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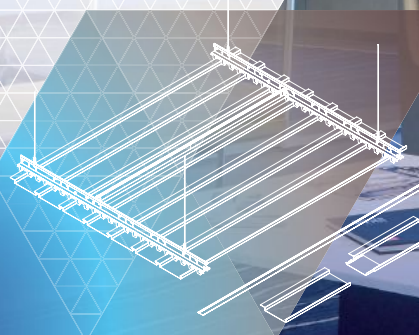

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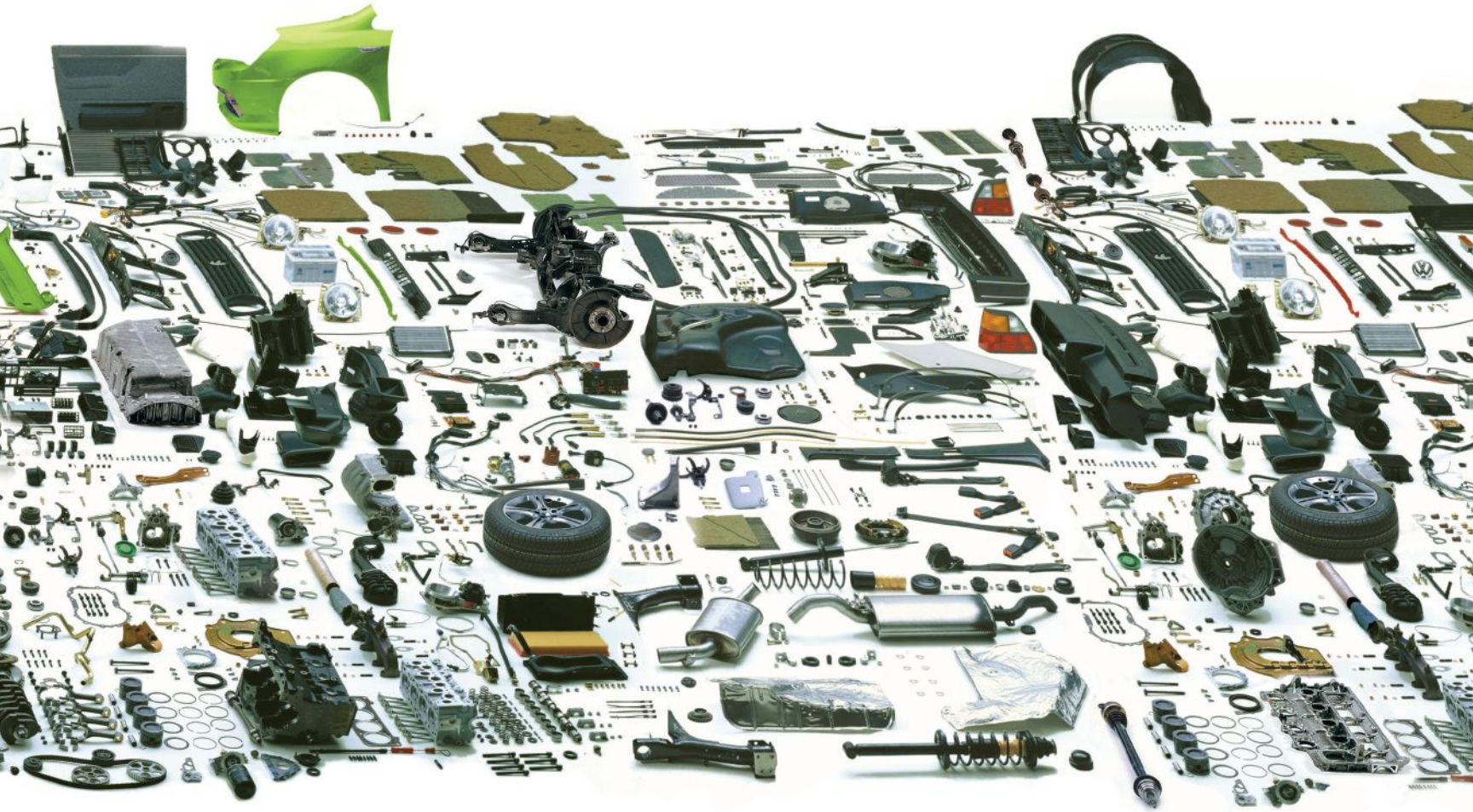

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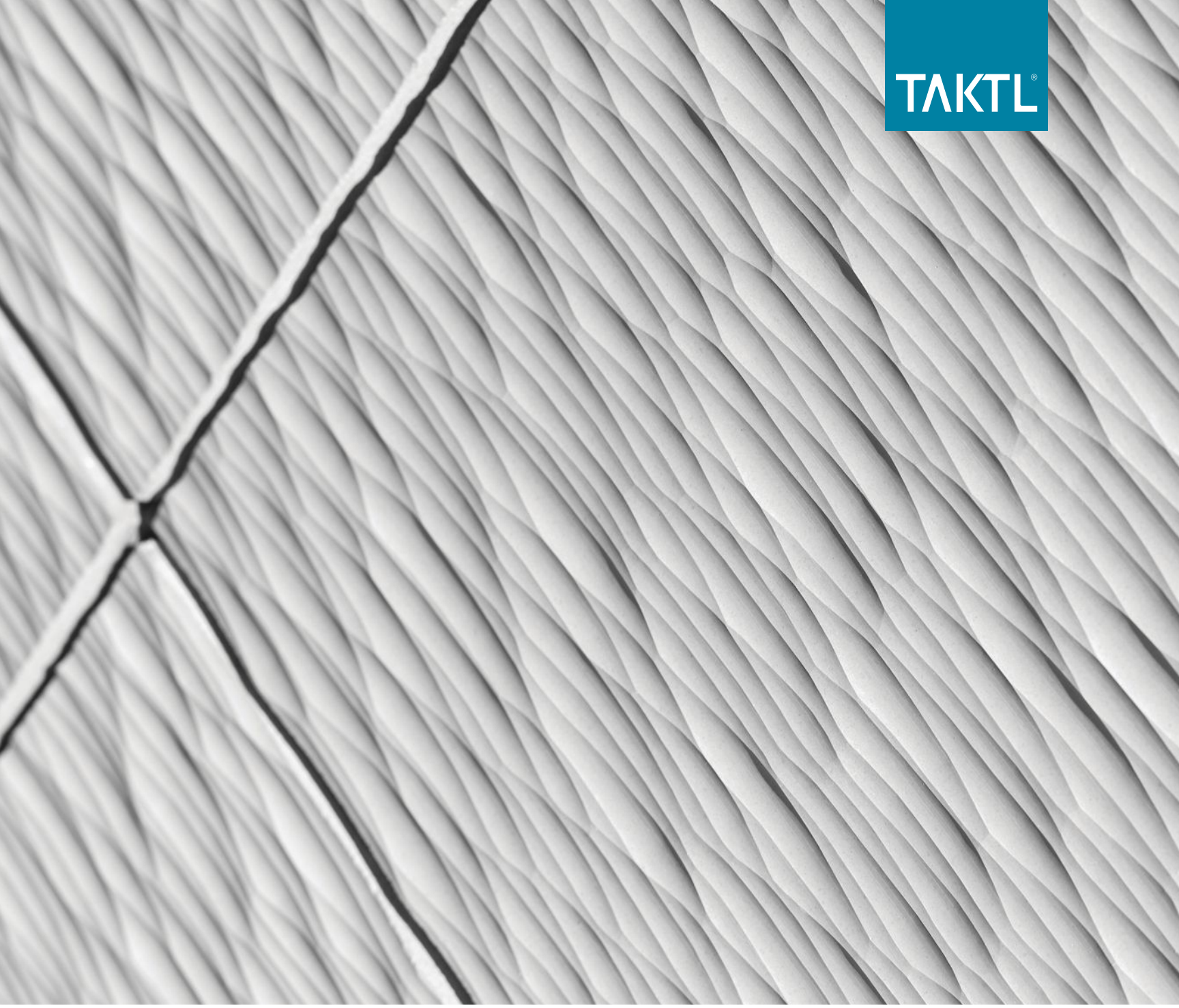

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Editor-in-Chief
Ned Cramer, ASSOC. AIA
ncramer@hanleywood.com
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Managing Editor
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gobrien@hanleywood.com

Design
Editor
Katie Gerfen
kgerfen@hanleywood.com

Associate Editor
Sara Johnson
sajohnson@hanleywood.com
@SaraA_Johnson

Technology and Practice
Editor
Wanda Lau
wlau@hanleywood.com
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Associate Editor
Katharine Keane
kkeane@hanleywood.com

Assistant Editor
Selin Ashaboglu
sashaboglu@hanleywood.com

Features
Senior Editor
Eric Wills
ewills@hanleywood.com

News and Social Media
Engagement Editor
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cblahut@hanleywood.com
@chelseablahut

Editorial Interns
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Multimedia
Video Production Manager
Lauren Honesty
lhonesty@hanleywood.com

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rogle@hanleywood.com

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Design Group
Group President
Ron Spink
rspink@hanleywood.com
202.736.3431

Advertising
Northeast, Digital, International
Christie Bardo
cbardo@hanleywood.com
202.736.3363

West
Suren Sagadevan
ssagadevan@hanleywood.com
310.863.1153

China, Hong Kong, Taiwan
Judy Wang
judywang2000@vip.126.com
86.13810325171

Production
Production Director
Margaret Coulter

Ad Traffic Manager
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Mid Atlantic, Southeast
Susan Shepherd
sshepherd@hanleywood.com
404.386.1709

Lighting
Cliff Smith
csmith@hanleywood.com
864.642.9598

Canada
D. John Magner
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Canada
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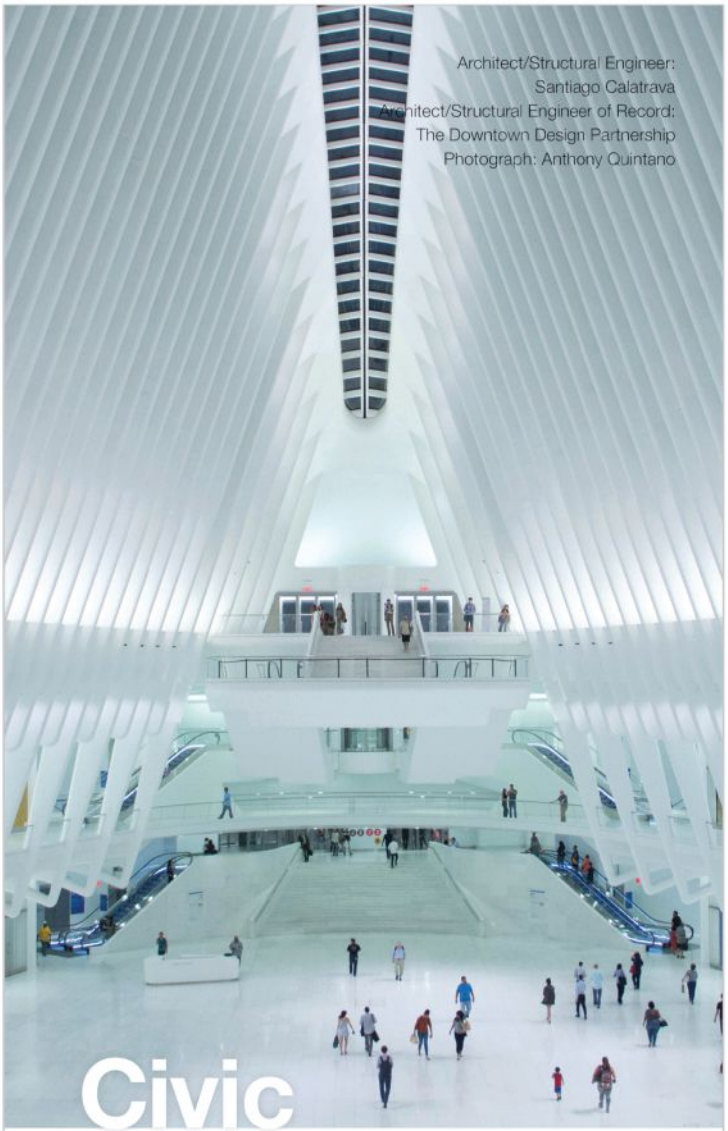

Civic Duty

New Yorkers watched in awe as ironworkers erected each of the **World Trade Center Transportation Hub's** steel ribs into place. Now, 250,000 commuters marvel at the 12,500 tons of structural steel arching overhead as they pass underneath each day. The vision of international architect **Santiago Calatrava** and his team, the Hub's central Oculus connects New Yorkers not only with the places to which they need to go—but with the skilled labor needed for such a vision to be realized.
Read more about it in **Metals in Construction** online.

