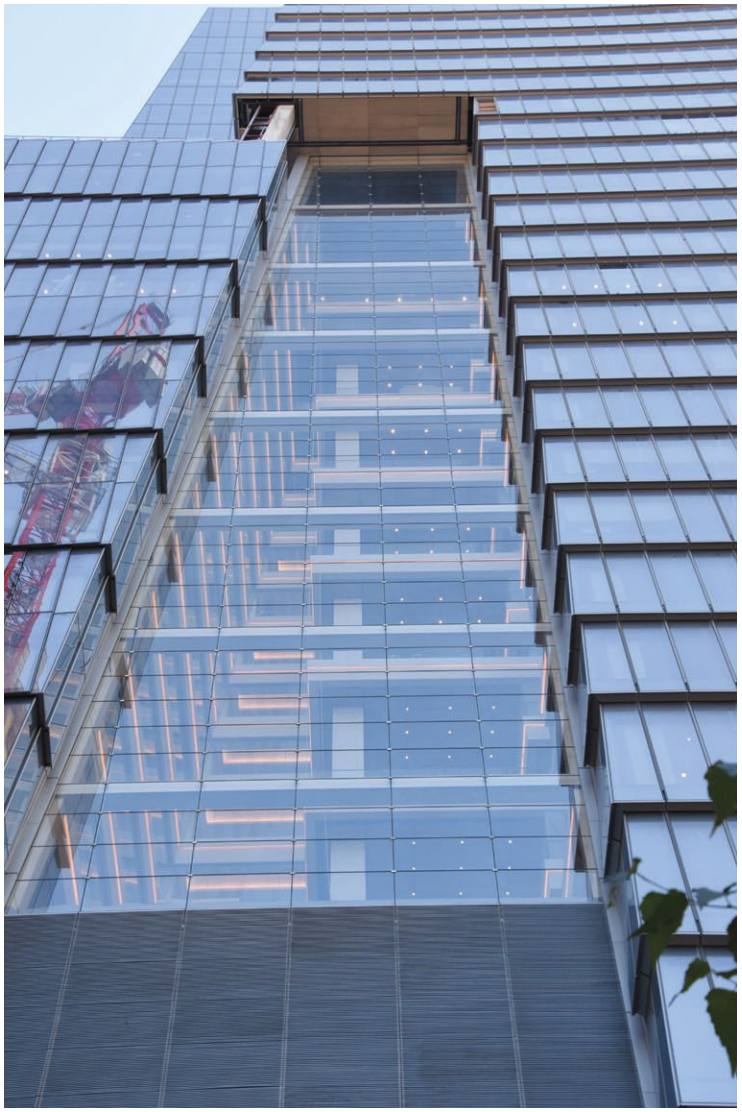
All of these inputs are important to determine what panel size, fitting size, and structural glass system configurations will work best for the project.

Because the curtain wall system is also tied into the building enclosure, serving as the first line of defense for air, moisture, and water infiltration, it's important to utilize an experienced installer with expertise in erecting weathertight complex glass systems. Also, failing to hire an expert system fabricator can result in poor tempering of the heavy tempered glass used in structural glass applications, thereby showing visual defects, such as high roller-wave distortion and bow and warp in the glass.

A high-profile example of bringing in an experienced curtain wall system fabricator and installer team to engineer, manufacture, and assemble a complex project is the point-supported structural glass systems at Hudson Yards Tower C, 10 Hudson Yards in Manhattan's west side.

The 52-story high-rise features an 82-foot-tall cable wall lobby facade and a trapezoidal 207-foot-tall atrium cable wall rising from the

Photos courtesy of W&W Glass, LLC

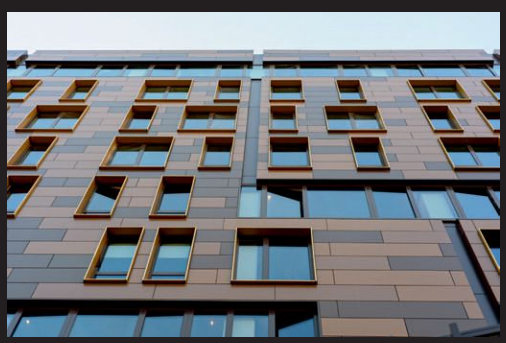


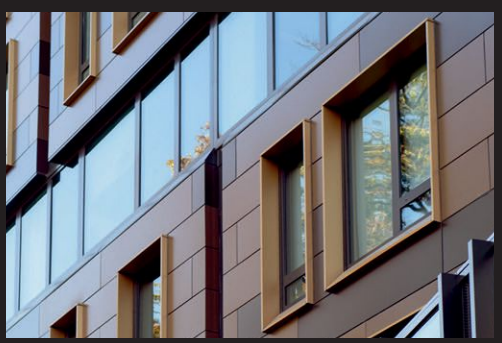
For the Kohn Pedersen Fox-designed 10 Hudson Yards in Manhattan, a point-supported structural glass system clads the 82-foot-tall cable wall lobby facade and a trapezoidal 207-foot-tall atrium cable wall for the 52-story high-rise.

ACP EXPRESS®

PANELS & COLUMNS INTERIOR - EXTERIOR

THE REVOLUTION IN PANEL SYSTEMS





CIRCLE 249

PIERHOUSE
Brooklyn Bridge Park

ARCHITECT: MARVEL ARCHITECTS PLLC - NEW YORK, NY

PANEL SYSTEM PROVIDER: ESTOLGA 1000®/ ACP EXPRESS®

GC: HUDSON MERIDIAN CONSTRUCTION GROUP - NEW YORK, NY

PANEL INSTALLER: PG DRYWALL - TUCKAHOE, NY

MATERIAL SUPPLIER: REYNOBAND

Photo courtesy of Andrew Adkison, GFF

This GFF Architects-designed thermally broken curtain wall at the 9001 Cypress Waters office space in North Dallas, Texas, features unique T-shaped mullions and extended face caps.

sixth floor to the 21st floor. Both walls were made from 10-foot-wide modules, which is quite large for a structural glass facade.

The lobby walls also incorporate two full-height structureless corners supported with a special thin stainless steel angled bar located directly behind each corner.

In order to limit solar heat gain, Kohn Pedersen Fox required low-e coatings in some areas. Working with the glass fabrication engineers, approximately 1-inch-thick low-iron laminated glass was specified.

GLASS ENTRANCE SYSTEMS

To better achieve the sought after all-glass profile, technological advances are focusing on enhancing sightlines while maintaining thermal performance. As a result, architecture today is pushing the boundaries of aesthetics and function.

One area where this is evident is with entryways, which are being designed as key facade focal points. For example, one of the latest entrance systems to hit the market supports door handle hardware on 1-inch insulating glass panels using innovative through-glass fittings. The result is an attractive "floating on air" appearance. The system also delivers an ultra-thin door stile width of $1^{1}/_{8}$ inches and an overall depth of 2½ inches, significantly reducing the amount of visible hardware. This creates a striking aesthetic that showcases the beauty of glass.

Facades must not only provide aesthetic excitement, they must also deliver exceptional thermal performance due to increasingly stringent energy codes. Despite the entrance system's thin frame, it features heavy-duty, thermally broken cladding that produces U-factors as low as 0.33. Its clamping system also accommodates all high-solar and energy-efficient glass options. In all, the progressive entrance system provides the unique combination of all-glass aesthetics with full-frame performance.

Highlighting the key role that a well-engineered entryway can play in a facade's overall aesthetic is the new 9001 Cypress Waters office space in North Dallas. The 215,000-square-foot facility, owned by the Billingsley Company, was designed by GFF Architects and features a monumental, four-story trellis composed of layered aluminum tubing. Surrounding concrete panels are peeled back to reveal a delicate, thermally broken curtain wall behind the trellis, with unique T-shaped mullions and extended face caps. This creates clean, streamlined glass spans that maximize daylighting and views to an adjacent park.

To complete the grand entryway, GFF Architects selected a thermally broken, all-glass entrance system to boost thermal performance and enhance aesthetics. The system is engineered to meet air and water infiltration requirements as well.

GFF teamed up with contractor Adolfson & Peterson Construction and glazing contractor Denison Glass & Mirror Inc. to deliver the project.

"When we're thinking about the design of a building that is speculative in nature, we're looking at ways to amplify the impact of the primary elements composing the facade, and we consider how these elements can be articulated to meet the need for maximizing daylight and thermal efficiency," states Maria A. Gomez, principal, GFF Architects, Dallas. "The doors at the main entrance solved the requirement for thermal performance and weather protection, while maintaining an upscale look that complements the clean facade."

It's to the architect's advantage to select single-source manufacturers that are capable of delivering a full range of facade solutions, including windows, entrance systems, storefronts, and curtain walls. Some glazing manufacturers also offer metal systems (e.g., sunshades, railings, windscreens, point-supported structural fittings, metal cladding, perforated panels, etc.) in order to present a complete selection of facade options.

"A successful facade design relies on the architect's coordination of different products to achieve the aesthetic and functional goals of their client. We've experienced success in our ability to simplify this process by supplying a wide variety of systems, options, and upgrades that accomplish the design intent while meeting performance requirements," says George Heflin, sales director, CRL-U.S. Aluminum, Dallas.

DEVELOPMENTS IN KINETIC FACADES

While glass curtain walls are a popular and effective solution, kinetic facades—defined as the ability to respond and adapt to the changing environmental conditions—take designs a step further by employing the facade as an active system, capable of reducing energy costs and HVAC requirements through enhanced daylighting and natural ventilation.

A marriage of form and function, these visually captivating facades reduce solar heat gain by shielding the building from direct sunlight, while still supporting natural ventilation within the structure. Kinetic facades are designed to proactively respond to changing conditions, thereby enabling the facade to function more efficiently.

"By actuating the facades and making them dynamic, they can now better adapt to the conditions and provide for improved comfort of the occupants by providing for more of the tasks at

Architectural Products Magazine's PIA'15 product innovation awards

ARCHITECTURAL RECORD Record Products 2015 BEST IN CATEGORY

TOGETHER AT LAST

PERFORMANCE + *AESTHETICS*

NEVER AGAIN SPECIFY ONE AT THE EXPENSE OF THE OTHER

ENTICE® ULTRA NARROW **THERMAL ENTRANCE SYSTEM**

FULL-FRAME PERFORMANCE

- NFRC Rated
- U-Factors as Low as 0.33
- Thermally Broken Framing and Cladding
- Satisfies ASHRAE 90.1-2016 Air Infiltration Criteria

ALL-GLASS AESTHETICS

- 1-1/8" Ultra Narrow Vertical Stiles With a System Depth of Only 2-1/2"
- Unique Ability to Support Door Handle Hardware on 1" Insulating Glass
- Custom Cladding in a Variety of Premium Finishes

"The cleanliness in lines is equaled by the sophistication of the hardware and performance."

— Product Innovation Awards Judge

CRL® U.S. ALUMINUM

crl-arch.com/ENTICE

Photo courtesy of EXTECH/Exterior Technologies, Inc.

Designing a kinetic facade for the Logan Airport Parking Expansion in Boston, Arrowstreet selected curved aluminum 'flappers' inside unitized panels to capture the dynamic patterns of the wind coming off the Atlantic Ocean.

a higher level of performance," explains Ryan Hansanuwat, faculty of the school of architecture, University of Southern California, in a paper titled "Kinetic Facades as Environmental Control Systems: Using Kinetic Facades to Increase Energy Efficiency and Building Performance in Office Buildings." "The building can be constantly working toward a better environment for the user as opposed to simply protecting them from it."

By partnering with a kinetic facade provider early in a project, building teams can more effectively meet structural requirements due to the inherent lightness and energy efficiency of kinetic wall systems. Additionally, a kinetic facade's aesthetic qualities may help municipalities save money on Arts in Transit and percent-for-art compliance.

For example, kinetic facades elevate the quality of the ridership experience and disrupt the monotony of commuting by providing a dynamic, interesting sight.

Case in point, for the Logan Airport Parking Expansion project in Boston, Arrowstreet partnered with one of these providers to create a kinetic wall based around 6-inch square curved aluminum 'flappers.' Elevating the parking lot into an art installation, the flappers were assembled into 350 unitized panels to capture the dynamic patterns of the wind coming off the Atlantic Ocean. Because of the facade's innovation and novelty, the fabricator provided several mockups and prototypes to ensure the flappers would meet the design intent.

"The kinetic facade provides a visual representation of an unseen and unpredictable natural phenomenon—the wind," relates Jim Leslie, general manager, EXTECH/Exterior Technologies, Inc., Pittsburgh.

A total of 48,000 custom-made flappers, spanning eight stories high and 290 feet wide, deliver an array of cost and sustainability benefits: they allow air to flow through and ventilate the building, they permit visibility from the inside, and they deflect solar heat gain. Furthermore, the panels deliver an eye-catching aesthetic of the wind rippling across the flappers.

On another project designed by Anmahian Winton Architects for Community Rowing's Harry Parker Boathouse and Ruth W. Somerville Sculling Pavilion in Brighton, Massachusetts, a wood-faced operable paneled facade evokes the look of New England's traditional covered bridges and tobacco barns, while delivering superior insulation and ventilation for the largest rowing company in the country.

A CNC router was used to fabricate the panels in a variety of unique shapes, and aluminum extrusions support the wood panels in their various orientations. Meanwhile, panels of 16-foot-high operable windows are hinged at the top and bottom and open in the centers, driven by rack and pinion hardware. Designed to be easily operable and efficient, as many as 30 glass panels can be opened by a single drive mechanism.

In addition to the wood facade and operable wall panels, unique aluminum clips were fabricated to support a shingled glass wall on the adjoining sculling pavilion.

Some custom facade fabricators are capable of "delving so completely into the conceptual objectives of a project that it produces unexpected solutions that have the power to redefine a project for the better," explains Alex Anmahian, principal, Anmahian-Winton Architects, Cambridge.

THE FACADE'S MANY ROLES

From aluminum to steel to wood to glass, building facades play a very key role within buildings, serving a variety of essential functions.

"While the facade is an elegant component that helps to define the unique architectural aesthetics of the building, it also has the critical role related to energy performance and interior function of a building," confirmed Dudley McFarquhar, Ph.D., PE, McFarquhar Group Inc., Mesquite, Texas, in a "Role of the Building Facade" white paper for the Building Enclosure Science & Technology (BEST3) Conference.

He concludes, "As technology continues to improve, different options for improvement become available for incorporation into building facades."

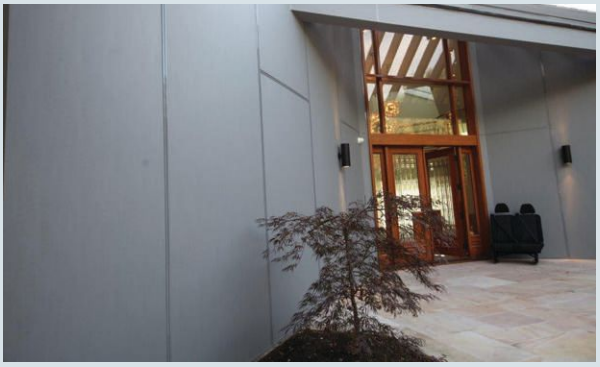
Continues at ce.architecturalrecord.com

PRODUCT REVIEW

First Impressions

Cladiators

Photo courtesy of Cladiators



Cladiators Calor Wall System

Patented Calor™ wall technology eliminates the traditional sealant and gasket and adds thermal performance to the building envelope. Calor wall systems are developed for high performance, uniquely innovative thermal and moisture control, and exceptional design versatility.

www.cladiators.com Circle 173

EXTECH/Exterior Technologies, Inc.

Photo courtesy of EXTECH/Exterior Technologies, Inc.

KINETICWALL™ Moving Dynamic Facade

KINETICWALL is a dynamic moving facade that creates an eye-catching aesthetic. Made of 6-inch flappers attached to steel rods, KINETICWALL responds to wind currents to look like rolling waves. Customizable flappers are structurally designed to withstand hurricane-force winds and rainfall. KINETICWALL permits air flow and visibility, prevents solar heat gain, and provides opportunities for Arts in Transit.

www.extechinc.com Circle 174

CRL-U.S. Aluminum

Image courtesy of C.R. Laurence Co., Inc.

Entice® Thermal Entrance System

Entice® is engineered to provide all-glass aesthetics with full-frame performance. The system has the unique ability to support door handle hardware on 1-inch insulating glass panels. Boasting the thinnest thermally broken profile in the industry with a vertical stile width of 1⅛ inches, this completely customizable system delivers premium aesthetics while producing U-factors as low as 0.33.

www.crl-arch.com/entice Circle 175

PRODUCT REVIEW

First Impressions

Longboard® Products a Division of Mayne Coatings Corp.

Photo courtesy of Mayne Coatings Corp.

Longboard® Cladding Products

Longboard® Cladding Products are lightweight, versatile, and applicable to any project. The wood-grain finishes offer an authentic natural look, while the solid colors offer clean lines to satisfy even the most delicate designs. Sustainable manufacturing processes and superior product quality are the backbone of this contemporary product.

longboardproducts.com Circle 176

Prodema

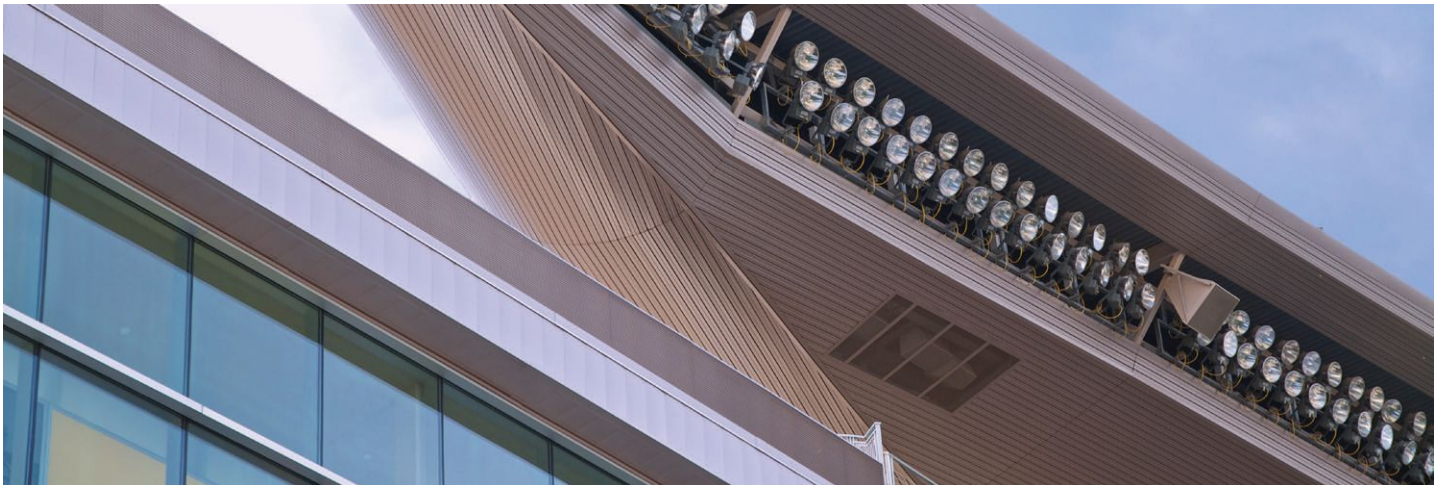
ProdEX Natural Wood Facades

This rainscreen panel offers the warmth and elegance of natural wood and is maintenance free. Use it on facades, soffits, screen walls, louvers, and even curved surfaces. Its proven performance far exceeds the industry requirement, and it is LEED friendly.

www.prodema.com Circle 177

New Millennium Building Systems

Photo courtesy of New Millennium Building Systems



Architectural Steel Decking

Game-changing building exteriors: curved, smooth, ribbed, or lineal plank patterns use exposed steel decking. Structural and aesthetic, architectural decking can be acoustic, span to 35 feet, incorporate MEP, and coated to outlast other options. It is often the lowest total-project cost solution.

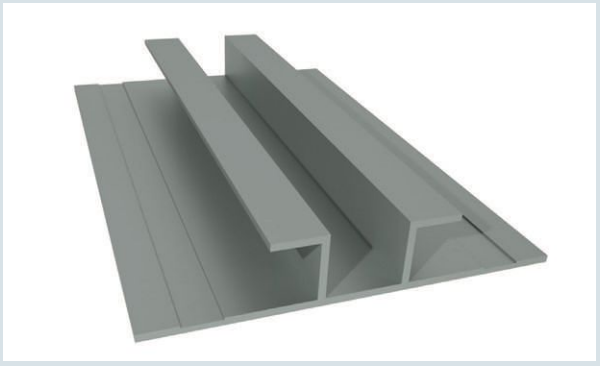
www.newmill.com Circle 178

PRODUCT REVIEW

First Impressions

TAMLYN

Image courtesy of TAMLYN



XtremeTrim® Reveal Trim System

XtremeTrim® (extruded aluminum trim) profiles are available to match multiple panel siding systems. XtremeTrim® has thousands of design and color options, allowing architects and users to dramatically improve their building aesthetics and create modern architectural lines. Sustainable, durable, noncombustible, lightweight, easy to use, for interior or exterior use—that's XtremeTrim®.

www.xtremetrim.com Circle 179

TILE EZE

Image courtesy of TILE EZE

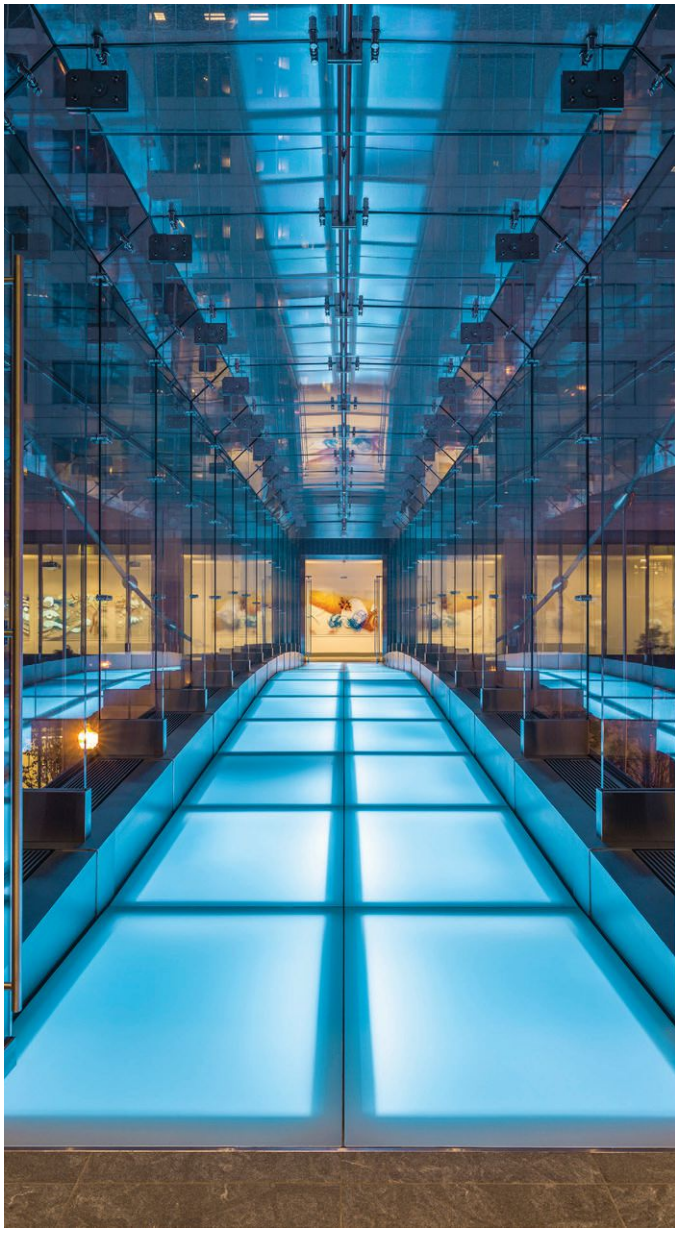
Keil Concealed Anchoring System

The KEIL anchor was developed for mechanical, non-adhesive, concealed anchoring for different facade cladding materials. The anchor is used worldwide in the facade industry for rainscreens, wall cladding, and exterior and interior facades.

www.keilanchor.com Circle 180

W&W Glass, LLC

Photo courtesy of W&W Glass, LLC



Pilkington **Planar**™ Structural Glass System

As the world's leading point-supported structural glass system, the Pilkington **Planar**™ system continues to evolve using larger glass panels and innovative backup structures. Backed by a 12-year comprehensive system warranty by Pilkington, architects and owners continue to specify this product time and time again for their most challenging projects.

www.wwglass.com Circle 181

New strategies—from architectural design elements to bacteria-fighting solutions—are being used to create more productive and efficient health-care environments, and, importantly, to promote healing.