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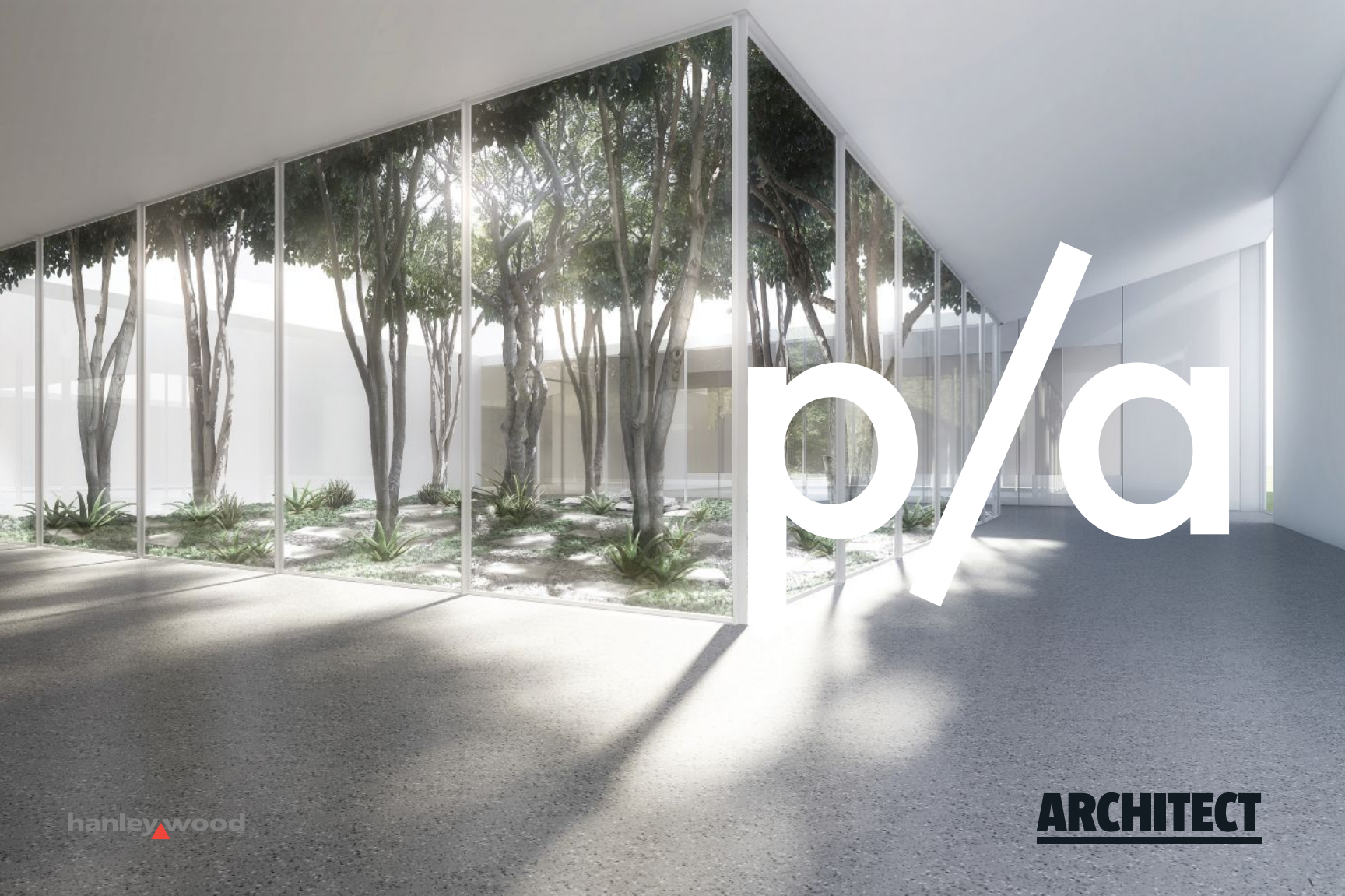

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The League

Every year since 1981, the Architectural League of New York has recognized practices and practitioners on the verge. This year's six Architectural League Prize winners (a group of nine designers) are Jonathan Louie and Nicole McIntosh of Architecture Office, Syracuse, N.Y.; Kevin Hirth of Kevin Hirth Co., Denver; Mustafa Faruki of TheLab-Lab for Architecture, New York; Isabel Martínez Abascal and Alessandro Arienzo of Lanza Atelier, Mexico City; Greg Corso and Molly Hunker of Sports, Syracuse; and Michelle JaJa Chang, Houston (her "House A, B," is shown above). —CHELSEA BLAHUT AND GREIG O'BRIEN

> *To learn more about this year's Architectural League Prize winners, visit bit.ly/2017ArchLeaguePrize.*

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"Mr. Trump, Tear Down This Wall"

Walls carry both literal and figurative meaning, subdividing spaces into two zones—for protecting one side from another. Ronald Rael's *Borderwall as Architecture: A Manifesto for the U.S.-Mexico Boundary* takes on this topic. Part historical account, part theoretical appraisal, and part design manifesto, it is reminiscent of Rem Koolhaas' *Delirious New York*, and its ingenious conflation of fact and fantasy invites careful perusal from readers unfamiliar with borderwall history, as if to emphasize that truth can be stranger than fiction. At every turn, Rael invites them to realize the deeper implications and contradictions of the borderwall itself. —BLAINE BROWNELL, AIA

> *To read Blaine Brownell's full review and more of Ronald Rael's designs, like the borderwall as a labyrinth, visit bit.ly/BorderwallArchitecture.*

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JONATHAN HARRIS

Farewell to a Provocateur

Designer and artist Vito Acconci died in April at age 77. Known for provocative installations and performances—such as *Seedbed* (1972), during which he hid beneath a false floor and masturbated as gallery visitors walked overhead—Acconci transitioned to architecture and furniture design starting in the late 1980s. In 2012, Design Miami named him its designer of the year, and MoMA PS1 staged a retrospective in 2016. Acconci's later work includes the waterfall sculpture at the Newtown Creek Wastewater Treatment Plant Visitor Center in Brooklyn, N.Y., and Mur Island, a floating steel amphitheater in Graz, Austria. —KATHARINE KEANE

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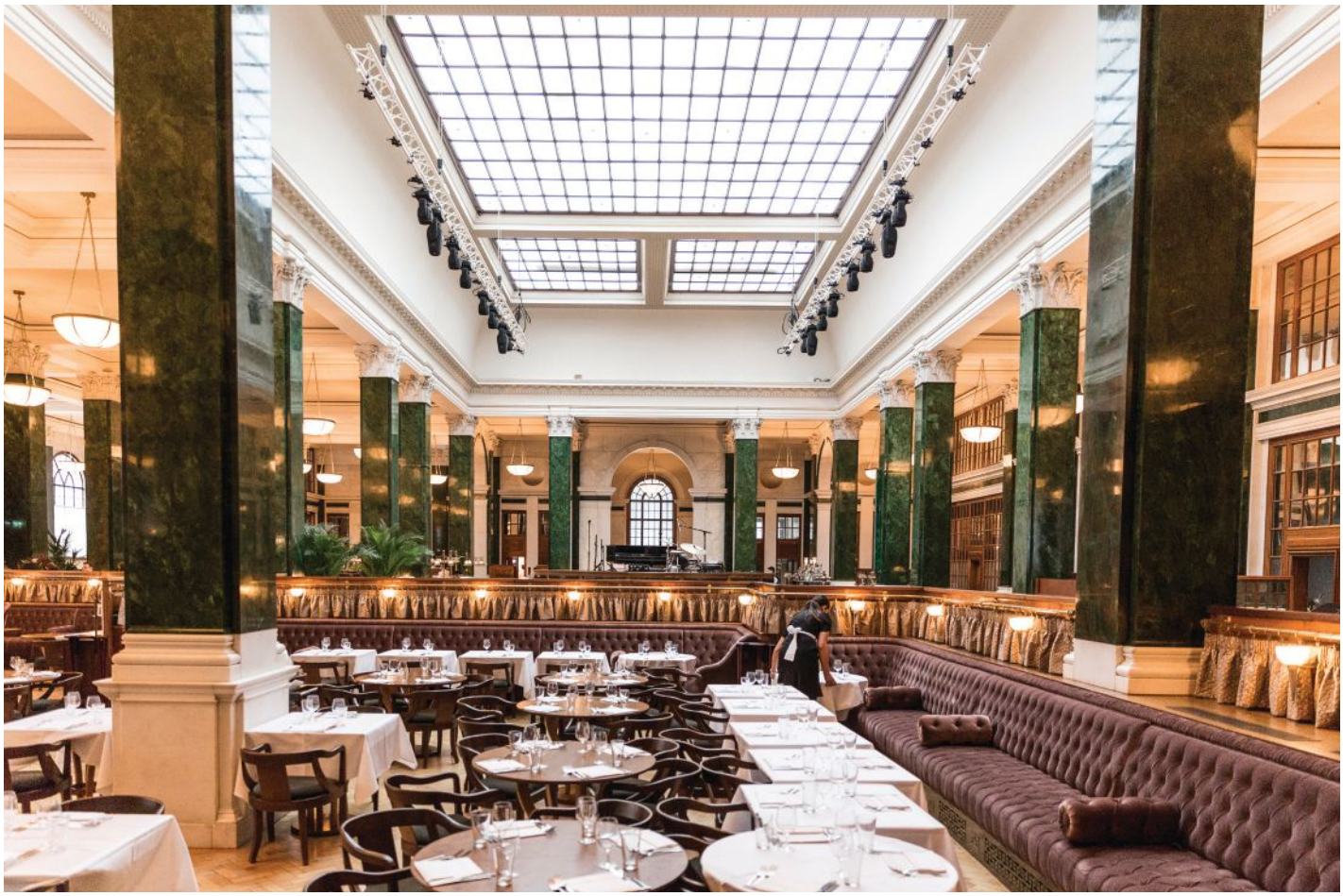

SCOTT CHASSEROT

New Life for a Lutyens Landmark

On May 2, the historic Midland Bank headquarters building in London reopened with a markedly different purpose: the 317,000-square-foot classical structure now houses the Ned, a 252-room hotel, club, and multi-restaurant space from über-hip member's club Soho House and hotel operator Sydell Group. Designed in 1924 by British architect Sir Edwin Lutyens—whose nickname was Ned—the Grade I–listed building, once called "The Palace of Finance," now hosts diners among the old banking hall's verdite columns and walnut counters (above). —SARA JOHNSON

> *Read more about the Ned at bit.ly/LutyensTheNed.*

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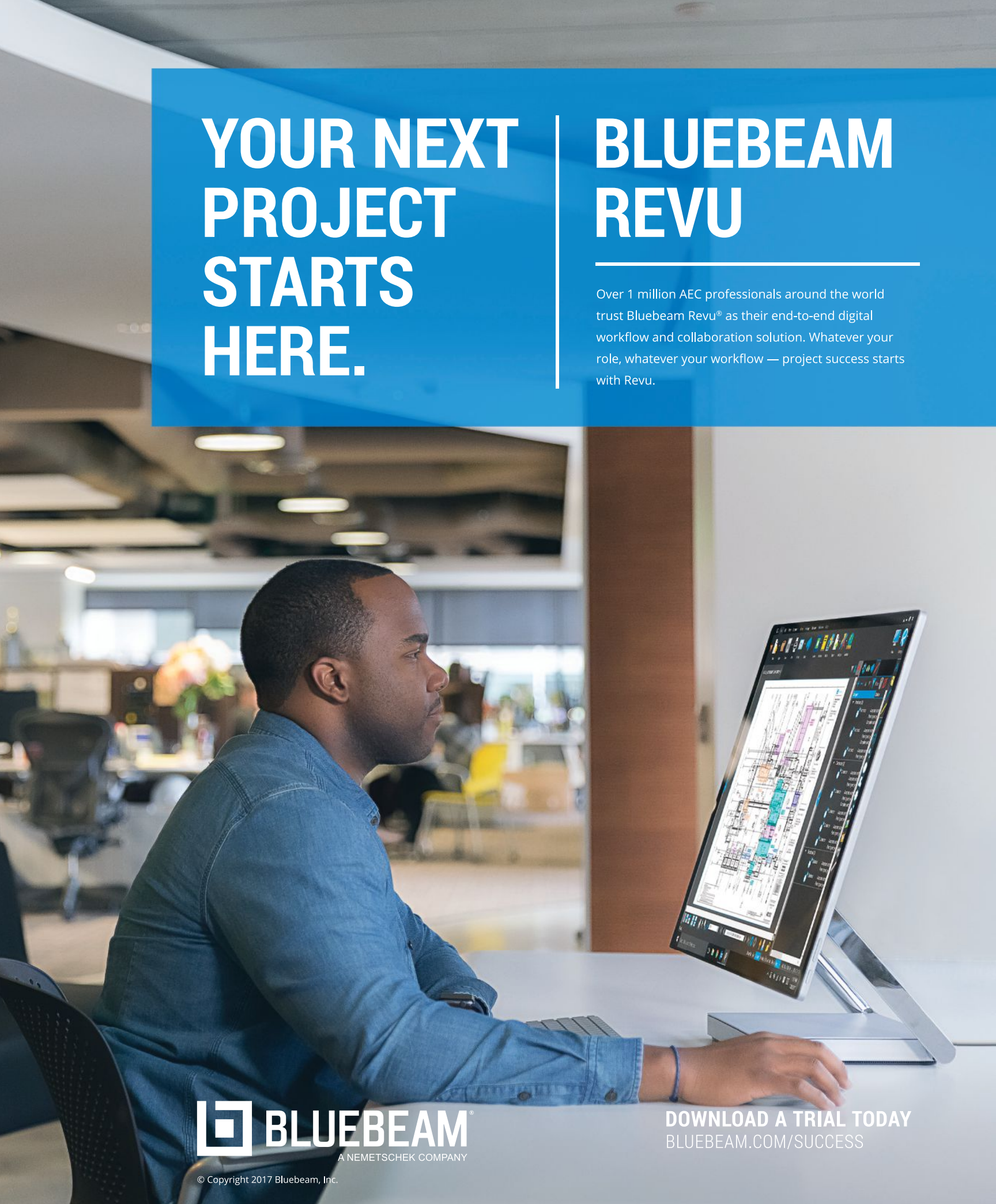

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Best Practices: Crafting a Mission Statement

TEXT BY NATE BERG

For many firms, establishing and publicizing the philosophical approach to their work can help establish a sense of self and distinguish them from other studios. By articulating and crafting a mission statement, firms can provide guiding principles for their work and their staff. Below, business advisers and practitioners discuss approaches to developing a mission statement.

Establish Intent

A mission statement can be a useful starting point for firms to identify and formalize their design philosophy and motivation for doing their work, says Chris Denby, CEO of the Alexandria, Va., architecture marketing consulting firm Markitecture. "It's a way to ask, 'Why are we here?' " Denby says. "It's short and sweet, and gives the purpose of the firm."

However, Eric Reinholdt, Mount Desert, Maine–based designer and the author of *Architect + Entrepreneur* (30x40 Design Workshop Press, 2015)—a two-book set of business strategies for architecture firms—believes that branding is more important than a mission statement in conveying what a firm is trying to do. But he readily admits to being in the minority among advisers.

> "Our mission is both an extension and evolution of our design practice."
>
> —Gabriela Frank, director of business development and marketing, Olson Kundig

Ultimately, Denby says, crafting and following a mission statement provides guidance for leaders and staff alike.

Add in a Vision Statement

For the Seattle-based architecture firm Olson Kundig, the key to maintaining parity in its work and guiding principles was establishing a mission statement, says Gabriela Frank, the firm's director of business development and marketing. The practice regularly thinks about the design standards outlined in its mission statement and its central tenet of giving all projects a "macro to micro level of attention." "Our mission is both an extension and evolution of our design practice," Frank says. "It happens organically, and we tend to verbalize or capture our values as our practice shifts."

That then becomes the basis for what Denby says is another crucial element: the vision statement. "The vision is more of the motivation and inspiration of the firm," he says. "It's going to help people envision what [will] happen if the firm is successful in achieving its mission."

These two statements, combined, paint a picture of what a firm wants to be and how it can get there.

Be Specific but Flexible

Mission and vision statements are not merely a set of discrete business goals or vague aspirations, but also a road map for a firm's long-term future—what it wants to be, where it wants to go, and what niche in the market it hopes to fill.

"The mission statement has to be as specific as it can be while still allowing room to grow," Denby says. A mission statement for a four-person residential studio, he notes, will necessarily be different from that of a 400-person global firm.

He also cautions against being too vague. "Words like 'full service,' 'multidisciplinary,' and 'award-winning' are the same kind of jargon you can pick up on any firm's website," he says. "They don't help to set [your firm] apart."

Connect to Your Brand

But a mission statement can do more than synthesize a firm's work. Reinholdt says architects should use their mission to indicate what their brand stands for: "Too few architects are actively engaging in branding their businesses today."

This is the approach taken by Waldon Studio Architects, a 30-person firm based in Columbia, Md. Its succinct mission statement—"We exist to create and serve"—underlines the firm's commitment to focus on the needs of its clients while also being a firm rooted in faith. The word "serve" also ties into the firm's focus on churches and community-centric design projects.

Like Olson Kundig, Waldon Studio regularly reviews its mission statement and priorities to make sure its work aligns with what it wants to be doing. "We make it a point not to be an ego-driven firm," says president Ravi Waldon, AIA. "We remind ourselves that we're looking for what's of value to our clients."

> *To learn more about crafting a mission statement, visit bit.ly/ARMissionStatement.*

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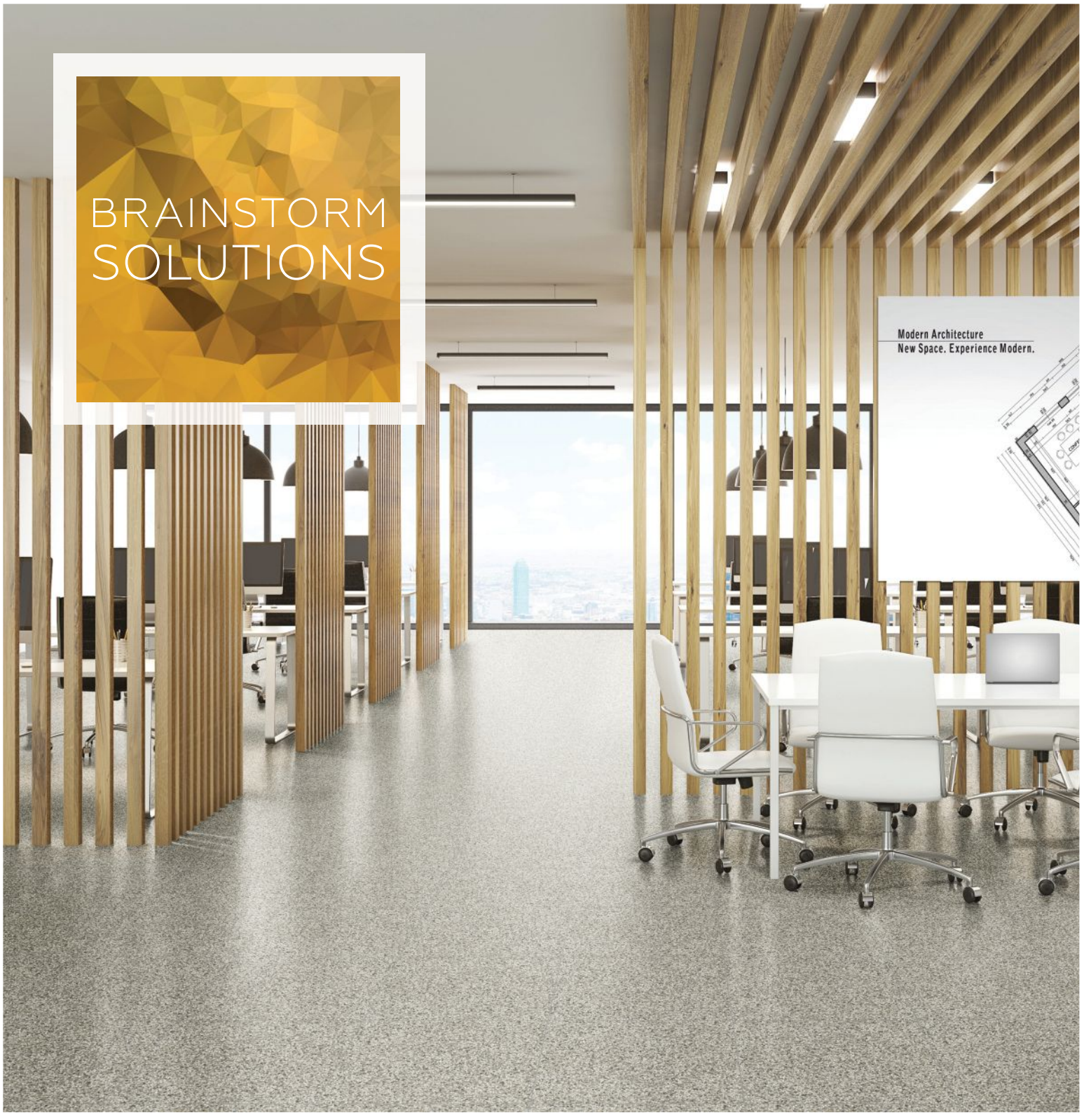

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Detail: Thompson Exhibition Building Structure

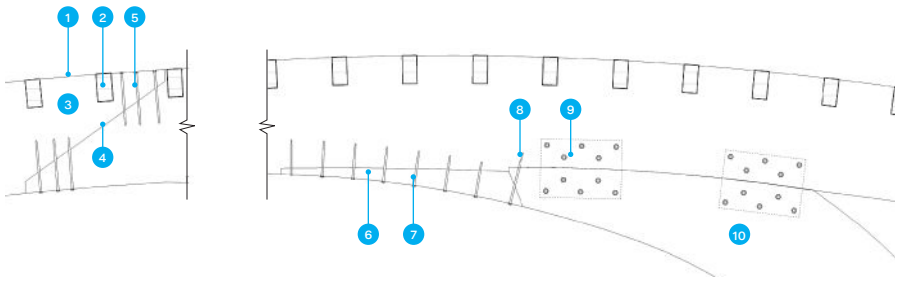
TEXT BY TIMOTHY A. SCHULER

As part of a new arrival sequence to the Mystic Seaport, a museum and re-created 19th-century maritime village in Mystic, Conn., the curvilinear, 14,000-square-foot Thompson Exhibition Building draws on everything from early shipbuilding to the radial geometry of mollusk shells. "Mystic Seaport calls itself the Museum of America and the Sea, and it's got the America part down great," says Chad Floyd, FAIA, a partner at Centerbrook Architects and Planners. What was missing, he says, was the feeling of the sea, which "got us thinking about ... the 'geometry of the sea.'"

The long-span structure assumes the form of a three-story wave cresting around the building's entrance. It was designed entirely in 3D using Autodesk Revit and rendered via Act-3D Lumion "quickly, early, and often," Floyd says.

Each of the 10 Douglas fir glulam ribs that comprise the structure contains a splice near a support column, shaped to complete the look of each rib's curvature. It took Goodlam (a division of Goodfellow), based in Delson, Quebec, 30 days to fabricate all 22.5 miles of the glulam. Steel knife plates concealed inside the structural members give the project "a much more elegant effect," Floyd says.

The exhibition building has expanded the experience of Mystic Seaport. "I like the fact that it resonates, has meaning, [and] communicates," Floyd says. "So many buildings are just abstract exercises that are wonderful and marvelous, but this is that and more."