Photo courtesy of The Sherwin-Williams Company

Design Strategies for Optimal Well-Being in Health-Care Environments

Improving the patient, visitor, and caregiver experience through innovative and flexible design solutions

Sponsored by AD Systems, Metl-Span, and The Sherwin-Williams Company

By Robyn M. Feller

This past August, economists from the American Institute of Architects, the National Association of Home Builders, and the Associated Builders and Contractors got together to deliver a midyear status update on the health of the construction sector; the diagnosis was good. Spending through June 2016 increased by 2.2 percent over the same time period last year—$19.6 billion (2016) from $19.2 billion (2015). In a subsequent press release, AIA Chief Economist Kermit Baker, Hon. AIA, stated, "Given current demographic trends, the single-family residential and the institutional building sectors have the greatest potential for further expansion at present." In 2017, growth is expected to swing to the institutional sector, with health-care construction spending poised to double.

This all makes sense from a demographics standpoint. With the U.S. population gradually aging, there inevitably will be a greater demand for hospitals—not to mention the implementation of the Patient Protection and Affordable Care Act, which has resulted in millions more individuals gaining access to health-care insurance coverage, further driving up the need for hospital services.

With the demand for services and health-care construction on the rise, it is more critical than ever to create spaces that keep patients well and provide optimal environments for wellness, comfort, safety, and productivity.

CONTINUING EDUCATION

1 AIA LU/HSW

BNP MEDIA IS AUTHORIZED BY IACET TO OFFER 0.1 CEUS FOR THIS PROGRAM

Learning Objectives

After reading this article, you should be able to:

1. Identify architectural design features, such as sliding door systems, that can improve privacy and acoustics and explain how those systems add to a more positive patient experience.
2. Discuss how specific paint and coatings technologies, as well as FRP systems, can improve building maintenance and life cycle while providing performance and functional attributes to benefit the overall well-being of occupants in health-care settings.
3. Assess different strategies that can be used successfully to contribute to the design, construction, and operation of modern health-care facilities.
4. Recognize various design elements used to create healthier, more productive, and more efficient health-care environments.

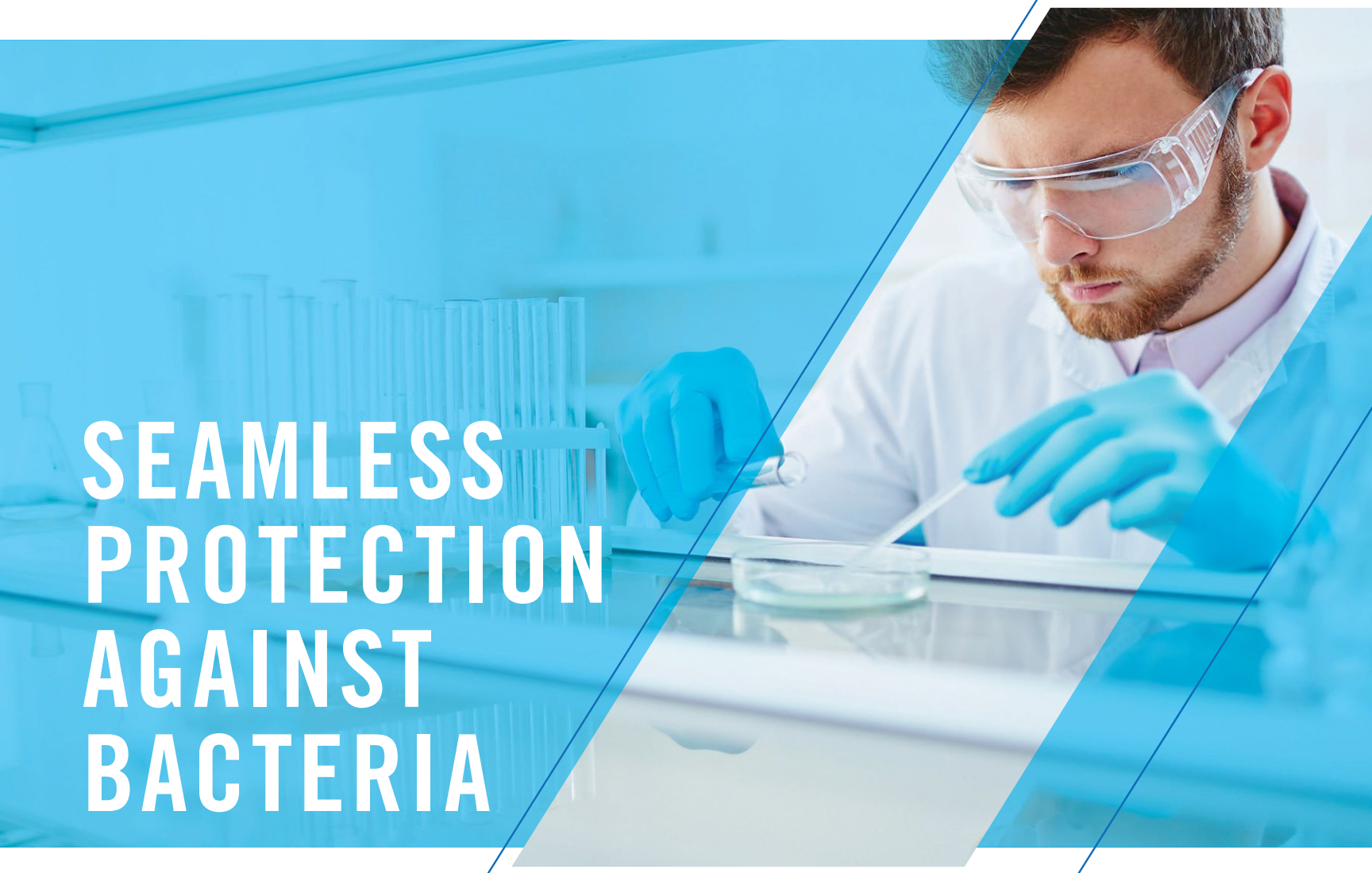
To receive AIA credit, you are required to read the entire article and pass the test. Go to **ce.architecturalrecord.com** for complete text and to take the test for free.

AIA COURSE #K1612K

METL SPAN®

INSULATED METAL PANELS

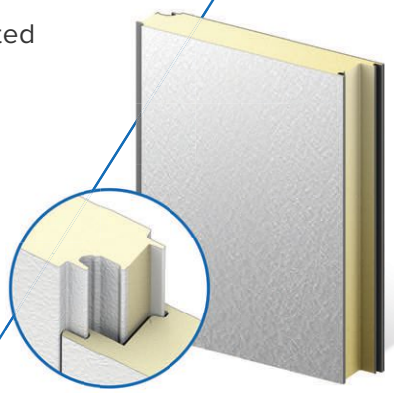
FRP CleanSeam™



SEAMLESS PROTECTION AGAINST BACTERIA

The revolutionary CleanSeam™ insulated metal panel system enables a virtually seamless joint of wall and ceiling panels, eliminating any penetrable spaces and preventing growth of mold or mildew for superior hygiene and performance.

For more information please call 877.585.9969 or visit ***metlspan.com***



CIRCLE 30

As noted by The Center for Health Design, a 501(C)(3) organization, among the many concepts and strategies that might be considered include:

- **Healthy building materials:** Use products that are easy to maintain, are environmentally friendly, and don't include toxins and carcinogens.
- **Smart circulation:** Include a central building spine that can easily be the backbone of future expansions, with separate public, patient, and service flows.
- **Patient experience:** Think about safety in transfers, bedside technology, and room standardization as well as positive distractions and elements like daylight. Infuse art into spaces where possible and integrate natural forms and materials, while also providing spaces for social interaction.
- **Family space:** Provide areas for family inside patient rooms and outside, with healing gardens available, too.[1]

The bottom line for everyone involved from patients, medical staff, and concerned friends and families to the project architects and designers is to promote wellness. That means taking a broader approach to the health-care environment. Addressing the patient's physical health is no longer enough. We need to find new ways to promote overall health and well-being.

In the following course, we will look at some products and approaches that can contribute to achieving patient wellness, provider efficiency and overall occupant satisfaction in all types of health-care environments.

EFFECTS OF NOISE IN MEDICAL SETTINGS

In the words of Florence Nightingale, "Unnecessary noise is the cruelest absence of care." Basic tenets of dignity and respect would dictate that a quiet and private space for recovery should be at the core of care in medical settings.

Noise is a factor that affects both patient satisfaction and outcomes as well as staff satisfaction and performance. In order to reduce hospital noise and improve the auditory environment, designers need to make a commitment to creating a complete healing environment for patients and staff.

With a greater focus on patient satisfaction and mandated standards, health-care facilities are seeking ways to increase acoustic comfort and privacy. These two factors strongly contribute to patient satisfaction by optimizing rest and relaxation as well as providing the peace of mind of confidentiality. By incorporating sound-masking strategies in health-care settings, patients are able to sleep better, resulting in an improvement of medical outcomes.

It is no secret that noise is a significant issue for many hospitals. It has been found that there are typically no fewer than 86 different sources, including patients, staff, and visitors talking; an abundance of sounds from televisions, alarms, carts, and doors; and the beeping and buzzing of medical equipment and mechanical systems.[2]

This cacophony is more than just a nuisance. More and more research shows that noise can actually cause physical harm to patients by elevating heart rate and blood pressure, for instance.[3] Furthermore, noise obviously keeps patients from getting needed rest, which serves to weaken the immune system and can lead to problems exacerbated by lack of sleep, such as agitation, delirium, and decreased tolerance to pain.[4]

Moreover, adverse effects of noise go beyond just the patients. While it might seem that staff can just tune out the sounds they hear day in and day out, it's just not true. No one can fully ignore these disturbances since human senses are designed to detect these types of changes in our environment. Noise disruptions, which impacts caregivers' concentration, causes stress and fatigue, and potentially affects quality of care.[3]

The challenge of managing hospital noise and creating a quieter, more soothing, and relaxing environment is not just an abstract concept—its success is being measured against Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores and Health Insurance Portability and Accountability Act (HIPAA) compliance, and is tied to government funding in the United States. The resulting financial consequences can be substantial. HCAHPS surveys provide the basis for calculating Patient Satisfaction Scores under the Value-Based Purchasing (VBP) program, which enacts penalties on poorly performing hospitals by withholding Medicare payments. Currently, noise remains the lowest-rated marker of patient satisfaction across the United States.[5] (For more details on the HCAHPS Survey, see the sidebar in the online portion of this course.)

HOW SLIDING DOOR SYSTEMS AFFECT ACOUSTICS, PRIVACY, SPACE, AND ACCESSIBILITY

Sliding exam doors provide a host of benefits for health-care settings. Some high-quality sliding door products are purpose built for outpatient health-care projects, providing a range of locking and latching, acoustic, and other functional solutions to suit the needs of medical office building (MOB)/outpatient/free-standing ER and patient restroom settings.

Successful door systems should be highly configurable and can be standalone doors or interior storefronts with sliding doors. Manufacturers should offer design support to ensure the sliding doors meet individual project requirements. Let's look at some of the benefits and features of these door systems.

Sliding doors vs. swing doors: The use of sliding doors can dramatically improve the efficient use of space in outpatient health-care settings or inpatient restrooms. A swing door requires that a significant amount of space be dedicated to the swing of the door and the approach clearances. Particularly in areas where large door openings are desired (typical of bathrooms or other areas in medical construction), the door swing is very obtrusive. When sliding doors are used, the layout of individual rooms is dramatically improved or a clinic can accommodate more exam rooms and usable space without wasting valuable space on door swings.

Space and design considerations: Sliding doors can also be an excellent solution for achieving a unique design concept in patient room corridors. For instance, for the 18-clinic rollout of the MultiCare Indigo Urgent Care Clinics in the Seattle-Tacoma, Washington, area, the architectural design firm on the project, BCRA Design, at the suggestion of the GC, Anderson Construction, chose a sliding door system in order to meet its goal of avoiding uninspired corridor walls and instead create a dynamic focal point that was visible from the lobby and other areas of the clinic. Furthermore, the sliding door system achieves the fundamental principles of universal design, a feature BCRA considered when deciding on its door approach. Laura Jacobson, an architect with BCRA, explains, "In order to achieve this impactful look and still be compliant for a health-care setting, we needed a system with an integral relite that was still able to put the door plane flush with the

At the Indigo James Center, part of the MultiCare Indigo Urgent Care Clinics in Tacoma, Washington, a sliding door system helps to create an impactful design effect, while maintaining compliance for a health-care setting.

CIRCLE 44

INNOVATION BEHIND EVERY DOOR™

- Tested acoustical performance up to NIC 39
- Soft-Close feature on all doors
- Locking and latching hardware options (ADA compliant)
- Automated, Self-Closing and Smoke-Rated options available
- Provided as a complete assembly, ensuring quality, performance, fit and finish

ADSYSTEMS™
HIGH PERFORMANCE DOORS

specADsystems.com™

wall to link branded signage elements from the door to the wall." Additionally, the door system had the advantage of heavy-duty construction and STC-rated assemblies.

Maintaining acoustical and visual privacy: Acoustical privacy issues are often a concern with sliding doors in general, but some newer doors have been designed to achieve high levels of acoustical separation that are required in health-care spaces. Other standard features include a frame system that wraps the wall construction to prevent damage from high traffic in and out of spaces and closes gaps that present issues for visual and acoustical privacy, soft closers that prevent slams and wear and tear on the doors, and a top-hung assembly with a concealed bottom guide so that no exposed floor track is required, making it an especially optimal choice from an accessibility and cleaning standpoint.

Balancing acoustics and accessibility: According to Tysen Gannon, sales and marketing manager at AD Systems, a manufacturer of sliding door solutions, finding the proper balance of acoustics and accessibility can be a challenge. Gannon states, "The goal is to comply with FGI (FGI refers to the Facility Guidelines Institute, publisher of the *Guidelines for Design and Construction of Hospitals and Outpatient Facilities*) and ADA guidelines so that patients can expect speech privacy from a door with good perimeter seals and ideally a dropdown bottom seal but not have the door sealed so tightly that it won't allow for ease of operation. It takes good design, engineering, and a lot of experience working on medical projects to make products that are up to the tough standards of those environments and the high expectations of medical facility managers."

Installing an acoustical sliding door opens up the opportunity for health-care facilities and medical office spaces to realize a range of benefits. Developed to prevent a high level of sound from filtering through, acoustical sliding doors help these facility owners protect their work settings and provide patients and employees with a positive environment. The following advantages offered by acoustic doors make them an increasingly popular choice for numerous architects and their clients.

- **Provides confidentiality:** Patient confidentiality is a serious matter that is expected to be upheld in all doctor offices, medical clinics, and hospital institutions. Along with the Health Insurance Portability and Accountability Act (HIPAA) making it the responsibility of health-care providers to comply with strict regulations regarding privacy came a change in the way many establishments were designed and constructed. There have been many changes to facility design centered around addressing HIPAA concerns as well as more efficient delivery of care—and the use of sliding doors is of course affected by both. Along with designing full-height walls and being mindful of the routing of HVAC ducts, doors are a critical element of ensuring privacy of exam rooms, as they are responsible for sealing the hole in the wall that allows access. Sliding doors have traditionally been lower performing acoustically than swing doors because the tracks set them either within the wall cavity or part of the walls with spaces all around, but new sliding door designs feature much more solid construction than the typical "pocket door," and acoustic gaskets and drop seal features bring their performance in line with the gasketed swing doors that would be used in the same occupancies.
- **Helps maintain focus:** Most medical offices are busy places, with constant action going on amongst coworkers and patients. In today's on-stage/off-stage patient clinics, doctors and nurses are often working in open-plan environments in the "back-of-house" area. Frequently, the acoustical performance is only considered from the corridor side, but it is equally important for the provider side. This assures not only that patient confidentiality is maintained when doctors need to carry on conversations in the back of house, but also that workers in the open-plan environment are not distracted by what is happening in the surrounding exam rooms or adjacent areas. It can be easy to lose focus and difficult to concentrate on the tasks at hand when employees are consistently getting distracted and interrupted by everything that is happening around them so it is critically important that heath-care workers have workspaces conducive to concentration and productivity in order to deliver the best possible care to many patients.
- **Offers a comfortable environment:** Having the ability to get some peace and quiet when necessary does wonders for a patient's recovery time and the happiness of employees. Nonstop noise is a general characteristic of medical establishments. This makes it hard for patients to get the rest and relaxation they need to get better in a timely manner. For staff, it cultivates a more stressful and overwhelming environment. To maximize comfort and eliminate disturbing sounds, an acoustical sliding door can be the answer.

Installing an acoustical sliding door will give health-care facilities all these noise-canceling benefits, while allowing them to maintain a high level of aesthetic appeal and save a significant amount of space as well. However, not all acoustic door systems are created equal so it's essential to select products from a reliable supplier to ensure optimal performance. Look for a product comprised of high-quality materials, advanced engineering features, with numerous options for finishes and hardware, and that complies with ADA requirements. (See the sidebar on ADA Compliance in the online portion of this course.)

Photo courtesy of The Sherwin-Williams Company

Innovations in paints and coatings, including advancements in microbicidal technologies, can help support critical initiatives in medical settings.

KEEPING BACTERIA AT BAY

According to The Center for Health Design, "…easily transmittable diseases are a serious concern in most facilities today. Implementing some of the latest best practices in your physical environment can help to minimize their impact—and help you get the best outcomes from your efforts."[6] Some of the latest advancements include the advent of a microbicidal paint with the power to kill bacteria on a painted surface, as well as fiber-reinforced plastic (FRP) insulated metal panels that can create airtight seals.

THE POWER TO KILL BACTERIA.

NOW IN 550 COLORS.

Introducing Paint Shield®, the first EPA-registered microbicidal paint that kills greater than 99.9% of Staph (*Staphylococcus aureus*), MRSA, *E. coli*, VRE*, and *Enterobacter aerogenes* within 2 hours of exposure on a painted surface. And it continues to kill these disease-causing bacteria for up to 4 years when the integrity of the surface is maintained.

For more information, visit swpaintshield.com

*MRSA (Methicillin-resistant *Staphylococcus aureus*), *E. coli* (*Escherichia coli*), VRE (Vancomycin-resistant *Enterococcus faecalis*)

CIRCLE 132

Paints and Coatings

While it's long been acknowledged that color choice can create a more restful environment, technological advancements in paint and coatings now let architects and specifiers deliver much more to a health-care environment than a soothing color. (More on color later in this course.) Innovations in certain coating technologies support critical initiatives in medical settings, including acute-care and long-term care facilities.

Improving indoor air quality (IAQ) and providing other unique benefits are among the key reasons to consider choosing an advanced coating to optimize the health-care facility setting. Some of the considerations include:

- Formaldehyde-reducing and odor-eliminating technologies help to improve the indoor environment of patient rooms in acute and long-term care facilities.

Hospitals and other facilities face many challenges when it comes to controlling odors, which can emanate from sources such as cafeterias, restrooms, and patient rooms. Odors can be detrimental for hospital patients, visitors, and staff members alike. Paint exists today with odor-eliminating technology that can deconstruct carbon molecules to neutralize and dissipate odors of an organic origin.

Airborne concentrations of formaldehydes and other aldehydes, known as volatile organic compounds (VOCs) that originate from sources such as carpet and insulation, contribute to poor indoor air quality. Paint with formaldehyde-reducing technology actually helps to improve indoor air quality by transforming aldehydes into water molecules and a harmless inert gas, resulting in a reduction in airborne concentrations of formaldehydes and other aldehydes. The length of time these technologies actively reduce odors and formaldehyde depends on the concentration, the frequency of exposure, and the amount of painted surface area.

- Antimicrobial technology can inhibit the growth of mold or mildew on the paint film in patient bathrooms, food service areas, exam rooms, and other areas where moisture is present.

Additionally, there are other benefits related to advancements in paint and coating technologies, particularly those with high-performance and microbicidal properties. Those benefits include the following:

- Microbicidal paint can offer health-care facilities an important new tool to help combat certain bacteria on painted surfaces. For example, one EPA-registered microbicidal paint can kill greater than 99.9 percent of certain bacteria* within 2 hours of exposure on a painted surface.
- High-performance coatings can be chemical and abrasion resistant.

According to Steve Revnew, senior vice president of product innovation at Sherwin-Williams, "For those involved in the decision-making process of selecting a coating for a health-care setting, it's essential to be aware of new developments in coatings technology and their benefits in order to drive the most impactful outcomes in look and function."

Paints and coatings go well beyond aesthetics. Advancements in technology mean paint now can accomplish a variety of important tasks ranging from killing harmful pathogens on painted surfaces, to helping reduce odors, to improving indoor air quality.

Permanent fiber-reinforced plastic (FRP) insulated metal panels can provide an infection-control solution in sterile environments by preventing mold and mildew growth.

Revnew adds, "The advent of a microbicidal paint represents a major breakthrough in the industry, with far-reaching benefits for health-care facilities and beyond. This new paint has an active ingredient—quaternary ammonium compound (Alkyl Dimethyl Benzyl Ammonium Chloride)—commonly known in the health-care industry as 'quat' that actually kills five disease-causing bacteria. This advancement in technology means hospitals and other health-care facilities now have the ability to continuously kill harmful pathogens on painted surfaces with minimal effort."

Fiber-Reinforced Plastic Insulated Metal Panels

Another industry solution being used to optimize hygiene and infection control in health-care settings requiring sterile environments are permanent fiber-reinforced plastic (FRP) insulated metal panels. FRP is a composite material made of a polymer matrix reinforced with fibers. The polymer is usually an epoxy, vinylester, or polyesterthermosetting plastic. FRP is commonly used in industries such as aerospace, automotive, marine, and construction.

The panels are designed to create a virtually seamless joint between wall and ceiling to prevent mold and mildew growth. Generally speaking, the joint is where mildew or mold will grow the majority of the time, just like in your bathroom shower at home. While you can get mildew or mold on the walls, mildew or mold growth is more often found growing in the caulking at the joints. For health-care facilities where they may use chemical or high-pressure washes on the wall, the traditional surface-applied silicone or urethane sealants can weaken over time, thereby creating a place for mildew and mold to hide. The two-part welded seal used with permanent FRP insulated metal panels, on the other hand, creates a permanent bond, which does not break down over time with the use of harsh chemicals, frequent hot water, and high-pressure spray cleanings often required to effectively sanitize an area.