1. Plywood roof deck
2. 5.125" × 8.75" glulam purlin (18" o.c.)
3. 8.75" × 39" Douglas fir glulam rib with 100'-radius curvature (19' o.c. between bays, 22' o.c. at end bays)
4. On-site splice made in rib
5. Ø0.625" × 18" lag bolts (typ.)
6. 8.75"-thick Douglas fir glulam wedge
7. Two Ø0.375" × 12" fasteners (10" o.c.) (typ.)
8. Two Ø0.625" × 18" lag bolts
9. 28" × 20" × 0.5" knife plate (typ.)
10. 8.75" × 43.5" Douglas fir glulam column, with 10'-radius curvature (spaced to match that of the glulam ribs)

JEFF GOLDBERG/ESTO

> *To read more about the design and fabrication of the Thompson Exhibition Building, visit bit.ly/ARThompson.*

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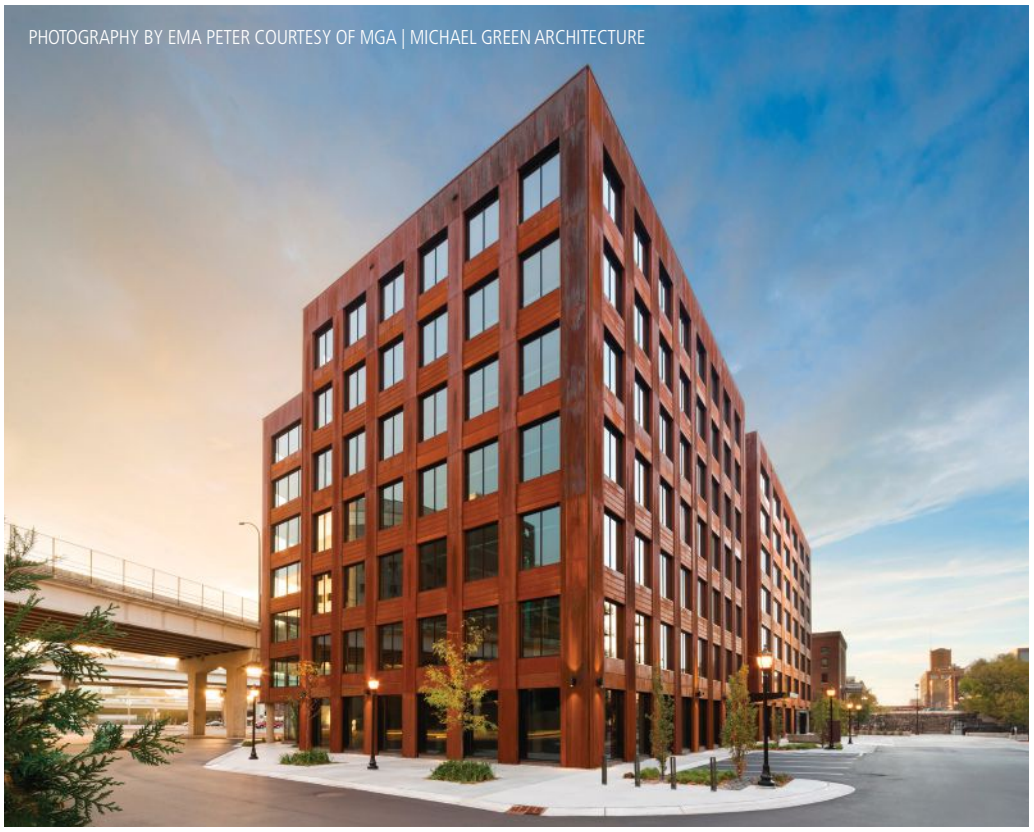

PHOTOGRAPHY BY EMA PETER COURTESY OF MGA | MICHAEL GREEN ARCHITECTURE


PHOTOGRAPHY BY EMA PETER COURTESY OF MGA | MICHAEL GREEN ARCHITECTURE

T3 is made chiefly with nail-laminated timber (NLT). Over 1,100 8-foot wide by up to 40-foot long NLT panels were used for exposed structural ceiling and roof panels with concrete topping. Spruce was used for the glulam beams and columns. "The texture of the exposed NLT is beautiful," notes Candice Nichol, project lead and architect for MGA. "The small imperfections in the lumber and slight color variation adds to the warmth and character of the space."

WOOD: TENANT-COOL, TECH-FRIENDLY COMMERCIAL SPACE

T3 has gained attention as the nation's largest mass timber modern office building. The $24.5 million Minneapolis project successfully fuses mass timber construction with buzz-worthy beauty and amenities. The big surprise? How code-compliant and mainstream the project is.

T3 may be one of the most closely watched architectural projects in recent years. A Google® search (April 2017) of "T3 Building Minneapolis" yields over 300,000 results.

Often lost in the public fanfare is the fact the seven-story, 220,000 square foot Class-A office and retail center "is not pushing any boundaries."

That observation may be the project's great lesson says project lead Candice Nichol, AIBC, NCARB of Vancouver-based MGA | Michael Green Architecture. Her firm designed T3 (short for **T**imber, **T**ransit, **T**echnology) in partnership with the DLR Group of Minneapolis.

Past As Prologue

"What makes T3 special is the way it's getting the industry to think about building with mass timber again," Nichol explains. "T3 is an incredibly beautiful building that's also economical and responsible."

International real estate company Hines is the owner and developer. Located in the booming North Loop neighborhood of downtown Minneapolis, T3 "puts a modern spin on an old idea" says Hines.

A great example of that "old idea" is just a few blocks from T3: Butler Square is a 367,717 square foot, nine-story brick and heavy timber building built in 1906 and substantially renovated in 1974.


PHOTOGRAPHY BY EMA PETER COURTESY OF MGA | MICHAEL GREEN ARCHITECTURE

Exposed NLT panels, beams, and columns meet all aspects of code, including fire. Mass timber has different burn characteristics than light-frame lumber and building and fire code recognizes that tested life safety margin. Charring is the difference. A charred timber retains most of its mass and strength at a predictable rate, with surface charring acting as a fire insulating material.

Code Compliant

"T3 shows what a new generation of office buildings can look like," says Nichol. "We're not used to seeing buildings like this because we've gotten away from mass timber construction. The fact is we didn't do anything outside of code. T3 is a Type IV building. It's a concrete podium topped by six floors of mass timber. There was no need for alternative means and methods."

Code compliance wasn't the only advantage. Construction speed was another. The timber structure for T3 was completed in just 9 weeks. "We finished a floor about every nine days," says Lucas Epp, engineering and 3D manager, StructureCraft. That work was comparatively quiet too, without the collateral noise associated with other building materials.

Differentiation Rules

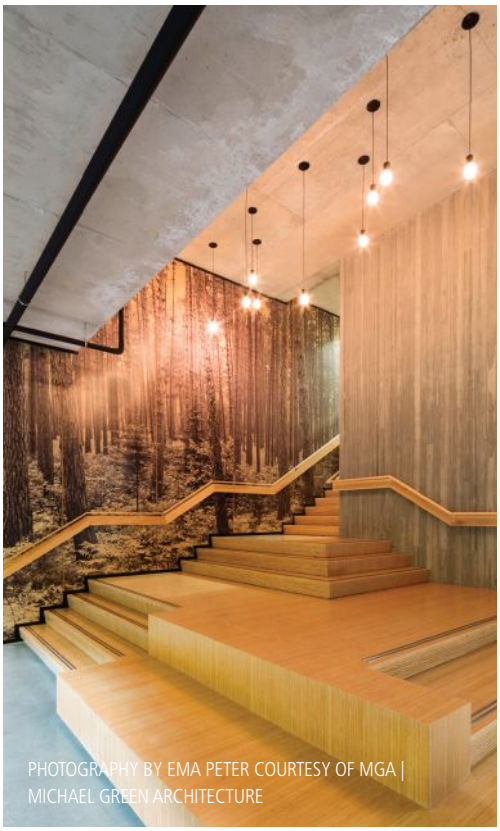
Mass timber structures are lighter than both the steel equivalent and post-tensioned concrete. So the project benefits from a smaller foundation requirement and lower seismic loads. For owner/developer Hines, T3 has proven to be a critical differentiator in a hot market. Wood's natural warmth and beauty offers leasing agents a competitive edge. Coupled with T3's leading-edge technology, LEED Gold certification, and extensive workplace amenities, T3's leasing story is a powerful one for Millennial, tech-focused tenants (Amazon is T3's lead tenant, occupying two floors).

Emerging Template

T3 is a successful example of a mass timber structure that is cost-competitive with steel and concrete. With its success, there has been incredible interest across the U.S. in reviving mass timber as a primary building material. "I know some people have been shocked by the scale and composition of T3," Nichol says. "They shouldn't be. We're not doing anything that hasn't been done before.

"T3 helps everyone get comfortable with mass timber again. It's inviting. It's sustainable. A mixed-use building like T3 makes so much sense for the owner in terms of construction speed, labor, budget, and result. T3 is a very mainstream project."

As an endorsement, Hines recently announced plans to build T3's twin in downtown Atlanta.


PHOTOGRAPHY BY EMA PETER COURTESY OF MGA | MICHAEL GREEN ARCHITECTURE

The mass timber building offers Wi-Fi in its public spaces including the rooftop deck. T3 also has bike rentals, bike storage, a café, community conference room, and a social workspace area on the ground floor with lounge seating and swing seats. "The social workspace is really cool," says project lead and MGA associate Candice Nichol. T3 is the first office building in Minneapolis to receive preliminary certification from WiredScore, which rates buildings with the best internet connectivity—a tech-friendly win.

Design Architect: MGA | Michael Green Architecture

Architect of Record: DLR Group

Structural Consultant: Magnusson Klemencic Associates

MEP: Dunham Associates

Civil Engineer: Loucks Associates

Design Assist + Build: StructureCraft

LEED: DLR Group

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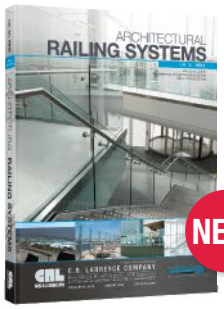

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Next Progressives: Firm Architecture and Design

EDITED BY KATHARINE KEANE

Location:
Brooklyn, N.Y.

Year founded:
2011

Firm leadership:
James Khamsi

Education:
B.Arch., Cornell University; M.Arch., Harvard Graduate School of Design

Experience:
Before starting Firm, I worked at Foreign Office Architects (now defunct), in London, on projects ranging in scale from the London 2012 Olympic Park Master Plan to an inflatable 7-foot cube. I currently teach at Columbia University Graduate School of Architecture, Planning and Preservation and at the City College of New York.

Firm size:
One to three

Mission:
Firm works at the intersection of architecture, urbanism, and art. My goal is to catalyze public spaces and networks in cities through design. To that end, I've pursued a wide range of work beyond traditional architectural commissions that has allowed me to think differently about design's agency in the contemporary city.

Design is a fundamentally inclusive process. Creating vital places within the city isn't a task for compartmentalized specialists. Rather, it is best achieved by cross-disciplinary teams that understand how to combine the social and cultural needs of a larger ecology.

Origin of firm name:
Firm refers to the Vitruvian trilogy of commodity, firmness, and delight. In contemporary practice, commodity is dictated by the client; delight is experienced by the end user after design and construction; and firmness is the realm of action for the architect—where we transform commodity into delight through our work. Also, I like the tautology of having a firm called Firm.

Memorable learning experience:
The first lesson I learned from Farshid Moussavi was "in architecture, one must be opportunistic." This has inspired me to seek interesting collaborators and atypical design projects.


James Khamsi

Favorite project:
The SFC Bridge in Toronto is both urban infrastructure and a work of public art. It came out of a multidisciplinary collaboration with artists, architects, and engineers, and it demonstrates how novel experiences can be brought to the more prosaic elements of the city.

The space has developed a following on Instagram and I collect the photos people post. We are keen to see what catches peoples' eyes and how the environment instigates behaviors beyond the bridge's intended use.

Second favorite project:
Since 2015, I have been the architect for the annual Art Toronto. I approach it as if I'm master planning a pop-up city, combining architecture, urbanism, and art. My design organizes the fair into streets, blocks, and public spaces. And because it needs to be built fast—in around 72 hours—it's been a chance to experiment with inflatable structures and geodesic domes.

Design heroes:
Designer Verner Panton and painter Bridget Riley—they've influenced how I blend graphic qualities, such color and shape, with tectonic qualities, such as materiality, texture, and structure.

Social media platform of choice:
Instagram (@jamesmsk)

Vice:
$5 lattes

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> *To read more about Firm's work, go to bit.ly/ARFirmAD.*

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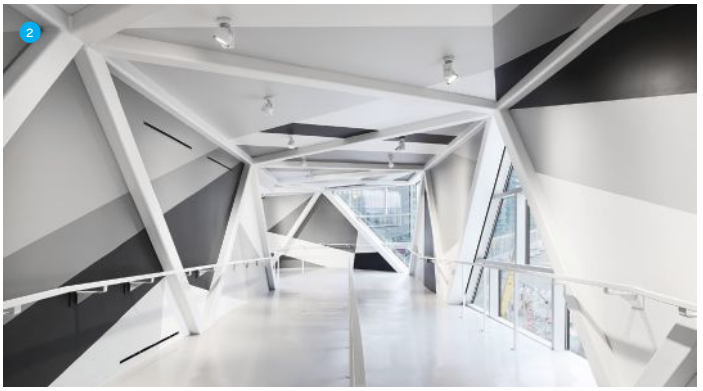

1,2: ANDREW ROWAT

1, 2. Developed in a collaboration with artists Jennifer Marman and Daniel Borins and Toronto-based firm Page + Steele/IBI Group Architects, the SFC Bridge in Toronto is a pedestrian walkway that connects the new Delta Hotel to the Metro Toronto Convention Centre. Clad in dark- and light-colored aluminum panels, the bridge features triangular windows that create geometric patterns of light and shadows inside. **3.** Firm collaborated with New York–based Tang Kawasaki Studio for this concrete mixed-use development concept intended for Brooklyn, N.Y.'s Bushwick neighborhood. The tower uses the air space over a neighboring church to create the impression of three stacked volumes of masonry, glass, and concrete. **4.** This Charleston, S.C., transportation hub concept includes a wood and steel composite canopy with a green roof and a glue-laminated vertical wood structure. **5.** Khamsi collaborated with Marman and Borins to create "Speech Bubble" in Toronto, a cantilevered LED screen, framed with aluminum-clad steel, that displays abstract video and imagery. **6.** Khamsi's design for the 2016 Art Toronto fair included an inflatable auditorium for hosting lectures and panel discussions. **7.** The bank-side bike shed concept is Khamsi's effort to provide London with "Microns," or micro-icons, that are ubiquitous and distinctive to the city. The shelter is made of steel rods with a waterproof tarpaulin membrane.

3, 4, 6, 7: COURTESY FIRM A.D.; 5: JEFF MCNEILL; 8: JAMES KHAMSI

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ICEBERG AESTHETIC

The $29 Million Polk Penguin Conservation Center Delivers Antarctic Wonder To Michigan

Detroit penguins have become the envy of the zoo world thanks to the $29 million Polk Penguin Conservation Center at the Detroit Zoo. The facility is a zoological breakthrough that simply delights penguins like no other indoor facility in the world.

Why such envy? These adorable birds are able to frolic in a 33,000 square foot facility that faithfully mimics Antarctic conditions. It offers a massive 326,000-gallon, 25-foot deep aquatic area that is chilled to a constant 37 degrees. It also snows up to three feet a day and offers three wave settings, just for fun.

Unmatched Experience

The penguins aren't the only beneficiaries. It charms zoo-goers as well. The Center is a portal into the otherworldliness of the Antarctic that engrosses visitors. The icy journey begins with the building's muscular, pointed, iridescent white exterior. Call it iceberg aesthetic.

"Constructing the geometry of the building was challenging," says Alan Cobb, FAIA, LEED® AP, design principal of Detroit-based Albert Kahn Associates Inc., a 122-year old international architecture firm.

The visually arresting exterior is without dimension. The irregular geometry is based wholly on computer coordinates to artfully capture the power and serendipity of natural ice formations.

"There's no straight outside wall," notes Pankaj Patel, AIA, LEED® AP, Albert Kahn project architect.

Antarctic Splendor

Color choice presented challenges, too. The design team sought to replicate the ethereal, constantly shifting hues of white that have long-dazzled Antarctic explorers and researchers. The Albert Kahn team partnered with Valspar, a coatings company with a distinguished history of supporting high-profile, signature projects. What kind of coating magic could Valspar summon to channel Antarctic splendor?

Jay Register, Valspar's group project leader remembers the requirement well. "We went through several types of coatings and color variations until we found the perfect fit for the Antarctic vision," he explains. The consensus winner was a Fluropon Classic II Special SR coating that is a piercing white with a hint of blue.

Iceberg White

The color, christened Iceberg White, contains 70 percent PVDF resins that offer outstanding dirt and staining protection—a design team concern. "We were worried about the building getting dirty and showing that dirt," Cobb says. "We were concerned about weathering. It's been successful."

Diamond-shaped metal panels interlock across the façade in layered, feather-like fashion, similar to a penguin. The Iceberg White coloring was coil-coated on the paneling. In addition to dirt resistance, the Valspar coating also features solar reflective technology, minimizing UV ray damage and reducing overall energy costs.

"As the sky colors and shadows change, so does the building. It's a very playful scheme," notes Patel.

Global Recognition

The world has noticed. One of the world's foremost polar ecologists and penguin experts, Dr. Bill Fraser, is a huge fan of the Center. The project has earned no less than six awards to date, including top honors from the Engineering News Record, an award usually reserved for mammoth infrastructure projects, according to Cobb.

Best of all, it's inspired the public. Zoo attendance has skyrocketed by more than 200,000 visitors since the April 2016 opening. The penguins have scarcely noticed. They're too busy having fun in their spacious new haven.

To learn more, visit the project gallery at **ValsparCoilExtrusion.com**.

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TEXT BY SELIN ASHABOGLU

Contour Table, Bodo Sperlein
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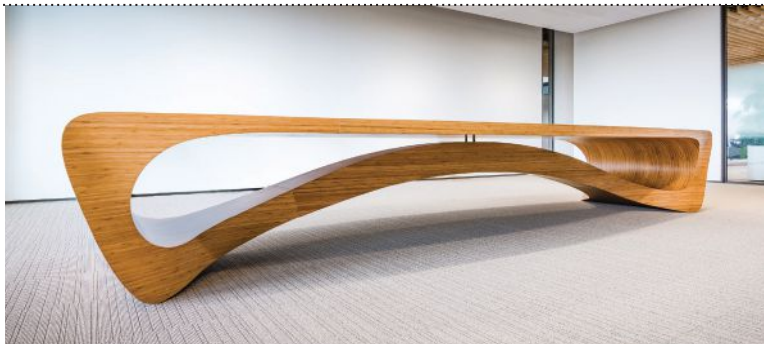
Form Follows Function Boardroom Table, Daan Mulder
Wrapped in bamboo veneer, this table comprises a series of plywood ribs that interlock to create a seemingly continuous form. The 200.7"-long by 65.7"-wide table can seat up to 12 people and comes with integrated technologies that include a Bluetooth charging dock, two electrical outlets, and an HDMI port. *daanmulder.eu*



Mizu, Fratelli Reifer Custom
Handcrafted in Brixen, Italy, with local designer Eberhard Mitterrutzner, this limited-edition desk and incorporated bench was formed by bending and gluing 10 layers of 315"-long Canaletto walnut panels around an existing wood frame. The integrated bench measures 78.7" long, while the table is 157.4" long. Mizu houses three power outlets in its base as well as two USB ports in its drawer. *frcustom.eu*

> *To learn more about these wooden tables, visit bit.ly/WoodTables.*

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Technology: Self-Illuminating Glass

TEXT BY BLAINE BROWNELL, AIA

German author Paul Scheerbart captivated architectural imagination with his visions for a future built environment made of glass. In his 1914 book *Glasarchitektur*, he not only espoused glass's merits as a primary façade material and speculated about its future manifestations for channeling light, but he also articulated a technical capacity that would, for decades, remain a mystery to his readers: "The light between these walls shines outward and inward, and both the outer and the inner walls may be ornamentally colored."

Almost a century later, in 2012, chemical company BASF and technology company Philips announced a similar capability in an organic light-emitting diode–based car sunroof. Scheerbart's architectural vision would soon be fulfilled.

In 2016, Vienna-based glass solutions company LightGlass Technology launched a line of self-illuminating products in the U.S. market. LightGlass ALED has positioned itself as an innovative contender within the field of smart glass technology. Unlike more common liquid crystal– or electrochromic-based approaches that provide adjustable shading or opacity to control daylight levels and glare, LightGlass acts as its own illumination source. A closer analysis reveals its potential for architecture.

ALED technology is composed of an insulating layer of single-pane safety glass that distributes electric light uniformly over a light-conducting surface, rendering the transparent insulated glass unit opaque.

ALED can be integrated into standard building profiles for both exterior and interior applications. According to Reinhard Tschaickner, LightGlass' head of marketing and public relations, ALED allows transparent glass to be fully and homogeneously illuminated, and—in color temperatures that can match the actual course of daylight—be controlled to fall within a custom spectrum of visible light, and differ on each glazing face.

ALED "can be integrated everywhere where there is architectural glass," Tschaickner says, including windows and doors, building façades, elevators, hospital technologies, and partition walls. It can also be incorporated into horizontal applications, such as ceilings, countertops, and floors. And the addition of LightGlass TechWall, an optional electronic module embedded into the glass system, integrates once external capabilities such as responsive monitors, gauges, and sensors.

Although Tschaickner declined to provide cost information, he is enthusiastic about ALED's potential. "Imagine," he says, "a future in which light turns into architecture—in which glass possesses new functions and intelligently participates in shaping our daily lives."

To that end, it is easy to imagine an office environment, or virtually any space, in which the primary interior light sources are self-illuminating windows

Partition wall featuring ALED technology

CLAUDIO FARKASCH

in lieu of overhead fixtures. In such an instance, the nocturnal experience might become uncannily similar to that of the day, particularly with ALED's color-temperature customization capabilities, which can be tuned to render a perpetual sunset or the light of high noon at any time—potentially enticing the perpetually overworked to burn even more of the midnight oil. However, it would also likely improve working conditions for the late-shift set.

Describing ALED as an "everyday life application," Tschaickner is confident about the technology's adoption based on building occupants' understanding and habitual use of windows as their primary source of illumination. "The phrase 'turn on the window' will be as common as 'turn on the light' nowadays," he predicts.

Scheerbart would doubtless be pleased.

> *To learn more about ALED technology and its applications, visit bit.ly/ARALED.*


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BUILDING RESILIENCE: EXPANDING THE CONCEPT OF SUSTAINABILITY

CAN TRADITIONAL AND NEW WOOD BUILDING SYSTEMS MEET EVOLVING DESIGN OBJECTIVES?

Presented by: reTHINK WOOD®

Part of the structural system, the arches in this apparatus bay are designed to resist vertical and lateral loads required for essential facilities under the Oregon Structural Specialty Code. This project won a 2016 WoodWorks Wood Design Award. Photo credit: Josh Partee Photography

LEARNING OBJECTIVES

Upon completion of this course the student will be able to:

1. Discuss why the concept of resilience can be viewed as another step in the evolution of sustainable building design.
2. Identify the strengths of traditional wood framing and mass timber systems in the context of building resilience, including performance during and after earthquakes, hurricanes, and other disasters, as well as the relevance of carbon footprint and embodied energy.
3. Explain how the International Building Code (IBC) and referenced standards such as the National Design Specification® (NDS®) for Wood Construction support building resilience.
4. Describe examples of research related to the development of new building materials and systems that could help communities meet more stringent resilience criteria.

CONTINUING EDUCATION

AIA CREDIT: 1 LU/HSW
GBCI CREDIT: 1 CE HOURS
AIA COURSE NUMBER: AR062017-5

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Building resilience is one of those concepts you read about and think, 'Of course.' It's an obvious next step in the evolution of sustainable design, conceived to meet a critical need, just as green building itself can trace its beginning to the oil crisis of the 1970s and the need to reduce energy consumption. Today's need is to anticipate and prepare for adverse situations—such as earthquakes and hurricanes, the effects of climate change, even deliberate attacks—because there is nothing sustainable about having to rebuild structures before the end of their anticipated service lives and all of the resources that entails.

As the American Institute of Architects (AIA) recently pointed out, "A resilient building in a non-resilient community is not resilient." In the context of building materials, a complementary statement is that no building material in and of itself is the answer to resilience. Although materials such as wood have inherent characteristics that positively affect their performance, there are many greater factors that go into the design of a truly resilient structure.

With that in mind, this course will consider traditional wood framing and mass timber systems in the context of resilience, including performance during and after earthquakes, hurricanes, and other disasters, as well as the relevance of wood's light carbon footprint and low embodied energy. It will describe how building codes and standards such as the National Design Specification® (NDS®) for Wood Construction support resilience now, and consider how wood structure can be utilized to meet evolving resilience objectives.[1]

INTEGRATED DESIGN BUILDING, UNIVERSITY OF MASSACHUSETTS

Photo credit: Alexander Schreyer, University of Massachusetts

Location: Amherst, Massachusetts

Architect: Leers Weinzapfel Associates

Structural Engineer: Equilibrium Consulting Inc.

Despite its location on the East Coast, the University of Massachusetts Integrated Design Building was governed by seismic as opposed to wind loads—and the aspect of the project that best illustrates resilience is its innovative seismic design. Comprised of an exposed heavy timber structural system and cross laminated timber (CLT) decking and shear walls, the four-story, 87,000-square-foot structure accommodates the rules of capacity design—where certain elements of a structural system are intended to yield, and others are intended to remain elastic. In this case, structural engineer Robert Malczyk, principal at Equilibrium Consulting, explains that all of the elements of the lateral system are overdesigned except the bottom of the hold down brackets, which are sized to yield at the level of the design earthquake.