Continues at ce.architecturalrecord.com

Robyn M. Feller *is a freelance writer and editor specializing in the architecture, design, and construction industry.*
www.linkedin.com/in/robynfeller

*Staph (*Staphylococcus aureus*), MRSA (Methicillin-resistant *Staphylococcus aureus*), E. coli (*Escherichia coli*), VRE (Vancomycin-resistant *Enterococcus faecalis*), and *Enterobacter aerogenes*

PRODUCT REVIEW

Design Strategies for Optimal Well-Being in Health-Care Environments

AD Systems

Photo courtesy of Aaron Locke/BCRA

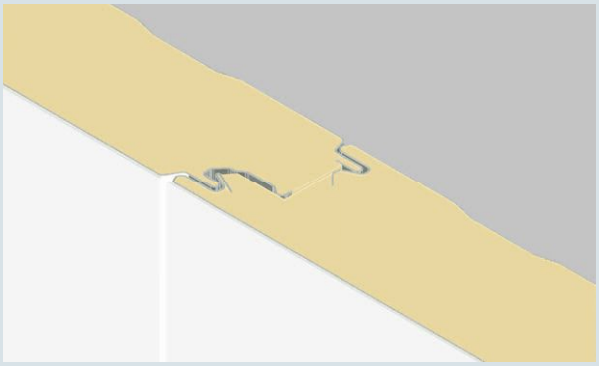
AD Systems Sliding Door

AD Systems offers complete sliding door and office-front assemblies ideally suited to health-care and corporate environments. This unique product provides excellent acoustical mitigation, reliability, and a wide range of customizable design options and hardware features thanks to its innovative frame design and tested performance. For more information, please visit www.specADsystems.com.

www.specADsystems.com *Circle 182*

Metl-Span

Image courtesy of Metl-Span



FRP CleanSeam

The FRP CleanSeam insulated metal panel is designed to create a virtually seamless joint between the wall and ceiling to prevent mold and mildew growth. The two-part welded seal system creates a permanent bond. FRP CleanSeam is the ideal solution to clean rooms, pharmaceutical, and health-care facilities.

metlspan.com *Circle 183*

The Sherwin-Williams Company

Image courtesy of The Sherwin-Williams Company

Paint Shield®

Paint Shield® is the first EPA-registered microbicidal paint and represents a game-changing advancement in coatings technology. Paint Shield kills greater than 99.9 percent of Staph (*Staphylococcus aureus*), MRSA (Methicillin-resistant *Staphylococcus aureus*), E. coli (*Escherichia coli*), VRE (Vancomycin-resistant *Enterococcus faecalis*), and *Enterobacter aerogenes* within two hours of exposure on a painted surface.

www.swpaintshield.com *Circle 184*

Landscape architectural elements are integrated to provide maximum environmental benefits at Kaiser Permanente Hospital.

Photo courtesy of Soil Retention Products, Inc.

Designing for Landscape Architecture

Strategies to help meet the new SITES v2 Rating System

Sponsored by Firestone Building Products, Soil Retention Products, Inc., and Tournesol Siteworks | *By Elena M. Pascarella, RLA, ASLA*

What is the SITES v2 Rating System? Studies have shown that nature has positive effects on people, including increased productivity and a sense of wellness. This course outlines ways to design and integrate landscape architectural elements into a project to benefit the natural environment, without incurring hefty costs to maintain it.

SITES is a comprehensive rating system administered by Green Business Certification Inc. (GBCI). It was developed as a result of the LEED rating system, which focuses on building construction and provides a limited number of guidelines directed toward measuring the sustainability of sites and the value of landscapes. The SITES draft guidelines and performance benchmarks were developed in 2007. *The Guidelines and Performance Benchmarks* (SITES version 1) were released in 2009. The rating system was then field tested through a two-year pilot program involving more than 160 projects. The information gained from the participating pilot projects was used to develop the SITES v2 Rating System.

SITES criteria support the unique conditions of each project site and provide flexibility for project design teams so that they can achieve a SITES-certified project. SITES-certified projects positively address issues of stormwater runoff, wildlife habitat, energy consumption, air quality, carbon storage, and human health and well-being.

As of 2015, design professionals are now able to obtain SITES certification for projects through the SITES v2 Rating System. SITES has adapted LEED credits as part of its SITES v2 Rating System, when relevant and appropriate. GBCI provides project certification to the requirements of the SITES v2 Rating System. Also, the U.S. Green Building Council (USGBC) has adapted certain SITES credit content into the LEED green building rating criteria.

CONTINUING EDUCATION

1 AIA LU/HSW

1 PDH, LA CES/HSW

BNP MEDIA IS AUTHORIZED BY IACET TO OFFER 0.1 CEUS FOR THIS PROGRAM

Learning Objectives

After reading this article, you should be able to:

1. Identify the integrated nature of green and sustainable landscape design as outlined in the new SITES v2 Rating System.
2. Assess design options for using permeable paving products that contribute to sustainable site design.
3. Describe how geomembranes work in the design of stormwater management and water retention ponds.
4. Explain how thermally modified wood products can positively contribute to both design enhancements and environmental quality.
5. Review sustainable products and materials that are beneficial to landscape architectural design as well as human health and environmental quality.

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

AIA COURSE #K1612E
LA CES COURSE #K1612E

Slabtown Marketplace, Portland, OR; GBD Architects, Holst Architecture, Lango Hansen Landscape Architects

The basis for the SITES v2 Rating System is ecosystem services. The services provided by healthy ecosystems include regulation and moderation of weather and climate change by vegetation, promotion of varied plant and crop growth by pollinator species, purification of stormwater by vegetation and soil ecosystems, and the uptake and storage of carbon by plants. These ecosystem services occur at a variety of scales and habitats. However, these ecosystem services are difficult to measure and monetize, and consequently the design elements that positively support them are typically ignored or value engineered out of a project's design.

The SITES v2 Rating System provides a series of performance measures that focus on an understanding of natural processes, best practices in landscape architecture, ecological restoration, and human health and well-being. By achieving SITES benchmarks, a project will contribute to maintaining, supporting, and enhancing natural systems and the ecosystem services that they provide.

The SITES v2 Rating System is designed to distinguish sustainable landscapes, measure their performance, and elevate their value. There are a total of 200 potential points allocated among 48 credits for a given project site. The rating system reflects each credit's impact on improving site sustainability and protecting and restoring ecosystem services. Projects will receive SITES certification by achieving the minimum requirements (i.e., prerequisites) and a certain specified number of points for the different levels of performance. The value assigned to each credit is based on its potential effectiveness in meeting the following four goals:

1. Foster resiliency and create regenerative ecological systems
2. Mitigate climate change and ensure a future supply of natural resources
3. Transform the market through design, development, and maintenance practices
4. Enhance human well-being and strengthen community

DESIGNING PERMEABLE LANDSCAPE SURFACES

The SITES evaluation system places a strong emphasis on providing permeable surfaces in landscape projects. Surface permeability assists in stormwater management and management of on-site precipitation (SITES Water P3.1). Permeable landscape surfaces also allow stormwater to infiltrate through natural soils and replenish groundwater aquifers. Water resources are thus enhanced and restored. Some permeable surfaces can also assist in mitigating heat island effect through the use of pavement types that have a higher solar reflective index (SRI) than asphalt.

Flexible Concrete Mats as Permeable Pavements

One type of permeable surface is a flexible concrete mat, which is a modular and bendable open-grid pavement unit that can be used in a variety of applications. The open-grid system in the mat allows for a variety of material infill options, including:

a. Planted options, such as lawn and ground covers
b. Unplanted options, such as artificial turf, decomposed granite, sand, and other customized soil infill materials

For high-traffic areas that must meet the requirements of LEED, SITES, or International Green Construction Code (IGCC) criteria, the flexible concrete mat can assist in stormwater management, reduce heat island effect, lower runoff coefficients, assist in on-site water storage and biofiltration, and contribute to groundwater recharge.

Flexible concrete mats provide a permeable, flexible, and in some cases, plantable concrete paving system that is environmentally friendly and is an attractive alternative pavement option to impervious surfaces, such as concrete and asphalt. Flexible concrete mats provide designers with the option to green up an outdoor space by adding vegetation to the interior openings in the mat. The mats can be used in a wide variety of applications, including driveways, parking lots, pathways, drainage channels, swales, and fire lanes.

Flexible Concrete Mats for Stormwater Management

The mats are fabricated of wet-cast, low-moisture-absorption concrete, which is laid out as a grid with ½-inch square openings. Each mat covers 4 square feet and weighs 45 pounds. The concrete has a PSI of 5,000 pounds, and each mat provides about 60 percent plantable area. The openings allow for infiltration of water as well as the root penetration of the infill vegetation material. Cast inside the concrete is an engineered polymer grid that provides flexibility to the concrete mat. This flexibility provides added tensile strength to complement the compressive strength of the concrete. The flexibility also allows these mats to conform to irregular ground surfaces along predefined linear grooves while providing structural support for high-traffic use. The flexible concrete mat maintains its load-supporting characteristics even when saturated. The design also eliminates sharp edges and won't crack and break. The small openings in the concrete grid also provide spaces for infill planting of turf grass or groundcovers as well as infill with gravel, sand, or crushed stone, depending on application.

The mat is designed so that the grass or groundcover that is planted in the holes can develop a continuous root system below the mat surface, thus promoting a healthy turf while minimizing moisture evaporation. Because the flexible concrete mat has porous openings and a shallow depth, it allows water to flow through laterally and to penetrate the root system of the grass. In addition, the geometry of the mat limits infill and root compaction by concentrating the load on the concrete pads instead of void spaces. The large bearing connections of the concrete coupled with the small size of the holes or void spaces provides the optimal situation for sustaining and maintaining grass or other groundcover materials.

Flexible concrete mats are manufactured to meet ASTM precast concrete standards for compressive strength, standard proctor soil compaction, particle size analysis, concrete aggregates, mixed concrete, portland cement, blended hydraulic cement, slump flow, and pigments for integrally colored concrete. The manufacturing process for the flexible concrete mats also follows the American Concrete Institute (ACI) standard practice for selecting proportions for normal, heavyweight, and mass concrete and for durability.

Flexible concrete mats can be used in all climate areas, but special recommendations are provided for cold-weather applications. Specifications recommend that sites requiring the use of snowplowing machinery install mow curb strips prior to installation of the paving mats and that the mats be depressed ½-inch below the top of the mow curb/strip to protect the mat from the snowplow blade. In addition, it is recommended that snowplow equipment operators be educated about the underlying surface prior to snow removal and that the snowplow equipment be fitted with Teflon runners to prevent damage to the mat.

Image courtesy of Soil Retention Products, Inc.

This image shows the flexibility and porous structure of flexible concrete mats.

Green Materials

SKYSCAPE™ VEGETATIVE ROOF SYSTEMS

Cincinnati Children's Hospital Medical Center

Greener Possibilities

Learn more about our wide range of sustainable roofing solutions.
firestonebpco.com/skyscape

CIRCLE 67

BUILDING PRODUCTS UNIVERSITY

SkyScape Vegetative Roof Systems serve as a comfortable healing environment for more than 600 children.

For easy-to-install, sustainable vegetative roof systems that deliver high performance with little maintenance, it's SkyScape Vegetative Roof Systems from Firestone Building Products. We offer multiple vegetative roof system options, from modular to built-in-place, all designed to:

- Effectively manage storm water on-site
- Provide a cooler, more beautiful rooftop
- Contribute to LEED® certification

Count on Firestone for eco-friendly products and systems that keep your building—and the people inside—protected. **Because nobody covers you better.**

/FirestoneBuildingProducts

@FirestoneBPCo

Firestone BUILDING PRODUCTS

NOBODY COVERS YOU BETTER.™

Using Flexible Concrete Mats in the Landscape

Many urban sites with large paved surfaces are challenged in trying to obtain LEED and SITES credits. The need for durable pavement surfaces requires the use of materials that are easy to maintain. LEED NC Criteria SSc6.2 provides credits for Stormwater Design – Quality Control. Credits are given to projects that address polluted runoff. The credit measures the total suspended solids (TSS) as the indicator of level of pollution, and the design must be able to show that the stormwater treatment system is effective at treating all rainstorms for any year up to 90 percent of the average annual rainfall. In the SITES v2 Rating System, Section 3: Site Design Water provides a possible 23 credits for designs that manage and reduce stormwater at the site. The flexible concrete mats have also been tested for hydraulic performance in drainage channels and can be used to provide erosion control for V-ditches, drainage swales, and other runoff areas.

Because flexible concrete mats can be used in place of concrete or asphalt pavement for vehicular traffic areas, they can provide alternative solutions to stormwater management by providing large surface areas for biofiltration, infiltration, and water storage below the parking/driving surface without requiring the loss of valuable site area to surface bioswales or detention basins.

DESIGNING FOR WATER IN THE LANDSCAPE

Designing water features, both functional and decorative, has been a component of landscape design since the earliest civilizations. Early Asian and Roman settlements provide examples of decorative and functional water features that enhanced both the aesthetics and the ecology of developments. The SITES v2 Rating System provides a number of criteria that address water conservation as a critical consideration in landscape architectural and site planning projects.

In the SITES v2 Rating System, Section 1: Site Context provides criteria for protection of flood plain functions (P 1.2) and conservation of aquatic ecosystems (P 1.3). Section 3: Site Design – Water, has six criteria addressing water management. These criteria include

- Water P3.1: Manage precipitation on-site
- Water P3.2: Reduce water use for irrigation
- Water C3.3: Manage precipitation beyond baseline
- Water C3.4: Reduce outdoor water use
- Water C3.5: Design functional stormwater features as amenities
- Water C3.6: Restore aquatic ecosystems

Outdoor water features can provide a means for managing precipitation, providing functional stormwater features, providing areas for the restoration of aquatic ecosystems, and providing storage for rainwater collection that can be used for on-site irrigation. Construction of outdoor water features requires an impervious layer to hold the water. This impervious layer can be a rubber liner or an EPDM geomembrane.

By definition, EPDM rubber (ethylene propylene diene monomer [M-class] rubber) is a type of synthetic rubber that is also an elastomer characterized by a wide range of applications. The M refers to its classification in ASTM standard D-1418; the M class includes rubbers having a saturated chain of the polymethylene type.

Geomembranes can be used for a variety of conditions and to address a number of different design challenges. They have been used in the following applications.

- Agricultural pits and ponds
- Aquaculture applications
- Canals
- Constructed wetlands
- Decorative water features
- Evaporation ponds
- Exposed covers and caps
- Landscaping features
- Mining applications
- Retention ponds
- Water reservoirs

When designing the landscape of a home, landscape architects, architects, and engineers may consider a pond or water feature to increase the aesthetic appeal and value of the property, and enhance the ecology of the site through the creation of ponds for mitigating stormwater runoff and for the collection of rainwater.

Rubber liners or EPDM geomembranes are the ideal tool for creating a unique water feature in a landscape design, such as a decorative pond, a fountain, a koi pond, a small stream, or a waterfall. Rubber liners are available in a variety of sizes and lengths, contributing to design flexibility and allowing the liner to fit snugly over the ground under any water feature without cracking or tearing. EPDM geomembranes are available in various panel sizes so that designers can choose a minimal number of panels to reduce the amount of field seaming required.

EPDM geomembranes are a durable, dependable solution for many water gardening projects in both residential and commercial applications, but especially for larger projects that require water containment applications, such as agriculture, aquaculture, and mining. EPDM is specifically formulated to be safe for fish and aquatic life.

The specially compounded material in the EPDM geomembrane prevents cracking, thus making it durable against UV and ozone exposure as well as extreme temperatures.

ENHANCING THE URBAN LANDSCAPE

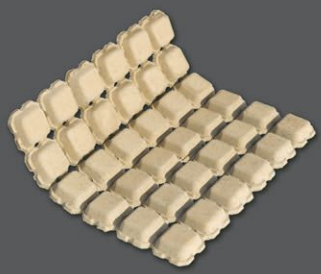
Designing for landscape architecture in urban environments presents some unique challenges with respect to enhancing the environment of a site. The urban environment can become "green" by integrating landscape architectural design tools into architecture so that both people and the built environment derive benefits.

Landscape architecture can be integrated into the architectural structure of an urban site through the installation of a terrace or roof amenity space using plantings, decking, furnishings, and vertical profile elements, such as green walls. The 20th century's green building movement arose out of the need for more energy-efficient buildings and a desire for more environmentally focused construction prac-

Photo courtesy of Firestone Building Products

Pond liners can be used to create water features at residential and commercial sites.

PROJECT: Sanford Consortium
ARCHITECT: Fentress Architects
ASSOCIATE ARCHITECTS: Davis Davis Architects
LANDSCAPE ARCHITECT: Civitas, Inc.
GENERAL CONTRACTOR: Hensel Phelps Construction Co.
INSTALLER: Valley Crest Landscape Development



DRIVABLE GRASS®

Access Lane

SOIL RETENTION
Plantable concrete systems®

To learn more about Drivable Grass®, see our CEU "Design Considerations for Vegetated Permeable Pavements".

www.soilretention.com
800-346-7995

CIRCLE 91

tices. Oil price increases in the 1970s spurred improvements in energy-efficient design and construction and the use of renewable material resources as well as renewable energy resources.

Green buildings use a number of approaches toward achieving sustainability, including:

- Using sustainable and renewable resources and materials in their construction
- Creating healthy living environments by minimizing the use of toxic materials and chemicals
- Using landscape architectural design features and products to reduce energy consumption and manage stormwater effectively

There are a variety of products available to designers and specifiers for transforming a roof space, a blank vertical wall, or a ground-level terrace into a greener landscape environment.

The incorporation of sustainable materials into project construction requires knowledge of the product's building life-cycle impact (LEED MRc1), environmental impacts (LEED MRc2), raw material sources (LEED MRc3 and SITES Materials Selection), material ingredients (LEED MRc4 and SITES Materials Selection), and the manufacturing, fabrication, and shipping processes required to get that material to market. In addition, LEED v4 has changed the evaluation process for Materials and Resources criteria, requiring more rigorous technical standards for qualifying sustainable materials and resources by including:

- The entire life-cycle assessment of the material/resource
- A comprehensive environmental products declaration (EPD) through full disclosure of impacts and ingredients for the material/resource
- Adherence to higher standards such as GreenScreen, the European REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) program, and others

USING THERMALLY MODIFIED WOOD FOR LANDSCAPE ENHANCEMENTS

Thermally modified North American hardwoods are used as exterior tiles for roof decking, ground-level decking, and as wood components for landscape site furniture, such as benches, chairs, tables, and planter boxes. These wood products do not require chemicals to enhance their durability or resistance to decay, as the thermal heat process provides this durability. Thus, the product is ecologically and environmentally safe. Thermally modified wood is used to fabricate wood planters as well as structural wood tiles. Both of these sustainably produced products provide a means for designers to enhance and "green up" an urban environment.

Photo courtesy of Tournesol Siteworks

Thermally modified wood planters enhance an urban streetscape.

Structural wood tiles are available to provide decking on roofs or as outdoor at-grade platforms where designers are looking to soften the harshness of hardscape pavements.

These thermally modified North American hardwoods are domestically sourced from red oak and ash trees that are currently harvested in Wisconsin. Red oak and ash are the preferred species because of their consistency in durability and color.

The natural durability of the red oak and ash is enhanced through the thermal heating process, creating a product that is a Grade A wood with a 25-year Class 1 durability level and a resistance to decay that is comparable to South American hardwoods. Ash and oak are not threatened species, such as the more exotic hardwoods from South America, so this eliminates the use of wood from threatened tree species (MP5.1). The thermal modification process supports sustainability in materials and manufacturing (MC5.9) and is a responsible extraction of raw materials (MC5.7) in the SITES v2 Rating System.

The process begins with harvesting FSC-certified domestic hardwoods (typically red oak or ash). The lumber is treated at high temperatures and with steam in a special kiln. The natural process changes the chemical makeup of the wood, eliminating sap and resin, which creates a gorgeous dark-colored lumber with exceptional rot, pest, and decay resistance. The wood is finished and the tiles assembled, and it is all done locally within the United States. The structural wood tiles have UC3B durability (25-plus-year life in outdoor settings), and a Class A flame-spread rating (ASTM E84).

These structural wood tiles are 50 percent lighter than other wood products so shipping costs are less, and the lighter weight makes them far easier to modify and work with on-site than ipe, a South American hardwood, or other hardwoods, such as mahogany. Thermally modified wood is free of the arsenic, copper, chrome, and other hazardous metals present in pressure-treated wood.

The structural wood tiles are mounted on adjustable pedestals made of recycled high-density polyethylene (HDPE) plastic. The pedestals allow the wood tiles to be installed and levelled. The wood tiles can aesthetically soften the hardscape of a ground-level pavement or rooftop terrace, while providing opportunities for greening the space. There are also a variety of living wall products for greening the urban environment with a range of price points for any type of project.

Continues at ce.architecturalrecord.com

Elena M. Pascarella, RLA, ASLA**, is a practicing landscape architect, continuing education presenter, and consultant engaged in a private practice based in Rhode Island and focused on projects relating to ecological design and historic preservation.* ***www.landscapeelementsllc.com

PRODUCT REVIEW

Designing for Landscape Architecture

Firestone Building Products

Photo courtesy of Firestone Building Products

GeoGard EPDM Geomembrane

Firestone Building Products GeoGard EPDM Geomembrane is the durable, dependable solution for nearly any application. Whether for decorative commercial water features or agriculture, aquaculture, mining, and other water-containment applications, it is easy to install and built to last.

www.firestonebpco.com/lining *Circle 185*

Soil Retention Products, Inc.

Image courtesy of Soil Retention Products, Inc.

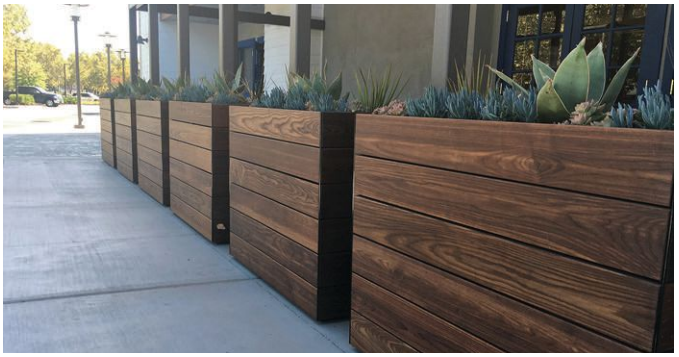
Drivable Grass®

Drivable Grass® is a permeable, flexible, and plantable concrete pavement system that is environmentally friendly and a beautiful alternative to poured concrete and asphalt. Drivable Grass offers strength, permeability, flexibility, and many design opportunities due to various infill options, such as grass, artificial grass, decomposed granite, and ground covers.

www.soilretention.com/drivable-grass *Circle 187*

Tournesol Siteworks

Photo courtesy of Tournesol Siteworks



Boulevard Thermally Modified Wood Planters

Our wood planters are produced from Boulevard thermally modified wood, which goes through a process that changes the chemical makeup and cell structure of the wood, providing exceptional resistance to rot, pest, decay, and warping. Technically, it shares a 25-year preserved-wood-like durability level similar to South American hardwoods yet is ecologically friendly.

tournesolsiteworks.com *Cirlce 188*

© Agence Rudy Ricciotti

Architectural concrete is a versatile building material that can provide structure, enclosure, and finish with exceptional design flexibility.

Designing with Concrete in the 21st Century

Some architects have defined their careers by combining this versatile construction material with modern design software

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

Concrete is a rather ubiquitous, tested, proven, and versatile building material. It has been used for literally thousands of years to create long-lasting man-made structures of all types, including buildings. Architects in the past few centuries have found it to be an appealing choice to express dynamic and vibrant designs in ways that other materials could not. The ability to structurally reinforce concrete and form it into custom, free-flowing shapes can give it an organic quality that is different from most other materials. This can produce more design freedom and the ability to incorporate unique and custom features into a building as part of the basic construction process. It is not surprising then that new technologies, techniques, and design approaches have been developed that allow architects to think and design with concrete in ways that are even more creative, structurally efficient, sustainable, and cost effective. It is also common to couple the technical knowledge of concrete with the ability to design in three dimensions using building information modeling or similar design software to create award-winning and stunning facilities. Some architects even attest that their careers have not only been made possible but have flourished through this combination.

CONTINUING EDUCATION

1.25 AIA LU/HSW

BNP MEDIA IS AUTHORIZED BY IACET TO OFFER 0.1 CEUS FOR THIS PROGRAM

Learning Objectives

After reading this article, you should be able to:

1. Explore the historical and contemporary evolution of concrete and its use as a key building material.
2. Investigate the design issues related to using concrete as a durable and long-lasting primary building material.
3. Assess design strategies related to creating buildings that can be innovative in shape and form and meet structural and fire code requirements.
4. Identify the role that design software and building information modeling can play in achieving exceptional concrete building designs.

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

AIA COURSE #K1612F

CONCRETE AS A BUILDING MATERIAL

Concrete has long been regarded as a remarkable material that is extremely plastic and malleable when newly mixed but exceptionally strong and durable when cured and hardened. These properties come from the fact that it is a man-made combination of some very common natural ingredients that give it these characteristics.

- **Gravel or crushed stone:** This is the coarse aggregate that makes up the majority of concrete and is fundamentally the source of its strength. Aggregate can vary in type and size and, for practical reasons, is usually sourced locally for a particular project where it is being used.
- **Sand:** This is the fine aggregate that serves the purpose of filling in the spaces between the coarse aggregate. The ratio of fine to course aggregate can vary depending on the specific concrete mix and the intended final use or appearance of the concrete.
- **Cement:** While some in the public mistakenly use the term cement when they mean concrete, design professionals are quite aware that cement is just one ingredient of concrete. This is the paste that coats the aggregate with the ability to bond or hold it all together and is typically on the order of only 10 to 15 percent of a concrete mix. While made from natural materials, cement, specifically often portland cement, is a manufactured product that may be shipped in from elsewhere. It is a controlled chemical combination of calcium, silicon, aluminum, iron, and other ingredients. Common raw materials used to obtain those chemicals include limestone, shells, and chalk or marble combined with shale, clay, slate, blast furnace slag, silica sand, and iron ore. These ingredients, when heated at high temperatures, form a rock-like substance that is ground into the fine powder that we know as cement. Different combinations of ingredients can yield different bonding strengths as well as different colors of cement.
- **Water:** The above materials are all dry and by themselves will not interact to form concrete until an appropriate amount of clean, potable water is added. The hydrogen and oxygen in the water create a chemical reaction called hydration with the chemicals in the cement that allows it to transform and bond all of the aggregates together. As a significant and important chemical ingredient, water may account for 15 to 20 percent of the concrete mix.
- **Air:** As with any mixing process, some air is inherent in the process of creating concrete. The amount of air can affect the physical properties of the concrete and can be controlled somewhat but will commonly be on the order of 5 to 8 percent of the mix.

Understandably, varying the type and proportions of ingredients will determine different basic characteristics of the concrete, including its overall strength, appearance, color, texture, and the corresponding suitability for different applications. In recent decades, chemical admixtures have been developed that can be added to further influence the final characteristics of concrete.

THE EVOLUTION OF CONCRETE

Putting all of these ingredients together didn't just happen by accident so it is amazing to realize how long people have been using concrete as a building material and how it has been adapted and developed over time.

Early Uses of Concrete

The earliest known use of rudimentary concrete dates back to about 6500 BC in the Middle East (current day southern Syria and northern Jordan) by Nabataea Bedouins who controlled oases in this desert area. They were interested in creating places to store water and found they could mix lime with some local deposits of silica sand and pozzolan (sandy volcanic ash) to create a rather waterproof enclosure. They used a very dry mix of materials with only a little water and would tamp it into place by hand to make it more gel like, producing greater bonding.

Around 3000 BC, ancient Egyptians began to use lime mortars that were similar to concrete in the building of the pyramids. These mortars held the stone and bricks of the pyramids and other structures together but were also placed first as a bedding material for cut stone and bricks. This concrete-like bedding allowed some of the stones to be carved and set with extremely thin joints no wider than $^1/_{50}$ of an inch. Around the same time, the Great Wall of China used a form of cement and mortar in and around stone and brickwork. Modern day spectrometer testing has shown that a key ingredient in this mix was glutinous sticky rice among other things.

Concrete in Roman Times

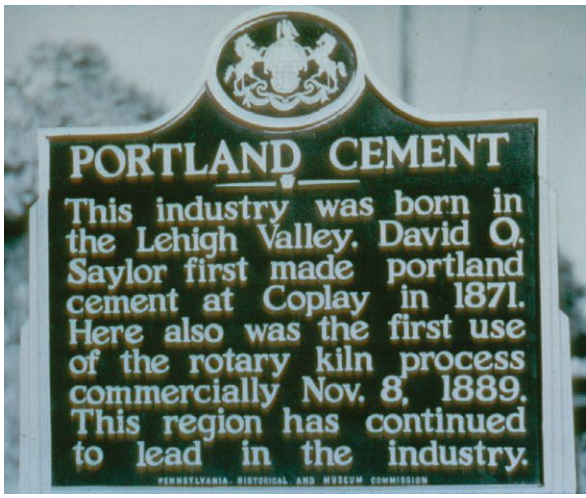
By 600 BC, the Greeks had discovered a natural pozzolan that formed cement when mixed with lime and water and used it somewhat selectively for buildings. The Romans by contrast were very prolific with concrete, although they often used a drier, less plastic version than the Greeks. Initially, this mixture was used more as a means to hold large stones and bricks together. For larger and grander structures, the Romans began to incorporate volcanic sand to react chemically with lime and water, causing hydration and allowing it to cure beautifully under water. This likely represented the first large-scale use of a truly cementitious binding agent as part of concrete and was a part of utilitarian structures like aqueducts, bridges, etc. It was also used for significant buildings, many of which are still standing today, such as some Roman baths, the Pantheon in Rome, and the Colosseum. There was also some experimentation with admixtures, such as animal fat, milk, and blood, to adjust the physical properties of the concrete mixtures. When natural pozzolan aggregate was not readily available, the Romans seem to have learned how to manufacture two types of artificial pozzolans, which reflected a fairly high level of sophistication for the time.

Concrete Advances in the 19th Century

Like many other things around the time of the Industrial Revolution, the process of producing cement and concrete took many leaps forward in the 1800s. As early as 1793, John Smeaton discovered a modern method for producing hydraulic lime for cement by using limestone containing clay that was fired in a kiln. The resulting stone-like products called "clinker" were then ground into a fine cement powder. This produced a steady and consistent supply of cement that could be shipped to construction locations and mixed with other local ingredients to form concrete for special or unique structures. In 1824, an Englishman named Joseph Aspdin took this process a step further by burning finely ground chalk and clay in a kiln until the carbon dioxide was removed. The resulting product was named "portland" cement because it resembled the light-colored, high-quality building stones found in Portland, England.

It soon became apparent that some engineering was needed to ascertain the true structural properties of different cement and concrete products. Between 1835 and 1850, systematic tests to determine the compressive and tensile strength of cement were first performed, along with the first

Photo courtesy of Pennsylvania and Historical Museum Commission



Portland cement was first developed in England and became popular in the United States in the late 1800s with advances in its production.

© Agence Rudy Ricciotti

At the Musée Jean Cocteau – Collection Severin Wunderman in Menton, France, (2007), concrete is used to establish a rectilinear enclosure with a curved and flowing design expression.

accurate chemical analyses. By 1860, portland cements of modern composition were produced and manufactured to detailed standards important to the hydration process and the chemical characteristics of the cement. These standards were based on heating a mixture of limestone and clay in a kiln to temperatures between 1,300 degrees Fahrenheit and 1,500 degrees Fahrenheit. In 1885 came the development of a horizontal, slightly tilted kiln that could rotate the cement ingredients and function more efficiently. This rotary kiln provided better temperature control and did a better job of mixing materials so much so that by 1890, rotary kilns dominated the market.

The other significant advance during this time was the evolution of steel products. It didn't take long to realize that combining concrete with steel reinforcing bars would allow the best of both worlds: the compressive strength of concrete and the tensile strength of steel. By the late 1870s, the first steel-reinforced concrete buildings came into existence and have been a common structural system ever since. However, despite all of these advances, concrete during this time was still seen as a utilitarian material to be used for mostly industrial and infrastructure projects.

Concrete in the 20th Century

By the early 1900s, the variations in concrete types and capabilities called out a need for standards. Founded in 1904 and headquartered in Farmington Hills, Michigan, the American Concrete Institute (ACI) quickly became the leading authority and resource for the development and distribution of not only consensus-based standards but also technical resources, educational and training programs, and, more recently, certification programs. Membership was, and still is, open to individuals and organizations involved in concrete design, construction, and materials who share a commitment to pursuing the best use of concrete. (ACI has since grown to over 95 chapters, 110 student chapters, and nearly 20,000 members spanning more than 120 countries.) Soon after, in 1916, The Portland Cement Association (PCA) was founded as a policy, research, education, and market intelligence organization serving America's cement manufacturers. The stated purpose of the PCA is to promote safety, sustainability, and innovation in all aspects of construction, foster continuous improvement in cement manufacturing and distribution, and generally promote economic growth and sound infrastructure investment. (Today, PCA members represent 92 percent of U.S. cement production capacity and have facilities in all 50 states.)

As ACI and PCA resources became better known and the industrialization focus of the 1800s passed to the more vision-focused modern movement in the 1900s, reinforced concrete started to become a material of choice by well-known architects who used it for many notable buildings. Not only did it provide the ability to create a fire-proof structure, but air-entraining agents and other chemical admixtures that were developed in the 1930s increased resistance to freezing and improved workability. These attributes solved a number of technical issues, but the plastic, malleable qualities of poured-in-place concrete offered exciting new design possibilities, too. Architects could begin to investigate concrete forms that could either be cubist and rectilinear or free flowing and expressive of nature. Increasing expertise with reinforced concrete allowed thin shell construction, which employed thinner concrete slabs and shapes than previously. New forms, such as parabolic arches and hyperbolic paraboloid roof structures, began to be used. The Sydney Opera House in Sydney, Australia, became a mid-century poster child for the artistic use of concrete formed into segments of spheres to produce a dramatic structure that appeared light and airy, like sails on a ship. Other structures like Saarinen's Washington Dulles International Airport and TWA Flight Center at John F. Kennedy International Airport became equally iconic in the United States.

During this time, high-rise building construction using concrete also became common. In dense urban areas, buildings were getting taller and construction techniques were needed that could provide both an efficient structure and fire proofing. Reinforced concrete fit the bill in many cases, allowing vertical columns and other supports to be tied directly into the horizontal floor and roof slabs that they supported. Even steel-framed buildings tended to rely on the use of either precast or cast-in-place concrete for floors. Construction companies became known for how efficiently and how well they could "get concrete up in the air."

TWENTY-FIRST CENTURY CAPABILITIES

Today, we are the beneficiaries of all of the past exploration, technical development, and creative experimentation by associations, design professionals, and construction companies that have worked with concrete. Further refinements into materials research, engineering, and the science of concrete combined with new design methods and technology have allowed architects to demonstrate innovative and exciting new capabilities. We will look at a few of those recent developments here.

High-Strength Concrete

The PCA points out that the key to achieving a strong, durable concrete rests in the careful proportioning and mixing of the ingredients. A mixture that does not have enough cement paste to fill all the voids between the aggregates will be difficult to place, produce rough surfaces, and will be porous. A mixture with an excess of cement paste will be easy to place and will produce a smooth surface; however, the resulting concrete is not usually cost effective and can more easily crack.

Concrete is commonly defined structurally in terms of its compressive strength. Because it is custom mixed and subject to human variation, it is routine to require test cylinders to be pulled from each mix or batch that is used in a building. In order to obtain a determination of actual strength, measured cylinders can be

filled and allowed to cure up to 28 days. At that point, the cylinders are removed from around the concrete and hydraulic testing equipment can be used to determine how much pressure the concrete can withstand before breaking or otherwise failing.

The combination of engineering and years of test results have allowed those who specialize in concrete mixing and production techniques to gain a good understanding of how to formulate the mixtures to accurately predict the strength of cured concrete and design accordingly. The common, medium-strength concrete used in a lot of building construction is usually specified to withstand about 4,000 pounds per square inch (psi) of pressure. Some installations where strength is less important can be approximately of 2,000 to 3,000 psi, while concrete that needs to be more durable and may be thinner (such as sidewalks) is usually on the order of 5,000 to 6,000 psi.

In recent times, the question has been raised about whether or not concrete of even higher strengths than these are possible. During the past two decades, researchers and engineers have worked with the chemistry of cement and concrete to answer that question with a resounding yes by developing mixes that yield higher strengths than previously typical. Although there is no precise point of separation between high-strength concrete and normal-strength concrete, ACI has defined any concrete with a compressive strength above 6,000 psi to be termed high-strength concrete. Those engaged in the development of high-strength concrete were influenced by experts from the early 1970s who predicted that the practical compressive strength limit of ready-mixed concrete would unlikely be able to exceed 11,000 psi. However, modern development and testing have achieved compressive strengths of up to 12,000+ psi with two buildings in Seattle, containing concrete with a compressive strength of an incredible 19,000 psi.

The manufacture of high-strength concrete involves making optimal use of the basic ingredients that constitute normal-strength concrete. Those who produce it have learned the specific factors that affect compressive strength and how to manipulate those factors to achieve greater strength. In addition to selecting a high-quality portland cement, they optimize aggregates, then optimize the combination of materials by varying the proportions of cement, water, aggregates, and admixtures. For example, when selecting aggregates for high-strength concrete, the inherent strength and optimum size of different aggregates are considered. In looking at the bond between the cement paste and the aggregates, the surface characteristics of the aggregate as well as the characteristics of the cement are considered. Any of these properties could enhance or limit the final capabilities of high-strength concrete.

© Agence Rudy Ricciotti

Concrete can be formulated by adjusting the type and proportion of ingredients to achieve a range of compressive and even tensile loading strengths.

Taking things up to an even higher level, ultra-high-performance concrete (UHPC), also known as reactive powder concrete (RPC), has been developed as a high-strength, ductile material. The material provides compressive strengths up to an astounding 29,000 psi but also provides flexural strengths up to 7,000 psi. The flexural or ductile behavior of this material is a new first for concrete—concrete has not previously had the ready capacity to deform and support flexural and tensile loads. Normally, rock and concrete respond to structural stress either by breaking or bending. When rock or concrete breaks, it is called brittle deformation since any material that breaks into pieces exhibits brittle behavior. When rock or concrete actually bends or flows, it is called ductile deformation, meaning the material deforms but stays intact. We normally think of metals, such as steel, deforming in this way so the ability of UHPC to do this is unique to concrete construction. It is formulated by combining portland cement, silica fume, quartz flour, fine silica sand, a high-range water reducer, water, and steel or organic fibers. Using this material for construction becomes simplified since reinforcing steel may be able to be eliminated. It may, in some cases, be dry cast or self-placed with minimal use of formwork. UHPC also exhibits superior durability characteristics due to a combination of fine powders selected for their grain size (maximum 600 micrometer) and chemical reactivity. The net effect is a maximum compactness and a small, disconnected pore structure.

What does this mean for building design? High-strength and ultra-high-performance concrete provide new possibilities for high-rise buildings and other structures where greater strength and thinner profiles (i.e., less weight) are important. This newly available combination of superior properties and design flexibility can facilitate the architect's ability to create attractive flat, curved, or multidimensional shapes. It can also offer solutions with advantages like speed of construction, improved aesthetics, superior durability, and impermeability against corrosion, abrasion, and impact, which can mean reduced maintenance and a longer life span for the structure.

Architectural and Decorative Concrete

The term "architectural concrete" refers to concrete that, while providing a structural function, also achieves an aesthetic finish to a building. By contrast, "decorative concrete" typically refers to concrete flatwork or building elements that are enhanced with texture or color but are not structural building components. In either case, the concrete can be mixed and treated to take almost any form, texture, or color. Forming is a matter of creating the appropriate forms or molds for the material to be set into.

▶ Continues at ce.architecturalrecord.com

Peter J. Arsenault, FAIA, NCARB, LEED AP, *is a practicing architect, green building consultant, continuing education presenter, and prolific author engaged nationwide in advancing building performance through better design.* ***www.linkedin.com/in/pjaarch***

Windows are typically installed over exterior sheathing in wood-framed walls. Using proper flashing to assure the continuity of air and water barriers along the face of the sheathing is critical to avoiding defects.

Mitigating Water Leaks around Windows in Wood-Framed Walls

Flashing solutions to avoid common leak paths

Sponsored by Huber Engineered Woods, Inc. | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

Water infiltration from outdoors into any building construction is a significant design and construction issue. The reasons are self-evident—unwanted water can cause materials to degrade, contribute to mold growth, and cause damage to people or building contents. While it is common to think of exterior walls and roofs as the primary barriers to water infiltration, the reality is that the technology to create such surfaces that can effectively resist water is readily available and fairly common. The usual problem is the openings in those surfaces, such as roof penetrations or doors and windows that become the weak points in the water tightness of walls. If window or door openings are overlooked or addressed inadequately, then the likelihood of water leaks and the related complications is high. If they are treated properly, through the appropriate use of flashing and integration with adjacent surfaces, then it is much more likely that the successful sealing and protection of walls will be achieved not only in opaque areas, but also in all of the locations where there are openings, too.

IDENTIFYING COMMON CONSTRUCTION DEFECTS

Practical experience and most contractual agreements for design and construction recognize that perfection in buildings is not a realistic goal. Rather, a common "standard of care" is usually identified as a benchmark based on a common understanding of what could be reasonably expected of any competent design or construction professional. Anything that falls below this standard can be considered a defect (or worse, negligence), and many professionals and their insurance companies have spent considerable time and effort determining if, in fact, any defect exists and if so, how to defend against claims for damages.

A white paper published in 2014 by the Travelers Insurance Company (The Travelers Indemnity Company and property casualty affiliates, Hartford, Connecticut) addresses "The continued evolution of construction defect." While billed as "Strategies for contractors to stay on top of evolving issues" and "Helping companies manage risk," the paper is very informative for design professionals, too. In this paper, these insurance-company authors identify the following four main types of construction defects.

CONTINUING EDUCATION

1 AIA LU/HSW

BNP MEDIA IS AUTHORIZED BY IACET TO OFFER 0.1 CEUS FOR THIS PROGRAM

Learning Objectives

After reading this article, you should be able to:

1. Explain common construction defects in design and construction projects that can impact window and wall performance and durability.
2. Define the primary causes of water penetration around windows.
3. Review the building code requirements related to flashing around openings in walls, particularly windows.
4. Compare different flashing solutions for their use in wood-framed wall assemblies, particularly for multifamily buildings.

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

AIA COURSE #K1612H

1. Design deficiencies, that is, errors or omissions, can show up in the documents prepared by architects, engineers, or others. If corrections or revisions aren't picked up during the preparation of the documents, then the deficiency will likely show up afterwards when a building component or system does not work as intended or as expected. As an example, a roof design that didn't provide proper details to achieve full water tightness but was nonetheless constructed according to the documents and later found to be the source of water intrusion would be determined to be a design deficiency.
2. Material deficiencies refers to building materials that are defective or damaged and can subsequently lead to failure despite proper design and construction. As an example, window frames that become bent or warped during shipping to the project site but are nonetheless installed can lead to problems of proper sealing and water resistance. Similarly, inferior products that are substituted for specified products may not function properly or last as long as intended.
3. Construction deficiencies usually refers to workmanship that is poor in quality. It could be caused by incomplete work, sloppy, imprecise work, or conversely be very neat and complete, just incorrectly done. This can happen in any trade and in any location in a building with direct implications onto other parts of a building or system that it comes into contact with.
4. Operation and maintenance is typically the purview of the building owner or operator. Since some problems emerge only after construction is complete and a project is turned over to its owner, it is important to determine whether a building defect exists or if there is instead a problem with operations and maintenance. After all, at some point, the building passes from being the responsibility of the design and construction team to being the responsibility of those who are operating and maintaining it. For example, some building sealants need regular maintenance or replacement which, if unattended, can cause leaks over time. Those leaks have nothing to do with the design, the construction, or the materials, they simply have everything to do with the realistic service life of the sealant and the fact that maintenance is required.

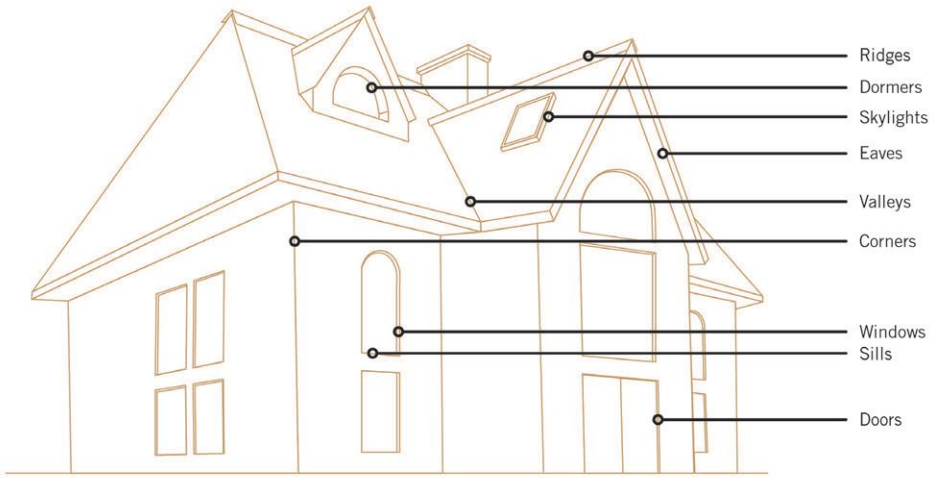
Recognizing these four types of deficiencies, the next logical question is: Which ones are the most common? The insurance industry has the data in the same paper discussed above to provide that answer. It may come as no surprise that the most common defect causing insurance claims is from water intrusion through the building envelope, either because of a design or construction deficiency. While we might expect such water leaks in roofs, it is also reported to be extremely common around windows, through exterior siding, and around irregular surfaces, such as balconies, patios, and garages. After that, defective materials show up as reasons for insurance claims, including manufacturing defects or premature corrosion or deterioration of things like pipes and other building materials. Finally, and quite significantly, inadequate integration of components or compatibility of materials is a notable issue. Although any of these common conditions can show up on virtually any type or size of building, each individual case can be quite different. That sometimes means that the reason reported for a problem may prove to be something quite different once proper investigation and analysis takes place.

Compounding this list of potential issues is the recognized national shortage of skilled trade workers and experienced supervisors, all of whom directly impact on-site quality control. In particular, a 2014 national survey by the Associated General Contractors of America (AGCA) found that 74 percent of firms are having trouble finding qualified trade workers, including carpenters, equipment operators, and laborers. In addition, 53 percent of the firms surveyed report that professional positions, such as project supervisors, estimators, and engineers, are difficult to fill. The implication for this shortage of skilled and experienced workers cuts to the core of quality construction, as quality workmanship requires certain skills. It would be great if a major boost were provided in training people to fill all of these open positions, but realistically, it takes years to develop many of the skills needed in construction and supervision. Recognizing a more immediate need, some product manufacturers have responded by finding ways to simplify installations such that the skills needed to install their products is more focused and requires less time for proficiency. Such quality control that is built into the manufactured systems and installation processes can help to achieve better building results with fewer potential construction deficiencies.