In a seismic event, the brackets are intended to dissipate energy, without causing further structural damage, with the idea that they can be replaced afterward for faster building recovery. The wood structure is relevant because of its weight. "The seismic force is proportionate to the weight of the building," says Malczyk. "If this building were designed in concrete, which was considered, the weight would be six times more than the mass timber design, which means the seismic forces could also be up to six times greater. All of the elements, including foundations, hold downs, and everything else, would have needed to be much stronger. This is part of the reason wood buildings are so popular in high seismic regions."

DEFINING RESILIENCE

In 2014, the National Institute of Building Sciences (NIBS), AIA, ASHRAE, American Society of Civil Engineers (ASCE), and other organizations representing some 750,000 professionals issued a joint statement on resilience with a definition drawing from the National Academies.[2] Describing resilience as "the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events," the statement read: "The promotion of resilience will improve the economic competitiveness of the United States. Disasters are expensive to respond to, but much of the destruction can be prevented with cost-effective mitigation features and advanced planning. Our practices must continue to change, and we commit ourselves to the creation of new practices to break the cycle of destruction and rebuilding. Together, our organizations are committed to build a more resilient future."

Recognizing the importance of "contemporary planning, building materials, and design, construction, and operational techniques," the group outlined its commitment through steps that include:

- Research related to materials, design techniques, construction procedures, and other methods to improve the standard of practice
- Education through continuous learning
- Advocating for effective land use policies, modern building codes, and smarter investment in the construction and maintenance of buildings and infrastructure
- Response, alongside professional emergency managers, when disasters do occur
- Planning for the future, proactively envisioning and pursuing a more sustainable built environment

Within this context of improvement, it is useful to consider how current design practices align with resilience objectives.

BUILDING CODES AND STANDARDS: A BASE LEVEL FOR RESILIENCE

The International Building Code (IBC) includes countless provisions and guidelines for designing structures to better withstand disasters. It is updated on a three-year cycle and, throughout its history, has continued to evolve to improve building performance. Although building codes accept that some non-structural and structural damage will occur in a major event, they seek to preserve life safety, prevent structural collapse, and ensure the superior performance of critical and essential facilities, such as hospitals and fire stations, relative to other structures.

RISK-BASED CODE REQUIREMENTS

From a resilience perspective, an important aspect of the IBC is that it is scaled to reflect risk—which, in this context, describes the combination of event probability and consequence of building failure. Buildings are classified into risk categories based on use, from Risk Category I for those representing a low hazard to human life in the event of failure (such as storage buildings) to Risk Category IV for structures with greater consequences associated with their failure (such as hospitals). The higher the category, the greater the evaluated risk.

They are further defined based on the likelihood of a specific type of event occurring. Buildings constructed in regions known for hazards such as hurricanes, earthquakes, or floods, for example, are subject to design requirements that make them better able to withstand these events.

For wind and seismic design, statistical modeling based on prior event history is used to anticipate the magnitude of future events, even if they have not yet occurred at that scale.

For wood building design, the code is supported by referenced standards such as the National Design Specification (NDS) for Wood Construction, Special Design Provisions for Wind and Seismic (SDPWS), and Wood Frame Construction Manual (WFCM). These standards provide the tools for the design of wood buildings to meet structural loadings associated with naturally occurring threats, such as wind and seismic events.

Earthquakes

Seismic design forces are specified in the IBC to allow for proportioning of strength and stiffness of the seismic force-resisting system. Structures with ductile detailing and redundancy, and without structural irregularities, are favored for seismic force resistance. These beneficial characteristics are specifically recognized in seismic design requirements. The IBC establishes the minimum lateral seismic design forces for which buildings must be designed primarily by reference to ASCE 7-10: Minimum Design Loads for Buildings and Other Structures.[3] For wood buildings, design guidance is provided in the NDS, SDPWS, and WFCM.

Traditional wood-frame buildings that are properly designed and constructed to comply with code requirements have been shown to perform well during seismic events. This is often attributed to the following characteristics:

Light weight. Wood-frame buildings tend to be lightweight, reducing seismic forces, which are proportional to weight.

Ductile connections. Multiple nailed connections in framing members, used in shear walls and diaphragms of wood-frame construction, exhibit ductile behavior (the ability to yield and displace without sudden brittle failure).

Redundant load paths. Wood-frame buildings tend to be comprised of repetitive framing attached with numerous fasteners and connectors, which provide multiple and often redundant load paths for resistance to seismic forces. Further, when wood structural panels such as plywood or oriented strand board (OSB) are properly attached to wood floor, roof, and wall framing, they form diaphragms and shear walls that are exceptional at resisting these forces.

Compliance with applicable codes and standards. Codes and standards governing the design and construction of wood-frame buildings have evolved based on experience from prior earthquakes and related research. Codes also prescribe minimum fastening requirements for the interconnection of repetitive wood framing members; this is unique to wood-frame construction and beneficial to a building's seismic performance.

There are numerous examples of post-disaster reports—and city disaster plans—noting the ability of wood-frame buildings to perform well in earthquakes. In California, for example, where wood-frame schools are common, an assessment of the damage to school buildings in the 1994 Northridge earthquake was summarized as follows: "Considering the sheer number of schools affected by the earthquake, it is reasonable to conclude that, for the most part, these facilities do very well. Most of the very widespread damage that caused school closure was either non-structural, or structural but repairable and not life threatening. This type of good performance is generally expected because much of the school construction is of low-rise, wood-frame design, which is very resistant to damage regardless of the date of construction."[4]

ADVANCEMENT THROUGH INNOVATION: SEISMIC DESIGN

As described under Defining Resilience, ongoing research is key to meeting evolving design objectives. This includes post-disaster investigations that lead to recommendations for improved construction techniques. It also includes the development of improved design procedures. In one study, for example, a full-scale wood-frame apartment building was subjected to a series of earthquakes on the world's largest shake table in Miki, Japan.[5] The test evaluated a performance-based seismic design procedure developed to gain a better understanding of how mid-rise wood-frame buildings respond to major earthquakes. The building was subjected to three earthquakes ranging in seismic intensities corresponding to a 72-year event through a 2,500-year event for Los Angeles, California. According to the report, it "performed excellently with little damage even during the 2,500-year earthquake."

Research is also key to the development of new building materials and systems that could help communities meet more stringent resilience criteria, such as the mass timber products being used in taller wood buildings.

The impetus for timber high-rises, which already exist in other countries, is largely based on wood's renewability, low embodied energy, and lighter carbon footprint compared to other materials. The fact that wood buildings continue to store carbon while regenerating forests absorb and sequester more carbon is viewed by many as a compelling reason to expand the use of wood.

To determine the safety of taller wood buildings, a great deal of research has focused on seismic systems. For example, in a study using the same shake table in Japan, researchers tested a seven-story CLT building.[6] After being subjected to 14 consecutive seismic events, the building suffered only isolated and minimal structural damage. The study is described in the U.S. CLT Handbook, which states, "There is a considerable advantage to having a building with the ability to quickly return to operation after a disaster and in the process minimizing the life cycle impacts associated with its repair. Based on full-scale seismic testing, it appears that CLT structures may offer more disaster resilience than those built with other heavy construction materials."

Another test evaluated "rocking" mass timber shear walls for use in high seismic regions.[7] Seismic activity was simulated by cyclic loading that pushed and pulled the top of a 16-by-4-foot CLT panel with an embedded vertical pre-tensioned rod into a rocking motion. The wall was able to reach 18 inches of displacement while maintaining its ability to self-center back to a vertical position. The result: the series of tests demonstrated the ability of this innovative building system to resist earthquake forces.

Hurricanes

Structural wind-loading requirements are specified in Chapter 16 of the IBC and obtained

Subjected to three earthquakes on the world's largest shake table in Miki, Japan, this full-scale wood-frame apartment building performed excellently with little damage. Photo credit: John W. van de Lindt, Colorado State University

primarily through reference to ASCE 7-10. The minimum requirements are intended to ensure that every building and structure has sufficient strength to resist these loads without any of its structural elements being stressed beyond material strengths prescribed by the code. The code emphasizes that the loads prescribed in Chapter 16 are minimum loads and, in the vast majority of conditions, the use of these loads in the design process will result in a safe building. However, it also recognizes that a designer may, and sometimes must, use higher loads than those prescribed. The commentary to ASCE 7-10 outlines conditions that may result in higher loads.

One of wood's characteristics is that it can carry substantially greater maximum loads for short durations than for longer periods of time, as is the case during high wind and seismic events.[8] As with seismic performance, the fact that wood buildings often have repetitive framing attached with numerous fasteners and connectors also helps to resist forces associated with high winds, as do diaphragms and shear walls made from wood structural panels properly attached to wood wall and roof framing.

According to a report by the Federal Emergency Management Agency (FEMA) on building performance during the 2004 hurricane season, new wood-frame houses built in accordance with the 2001 Florida Building Code performed well structurally, including those located in areas that experienced winds of up to 150 miles per hour (3-second gust). For these buildings,

load path was accounted for throughout the structure, including the connection of the roof deck to supporting trusses and rafters. Because of this, loss of roof decking on newer homes was rare.[9]

Tornadoes

Because of the low probability that a building will incur a direct hit from a tornado, the extreme winds of tornadoes are not included in building code requirements for the wind design of buildings other than tornado shelters. However, it is generally agreed that a building properly designed and constructed for higher wind speeds has a good chance of withstanding winds of weaker tornadoes. Statistically, weaker tornadoes—rated by the National Weather Service as between EF-O and EF-2 on the Fujita Tornado Damage Scale—comprise 95 percent of all tornadoes.

Stronger tornadoes (rated EF-3 to EF-5) require more rigorous design but are much less common. Designing for higher wind speeds can make a significant difference in terms of withstanding loads from even these tornadoes when the structure is located along the outer reaches of the area influenced by the vortex of such storms.

After a devastating tornado season that cost hundreds of lives and thousands of homes in 2011, the FEMA Mitigation Assessment Team investigation found that newer homes generally performed well under design-level wind loading, but a lack of above-code design left buildings vulnerable to damage.[10] Appendix G of the report, which makes reference to the WFCM and includes similar approaches, lays out prescriptive techniques that can improve building performance during weaker tornadoes. It notes that "Strengthening buildings by maintaining load path continuity and reinforcing connections has proven successful for mitigating hurricane and wind damage, and provides a good model for mitigating tornado wind damage." Techniques are also provided for developing a complete load path starting from an engineered design for wind resistance—i.e., sheathing to roof framing, roof framing to wall framing, and wall framing to foundation connections.

This article continues on http://go.hw.net/AR062017-5. Go online to read the rest of the article and complete the corresponding quiz for credit.

QUIZ

1. The concept of resilience covers the need to anticipate and prepare for which of the following adverse situations?
   A. Natural disasters, such as earthquakes and hurricanes
   B. Effects of climate change
   C. Deliberate attacks
   D. All of the above

2. For wood design, the International Building Code is supported by all of these referenced standards EXCEPT which one?
   A. National Design Standard® (NDS®) for Wood Construction
   B. Fine Woodworking Guide to Safety
   C. Special Design Provisions for Wind and Seismic
   D. Wood Frame Construction Manual

3. Which of the following characteristics of a wood-frame structure does not contribute to its effective seismic performance?
   A. Light weight
   B. Ductile connections
   C. Redundant load paths
   D. Structural irregularities

4. In a series of tests evaluating the use of rocking mass timber shear in high seismic regions, the test wall was able to meet how many inches of displacement while maintaining its ability to self-center back to a vertical position?
   A. 10
   B. 14
   C. 18
   D. 22

5. In a FEMA report on building performance during the 2004 hurricane season, what reason was given for the fact that loss of roof decking on newer homes was rare?
   A. Buildings built per the 2001 Florida Building Code accounted for load path throughout the structure, including connection of the roof deck to supporting trusses and rafters
   B. Hurricanes in 2004 primarily affected areas with older homes
   C. Most new roofs met LEED or Green Globes standards
   D. Most new roofs accommodate the rules of capacity design

6. True or False: It is generally agreed that a building properly designed and constructed for higher wind speeds has a good chance of withstanding winds of weaker tornadoes, which statistically comprise 95 percent of all tornadoes.