In the end, a proactive approach can be the best defense against all types of construction defects. All design and construction professionals need to keep up with current codes and standards, but staying on top of relevant industry advisories and best practices is also important. Further, actively understanding the capabilities of products being used in any given situation and following manufacturer guidelines will help ensure proper product performance. This can be important in terms of maintaining product warranties and producing a design that performs as intended. Finally, addressing the skills and experience needed for construction professionals engaged in the work will certainly have an impact.

ADDRESSING WATER PENETRATION AROUND WINDOWS

The National Institute of Building Sciences (NIBS) is a nonprofit, nongovernmental organization that brings together government, the professions, industry, labor, consumer interests, and regulatory agencies to focus on safe, affordable structures for housing, commerce, and industry throughout the United States. One of its well-known programs is the Whole Building Design Guide (WBDG), which is a free Web-based portal providing one-stop access to up-to-date information on a wide range of building topics from a



Typically, it is the locations on a building where surfaces or conditions change that can cause construction defects and require flashing to comply with building codes.

'whole buildings' perspective. Development of the WBDG is a collaborative effort among federal agencies, private sector companies, nonprofit organizations, and educational institutions. As such, it has become a recognized standard for best practices in many aspects of building design and construction and is a resource that all architects should take advantage of (www.wbdg.org).

When it comes to windows and their penetrations in walls, the WBDG first encourages everyone to look at window systems realistically, stating, "When designing interfaces for an off-the-shelf window, you should start with the assumption that window frame corners, glazing seals, and perimeter sealant joints will leak at some point during normal service life."[1] While this might sound a little pessimistic at first, the fact is that windows are subject to a lot of different forms of stress that can, over time, cause them to degrade a little, malfunction, or fail completely. The best defense then is to have a backup system built into the wall assembly that will be there when needed to address the unwanted, but quite possible, penetration of water in or around the window. Flashing is an example of such a backup system.

Moving beyond individual products and materials, the WBDG is ultimately focused on how an assembly works together to maintain a quality installation and avoid construction defects of any type. It points out that in a typical wood-framed wall assembly, conventional siding or cladding is not usually meant to be impervious to water or vapor but instead is intended to shed it away or allow it to escape through weep holes or other means. The exterior sheathing behind the cladding is generally designed to be the resistive barrier that drains water down and out of the wall system to the ground or elsewhere. The plane of the sheathing also needs to provide resistance to air infiltration not only to prevent drafts but to prevent air borne moisture from penetrating into wall assemblies. When the multiple tasks of the sheathing are interrupted by a window opening, the WBDG states, "Careful detailing is required to integrate water/air/vapor barriers with the window frames and maintain their continuity at the window perimeters."[1] The key word here is continuity since the windows are creating the interruption or breach in an otherwise continuous sheathing plane designed to resist water and air. The means to achieving that continuity and avoiding common defects comes down to attention to detail in all typical window conditions.

The Whole Building Design Guide and the IBC point out the need to address window openings as an interruption of the air- and water-barrier properties of the exterior sheathing.

FLASHING IN CODES AND STANDARDS

Building codes also recognize the importance of water/air/vapor barriers and their continuity around interruptions. For example, the 2015 International Building Code (IBC) is very clear about this point in Chapter 14: Exterior Walls, Section 1403.2, which reads, "Weather Protection: Exterior walls shall provide the building with a weather-resistant exterior wall envelope." The code doesn't dictate how that weather resistance is designed (that is the role of the architect), but it does require the weather-resistant performance of that wall, specifically with the ability to be water resistant. Further, it goes on to state, "The exterior wall envelope shall include flashing, as described in Section 1405.4." Turning ahead to that section, we can read, "Flashing shall be installed in such a manner so as to prevent moisture from entering the wall or to redirect that moisture to the exterior. Flashing shall be installed at the perimeters of exterior door and window assemblies, penetrations and terminations of exterior wall assemblies, exterior wall intersections with roofs, chimneys, porches, decks, balconies, and similar projections, and at built-in gutters and similar locations where moisture could enter the wall." In this instance, there seems to be a direct correlation between the code language and with the findings of the insurance industry on the common problem areas. The code is mandating what the rest of the design and construction community may already have learned: Flashing is required to cover over and around interruptions in the weather-resistant barriers and to redirect water or moisture away from the opening or interruption.

With all of the above in mind, let's look closer at the typical different conditions around window openings.

Window Head Conditions

The head, or top of the window, is the first place that will receive any water draining from above it. In this case, it is clearly important that this water needs to be diverted around the window rather than be allowed to run down into the window. Equally important, the window head needs to be sealed along the junction or seam between the window and the sheathing to prevent intrusion there. Many windows come with nailing flanges that purport to be "self-flashing;" however, if water drains down behind those flanges for any reason, that claim is neutralized. Investigate thoroughly any such products and see what is really needed to allow for the window head to be properly flashed and protected.

The WBDG looks specifically at conventional window head flashing techniques and suggests using durable metal flashings such as zinc-tin coated-copper or stainless steel. However, other flexible products are also available and should be considered based on product capabilities and particular window installations. Either way, window head flashings need to be sloped to the exterior for drainage and provide an outturned drip edge over the top of the window frame. This type of head flashing should extend several inches beyond the window frame to be sure that water drops to the ground and does not seep back into the window unit. It is also common to provide a 4-inch minimum upturned leg above the window that is counter flashed with a wall waterproofing membrane adhered to the vertical leg of the metal flashing. If head flashing is already built in to the window unit, it needs to meet all of these criteria. It may also need to be counter flashed as well since the sheathing, and not the siding/cladding, is the protective drainage surface. Head flashings will end on the sides at the top of the window jambs and need to be sealed both to the window frame and to the jamb flashings to assure a continuous barrier all around the window. For window openings that do not allow extension of the head flashing beyond the opening (e.g. recessed windows), the suggestion is to use dual sealant joints in lieu of head flashing to capture water and direct it to the jamb flashings.

Window Jamb Conditions

The window jamb, or sides of the window opening, require some specific attention. As suggested in the window head discussion, the junction of the head and jamb is a critical condition since water can seep behind a water-resistive barrier if the window is not sealed properly around its jambs. The WBDG points out that jamb flashings may be metal but more typically are a flexible membrane of a variety of types. The intent is that this jamb flash-

ing extends along not only the face of the sheathing around the window but also the full depth of the framing to catch and redirect any water away from the framing members. Where jamb flashings are part of an air-barrier system, they must be either metal or a membrane that is continuously supported by or adhered to a substrate capable of withstanding changes in air pressures. Otherwise, they will be prone to move and separate from the adjacent surfaces. The WBDG goes on to indicate that membrane flashings that bridge any gaps must be continuous for the full height of the window (i.e., no lap seams) because such gaps don't allow the support needed to keep seams watertight. When it comes to integrating jamb flashings with wall waterproofing systems, the flashing must overlap the wall barrier and be fully adhered at their intersection to create a continuous connection between the two. Mechanical attachment (i.e., fasteners) of the jamb flashing to the window can be required if there is insufficient surface area on which to adhere the flashing and rely on adhesion alone. Any gaps between the flashing and the window frame must be fully and continuously sealed. Finally, at the base of the jambs, the jamb flashings must be shingled over the sill flashing to properly direct water to run down the jambs and into the sill pan.

Window Sill Conditions

The sill is the base condition of the window that may include a horizontal or sloped surface that is exposed to the weather. If the sill is not designed properly, then rain, snow, ice, or other weather-based water can sit on a sill, seep in behind the window, and find its way into the wall. Since that water will naturally move downward, flashing is needed under the sill to provide an additional layer of protection for the wall below it. Here again, the WBDG makes some recommendations. In cases where the sill flashing is exposed (i.e., not covered by siding or cladding), it suggests using durable metal flashings (e.g., zinc-tin coated-copper or stainless steel) that are sloped to the exterior and provide an outturned drip edge over the face of wall cladding. For the interior condition of such metal flashing, it suggests an upturned leg (1 inch minimum, greater for high-wind exposures) with end dams soldered water tight. Membrane flashings are also appropriate here, where the sill flashings are concealed and drain down into the wall cavity behind the cladding or onto sloped precast concrete or stone sills.

Clearly, each of these window opening conditions (head, jamb, and sill) is important to address and flash properly. There is one additional critical detail to take into account though, namely, the attachment of flashings. If nails or other metal fasteners are used, then those are necessarily penetrating the membranes that are intended to do the protective work of the flashing. Therefore, attachment details need to be coordinated with each other so that attaching one type of flashing does not penetrate another type of flashing, such as a sill detail penetrating the jamb flashing. Further, it is important that fasteners do not penetrate the horizontal portion of sill and head flashings and cause an interruption in the integrity of the flashing. If that is not possible, then those penetrations need to be covered over or counter flashed to assure the integrity of the system.

Pictured are the joints of a continuous air and water barrier on the exterior sheathing being sealed.

Continues at ce.architecturalrecord.com

Peter J. Arsenault, FAIA, NCARB, LEED AP, *is an architect and green building consultant who has authored more than 140 continuing education and technical publications as part of a nationwide practice.* ***www.linkedin.com/in/pjaarch***

Whirlpool CORPORATION

Innovation with a purpose.

Our definition of innovation goes beyond the surface. We're not interested in extraneous, low-function features and technologies that value flash over function. We believe technology at its most innovative should simplify the things we do every day and we're committed to innovation that enhances your customers' experience at any stage of life.

DISCOVER MORE ABOUT TODAY'S INNOVATIONS FOR AGING IN PLACE.
EARN AIA CREDITS AT CE.ARCHITECTURALRECORD.COM

WHIRLPOOL® CLOSET-DEPTH FIT FRONT LOAD WASHER AND HYBRIDCARE™ VENTLESS HEAT PUMP DRYER
WFW9290FC & WED9290FC

AMANA® Whirlpool® MAYTAG® KitchenAid® JENN-AIR®

CIRCLE 164

Photo courtesy of Whirlpool Corporation

The concept of lifelong housing is based on designs that are appealing, functional, and flexible to accommodate different stages of life or changes in lifestyle, particularly in rooms with built-in features, such as kitchens.

Lifelong Housing

Strategies for aging in place through all periods of life from millennials through retirees

Sponsored by Whirlpool Corporation | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

What makes housing not only attractive and functional but truly livable? The answer can depend on who is being asked. Young or middle-aged singles or couples have specific needs and wants that can be different from families with children who are still different from empty-nest or retirement households. Recognizing this, developers and housing designers often create housing solutions focused around just one typical household type, anticipating that residents will move in and out based on the phase of life or lifestyle that a particular housing design addresses. But there is an alternative approach in the form of housing that can adjust or adapt to different life stages, allowing people to live in the same housing situation longer. In some cases, elements of such designs remain the same by being universally appealing or functional. Other parts of the housing unit might be designed to be readily adaptable, allowing for elements to be movable, expandable, or even collapsible to suit different conditions. Such an approach allows people to remain in a home and neighborhood despite lifestyle changes, giving rise to the design notion of "lifelong housing."

UNIVERSAL DESIGN

For the past few decades, buildings of all types have needed to comply with design requirements to allow people with physical disabilities to function independently in them. The Americans with Disabilities Act (ADA) and codified standards such as the American National Standards Institute (ANSI) 117.1 have become

CONTINUING EDUCATION

1 AIA LU/HSW

BNP MEDIA IS AUTHORIZED BY IACET TO OFFER 0.1 CEUS FOR THIS PROGRAM

Learning Objectives

After reading this article, you should be able to:

1. Identify the ways that universal design can be the basis for lifelong housing in residential design.
2. Distinguish between various programs and organizations that are promoting lifelong housing.
3. Explore the ways that leading designers and developers are achieving the successful integration of universal design and lifelong housing solutions.
4. Demonstrate the ways that kitchens, laundry rooms, and appliances can be accessible to all users while using resources efficiently.

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

AIA COURSE #K1612J

both recognized and required as guidelines for the design of accessible spaces, including residential living spaces. As these requirements took hold, the design community began to realize that many of the things that make a home more accessible don't need to rely on special or additional items, rather, just on a better design approach. Further, it became clear that residential units might need to accommodate people of different capabilities at the same time, as in multigenerational households, or that people who are otherwise able-bodied might have a temporary disability due to an accident or medical procedure. This gave rise to the concept of "universal design," which is a design approach that holistically integrates accessibility features that are useful to people of all capabilities without necessarily drawing special attention to those features.

Universal design looks beyond code and regulatory requirements for accessibility by recognizing that there is a wide spectrum of human abilities either between different people or between different periods in someone's life. Everyone, whether able-bodied or not, experiences childhood restrictions, adult capabilities, periods of temporary illness, physical injury, and limitations of old age. The differences at these periods can be found in physical, perceptual, and cognitive abilities, as well as different body sizes and shapes. By recognizing this diversity of experiences that affect all people, environments can be designed that are easier for all people to use. A good example can be found in curb cuts at sidewalks that were initially designed and constructed primarily for people who use wheelchairs. It didn't take long to recognize that they could also be used by pedestrians with strollers or rolling luggage, thus adding functionality and convenience for everyone as part of a universal population.

Universal design can be based on permanent design elements, such as corridors and doors of appropriate widths, or on adjustable solutions in a space, such as adjustable counter heights, movable furniture, or even movable partitions. This approach allows for the building to have a longer period of usefulness to the owner, making it functional over different stages of life and making it more sustainable in the process. Who can benefit from this universal design approach? Almost everyone. Young, healthy people may not need to worry about any physical accommodation of spaces, until they incur an injury or find themselves needing to care for someone else who does need an accommodation. Young veterans returning from Iraq and Afghanistan who were wounded in combat and are now back home recovering are an example of this situation. Households with children need spaces that are appropriately accessible to allow those children to participate fully in the family but are also appropriately limiting as they learn to navigate safely in their living environment. This might play out as isolating young children away from stairs or landings, while still allowing adults ready access for example. People entering or near retirement may not need to worry about any particular accommodations in the short term but often look at their housing with an eye toward the future, wishing to remove obstacles, such as stairs, to allow them to still function easily in the same home as they age. Of course, all of these different issues may come together at the same time if the household is made up of people of multiple generations, such as a middle-aged couple who has their adult child or children living at home with them or has brought an elderly parent to live in the house with them. In any of these cases, a universal design approach makes it easier for everyone to function and be accommodated in a coordinated/integrated way regardless of temporary or permanent physical capabilities. It also allows everyone to stay in the same living unit longer without being forced to move.

TRENDS INFLUENCING DESIGN

Residential designs are generally critiqued by the general public based on how well a residence suits their lifestyle, provides for their preferences, and stays within their budget. The interesting part for designers is to recognize that there are some very distinct groups of people that need housing with very different situations. To help us understand some of those differences, there are some national groups, publications, and organizations that are doing some very good and even groundbreaking work.

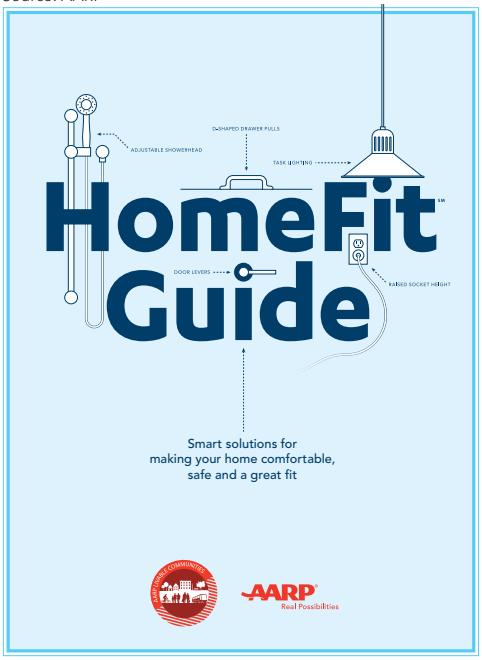
The Millennial Generation

At one time, the largest demographic group in the United States was the "baby boom" generation that emerged in the roughly 20-year period following World War II. That generation is now entering retirement and is being replaced by the "millennials" who were born roughly between 1975 and 1995. Currently in the age range of their 20s and 30s, this group has been touted in news reports, studies, and marketing efforts to discern what is similar and what is different about this generally well-educated, tech savvy, and capable generation. Of course, generalizations aren't always justified. For example, *The Atlantic* magazine has reported that while white, suburb-raised millennials have mostly attended college and are considered to be quite upwardly mobile, minorities of this generation are sometimes "stuck" in poorer neighborhoods with little opportunity to move out.[1] Nonetheless, most of this generation feels financial pain either from low wages or college debt burdens, and they have delayed buying homes accordingly. Many are living with their parents much longer as a result, even after finishing college, and in the interest of being mobile to find the best job opportunity (not to mention postponing marriage and a family for the same reason) would rather rent their housing than buy a

Photo courtesy of Whirlpool Corporation

Lifelong housing allows for people of different generations to live and function effectively in well-designed living units.

Source: AARP



The AARP HomeFit Guide is a resource for identifying ways to allow housing designs to accommodate people for aging in place.

place to live. Of course, there are variations and exceptions, but overall, this generation appears to be following a different path in life than their parents or grandparents did.

A magazine devoted to millennial lifestyle has even emerged, appropriately called *Millennial Magazine* (millennialmagazine.com). It recognizes some of these trends, but also indicates that millennials are indeed entering the housing market, with projections indicating they will begin to make an impact in large numbers in the coming years. Based on that, in March of 2015, the magazine published a list of seven things that they believe this generation is looking for when it comes to choosing a home.[2] These include:

- **Open floor plans** that allow for group activities and entertaining with friends without being limited by small boxy spaces.
- **Less maintenance** since busy work and social schedules, or the need to travel out of town for a few days, aren't conducive to spending a lot of time on cutting grass, repairing things in the house, or worrying about keeping up appearances.
- **No formal dining room** since sitting at formal group meals is not commonly part of their lifestyle. Rather, a home office or study space would be more useful, along with some flexible living space that could accommodate the occasional large meal gathering by moving the furniture around.
- **Energy-efficient** appliances that reflect an awareness of the need to control environmental impacts and a desire to keep long-term energy costs down. In some cases, it is reported that this single item could be the difference influencing a buying decision over another similar home that is not equipped with energy-efficient, more sustainable appliances.
- **Hardwood floors** or laminated flooring, which are are stated preferences over carpeting since they are easier to clean, meaning less maintenance, particularly if pets are involved.
- **Comfort**, a key criteria in most home decisions and one that certainly applies here, particularly for people who seek to unwind at home outside of work or other obligations.
- **Connectivity** to good cellular telephone service and high-speed Internet, which are not luxuries for this generation, but necessities of modern life. Many don't have, or want, land-line telephones and use the Internet for a plethora of basic uses, such as communication, banking, shopping, and entertainment.

This list is certainly not definitive, but suggests that open, flexible, connected living conditions are needed without the trappings of undue maintenance or formalities. It is also suggests that some, or all, of these characteristics will not likely change much as this generation moves into other phases of life.

AARP HomeFit Guide

Formerly known as the American Association of Retired Persons, AARP is a national organization focused on the 50-and-over population in this country with more than 38 million members. It has the resources and capabilities to look at a variety of social, economic, and lifestyle issues for this demographic, including housing. Its sheer numbers confirm the large increase in the aging and retired population in the United States. Research conducted by AARP among its members and retirees in general consistently finds that the vast majority of people age 50 and older want to stay in their homes and communities for as long as possible. This has produced the concept of "aging in place," which allows people to stay living where they are even as physical capabilities may change over time.

With the above in mind, AARP created the *HomeFit Guide* specifically to help people stay in their homes, turning them into "lifelong homes" suitable for themselves and anyone else in their household. Its approach is similar to universal design in that it seeks to make a home more livable by incorporating design principles and products that are adaptable, safe, and easy to use. It points out that, done properly, such smartly designed features are attractive, stylish, and can come at all different price points. The guide offers solutions that range from simple do-it-yourself fixes to improvements that are more involved and require skilled expertise but are all billed as well worth the expense. As both an educational resource and a personalized tool kit, the AARP *HomeFit Guide* is presented as providing lessons, suggestions, and practical solutions.[3]

AARP Lifelong Housing Certification Project

So it is one thing to follow a guide for your own residence, but how would you know if an existing housing unit is already suitable for lifelong housing or not? AARP teamed up with southern Oregon's Rogue Valley Council of Governments (RVCOG) to see if it could address that. What emerged is the Lifelong Housing Certification Project as a voluntary certification process for evaluating the accessibility and/or adaptability of homes. It provides a way to assess the "age friendliness" and accessibility of rental units, newly constructed homes, and existing homes. The program was specifically developed to help meet the growing market demand for accessible housing in the southern Oregon region and to promote aging in place for older adults and people with disabilities who want simply to live safely and independently. It is based on a comprehensive checklist of features developed using established universal design standards and with input from consumers, home builders, rental owners, and home inspectors. All Lifelong Housing Certification is done by a licensed inspector. The program became available for public use in 2013, and the first certifications were issued in 2014.

The program defines three different levels of certification based on the following:

- **Level 1:** Visitable: The home includes basic accessibility and/or adaptability of architectural features on the ground floor and is "visitable" for guests with disabilities. It has a wheelchair-accessible entrance, plus entertainment area, hall, and a bathroom. Other examples of basic features include door handles and faucets that are lever-style and don't require grasping.
- **Level 2:** Fully Accessible: The ground floor of the home is fully accessible, including all Level 1 features plus an accessible bedroom and kitchen, parking area, and entrance. Examples of additional features include raised toilet and appliances, grab bars in the bathroom, etc.
- **Level 3:** Enhanced Accessibility: The home includes Levels 1 and 2 features and has been customized for specific accessibility needs (for example, a ceiling track for transfer or electronic care monitoring). Specific features are noted on the certificate and available from the seller or listing agent.

Once rated, the home is then added to the RVCOG Lifelong Certified Housing database, which is available to Realtors® and potential homebuyers and renters. The certification makes it easier for individuals of all ages to find homes that are suitable for lifelong living and promote the social and economic value of

lifelong livability. Local consumers and housing industry professionals learn about the program from outreach activities (such as a booth at the Southern Oregon Home and Garden Show) and educational events for consumers and industry professionals that are organized by RVCOG, AARP, and other partners, including the local organization Age-Friendly Innovators. People can also find or learn more about the program online at the Rogue Valley Council of Governments website (www.rvcog.org).

NAHB Certified Aging-in-Place Specialist (CAPS)

The National Association of Home Builders (NAHB) (www.nahb.org), in collaboration with AARP and other experts, has taken things national by developing the Certified Aging-in-Place Specialist (CAPS) designation for housing design and construction professionals. Based on training and testing during a multicourse educational program, Certified Aging-in-Place Specialists are taught to understand the unique needs of the older adult population. They also become knowledgeable about aging-in-place home modifications, common remodeling projects, and solutions to common barriers. CAPS designees are often remodelers, but designers, architects, and others frequently achieve this designation as well.

Certified Aging-in-Place Specialists can fill a variety of needs. First, they can recommend updates to housing that will help a person live independently in his or her own home. They can also work with occupational therapists (OTs) to develop a home modification or build plan based on the safety and functional needs of an individual or household. Of course, they will need to collaborate with licensed architects, interior designers, or contractors about building and design strategies and techniques for creating barrier-free living spaces that are attractive and functional. NAHB is quick to point out that CAPS remodelers and design-build professionals are not medical or healthcare professionals and do not give advice on those matters. Rather, they provide guidance on ways to adjust the design and construction of homes to promote aging in place.