7. In a study of buildings demolished in Minnesota, why were most buildings demolished?
   A. Changing land values
   B. Changing tastes and needs
   C. Lack of maintenance of non-structural components
   D. All of the above

8. Which of the following is not a passive fire safety feature?
   A. Fire-resistant floors
   B. Fire-resistant walls
   C. Automatic sprinklers
   D. Open space

9. A mix of performance-based design and life cycle assessment involves working to identify a design solution that meets what objectives?
   A. Engineering
   B. Societal
   C. Environmental
   D. Economic
   E. All of the above

10. ICC Chief Executive Officer Dominic Sims recently said, "There is no more important contributor to reducing communities' risks from earthquakes than _____."
    A. government funding
    B. community support
    C. adoption and application of modern building codes and standards
    D. collaboration between government and communities

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UNIVERSAL DESIGN— GOING BEYOND STANDARDS

BIM TECHNOLOGY HELPS ARCHITECTS DESIGN HOLISTICALLY FOR ALL PEOPLE TO ACHIEVE GREAT RESULTS WHILE MEETING OR EXCEEDING STANDARDS

Presented by:

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Universal design is based on principles of equal access for all people in a manner that blends in with the overall design of outdoor or indoor spaces as shown here in the Garden of Migration at the Museum of Civilization in Europe and the Mediterranean at the Port of Marseille, France by architects Rudy Ricciotti and Roland Carta. Photo courtesy of Hemis / Alamy stock photo

LEARNING OBJECTIVES

Upon completion of this course the student will be able to:

1. Identify the distinction between the principles of universal design and design based simply on compliance with accessibility standards.
2. Investigate the ways that universal design can be incorporated into the overall building design process.
3. Recognize the ways that building information modeling (BIM) technology can support and supplement universal design.
4. Assess case study information from other architects who have incorporated universal design and BIM in their practice.

CONTINUING EDUCATION

AIA CREDIT: 1 LU/HSW
AIA COURSE NUMBER: AR062017-2

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Ever since the late 1980s and early 1990s when legislation like the Americans with Disabilities Act (ADA) became law in the United States, all buildings and facilities open to the public have been required to meet standards for accessibility. More specifically for architects and other design professionals, ANSI/ICC Standard A117.1 has been developed over this time period to incorporate specific code requirements for accessible design related to both new and renovated buildings. Based on this evolution of thought, accessible design has become fairly well engrained such that architects routinely incorporate it into designs that both comply with code requirements and complement an overall building design. However, many architects are adopting a more holistic approach to design and accessibility recognizing that any public or even private space may serve people of many different abilities either over time or perhaps simultaneously.

The term universal design has emerged to reflect this broader design approach to create spaces that work well for all people (able bodied or not), at different ability levels (recognizing permanent or temporary disabilities), and at different times of life (different ages). The overall premise behind universal design is that a space or a building can be designed to be readily usable by all people, hence the "universal" approach. It is intended to go beyond codes and standards and truly create the best outcome for the full range of people who use a building. In order to achieve that goal, design professionals need to look carefully at both overall layout and design details from multiple standpoints. In doing so, many are discovering that the type of visualization and information that Building Information Modeling (BIM) technology can provide is invaluable. We will explore how a number of architects are using BIM to very successfully create appealing and functional buildings that achieve universal design for all people.

UNIVERSAL DESIGN

What really makes universal design different from compliance with accessibility codes and standards? The answer lies in the approach to how aspects of accessibility are integrated into a building. Both the ADA and ICC/ANSI A117.1 look at very specific items like path of travel, turning radius, heights of building features, functionality of specific elements, etc.

This is all good and appropriate, particularly when it comes to people who are wheelchair bound since their situation requires some specific clearance and travel needs. However, those with mobility impairments that do not involve wheelchairs, such as walking with a cane or walker, or maybe temporarily with crutches, rarely need the same type of space requirements. Similarly, those with visual or hearing impairments have different concerns related to functionality and usability of spaces.

Despite the variety of possible needs, the codes and standards have created a tendency for design professionals, building owners, and the public to think of accessible design as segregated or separate from the rest of the design. In some cases, it may be seen as an "overlay" to a design such as designating paths of travel and providing signage in a parking lot. Either way, there is sometimes a perception that accessible features are more expensive and less attractive than other "standard" building features. Even worse, it makes it easy to think that the people using these accessible features must also be separated or segregated when using the buildings. That is clearly counter to the intent of the ADA and other civil rights legislation that has historically been built on the premise of inclusiveness for all people of all ability levels.

Universal design recognizes that building features can benefit people of all ages and all abilities without the appearance of separation or exclusion by anyone. Photo courtesy of Vectorworks, Inc.

Universal design, by contrast, recognizes that many of the features of accessible design can benefit everyone. For example, curb cuts and ramps are just as welcome and useful for people pushing baby strollers or pulling suitcases as they are for people in wheelchairs or for people that just need an easier path to walk. Similarly, door handles, light switches, shelves, and rest room accessories that are easy to use and installed at appropriate heights can be appreciated by all people. In short, providing building features that are not necessarily labeled with signage or other distinguishing features, but still meet the needs of people of all levels of ability, is the basis of the universal design movement. This holistic approach to buildings and how they are used means that designs can be more attractive and consistent with the rest of the building. It is also quite possible to incorporate standard construction techniques, thus avoiding added costs for special or unique work. It can even create a more marketable building if people recognize that it is inherently designed to accommodate different ages, lifestyles, and ability levels. This last point is particularly true in housing situations where the concept of "aging in place" has become desirable. Residents, or owners in this case, want to have the flexibility to use the building to suit their lifestyle while they are fully able bodied, but don't want to be forced to move if age, illness, or disability restricts their lifestyle.

Based on this approach, universal design can allow for a building to have a longer period of usefulness to the owner by making it functional over different stages of life. It goes beyond meeting the minimum requirements of codes and standards by bringing in holistic thinking and a broader view of accessibility. It recognizes that there are normal differences between different people in terms of abilities and even their size that influences the way they function in a space. This broader approach also accepts that ability levels are not permanent over time. Aging people have been mentioned already, but even younger, able-bodied people may incur temporary disabilities due to an accident, illness, or other condition. This has become particularly evident in recent times by wounded or crippled military veterans returning home. Their needs have changed, but those whom they live with in their family may not have the same needs, but all still want to live and work together. This has also become apparent in the growth in multigenerational households where family members or others of different ages and abilities live together. Universal design addresses all of these conditions as well as the overall health and wellness of people in their work, living, or public environment.

Thought Leadership on Universal Design

A number of design professionals have delved deeply into the concepts and principles of universal design and have been recognized as thought leaders in this area. Among them is U. Sean Vance, AIA, NOMA, NCARB, currently assistant professor in architecture at the Taubman College of Architecture and Urban Planning at the University of Michigan and previously part of the Center for Universal Design at North Carolina State University. The focus of his research, practice, and teaching has included three areas related to universal design: construction, spatial cognition, and design health. The design health focus drives most of his current research as one of three professors leading the University's Masters of Science in Design and Health program. "I'm interested in the role that the architect plays in improving health and safety for people in their environment," Vance says. "It is in this capacity that I investigate design's role in addressing health. Health is a broad term, encompassing individual and civic considerations. I have found it more suitable to discuss the definition of healthy by way of affordances for safety, and the inclusive considerations of wellbeing."

Vance takes a very broad and inclusive view of universal design in light of this health perspective, indicating that "the claims of universal design and its origins have grown with the needs of the time, maturing from affordances associated with usability in work zone situations, to engaging issues of health policy and theories of urbanism, bridging product design and urban design together." This broad view involves crossing traditional boundaries of architecture and design by reaching out to collaborate not only with other design professionals, but people in other fields, as well. This helps identify the full range of health issues, market trends, and other streams of influence to produce a truly holistic approach and design resolutions suitable for a broad range of people.

This article continues on http://go.hw.net/AR062017-2. Go online to read the rest of the article and complete the corresponding quiz for credit.

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SELECTING MATERIALS FOR OUTDOOR APPLICATIONS

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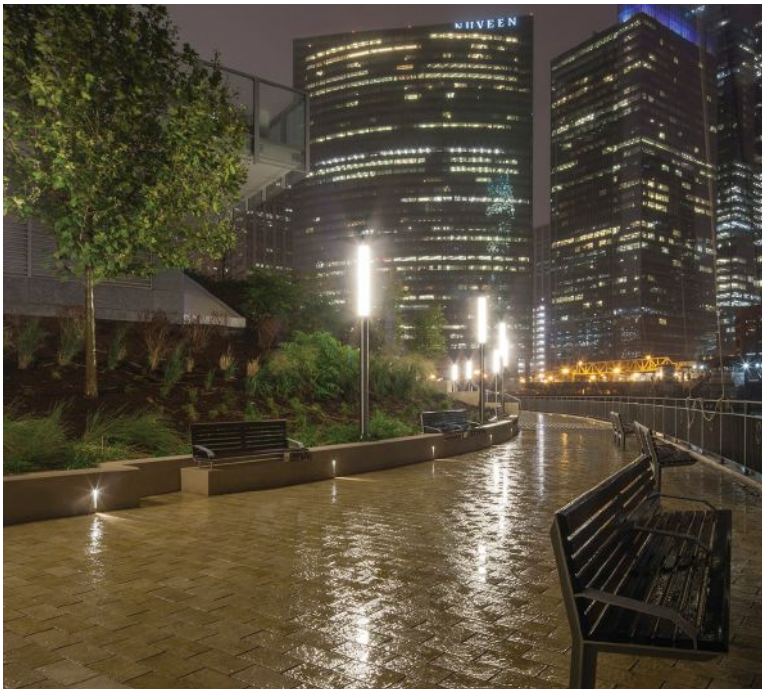

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LEARNING OBJECTIVES

- Identify conditions and constraints typical of outdoor environments, and understand the potential impact these can have on materials, finishes, and the installed project
- Evaluate several types of materials appropriate for outdoor applications based on criteria including durability, performance, aesthetics, and environmental impact
- Recognize leading green building standards and rating systems, and understand the importance of a product supplier's environmental impact management programs and environmental data collection and reporting practices
- Cite examples of products that use high-performance materials to balance these diverse challenges while offering tremendous design potential and adhering to a higher environmental standard.

CONTINUING EDUCATION

CREDIT: 1 LU/HSW

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Architects and designers have many options for specifying site furniture products for their projects, and selecting materials and finishes is an integral part of this process. Yet making material selections has become more and more complex.

Traditionally, material selection was based on criteria pertaining to aesthetics, durability and performance. More recently, in response to the rapidly growing sustainable design movement, the environmental impact of materials has become increasingly important as well.

Today's architects and designers have the responsibility of recommending materials that balance these different requirements. While numerous product options exist, the materials that comprise these products are not created equal.

It's a lot to keep up with as new materials hit the market and green building standards evolve. Two areas of focus can help guide the selection process:

1) By identifying ways to evaluate materials and select the best options for outdoor applications, the end result is beautiful, durable products—and projects—that adhere to a higher environmental standard.

2) By identifying product suppliers who can help navigate this ever-changing playing field, the better architects and designers—and their customers—can confidently make informed decisions.

Beginning with material selection, it's first critical to assess the conditions and constraints of a project site's climate, intended use, and the passing of time.

SITE CONDITIONS & CONSTRAINTS

Exposure to any or all of the following factors can have varying effects on the materials used in outdoor environments, and by extension, installed projects as a whole. The wrong materials are liable to perform poorly against desired end results, potentially requiring costly and time-consuming maintenance or repair, or even complete product replacement. The right materials can endure beautifully.

Climate & Weather

Climate and weather play a significant role in the durability of materials. Weather patterns such as fog, mist, rain, and high humidity can result in rot, oxidation and corrosion. In urban areas, acid rain caused by vehicular emissions and concentrated pollution can have a similar effect.

Likewise, exposure to deicing and coastal salts can cause materials to corrode. When it comes to coastal salt, while immediate coastal proximity might be an obvious concern, more distant locales aren't necessarily spared. Sites within five to ten miles of the shore are considered coastal; however, wind patterns can carry salt even further inland.

Hardwoods, too, are subject to weather, even those with a naturally high resistance to decay. Mildew can grow during periods of excessive moisture and sunlight's UV rays can degrade the surface of the wood.

Seasonal conditions are also important to consider. Extreme cold and freeze-thaw actions can cause distress and deterioration in porous materials like concrete. The potential weight of snow loads on overhead structures—shelters, sunshades and umbrellas, for example—can influence product and material decisions.

Sun and heat come into play as well. For example: light-colored powdercoat finishes and perforated materials are capable of reflecting or mitigating heat generated by exposure to direct sunlight. This can be important in urban areas where materials that absorb less heat can help alleviate the urban heat island (UHI) effect—a phenomenon that makes cities significantly warmer than their surrounding rural areas due to human activities.

Light-colored powdercoat finishes and perforated materials can help mitigate the effects of heat generated by exposure to direct sunlight.