Source: NAHB

Certified Aging-In-Place Specialist
Houses For Living. Homes For Life.

The National Association of Home Builders has developed a program for certified aging-in-place specialists who can assess housing for changing needs as occupants age.

Flexible, well-designed housing incorporates flexible-use spaces to accommodate owners' changing needs.

Photo courtesy of Whirlpool Corporation

LEADERSHIP BY DESIGNERS AND DEVELOPERS

Recognizing these trends, programs, and changes in the demographics of America, architects, urban planners, and developers have begun to respond by embracing the notion of lifelong housing and begun to incorporate it into their work. In some cases, this response has been due to client requests, while others have been proactively leading the way.

Sarah Susanka, FAIA: The Not-So-Big House

Most people involved in any residential design work have likely come across Sarah Susanka's popular work. With nine best-selling books to her credit, she has engaged the public in learning about effective, efficient, and creative residential design principles. In 2012, she participated in a demonstration program known as the Not-So-Big Showhouse, which was built in a dense, urban setting in Libertyville, Illinois. It incorporated some of the common features and principles that her work has become known for: efficient, affordable layouts that align with good natural lighting and three-dimensional spaces that are articulated cohesively. In addition to features that millennials would enjoy, such as open space in a very comfortable, energy-efficient design, she also incorporated aspects of flexibility that help with lifelong housing. In particular, she has included a first-floor "away room," which can serve as a home office, a guest room, or even a play room for kids. It is located just off of a mudroom and bathroom area, which means it is readily adaptable to become a first-floor, accessible bedroom suite should someone need such a space. She also does not include a formal dining room, opting instead for a space-efficient eating booth in the kitchen. If a large holiday meal is planned, the kitchen table is readily movable into the main living area and can accommodate a crowd. The concepts behind this house have now been taken further to the Not-So-Big Working Lab in Lake Zurich, Illinois, where additional homes are incorporating these same ideas.

Continues at ce.architecturalrecord.com

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

LECTURE HALL.

Introducing the Architectural Record CEU App. The only app that allows you to fulfill credits and track your progress without Internet access.

Download free at iTunes.

Sponsored by reTHINK WOOD®

Curved sliding fire doors protect multistory stairways and eliminate the need for costly smoke removal systems.

Photo courtesy of John Durant

Horizontal Sliding Fire Doors: Architectural Design Freedom

Special-purpose horizontal sliding accordion or folding door assemblies allow freedom of design while meeting egress requirements found in IBC and NFPA

Sponsored by Won-Door Corporation | *By Karin Tetlow*

Since successfully passing Underwriters Laboratories (UL) fire-rating tests in 1977, self-closing horizontal sliding accordion-type doors have long been sought as a solution to meeting fire requirements in certain applications. But 20th century codes did not accept them as a complete solution for meeting fire and building code egress regulations. Design professionals were often required to specify standard wood- or steel-framed hinged swinging doors to serve as emergency exits and to separate internal spaces. Since 2000, however, significant code changes have greatly expanded the use of horizontal sliding door systems. Today, these systems are universally accepted as meeting both fire and building code regulations in virtually any application. (The exceptions are certain applications categorized as Group H occupancies that typically include the storage of flammable and toxic materials.)

Yet many design professionals remain unaware of these code changes and the significant architectural possibilities resulting from their across-the-board code acceptance—and the implications of incorporating sliding door systems early in the design stages.

Sliding door systems play an increasingly key design role where there is a need to have openings that exceed the 4 or 8 feet provided by

CONTINUING EDUCATION

1 AIA LU/HSW

BNP MEDIA IS AUTHORIZED BY IACET TO OFFER 0.1 CEUS FOR THIS PROGRAM

Learning Objectives

After reading this article, you should be able to:

1. Describe the functioning components of horizontal sliding fire door assemblies and explain the practical safety benefits as compared to traditional vertical rolling door systems.
2. Assess the design implications of specifying sliding fire doors in commercial buildings.
3. Identify the building and fire codes that regulate sliding fire doors, particularly egress requirements found in IBC and NFPA.
4. Discuss the typical features of a horizontal sliding fire door system that contribute to both design flexibility and practical means of egress.

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

AIA COURSE #K1612G

conventional fire-rated single- or double-swing doors. Moreover, free from the limitations of rectilinear footprints, architects are now able to design fire-rated extended spans and curved openings for an almost endless number of applications. There are many application examples in the United States and abroad. Installed in a multitude of building types, they are found in schools, churches, high-rise office buildings, casinos, airports, senior living facilities, health-care facilities, shopping malls, hotels, public transit, and museums—often at lower costs than for other solutions. With an increased focus on building security since 9/11, government offices, embassies, schools, and courthouses are also increasingly turning to sliding door systems as protection in emergency situations.

From the Venetian Macao, the $2.4-billion anchor luxury hotel on the Cotai strip in Macao, China, to Frank O. Gehry's Guggenheim museum in Bilbao, Spain, sliding door systems also offer an innovative solution to the code constraints of creating iconic and unique architecture.

Sliding door systems provide an eminently practical means for quickly moving people through an unobstructed exiting system of a building. Repeated testing for use by occupants with disabilities and in wheelchairs has demonstrated that the sliding door system is far more effective when evacuating people from a building than a side-hinged or swing door. Swing doors clearly present user problems in building emergency situations, both for people in wheelchairs and on foot, particularly in crowded situations and when fire and rescue personnel are coming through the door from the opposite direction. Manufacturers have researched and developed sensors and precision microprocessor technology that opens and closes the sliding door with ease. In an emergency, a person with disabilities or in a wheelchair touches the fire exit hardware; the door opens to a preset width, allowing the person to egress, and then recloses, protecting the opening. "The fire-rated horizontal sliding door is the best way to move people through fire barriers during any type of building emergency—whether or not they have a disability," says Edwina Juillet, co-founder, National Task Force on Fire and Life Safety for People with Disabilities.

HOW DO THEY FUNCTION?

Horizontal fire-rated accordion-type sliding doors are custom-designed to be stored in shallow recessed pockets in walls. Monitored and controlled by electronic systems, they self-close in the event of fire. In addition to there being no restrictions on the width of the size of openings in UL listings, sliding door systems can reach a 2008 UL-approved maximum height of 28 feet (taller applications, however, can be considered on a case-by-case basis). Moreover, because no floor track is required, they may be specified for radial configurations. With track detail recessed above the ceiling and accordion doors that fold to just inches per foot behind a pocket door, they are virtually invisible until activated. Sliding fire door systems are not applicable in openings designed for doors that are normally closed.

A typical horizontal sliding door system employs a two-track system. Door panels are manufactured from 24-gauge steel and weigh 5½ pounds per square foot. Panels are 4½ inches wide, corrugated for strength. Between the two tracks is a 6-inch to 8-inch dead air space.

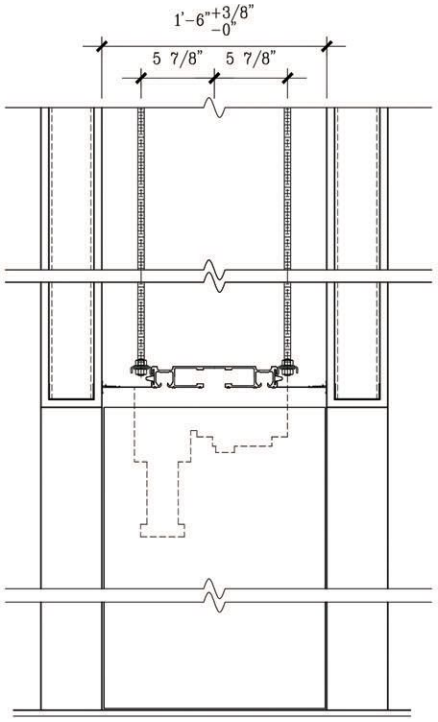
The door assembly suspension and driver systems are independent. Panels are suspended from an overhead track with a steel pin and roller assembly to increase durability and to make maintenance easier. The door can be completely repaired in place because individual panels may be removed and replaced.

Door assemblies have separate UL listings according to their fire rating, which is determined by building and fire codes. These are 20 minutes, 1 hour, 1.5 hours, and 3 hours (20, 60, 90, and 180 minutes.)

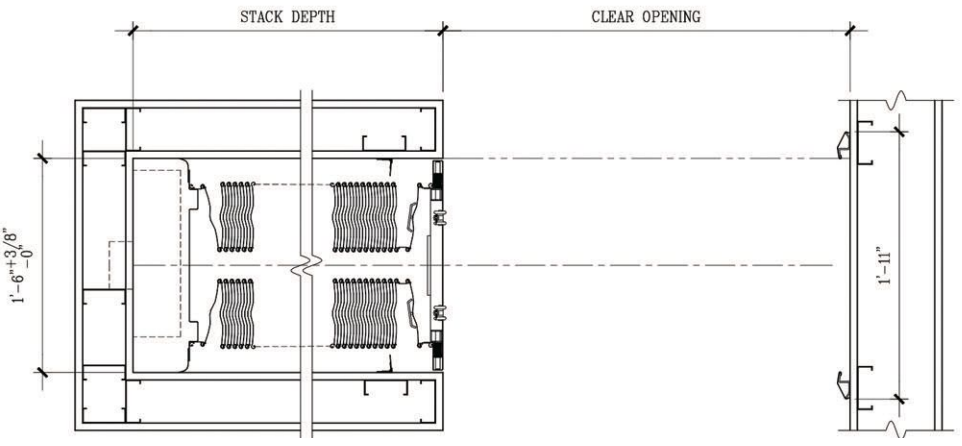
The sliding door system is designed to remain in the open position. Upon a signal from the building fire alarm panel, smoke alarm, fire alarm, a manual pull station, or, in some instances, the activation of a sprinkler flow valve, the door will automatically close. Opening and closing speeds are regulated by National Fire Protection Association (NFPA 80, Chapter 9) Code, which requires speed of not less than 6 inches per second and not to exceed 24 inches per second. The typical rate of opening and closing is between 8 and 9 inches per second. At this rate of speed, a clear opening width of 80 to 90 inches can be created in 10 seconds.

The door assembly's sophisticated electronic control system operates on a 120-volt AC system that includes a backup battery system and microprocessors that continuously monitor the door systems. The 120-volt line is connected to a junction box in the storage pocket near the control box and continuously charges the battery. Upon activation, a high-decibel sound indicates that the system is in fire mode, and the door closes. If the leading edge of the door, equipped with a special sensor, encounters an obstruction, it will stop, pause momentarily, and then continue closing. Only light pressure on the leading edge is required to cause the door to stop.

Head Detail for Horizontal Sliding Fire Door



Plan View of Horizontal Sliding Fire Door



Images courtesy of Won-Door Corporation

Sample of header and pocket details for single-parting door with integrated pocket cover door compressed stack panels

Photos courtesy of Eyemagination

Without a fire-rated sliding door system protecting the exit in this school, the corridor would require a wall and swinging doors, which could cause congestion in an emergency.

When in the closed position, it can be reopened easily from either side. Only 3 to 5 pounds of pressure on the exiting hardware cause the door to retract a certain preset distance (typically 36 inches), pause, and recycle to the closed position. The retractable distance was originally designed in conjunction with California Department of Rehabilitation engineers who were studying methods for evacuating persons with disabilities from multistory buildings during fire emergencies. Most manufacturers set the force to open at 5 pounds or less to comply with Americans with Disabilities Act (ADA) requirements for fire doors in egress applications. The distance the door retracts can be adjusted in the field.

Resetting the door assembly can be accomplished by pushing the open/close rocker switch on the leading edge of the door to the close position. When not in fire mode, this control can also be used to position the door as desired.

The typical sliding door system is designed, UL-listed, and installed so that it does not close upon power loss in the building, unless the loss of power is for a sufficiently long period of time that the voltage in the battery falls to around 11 volts. In typical openings, the door is capable of completing well over 50 complete opening and closing cycles on battery power alone. The door is also designed to be operated manually.

Because the door's drive system is structurally independent of the door's suspension system, any force applied to the door's surfaces will not obstruct the functioning of the door. Nor will any likely substantial deflection of the door have more than a minimal effect on the door's opening or closing. Logic circuitry in the control unit prevents the door from opening when heat sensors detect a high temperature or fire condition on either side of the door.

DESIGN POSSIBILITIES

By allowing openings to appear unencumbered, sliding door systems provide practical answers to fire and egress code requirements while allowing extraordinary architectural versatility. Many museum architects have determined that horizontal sliding door systems solve the problem of meeting fire and building codes while maintaining open vistas between large vertical and horizontal internal spaces. For the Bilbao Guggenheim Museum, Gehry Partners used 10 fire-rated horizontal accordion-style sliding doors totaling 3,000 square feet to deliver interior spaces that aptly reflect the dramatic forms of the exterior. For the J. Paul Getty Museum at the Getty Center in Los Angeles, Richard Meier and his firm Richard Meier & Partners specified 64 doors or more than 6,600 square feet of sliding doors as invisible fire breaks that allow people to move freely between the exhibition spaces.

Sliding door systems have a range of applications in a multitude of building types. Some serve several code-compliance functions at once, such as providing exits and protecting vertical openings, elevator lobby separations, and remote security monitoring capabilities, plus permitting multilevel fire-rated design features. In sum, they provide "area separation," a reference much in use but now outdated as a code term. Applications for code compliance include:

- Fire wall separation
- Fire barriers
- Shaft enclosures
- Fire partitions
- Smoke partitions

In high-rise buildings, sliding fire door systems are often the least expensive means of separating the elevator lobby from the remainder of the building and to provide egress doors as required by code. Sliding fire doors can maximize the opening into the elevator lobby and minimize any design constraints associated with accommodating doors swinging into the elevator lobby or encroaching on exit corridors.

Sliding door systems are found in Marriott, Hyatt, Walt Disney World, Ritz Carlton, and Hilton hotels. They also provide for open and easy accessibility to the gaming floors in many Las Vegas hotels. Caesar's Palace, for instance, has a concealed specially engineered 32-foot-7-inch-high 1.5-hour sliding fire door separating the multimillion-dollar Roman Forum shopping mall from the casino's main gaming area

Photos courtesy of Jim Roof Creative Inc.

Horizontal sliding fire doors with an integrated pocket cover door and compressed stack panels can reduce pocket depth by 50 percent.

Photos courtesy of Alan Wood

HORIZONTAL SLIDING DOOR SYSTEM

Typical Features of a Horizontal Sliding Door System

1. **Exiting hardware**
   Exiting hardware can be configured and placed where appropriate. This includes accommodation for persons with disabilities. It is purposely designed to provide a sharp contrast from the door's surface and includes both graphic images and bold lettering. Extensive time and motion studies have demonstrated that the hardware is easily recognizable and operable without any type of special knowledge or effort.
2. **Leading edge obstruction detector (not pictured)**
   The door will stop upon contact with an obstacle, pause, then re-seek the closed position.
3. **Leadpost (not pictured)**
   Doors can be prevented from closing and caused to reopen a preset distance by applying light pressure to the leadpost.
4. **Single- or bi-parting doors (not pictured)**
   A single door slides across the opening into a recessed jamb located on the opposite wall. The spanning of larger openings is possible by using the bi-parting configuration. The storage space is then divided on each side of the opening.
5. **Pocket cover door**
   Pocket cover doors can be designed to blend with any interior finishes. Pocket doors stay closed with a simple magnetic latch.
   a. Pocket cover doors may also be integrated into and made part of the doors lead post, eliminating the need for a custom-made pocket cover door.
6. **Track and trolley system (not pictured)**
   The two-track system allows the door to accommodate wide span openings. Curved configurations are also possible. Typically, the tracks are installed 3¼ inches above the ceiling line.
7. **Thermal lockout feature (not pictured)**
   Ambient temperature at the door is monitored, and the operating device is automatically disabled if the environment becomes untenable.
8. **Microprocessor monitoring (not pictured)**
   A control unit located in the door's storage pocket provides continuous monitoring of door status.
9. **Power supply**
   Sliding door systems employ a completely electronically supervised system utilizing solid-state circuitry as well as a backup DC power supply.
10. **Floor gasket and fire liner (not pictured)**
    A tight-fitting floor gasket and insulated liner provide an impenetrable barrier against the spread of smoke and flames.
11. **Modular design (not pictured)**
    Modular design provides for in-place reparability using basic tools.

1


5


5a

9

Photo courtesy of Michael Dersin Photography

Sliding doors keep corridors open for moving travelers but will separate areas in an emergency.

(noting the heavy track system and proposed construction modifications, UL issued an oversized special door certificate).

Sliding doors deliver spaciousness and open access in megaplexes, as well as provide fire separation walls required to compartmentalize the area. Some sliding fire door systems in shopping malls and sports facilities reach 100 feet in width when open. At the other end of the spectrum, sliding door assemblies have been used at the entrance of parking garages where there was insufficient height for a typical roll-down fire shutter.

In addition to being fire-code compliant, sliding door systems offer security against break-ins. In one California shopping mall, burglars succeeded in breaking through traditional roll-down gates, but their crowbars failed to dislodge the steel sliding door assembly installed in a fire separation upgrade at the entrance to the mall.

Concealed sliding fire-rated door systems that can also seal off sections to separate occupants are an ideal solution in airports whose business is to move many thousands of travelers quickly. The addition of the International Terminal at Baltimore/Washington International Airport required an area separation between the new and old terminal. RTKL of Baltimore, which provided a package of regionally sensitive graphic materials and a comprehensive set of tenant criteria, protected the wide span openings with a sliding fire door. The door assembly allows an unobstructed flow of airport traffic by remaining in the open position and yet having the capability to automatically close when the building fire alarm system is activated. Sliding fire door systems are also found in Orlando International Airport, Charlotte Douglas, Newark, San Diego, Ronald Reagan Washington International, and many other airports.

Continues at ce.architecturalrecord.com

ROSS ARCHITECTURAL SECURITY

SERIOUS THREATS DEMAND SERIOUS PROTECTION.

ADVANCED PHYSICAL SECURITY SOLUTIONS FOR HIGH-RISK FACILITIES

As threats increase to government buildings, data centers, petro-chemical facilities and other critical infrastructure, architectural security becomes an increasingly important design consideration.

We specialize in custom designed forced-entry, ballistic and blast resistant fenestration products engineered, tested and certified to meet the highest performance standards of the Department of State (DOS), UL 752 and NIJ – providing top-level protection for high-risk facilities around the world.

When safety is a priority, protect your buildings with Ross. Learn more at **www.rosstechnology.com/architectural-security/**

ARCHITECTURAL SECURITY | **SAFETY WORKS**
PERIMETER SECURITY | **INDUSTRIAL STORAGE**

CIRCLE 81

U.S. Embassy in Bujumbura, Burundi

U.S. Embassy in Vientiane, Laos

ROSS

Technology for Stronger, Safer Solutions

Photo courtesy of the U.S. Department of State

High-level physical security standards as well as innovative, sustainable design are built into the U.S. Embassy in Bujumbura, Burundi.

Design to Protect

Fenestration systems for extreme threat resistance

Sponsored by Ross Technology

As security threats continue to escalate around the world, demand for greater threat resistance in buildings increases at the same rapid rate. What formerly was a priority mainly in diplomatic and military facilities now extends not just to high-risk facilities, but to critical infrastructure like data centers, power generation plants, oil and gas centers and equipment, chemical manufacturing and transport, and centers of water supply and mass transit. Many other organizations, both public and private, are also seeking to incorporate higher levels of building protection into their physical security plans for commercial, financial, and educational centers. Since the 1995 bombing of the Alfred P. Murrah Federal Office Building in Oklahoma City, and even more intensively after the terrorist attacks of 2001, the safety of buildings and their occupants has become a concern in virtually every building type.

Fenestration in buildings—glazing, windows, doors, louvers, hatches, and other components—can be a key vulnerability, and thus it is an essential element of design for threat resistance. This course focuses on methods of understanding and responding to today's most urgent physical threats: explosive blasts, ballistics, and forced entry. The information here can guide professionals in asking the right questions about fenestration products and design, and can help define levels of protection for people and property so that the products can become a positive part of the architectural design and overall function of the building.

Continues at ce.architecturalrecord.com

CONTINUING EDUCATION

1 AIA LU/HSW

BNP MEDIA IS AUTHORIZED BY IACET TO OFFER 0.1 CEUS FOR THIS PROGRAM

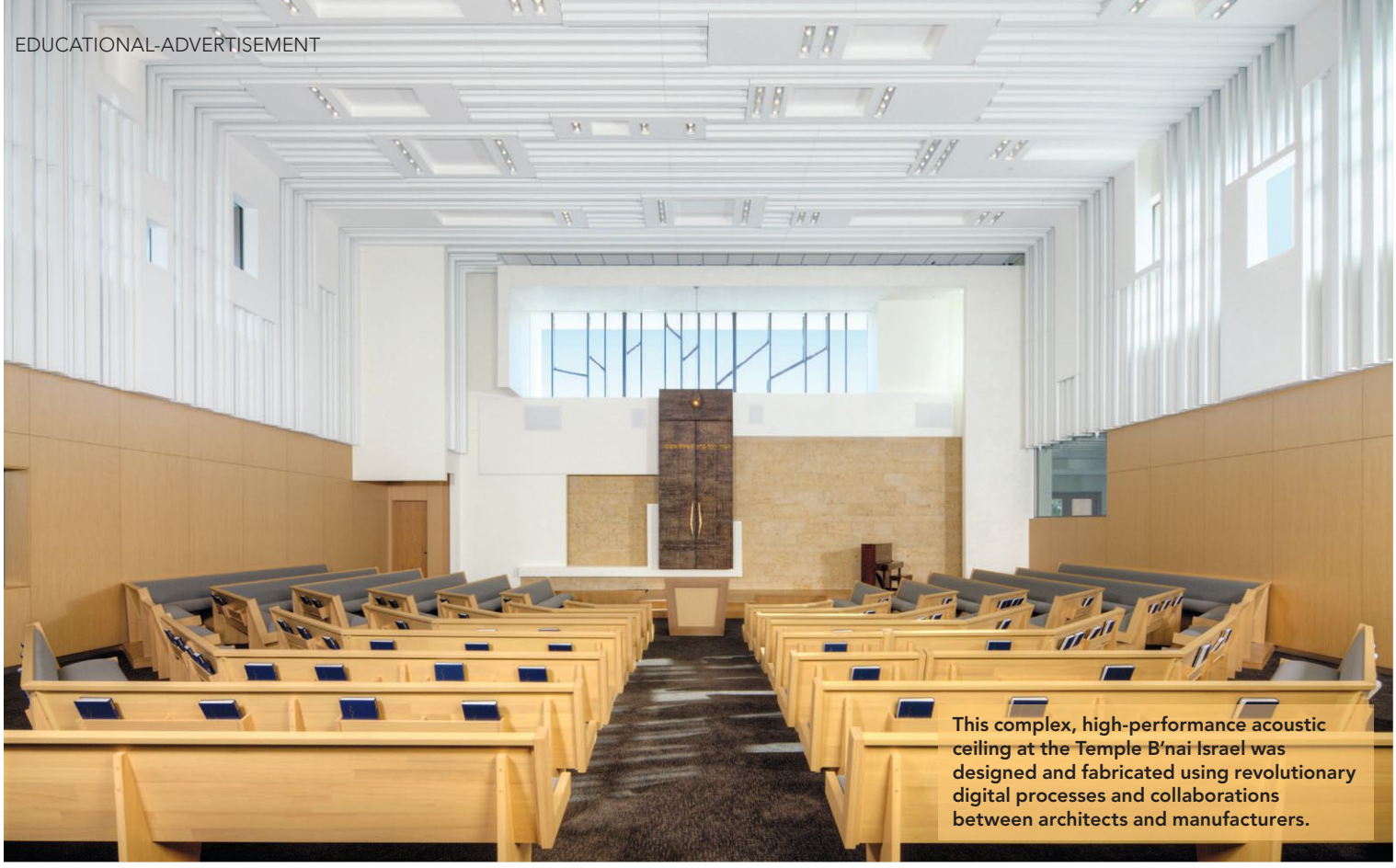
Learning Objectives

After reading this article, you should be able to:

1. Describe the methodology used to limit or manage risks to facilities.
2. Discuss at least three major criminal/terrorist threats to facilities.
3. Define the typical severity and product resistance levels for these threats, with a focus on fenestration systems.
4. Examine combined threat resistance and the challenges of designing to this criteria.

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

AIA COURSE #K1612P



This complex, high-performance acoustic ceiling at the Temple B'nai Israel was designed and fabricated using revolutionary digital processes and collaborations between architects and manufacturers.

All images courtesy of Ceilings Plus

Revolutionizing Ceiling and Wall Surfaces with Parametrics and Digital Fabrication

Parametric design and partnering with digital manufacturers can result in data-driven, affordable, high-performance, creative ceilings and interior finishes

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

Inspired by the talent of young graduate architects and fueled by advances in computing, the integration of design with automated fabrication is changing the nature of building. One of the most influential architects of the 20th century, Buckminster Fuller often predicted the future. "In order to change an existing paradigm, you do not struggle to try and change the problematic model," he said. "You create a new model and make the old one obsolete." As technology has progressed, his words can be applied to the latest advances in computer-assisted design and manufacturing. Through exploration with digital fabrication using computer numeric control (CNC) machines, numerous architectural schools are now training architects to become the makers of the building shapes that they are designing using parametric modeling software. A parallel movement in manufacturing is merging with this design trend. As both worlds collide, they are learning to collaborate in the construction of affordable, mass-customized, high-performance buildings.

Within the past 30 years, the traditional practice of architecture, with its formal renderings of schematic, design development and construction documents by pencil, has been transformed by the use of computers. In the 1990s, architects began to develop new ways to document buildings, using computers instead of hand drafting plans, sections, and details. The ability to quickly manipulate and change drawings to meet ever-shorter schedules led to the standardization of construction documents. A few architects, like Frank Gehry,

CONTINUING EDUCATION

1 AIA LU/HSW

BNP MEDIA IS AUTHORIZED BY IACET TO OFFER 0.1 CEUS FOR THIS PROGRAM

Learning Objectives

After reading this article, you should be able to:

1. Define the benefits of utilizing parametric design and advanced engineering to maximize the potential of digital manufacturing.
2. Identify the difference between computer-aided design and computer driven-design, the latter of which uses utilizes data parameters to achieve high-performance goals for health, safety, and welfare.
3. Employ new strategies for increased daylight and to reduce artificial lighting requirements through partnership with designers utilizing parametric model-based design analysis.
4. Optimize sound absorption and acoustic "tuning" in buildings through the use of predictive modeling in initial design phases.
5. Discuss the potential parametric modeling and digital manufacturing has to reduce waste, improve efficiency, and deliver higher-quality results beyond the abilities of traditional manufacturing paradigms.

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

AIA COURSE #K1612D

began to investigate the possibilities of new design opportunities, borrowing software used by designers of airplanes and automobiles to develop new forms that were then sent directly to a manufacturer for digital fabrication. New three-dimensional software provided enhanced opportunities to design complex forms. Unfortunately, the construction of these forms often required significant amounts of time and money, as these revolutionary visions were translated to the limits of existing technology and common construction practice.

As described by Erik Luhtala, former architectural instructor, now the manager of Advanced Computational Research at Ceilings Plus, "The traditional relationship from architect to manufacturer is typically a top-down structure. The architect conceives the design, and the manufacturer delivers the finished goods. During the development phase, there is often consultation on material, feasibility, cost, finish, and details, but the manufacturer is often responding by matching the needs of the architect to products and solutions within its existing arsenal. This traditional relationship is successful, but due to the limitations of the exchange, there is often little room for completely new solutions or a fully collaborative approach." Today, new digital fabrication tools and collaborative approaches are creating a design revolution. A new process of digital manufacturing and fabrication aligned with parametric design tools at architectural firms are generating mass-customized building materials from interior finishes to exterior facades. Leading architectural firms are partnering with manufacturers to utilize parametric software and digital fabrication tools. They are crafting new solutions for projects without inducing additional cost or delayed delivery. They are consulting with professionals with new 21st century job titles like Luhtala's.

Mass-customization allows architects to achieve customized solutions that deliver the capabilities of advanced engineering and digital manufacturing to every aspect of their project. The change is transforming the marketplace and allowing designers to meet ever more stringent environmental goals for energy efficiency, daylighting, air quality, acoustics, and material reductions. This course will highlight how designers from several architectural firms (SmithGroup JJR, HKS, Gensler, and SGR Partnership Inc.) are changing their firms' design processes and meeting targeted cost, branding initiative, environmental, health, safety, and welfare goals through mass customization of project ceilings and wall systems.

TRANSFORMATIVE DIGITAL TOOLS: PARAMETRIC DESIGN AND DIGITAL MANUFACTURING

In the seminal book, *Advanced Customization in Architectural Design and Construction*, the authors describe the evolution of advanced customized industrialization as a development supported by various evolutionary factors. These include "the use of increasingly complex technological interfaces, the intent to characterize architectural language, the search for improved performance and increased levels of flexibility over time, the need to minimize construction time and rationalizing the organization of activities within the site, and last but not least, taking into account the issues related to sustainability and ecology."[1] They describe a new method of designing that is process oriented. This process is related to the evolution of "digital technologies that enable a more direct interface from the design, thanks to parametric software and production modalities, nowadays realized by flexible CNC machines." [1] The key is not only to select the appropriate technology but also to define the conditions for design and technological material transfer to the construction process.

The first wave of computer-assisted drafting tools allowed the architect to complete a set of drawings in two dimensions. These static drawings, similar to those developed by hand, were produced to specify finishes and processes for the construction of a building. These drawings provided computer-aided documentation given to manufacturers to provide a cost estimate and as a guide for shop drawings. Variations on these early programs included the addition of smart tags by the architect that calculated materials and environmental quantities and qualities. Advanced programs led to three-dimensional computer models that allowed designers to investigate the collisions between components but did not generate component fabrication.

Today, architects employing new parametric digital tools are leading a change that is revolutionizing not just the ability to model variations on paper but evaluate parametrically the impact on materials from concept through fabrication.

This change is happening slowly, as architects are beginning to learn the impact of new manufacturing technologies. According to Jim Griffin, AIA, associate at HKS and project manager for the Airside Modification at Hartsfield-Jackson Atlanta International Airport, "We started with a very strong design concept to improve the passenger experience by evoking the feeling of flight in the concourses and passenger holdrooms. Our first pass at initial designs were completed in hand sketches and small, laser-cut models."

Parametric design combined with digital manufacturing and fabrication allows for the use of increasingly complex technological interfaces and modeling of aesthetic and environmental strategies.

Parametric Design Defined

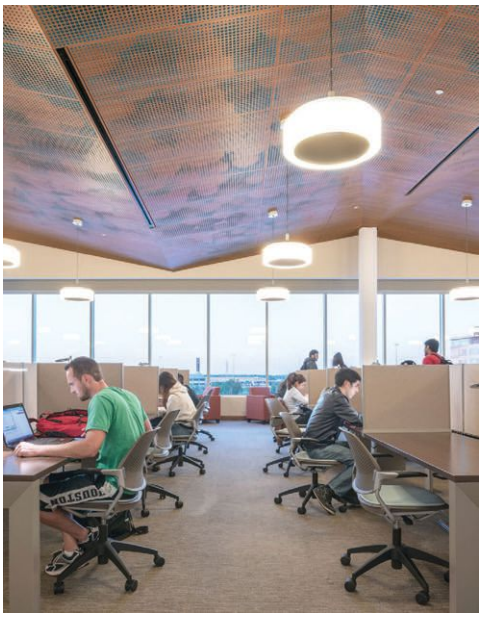
Parametric design is a process based on algorithmic thinking that enables the expression of parameters and rules that, together, define, encode, and clarify the relationship between design intent and design response. Parametric design in architecture is not a new concept. Design is a

series of relationships and/or principles that alter the end result of aesthetic choices. Any designer understands that by varying parameters, either mathematical or figuratively, a concept can be explored based on a set of design controls. For the Airside Modification project in Atlanta as well as the design of the Great Hall Ceiling at the University of Houston Classroom and Business Building, these design controls included the layering of technical requirements for lighting and acoustics determined by consulting engineers to the design requirements by the architect.

Digital parametric tools allow the designer to create customized form based on projected environmental goals—for example, the acoustic performance values for a concert hall or the foot-candles on a desk plane—while manipulating the aesthetic design of an interior or exterior facade. These tools allow architects to emulate the design of the natural world. They are able to design complex shapes that respond to data-driven parameters.

Many architectural graduates and innovative firms began using automated computer design software programs with building information modeling (BIM). For example, HKS Inc., one of the prime architectural firms leading the Hartsfield-Jackson Design Collaborative joint venture for the design of the Airside Modernization project for the Hartsfield-Jackson Atlanta International Airport, ordered a laser scan of the project that was quickly used to develop a BIM model. One-thousand-million dots were turned into a model the designers were able to manipulate and view with the client. According to Griffin, they collaborated with their MEP consultant, Thompson Consulting Inc., to apply environmental data in the digital model to vary daylighting and LED lighting as they adjusted the aesthetics of the design.

One-thousand-million dots were turned into a digital model of the Hartsfield-Jackson Atlanta International Airport to allow the designers to develop the ceilings for the concourses, holdrooms, centerpoints, train stations, and the train level transportation mall. More than 675,000 square feet of the acoustic ceilings were evaluated for lighting and acoustic parameters through digital and physical models to maintain the conceptual integrity while developing a ceiling that met the highest safety and environmental standards.



A new collaborative design process used parametric design software combined with digital fabrication to translate the spirit of the New York Public Library's Rose Reading Room into a new Reading Room at the University of Houston Classroom and Business Building.

Manufacturing Process

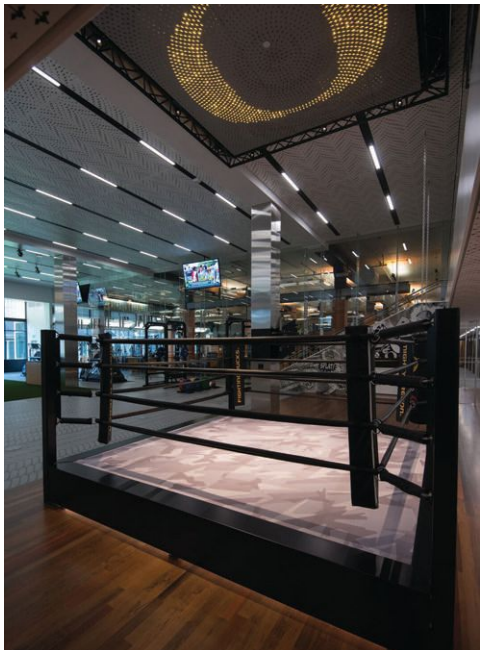
The industrial revolution offered the promise of affordably manufactured goods and services that would be mass produced. By the mid-20th century, modernists like Eero Saarinen enlisted manufacturers to develop mass-produced materials built to standard modules to simplify construction processes and manufacturing costs. These revolutionary initiatives led to the deadly conformity of many contemporary commercial buildings. Designers, restricted to selections from the catalogue, found rising budgets limited their ability to conceptualize and they paid dearly for choosing unique shapes and forms.

Manufacturers found that they too could control fabrication processes to create precise materials designed for specific locations. These manufacturers have found that the benefits include meeting demands for faster turnaround times, the creation of more precise forms, and a reduction in material waste. Now manufacturers are partnering with architectural firms as early as the initial design stage. The same data used in the design process can also run an automated production line. After fabrication, each custom-made piece arrives at the project labeled with its precise location for installation. This assures the architect's aesthetic intentions as well as the performance goals for each building component in a variety of microclimates in a building. See the case study online, Both Sides Now: Mass-Customized Acoustic Cloud Ceilings, for an example of how Gensler achieved both aesthetic and acoustic project goals in the design of the Reading Room at the Quiet Hall for the University of Houston's Classroom and Business Building.

THE DIGITAL DESIGN PROCESS

Digital design partnerships often begin with a charrette between project architects and digital manufacturers. Josh Orona, LEED AP BD+C, associate at SRG Partnership Inc., described the use of a digital design process for the University of Oregon Sports Center. The architects were in project documentation before bringing their SketchUp and Revit models to the ceiling manufacturer for fabrication. The ceilings were treated as graphics and an opportunity to showcase flying ducks throughout the building. With a seven-month design schedule and a seven-month construction schedule, they needed to develop details that met fire safety codes for interior finishes as well as acoustic and lighting goals.

Orona was comfortable with a partnership with the manufacturer. "I had seen parametric modeling used on other projects at my previous firm," he says. "It was used for facade studies and even programming studies. The first time I had experience with it was a project for the University



Customized cookie-cutter dies were manufactured as the shape of the holes in the acoustic ceiling throughout the Sports Center at the University of Oregon.

Fabricating punch machines are controlled by computers and can create multiple and custom designed sheets of ceiling materials without additional costs.

of Oregon Executive MBA Program. We were trying to highlight the fact that the program was attracting people and partnerships from all over the world. We had designed a ceiling that had a perforation in the shape of a flattened globe—the perforations would provide lighting to the space. We had an idea that we could perforate the population centers so that the more populace the region, the more light would shine through. We used a digital design program to plug in population data to certain regions of the ceiling, and the program generated a pattern."

Manufacturers who are able to fabricate materials based on parametric design information are able to input aesthetic and technical information into advanced software that communicates with fabrication machines. Predictive modeling of materials is based on aesthetics as well as environmental performance parameters. Using this methodology, architects can achieve conceptual integrity and technological control on more building surfaces. They are not limited to off-the-shelf solutions.

Design professionals are partnering not only with HVAC and lighting engineers but also with manufacturers who work with digital capabilities as they develop multiple options for the finished design. When information is inserted into advanced computer software, it instructs fabricating machines to construct the desired systems. It can also enable the construction of physical and digital models for design and client review. Branding the ceiling with the image of the University of Oregon's duck mascot was an affordable "standard" rather than a custom process using new technology. Customized cookie-cutter dies were manufactured as the shape of the holes in the acoustic ceiling throughout the Sports Center. For the ceiling design for the University of Oregon, the digital model provided data on lighting levels, acoustic properties, airflow, material safety, and structural integrity while simultaneously retaining the design concept of a flock of ducks soaring overhead.

ENVIRONMENTAL CONTROLS: LIGHTING

When designing to enhance daylighting and reduce the use of electric lighting, architects are using new strategies that include enhanced digital design solutions. In the development of the new boarding lounges for the Airside Modification of the Hartsfield-Jackson Atlanta International Airport, Griffin knew that such a large project that included multiple solar and acoustic analyses needed a sophisticated solution.

The complexity of the intersection of design with the big data crunching involved with the calculation of lighting and acoustic levels soon led to parametric computer software and digital fabrication.

According to Project Architect Tyler Cline, LEED AP BD+C, associate at HKS, they moved quickly from hand sketches and small laser-cut models to digital images for the different areas of the airport concourses. This modernization project included several areas of the concourses and the AGTS train level.

The lighting goal for the passenger holdrooms, where travelers gather before entering the passenger loading bridges, was to provide more natural light and use artificial light more efficiently. The designers wanted the ceilings in these holdrooms to suggest the images of airplane wings—designed to suggest movement and the sleek metals on airplane wings.

In order to achieve the desired high light reflectance values, a series of choices were used as inputs, then the digital fabricator produced mockups using standard and perforated tiles. They were able to evaluate the installation of a 14-foot glazing wall that would increase daylight in both the holding areas as well as throughout the concourse. The ceilings throughout the concourse were designed to guide passengers throughout the airport with integrated lighting as tool for wayfinding. More than 650,000 square feet of the ceilings were evaluated for lighting and acoustic parameters through digital and physical models to maintain conceptual integrity while developing a building that meets the highest safety and environmental standards.

▶ Continues at ce.architecturalrecord.com

All images courtesy of MIA+BSI: The Natural Stone Institute

Houston Museum of Natural Science
Exterior cladding made from natural stone can offer both an aesthetic beauty and sustainable surface to the building, and the anchorage system holding the material in place is a critical feature.

Understanding Anchorage Systems for Natural Stone Cladding

Knowing how anchorage systems work, their main components, and the difference in system types is critical for designing and engineering a natural stone cladding system

Sponsored by MIA+BSI: The Natural Stone Institute | *By Andrew A. Hunt*

One of the greenest building materials available is natural stone, especially when sustainable extraction practices are considered. The material itself is taken straight out of the earth from quarries. From there, it is cut to size, finished, and installed as everything from countertops and flooring to fireplace mantles, backsplashes, walkways, garden walls, and exterior cladding. Stone is low maintenance, easy to clean, and can offer a long lifetime of protection, beauty, and service, making it an ideal material for green building projects. Dimension stone is natural rock that has been quarried in prespecified block or slab sizes and finished to certain specifications and requirements.

INTRODUCTION TO NATURAL STONE AND ANCHORAGE SYSTEMS

Today, one ideal use for natural stone is in exterior cladding. Whether it is used to help reduce a building's heat island effect in a hot and dry climate, or to provide a water- and freeze-resistant exterior in a colder climate, exterior stone

CONTINUING EDUCATION

1 AIA LU/HSW

BNP MEDIA IS AUTHORIZED BY IACET TO OFFER 0.1 CEUS FOR THIS PROGRAM

Learning Objectives

After reading this article, you should be able to:

1. Discuss the main external forces that affect natural stone cladding, and explain why anchorage systems are needed to create a durable installation.
2. Describe the three elements of a natural stone anchorage system that ensure a safe and long-lasting exterior cladding installation and that can support sustainable building practices.
3. List the various types of natural stone anchorage systems available.
4. Explain the importance of proper fill used around the anchorage embedments to ensure a durable and sustainable exterior cladding system.

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

AIA COURSE #K1612R

cladding is versatile and appealing. The raw and authentic appeal of stone lends itself to bold and interesting design options, while also satisfying the structural needs of the building.

Natural stone cladding requires a safe, secure, and durable anchoring system. When used as a cladding, the weight of the stone is subject to several forces that it must be able to resist—namely gravity, wind pressure, and seismic loads. To ensure a safe and durable stone cladding project, architects need to understand how natural stone anchorage systems work, what key components are involved, and how to work with engineers and installers.

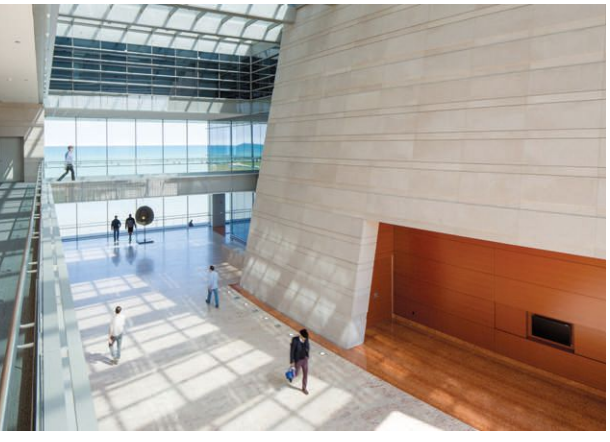
FORCES THAT IMPACT NATURAL STONE ANCHORAGE SYSTEMS

Forces such as gravity, wind load, and seismic activity all can negatively impact natural stone cladding and anchorage systems if the building team does not consider the potential impact of these forces. One of the best ways to ensure success is to hire an accredited stone installer to work with the project's structural engineer and architect. These team members are better suited for understanding the specific needs of the anchorage system and can ensure the final product remains structurally sound for years to come.

With that in mind, let's take a look at how nature impacts stone cladding, and how choosing natural stone as a cladding material inherently brings strength and durability to a project.

The Inherent Qualities of Natural Stone

As a natural product, stone is inherently eco-friendly. While it needs to be cut and finished, the material itself is "ready made" right out of the earth. Stone is naturally very strong, durable, and easy to maintain. When best practices are used for extraction and manufacturing, natural stone is considered one of the most sustainable products available.



Northwestern University Bienen School of Music, Evanston, Illinois

Whether inside in a protected environment or outside, the forces of nature are constantly working against cladding, making anchorage systems a critical safety and sustainable element of design.

Tarrant County Civil Courthouse, Fort Worth, Texas

When installing exterior natural stone cladding, to ensure safety and durability, each piece of the load path is important, and building professionals should understand how each works individually, as part of the building system, and in response to the various forces.

As a dense, strong, and durable product, natural stone works well as an exterior cladding. However, in order for the cladding to be safe and secure, it needs to literally be safely secured to the building structure by anchorage systems that can withstand the forces that impact natural stone cladding.

Forces that Impact Natural Stone Cladding

Stone cladding panels will be subjected to gravity and to applied loads, such as wind load, thermal movement, and seismic movement—anything that impacts the building's structure. The three primary forces that can affect the safety and security of natural stone cladding are gravity, wind load, and seismic load.

Gravity is an obvious force and is best understood by considering the very physical characteristic of stone as a heavy material. Gravity is a vertical force, and it is proportional to the mass of an object—in this case, a stone panel. The heavier the stone, the more work the anchor needs to do to secure it to the structure.

Wind load is a slightly more complicated concept than gravity, and it is much more complicated to predict and protect against. When wind encounters a building, it exerts pressure on the walls—and thus the cladding. This pressure can be both positive, with the wind pushing directly on the cladding, or negative, with the wind pulling outward on the wall, or essentially "sucking" the cladding. In most cases, negative wind loads on buildings tend to be stronger than positive loads. Corners and areas with raised or lowered surfaces typically experience the highest loads. The pressure that is put on the cladding depends on the building design. Wind loads are expressed in terms of pressure, either in pounds per square foot (lbs/ft^2) in U.S. customary units, or in pascals (Pa) in SI units.

With dimension stone cladding, the wind loads will always be proportional to the area of the stone panel. This means that a strong wind on a large panel will exert more force than the same wind on a smaller panel. In cases with negative wind pressure, force on the stone can act in inverse, creating suction. Depending on the geometry of the anchor clip design, in some cases, wind loads can exert forces on the anchor clips that are cumulative with the gravity forces. This is always the case when negative wind loads are experienced by soffit stones. A building's size, shape, height, location, and neighboring buildings all can influence wind loads.

Seismic loads stem from earthquakes and aftershocks, and they are unquestionably the most complicated loads to determine since the load can be both perpendicular and parallel to the face of the stone. As with gravity, this load is also proportional to the mass of the stone panel. Because seismic activity is not usually associated with high-wind events, standard building codes rarely require that building design consider a combination (or cumulative) load of seismic

and wind loads. That said, in cases where forces perpendicular to thin stone cladding faces are expected, the wind loads in most cases will be greater than potential seismic loads, and thus will govern most design decisions.

Building codes for seismic loading vary among locations. Some regions are prone to significantly strong earthquakes, which can exert extreme force on the buildings and the exterior cladding. Compared to regions where earthquakes are infrequent, these buildings will have much higher seismic load requirements. These requirements are determined by the probability of seismic action and the maximum possible intensity of the quake.

Regardless of the type of load, designers and builders need to understand how the actual **load path** works for natural stone cladding and ultimately how different loads affect that path. Load paths are foundational to structural engineering, and they consist of two distinct phases: first, building professionals must identify and quantify the loads; second, they must understand how that load gets transferred downward to the ground. These calculations are typically done by the structural engineer, not the architect.

As noted above, the three natural forces that impact natural stone cladding are gravity, wind load, and seismic load. On the most basic level, the load path begins with the individual stone panel, and it is transferred through the anchor to the building structure and frame, down to the foundation and footings, and eventually down to solid ground. Each piece of the path is important, and building professionals should understand how each works individually, as part of the building system, and in response to the various forces. The stone panel, the anchor, and the connection to the building are usually the three components for which the stone installers are responsible; however, they should plan to work closely with contractors to ensure that the entire system is safe and secure.

Designing to Withstand the Forces of Nature: Anchorage Systems

Anchors, which secure dimension stone to the building frame, are critical to the safety and durability of a building's external cladding. The anchorage systems must be chosen or designed to meet the specific needs of each individual project; anchors are definitely not "one size fits all" so each project needs to be engineered and designed based on the elements that affect the specific building.

From a structural standpoint, the **stone panel** is best thought of as a beam. That is, it receives a uniform load along its span, and it carries that load to the anchor points. These anchor points are usually found along the stone panel's perimeter. When the panel resists the load, it experiences **flexural stress** within the panel itself; design engineers responsible for this aspect of the project must make sure that the flexural stress of the stone panel does not exceed the allowable flexural stress. This allowable stress load can be calculated by dividing the flexural strength by the appropriate factor of safety for the specific project.

Three factors affect stone panels experiencing flexural stress: load, span, and depth (stone thickness). First, greater, or heavier, loads will result in increased stress within the stone panel. For example, a high negative wind load that creates suction on a stone panel face during a storm will increase the stress compared to a low-wind situation. The panel's span between supports also affects the stress. Increasing the distance between the anchor points (i.e., the span) does two things. First, it increases the bending stresses of the stone panel; second, it increases the area. This increase in area in turn increases the total load: doubling the span quadruples the stress, giving it a "squared" relationship. Finally, the thickness of the stone is comparable to the depth of a beam. It also has a squared relationship to stress; doubling the thickness of the stone reduces the stress by a factor of four.

Pictured is a combination gravity and lateral-load anchorage using welded stainless steel anchors.

ANCHORAGE SYSTEMS AND PERFORMANCE

There are many types of anchorage systems available, ranging from custom-designed devices for specific projects to standard, commercial options.

The **anchor** system connects the stone unit to the building's framing, and thus is the next critical piece of the load path. Often the anchor consists of multiple components to fasten the stone panel to the frame. Improperly designed, manufactured, or installed anchor systems are common failure points, often resulting in fractured stone around the anchor prep cut.

Anchors have three key load transition points: the junction between the stone and the anchor, the anchor itself, and the physical connection between the anchor and the building frame. Anchors can be attached to the stone panel in a variety of ways, depending on the project and stone type. A "prep cut," or kerf, is machined into the stone panel. The most common types are a hole, a "plunge cut" kerf, a kerf of a determined distance, and a continuous kerf.

In order to protect against potential failure, installers should make sure that the anchor tab is properly sized and, if possible, longer than needed to improve the strength of the connection with the stone panel.

Some situations will call for one type of anchor, while others require another, depending on the load path. For example, the anchorage needs of a load-bearing clip (or shelf) angle, where gravity is the primary load force, will be very different from a situation where positive or negative wind load (plus gravity) affect the panel.

Anchors can be connected to the building frame with a variety of techniques, depending on the material to which they are being anchored. Expansion anchors, for example, can be installed into concrete, and other anchors may be welded to hardware embedded in the concrete. If the frame is steel, anchors may be welded or bolted. Lighter-gauge metal frames may have self-drilling or self-threading fasteners installed as anchors. This connection is the last piece of the load path for which stone installers are usually responsible.

Early communication with a facade consultant can help avoid any problems further along in the project and ensure successful installation.

Collaboration Between Project Building Professionals

One of the biggest mistakes that architects may make when considering natural stone cladding is to fail to consult cladding engineers or facade consultants at the start of the project. A cladding engineer and/or cladding architect can review the architectural details of the project and help ensure that the proposed cladding and anchorage systems are compatible both with each other as well as with the rest of the project specifications.

Structural engineers will almost certainly be involved as engineer of record (EOR) to assess the project for potential seismic and wind loads; consequently, they will be interested in the cladding anchorage system and how it impacts the structural load. In many cases, the EOR may not be familiar with the cladding system or how it impacts the structural load, and so early communication with a facade consultant can help avoid any problems further along in the project.

Whenever possible, architects should hire Marble Institute of America (MIA) accredited stone installers to consult on the project (and to perform the installation), and they should be responsible for designating the anchorage system. Most installers work with many different systems and different stones, and thus can help determine the most appropriate system for the project. Good practice includes providing performance specifications at the start of the project, making sure that shop drawings and anchorage calculations are always required; the specs can help the rest of the team be more confident in the anchorage system.

ANCHORAGE TYPES

The main purpose of anchorage systems is to attach the stone to the frame. To be successful, such systems must resist both lateral and gravity loads. Consequently, the best anchors generally are the simplest and designed with the fewest components, and thus the fewest potential failure points. Anchors are also carefully designed to prevent galvanic corrosion, both of which can cause the anchors to fail years after they have been installed.

Continues at ce.architecturalrecord.com

Andrew A. Hunt, *vice president of Confluence Communications, has 16 years of experience in green building and has produced more than 100 educational and technical publications.* ***confluencec.com***

PRODUCT SPOTLIGHTS

Advertisement

DOORS, WINDOWS

DURABILITY TRANSFORMED

WR | GREEN

Construction Specialties
Acrovyn® Doors by Design

CS Acrovyn by Design® allows architects to incorporate a myriad of graphic imagery into our virtually indestructible Acrovyn® Doors

Product Application:
• High-traffic commercial interiors areas requiring custom design or higher-end aesthetic finishes
• Yale New Haven Hospital: Pediatric ER, New Haven, CT

Performance Data:
• Images embedded behind impact-resistant, PVC-Free Acrovyn sheet
•Doors feature rounded, replaceable edges for extra impact protection

www.c-sgroup.com/door
1.800.972.7214 | acrovyndoors@c-sgroup.com

Circle 49

DOORS, WINDOWS

ONE-PIECE HYDRAULIC & LIFT-STRAP BIFOLD DOORS

Schweiss Doors, Moving Walls

Schweiss Doors manufactures unique custom doors. One-piece hydraulic doors and patented Lift-Strap opening/closing bifold doors.

Product Application
- Moving doors and walls
- You think it, they build it
- Custom-designed storefronts and more

Performance Data
- Faster, safer operation
- Zero lost headroom
- Superior design that keeps working

www.schweissdoors.com
507.426.8273 | schweiss@schweissdoors.com

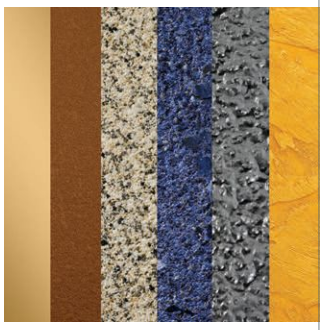
Circle 50

INTERIOR FINISHES, FURNISHINGS

ARCHITECTS AS ARTISTS

WR

Sto Corp.



Sto Façade Systems deliver the curated feel of atelier design with couture finishes ranging from ultra-smooth to deeply textured.

Product Application:
• Achieve versatile looks such as plaster, metal or concrete
• Explore countless color options
• Save time with easy trowel application

Performance Data:
• Highly breathable, mildew-resistant water-based acrylic finish
• Low VOC formula meets EPA and South Coast Air Quality Management District requirements

www.stocorp.com/ArchitectsAsArtists
1 (877) 712-6064 | marketingsupport@stocorp.com

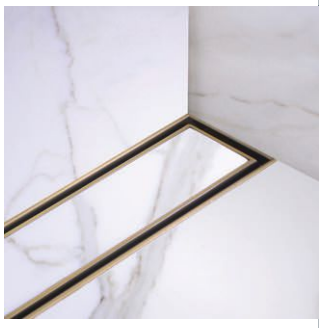
Circle 51

MECHANICAL SYSTEMS, HVAC, PLUMBING

SATIN BRONZE DECORATIVE SHOWER DRAINS

WR | NEW

Infinity Drain



New Satin Bronze finish available on Tile Insert Frame, Wedge Wire, and select decorative grate patterns. Offered in both linear shower drains and traditional center drains.

Performance Data
• Clear tinted Powder Coat finish on Stainless Steel provides supreme durability in the shower
• Create ADA, barrier free showers
• Transform the drain into a design element

www.InfinityDrain.com
516.767.6786 | Info@InfinityDrain.com Booth: 10120 HD Expo

Circle 52

ROOFING, SIDING, THERMAL & MOISTURE PROTECTION

WALL PANELS

$$ | GREEN | NEW

Petersen Aluminum Corporation

PAC 1/2" and 7/8" corrugated panels offer unmatched flexibility for both walls and roofing. Panels can be perforated for a variety of exterior projects, as well as interior acoustical applications.

Product Application:
• Mariano's Fresh Market, Oak Lawn, IL

Performance Data:
• 30- year non-prorated finish warranty
• 70% full PVDF-finished metal
• Available in 38 colors

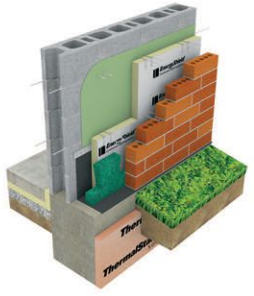
PAC-CLAD.com
800.722.2523 | Rob Heselbarth

Circle 53

ROOFING, SIDING, THERMAL & MOISTURE PROTECTION

CONTINUOUS WALL INSULATION

Atlas Roofing



EnergyShield® is a high performance rigid insulation board with a polyiso foam core. Offering high R-value and faced with durable foil or coated glass, it's engineered for a variety of applications.

- EnergyShield® (CI) for walls, including wood frame, steel frame or concrete. Use with multiple cladding types: stucco, siding, metal, brick and stone masonry veneers.
- EnergyShield® products are available to meet Class A requirements and have been tested in NFPA 285 approved assemblies. Can be used in WRB and/or Air Barrier systems.

www.atlasroofing.com/continuous-wall-insulation
678.402.9639 | John Hurst Booth: 454 CONSTRUCT

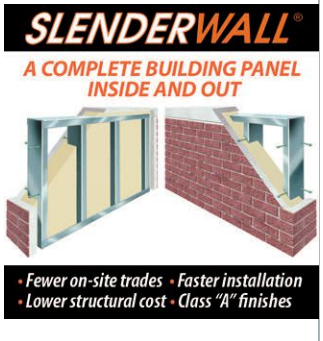
Circle 54

ROOFING, SIDING, THERMAL & MOISTURE PROTECTION

ARCHITECTURAL PRECAST CONCRETE CLADDING

GREEN | WR

Easi-Set Worldwide



Ultra Hi-Performance SlenderWall is a 28 lb/sf award-winning architectural precast concrete and integral steel-stud building panel system. Wind load tested to 226 mph. Continuous foam insulation.

Product Application
- BioInnovation Center, New Orleans, LA
- Hilton Hotel, Montreal, Quebec, Canada
- Westin Luxury Hotel, Virginia Beach, VA
- US Army Legal Headquarters, Ft. Belvoir, VA

Performance Data
- Compliant with all IECC/ASHRAE energy codes

www.slenderwall.com
800.547.4045 | info@easiset.com

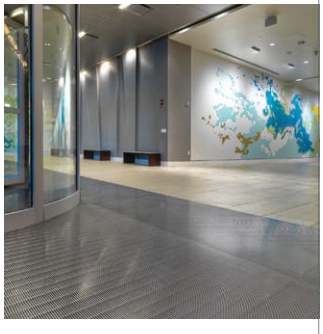
Circle 55

SPECIALTY PRODUCTS

STAINLESS STEEL ENTRANCE FLOORING

$$ | GREEN | WR

Construction Specialties



GridLine® entrance flooring systems trap dirt and debris at the door to protect your building from tracked-in contaminants. Available in a variety of depths and insert options.

Product Application:
• The Westin Denver International Airport, Denver, CO
• Whitney Museum of American Art, New York, NY
• Bill & Melinda Gates Foundation, Seattle, WA

Performance Data:
• Scrapes dirt and debris from incoming foot traffic to protect your interior from wear & tear
• Made with type 304 stainless steel for long-lasting durability

www.c-sgroup.com/efs
800.233.8493 | Wade Brown: wbrown@c-sgroup.com

Circle 56

PRODUCT SPOTLIGHTS

Advertisement

SPECIALTY PRODUCTS

WOLF INDUCTION RANGE

NEW

Wolf

Introducing the Wolf induction range. Incredible speed and control topside paired with reliably even heat and airflow below. Available in professional and transitional styles.

wolfappliance.com

Circle 57

Tough Protection for What's Inside Your Building

Garland's New Thermoplastic Membrane The Ultimate in Waterproofing Protection

- KEE-Stone® is the most durable KEE sheet in the industry, providing superior waterproofing protection and excellent puncture and hail resistance
- KEE-Stone has been formulated to provide superior heat and UV resistance, providing long-term protection
- Industry's best KEE stands up to weathering to keep you worry free and leak free longer than our competition
- KEE-Stone's unique scrim provides superior sheet strength for a longer lasting roof

GARLAND

made in USA self-certified

KEE-STONE ONLY THE BEST

The Garland Company, Inc.®
www.garlandco.com

CIRCLE 45

InterlockingRock® wall panels align to create seamless, sculptural wall surfaces of any size. Add drama and intrigue to any space, with durable, lightweight, natural gypsum.

modulararts®

www.modulararts.com 206-788-4210 made in the USA

CIRCLE 8

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**

Reader Service #	Advertiser	Page
61	Aluflam North America LLC	205
25	American Hydrotech	26
209	American Institute Of Architects	16
	Architectural Record House Ads -CEU APP	187
15	Architectural Record Skyscraper Museum	206
	Architectural Record - KBIS	135
139	Arktura LLC	112
72	ASI Global Partitions	21
74	Atlas Roofing Corporation	58
213	CAPTIVEAIRE	109
172	Dodge Data & Analytics	111
226	DORMA	10
4	Doug Mockett & Company, Inc.	35
35	Dryvit Systems	24
59	EPSON	12
92	Excel Dryer	119
99	Formica	28
45	Garland Company	203
29	Glen-Gery	23
60	Heather & Little	206
19	Huber Engineered Woods LLC	36
23	Invisible Structures	18
229	JELD-WEN	30
137	Laminators Incorporated	131
254	LG Hausys	8
166	Marble Institute Of America	104
8	modular Arts	203
186	National Terrazzo & Mosaic Association	14
160	Neolith by TheSize	125
12	Ornamental Metal Institute Of New York	6
248	SAFTIFIRST	7
76	Samsung	CV3
96	Sound Solutions	CV4
16	Steel Institute Of New York	4
233	Sto Corporation	32
32	Stromberg Architectural	33
31	Studco Building Systems	19
	Sub-Zero Group, Inc.	5
18	Sunbrella	2, 3
27	Technical Glass Products	CV2, 1
26	Thermocromex	123
95	Viracon	103

Publisher is not responsible for errors and omissions in advertiser index.
To access PDFs of all full-page or larger ads appearing in this issue, go to **www.architecturalrecord.com/productinfo**

Ⓡ Regional AD

New and Upcoming Exhibitions

Design Episodes: Form, Style, Language
Chicago
December 17, 2016–June 25, 2017
In anticipation of the Art Institute of Chicago's Fall 2017 new permanent display of architecture and design works, this exhibition presents highlights from the Art Institute's collection as three provocative episodes or vignettes: the modern chair, the emergence of postmodern design, and contemporary identity systems in graphic design. Each of the three distinct "episodes" in the exhibit is tied together by *Boundary Lines*, a custom-designed installation by graphic designer Amir Berbić that occupies the gallery windows overlooking Griffin Court. For more information, visit artic.edu.

Pop Art Design at the Orange County Museum of Art
Newport Beach, California
January 7–April 2, 2017
This exhibition features a large number of important works by artists including Andy Warhol, Claes Oldenburg, Roy Lichtenstein, Ed Ruscha, and Richard Hamilton, juxtaposed with works by designers such as Charles Eames, George Nelson, Achille Castiglioni, and Ettore Sottsass, as well as extensive ephemera. At the Orange County Museum of Art. For more information, visit ocma.net.

Ongoing Exhibitions

Michael Sorkin Studio and Terreform: Metrophysics
Los Angeles
Through December 4, 2016
Metrophysics foregrounds projects with meanings rooted in the urban, including buildings and sites designed with practical and polemical intent. On view at SCI-Arc, the work is from a team that operates as both a "traditional" architectural studio responding to clients and as a research practice that formulates its own agenda of investigation and intervention. For more information, visit sciarc.edu.

Reading Room: A Catalog of New York City's Branch Libraries
New York City
Through January 7, 2017
This exhibition features Elizabeth Felicella's work documenting all 210 branches of New York City's extensive public library systems. Felicella's subtle and technically accomplished photographs depict the libraries from varying vantage points—from full-scope exterior shots to intimate studies of window plants and pencil sharpeners—inviting the viewer to appreciate the intricacy, complexity, and vast scope of these vital and evolving public resources. For more information, visit cfa.aiany.org.

Model Behavior: Snøhetta at SFMOMA
San Francisco
Through January 14, 2017
This exhibition explores the design process behind Snøhetta's expansion of the San Francisco Museum of Modern Art. Architectural models, sketches, an interactive app, and a narrated walk-through of the building reveal how the firm responded to the built environment and its cultural context. At SFMOMA. For more information, visit sfmoma.org.

Building Optimism: Public Space in South America
Pittsburgh
Through February 13, 2017
Held at the Carnegie Museum of Art and spanning projects in Argentina, Brazil, Chile, Colombia, Peru, and Venezuela, *Building Optimism: Public Space in South America* investigates ways that emerging architects and designers instigate change through design of public space. Using photography, video, drawings, and models, the exhibition immerses visitors in the inventive ways that public spaces can become social spaces as the sites respond to the circumstances and pressures of their communities. Visit cmoa.org.

City of Ideas: Architects' Voices and Visions
Chicago
Through February 25, 2016
City of Ideas: Architects' Voices and Visions is an ongoing conceptual installation project traveling to the Chicago Design Museum from Sydney University's Tin Sheds Gallery. Its key objective is to present original visions of leading international architects recorded and transcribed by curator Vladimir Belogolovsky. Each installation will include different groups of voices, interpreted through continuously changing design by local artists, architects, and designers, collaborating with its curator. For more information, visit chidm.com.

Lectures, Conferences, and Symposia

Zoning at New Heights: Supertalls and the Accidental Skyline
New York City
December 8, 2016
New Yorkers have long had a love-hate relationship with height. And as the age of the

supertall tower sets a new precedent for what's possible, controversies are growing. In response, the Municipal Art Society launched its Accidental Skyline report in 2013 to track the construction of supertalls along the southern border of Central Park. Since then, countless more have sprouted up around the city. In this conversation at the Museum of the City of New York, leading experts will consider whether the zoning regulations that were created to tame towers in the early 20th century have kept pace with the evolving skyline. For more information, visit mcny.org.

Competitions

Kip Island Auditorium International Competition
Registration deadline: January 18, 2017
The Riga Exhibition Centre, located in the heart of the Latvian capital, is soliciting design proposals for an iconic addition to its already well-established complex, which houses two large exhibition halls, conference rooms and meeting rooms. The addition will include an auditorium, more conference rooms, and a new exhibition hall. For more information, visit kipislandauditorium.beebreeders.com.

eVolo 2017 Skyscraper Competition
Registration deadline: January 24, 2017
Established in 2006, this annual contest recognizes outstanding ideas that redefine skyscraper design through the implementation of novel technologies, materials, programs, aesthetics, and spatial organization, along with manifesting flexibility, adaptability, and change wrought by globalization and the digital revolution. Designs should reflect investigation of public and private space and the role of the individual in relation to the collective in a dynamic vertical community. There are no restrictions in regard to site, program, or size. Visit evolo.us.

The SOURCE Awards
Submission deadline: January 30, 2017
Now in its 40th year, the SOURCE Awards competition is open to all lighting designers, architects, engineers, professional designers, and consultants who use Eaton's lighting fixtures and lighting control systems in interior or exterior design projects. Students currently enrolled in any of these disciplines are also eligible to enter projects based on conceptual lighting designs that utilize Eaton's lighting and controls products. For more information, visit thelightingresource.eaton.com.

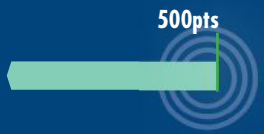
Metals in Construction Magazine 2017 Design Challenge: Reimagine Structure
Submission deadline: February 1, 2017
This competition invites architects and engineers to submit designs for a high-rise that integrates its enclosure and its primary structure for the purpose of minimizing embodied energy. It challenges participants to substitute
a hybrid frame-and-skin system for the typical aluminum-and-glass curtain wall. Entries will be judged on embodied energy reduced and overall performance, with a prize of $15,000. Visit metalsinconstruction.org.

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


myCLEARopinion™
SIGN UP TODAY
We're searching for experts like you.
Share your industry insight, earn CLEARcash™.
What is CLEARcash™? ▶▶

What is CLEARcash?

100 points of CLEARcash™ = $1



Minimum balance of 500 points to redeem gift card.

Points are paid out automatically once a month as long as they meet the minimum balance.

SIGN UP TODAY

Every survey invitation will list the amount of CLEARcash™ points that will be rewarded upon completion.

2017 Record Houses

CALL FOR ENTRIES

The editors of **ARCHITECTURAL RECORD** announce the **2017 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: **FEBRUARY 15, 2017**

Good Design Is Good Business

CALL FOR ENTRIES

The editors of **ARCHITECTURAL RECORD** are currently accepting submissions for the **2017 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 April 2017 issue.

The fee is US$150 per entry and $50 for each additional project. Download the official entry form at: **architecturalrecord.com/gdgb**. E-mail questions to arcallforentries@bnpmedia.com. Please indicate **GDGB** as the subject of your e-mail.
SUBMISSION DEADLINE:
January 15, 2017

snapshot

PROJECT EDITIONS DE PARFUMS FRÉDÉRIC MALLE
LOCATION PARIS
DESIGNER JAKOB + MACFARLANE

JAKOB + MACFARLANE'S new 260-square-foot Frédéric Malle perfume boutique in Paris's Marais district reflects an ambience that is as majestic as it is aromatic. The fragrance collection is showcased along a series of rippling, interwoven timber display units, suspended and jutting out from the mirrored-stainless-steel ceiling and walls. In concert with the shop's metallic surfaces, the glowing sculptural elements, backed by translucent panels lit from behind by LEDs, appear to float, carrying an endless array of scented treasures. *Alex Klimoski*

PHOTOGRAPHY: © ROLAND HALBE

Ceiling design by Hawkins\Brown

Round design, Surround cool

Samsung System Air Conditioner 360 Cassette

With its elegant circular design, it blends easily into any setting.
360° airflow ensures even, draft free cooling, reaching every corner of the room.

For more information, visit **samsung.com/business**

CIRCLE 76

iF DESIGN AWARD 2016

SAMSUNG

St Denis Junior Public School, Toronto | Bortolotto Architects © A-Frame

öko skin - neither painting nor staining

| sustainable glassfibre reinforced concrete
| non-combustible (ASTM fire rating) and maintenance free
| natural and durable material, authentic appearance
| NEW - concealed fastening system

Distributed by Rieder North America
1-877-740-0303 (toll free) | usa@rieder.cc | www.rieder.cc

RIEDER

CIRCLE 96