Finally, the tactile qualities and thermal conductivity of materials are of utmost importance, especially among surfaces that users may touch or come into contact with. Metal surfaces quickly register temperature changes, while concrete and wood absorb ambient temperature more slowly and retain temperature longer.

Intended Site Usage

Intended site usage should also be considered when choosing materials for outdoor applications. Public spaces and high-use areas especially require products constructed of materials appropriate to the task(s) at hand.

For example, in settings destined for large gatherings, crowds or assemblies, materials should be able to withstand boisterous human activity and potential misuse or abuse.

In urban environments, materials might need to be resistant to vandalism such as burning, carving and spray painting.

In security-conscious environments, the ability of a product to effectively protect a structure or setting can be as much a factor of the right material used in the product's fabrication as the right design, tamper-resistant mounting hardware, and solid construction.

In multi-use environments, where products are regularly moved to accommodate different needs, operational hours or events, or where on-site use is balanced by off-site storage, materials and finishes need to stand up to these routines.

The Passage of Time

Finally, it's important to consider the expected lifespan of the materials and products chosen for a given setting. How long will they need to function in the space—and look good while doing it? How much, and what kind of, maintenance will they require? Month after month, year after year, how will the weather and usage conditions described above take their toll?

Product longevity has become increasingly important to material selection as we move away from our disposable mindset in favor of designs and materials that last. High-performance materials not only contribute to a good environmental story as part of the overall product manufacturing process, but they also often lead to products that can remain in use for decades. Evaluating all of these factors upfront creates a sound backdrop for the next step in the process: material assessment.

MATERIALS

Many materials are commonly found in products designed for outdoor spaces. Among the most prominent today: wood, metal, concrete, and increasingly, glass. Each has its own aesthetic and performance characteristics. Each can be evaluated by separating these top-level groups into two distinct categories:

1) Conventional materials—those traditionally available—offer varying degrees of versatility and success when it comes to meeting aesthetic, durability, performance and environmental impact requirements.

2) High-performance materials—more recently available—offer higher degrees of versatility and success when it comes to aesthetics, durability and performance. They adhere to a higher environmental standard.

WOOD

Long a popular choice for use in site furniture products, wood is a material with multiple advantages. As a natural element, it blends harmoniously with outdoor spaces. It lends warmth and character to settings of all kinds. It's relatively easy to work with, so can be shaped and detailed in numerous ways. It's versatile, as different wood varieties suit a wide range of aesthetics and functionalities. It's structurally sound. If correctly installed and maintained, it can have an extremely long service life. Finally, if properly managed, it's a renewable resource.

Conventional: Non-certified hardwoods

Many of the woods used in site furniture applications are hardwoods. Several of these are tropical hardwoods—Teak and Ipé (aka Brazilian Walnut) are among the examples found on the market today.

Durability & Performance
Tropical hardwoods have become a favored material because of their inherent hardness and strength, as well as their natural resistance to moisture, fire, insects and decay. With minimal maintenance using natural oils, they perform well over time, even in the most demanding outdoor environments.

Aesthetics
Rich variations in color and graining and the ability to weather beautifully with or without regular maintenance are two reasons tropical hardwoods make an appealing addition to exterior spaces of all kinds.

Environmental Impact
Unfortunately, while hitting high notes for durability and aesthetics, many of the tropical hardwoods traditionally used in site furniture products are inferior on the environmental impact front—largely because they're the result of irresponsible harvesting and unsustainable forestry practices.

The most biologically diverse and complex forests on earth are tropical rainforests—forests that play a critical role in mitigating climate change because they act as a carbon sink, soaking up carbon dioxide and other greenhouse gases that would otherwise be free in the atmosphere and contribute to ongoing changes in climate patterns.

But these forests are being destroyed and degraded at alarming rates. Deforestation comes in many forms, including unsustainable logging for timber, fires, clear-cutting for agriculture, ranching and development, and degradation due to climate change. This impacts people's livelihoods and threatens a wide range of plant and animal species.

High Performance: FSC®-certified Hardwoods

Fortunately, better alternatives exist in the form of hardwoods—including tropical hardwoods like Ipé—certified through the Forest Stewardship Council® (FSC®). The Forest Stewardship Council was created in 1993 to halt deforestation and safeguard forest ecosystems using the power of the marketplace. A nonprofit organization, FSC sets voluntary standards by which forests are independently certified to help customers identify and purchase products from responsibly managed forests. Over the past 20 years, FSC has earned a reputation as the most rigorous, credible forest certification system. As a result, there are significant advantages to choosing FSC-certified products.

Durability & Performance

The inherent hardness and strength of hardwoods make them incredibly durable, and FSC-certified hardwoods are no exception. They're naturally resistant to moisture, fire, insects and decay. With minimal maintenance using natural oils, they perform well over time, even in demanding outdoor environments.

Aesthetics

A growing number of FSC-certified tropical hardwoods are used in site furniture products. Teak, Ipé, Cumaru and Jatoba are a few examples. Colors and visual characteristics vary, as do FSC certification categories. Selecting FSC wood may influence choice of colors and visual characteristics because only certain species are available FSC-certified.

FSC Certification Levels

There are three types of FSC certification, including FSC Mix, FSC Recycled, and FSC 100%. Of these, FSC 100% and FSC Recycled are most relevant to the hardwoods found in site furniture products.

The FSC 100% rating means that all of the wood designated FSC 100% is harvested from forests that are legally run, environmentally sustainable, have a long-term management plan, and are socially responsible to their local villages and communities. No non-FSC fiber of any kind is permitted. Yearly audits and re-certifications ensure that products and suppliers are in full compliance with the FSC 100% designation.

The FSC Recycled rating indicates that the wood has been reclaimed from built structures, including wood-consumptive boardwalks and piers, that were demolished or otherwise retired, and that no new trees were cut down—an especially compelling aspect when you consider that the world's forests are so heavily compromised.

The FSC Mix rating means that at least 70% of the wood in a product is from FSC-certified material or recycled material; and 30% is controlled wood. While not fully FSC-certified, controlled wood cannot be illegally harvested; harvested in violation of traditional and civil rights; harvested in forests where high conservation values are threatened; harvested in forests being converted to plantations or non-forest use; harvested in forests where genetically modified trees are planted.

Environmental Impact

FSC is generally accepted in the industry as a gold standard. As projects seek to meet their own sustainability goals, FSC-certified wood can help as most green building standards give credit for the use of FSC-certified wood, especially wood labeled FSC 100% and FSC Recycled. There are other forest certification systems recognized by some green building standards but FSC is the most widely recognized. FSC-certified hardwoods are sustainably

A growing number of FSC-certified tropical hardwoods such as Teak, Ipé, Cumaru and Jatoba are used in site furniture products.

An inherent characteristic of reclaimed wood is that anomalies like nail or screw marks, minor blemishes, or other visual signs of prior use may be present in the end product. These are not considered defects but rather speak to the authenticity of the reclaimed materials themselves and should be anticipated. Products are often designed around maximizing wood yields while minimizing these occurrences. A site furniture supplier's inspection criteria can help ensure that remaining visible blemishes don't compromise the structural integrity of the wood.

harvested, biodegradable, and have a long lifecycle. Maintenance needs are minimal and require no harsh or toxic cleaners.

Products incorporating FSC-certified hardwoods may help to meet multiple green building standards, including those pertaining to certified wood, materials with recycled content and/or salvaged materials. Compliance will vary per product and ranking system; site furniture suppliers should be able to provide product- and material-specific details.

METAL

Conventional: Carbon Steel

Carbon steel (an iron alloy in which carbon is the main alloying ingredient) has traditionally been one of the most commonly used metals in site furnishings and other products designed for outdoor environments.

Durability & Performance
As a material, carbon steel is inherently strong. But it's extremely vulnerable to corrosion so requires a secondary coating for corrosion resistance. Powdercoat finishing is a typical and effective option but must be done thoroughly, without breaches that expose the underlying material, to ensure the longevity of the steel as well as the product in which it is used.

If the finish is compromised—during the coating process or in the course of a product's day-to-day use—the steel can succumb to corrosion and experience a significant compromise in its structural integrity. In addition, corrosion can negatively impact the finished aesthetic of a product. It can stain surrounding surfaces and it can wash away, potentially contaminating nearby soils and surface water.

Aesthetics
Carbon steel can be formed or cast into a diverse array of shapes and sizes, making it appropriate for a wide range of aesthetics and outdoor product designs. Powdercoating, the most common form of protection, offers a tremendous array of color and texture options that further expand the visual versatility.

Environmental Impact
Carbon steel is an inherently non-toxic, non-emitting material that contains recycled content and is recyclable. Maintenance needs are minimal assuming an appropriate powdercoat finish; no harsh or toxic cleaners are required. Products incorporating carbon steel may help meet multiple green building standards, including those pertaining to materials with recycled content and low emitting materials. Specifics will vary per product and ranking system; site furniture suppliers should be able to provide product- and material-specific details.

QUIZ

1. True or False: Many of the tropical hardwoods traditionally used in site furniture products are inferior on the environmental impact front, largely because they're the result of irresponsible harvesting and unsustainable forestry practices.

2. True or False: Hardwoods are not subject to weathering because they have a naturally high resistance to decay.

3. True or False: Light-colored powdercoat finishes and perforated materials are capable of reflecting or mitigating heat generated by exposure to direct sunlight.

4. Which FSC certification level means that all of the wood designated is harvested from forests that are legally run, environmentally sustainable, have a long-term management plan, and are socially responsible to their local villages and communities?
   a. FSC Mix
   b. FSC 100%
   c. FSC Recycled

5. True or False: Both stainless steel and aluminum are inherently non-toxic, non-emitting materials that are recyclable, contain a high recycled content, and have a long lifecycle.

6. Which of the following is a class of concrete defined by its exceptionally high strength and durability?
   a. Traditional Precast Concrete
   b. Ultra High Performance Concrete
   c. Insulated Concrete Forms
   d. Shotcrete

7. True or False: Ultra High Performance Concrete is over ten times as strong as traditional precast concrete and performs exceptionally well in harsh conditions that cause most concrete to crack and degrade over time.

8. True or False: Safety laminated decorative tempered glass consists of one or more structural decorative interlayers laminated between two lites of glass under heat and pressure to create safety laminated glass.

9. Which green building rating system is administered in the United States by the Green Building Initiative® as an alternative to LEED?
   a. Living Building Challenge
   b. BREEAM
   c. CALGreen
   c. Green Globes

10. Which of the following should you look for in a reputable site furniture product supplier?
    a. Documented and readily available environmental impact data for their products, materials and processes
    b. Dedicated sustainability personnel that stay up-to-date on evolving green building standards
    c. Third-party supplier certifications
    d. A comprehensive Environmental Health and Safety program
    e. All of the above

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FUNDAMENTALS OF CONCRETE (PART 1)

MATERIALS IN MIX DESIGN

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LEARNING OBJECTIVES

Upon completion of this course the student will be able to:

1. Understand the fundamental ingredients that make quality concrete and their impacts on performance.
2. Recognize the variables that must be considered for installation and the impact that best practices in the field have on the long term performance of site cast concrete.
3. Identify the desired properties for fresh and hardened concrete.
4. Understand the impacts and benefits that supplementary cementitious materials and admixtures have on concrete.

CONTINUING EDUCATION

AIA CREDIT: 1 AIA LU/HSW
AIA COURSE NUMBER: AR062017-4

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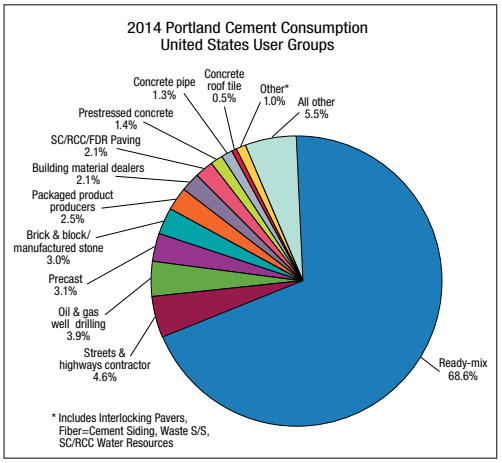
By David Shepherd, AIA LEED AP, Director—Sustainable Development

FUNDAMENTALS OF CONCRETE

Concrete is an essential building material used throughout the world, providing proven performance for strong, durable and economical construction. In fact, it is used in so many applications that it is the second most consumed material on the planet, after water. The United States uses about 300 million cubic yards of ready-mixed concrete annually for such diverse applications as paving, bridges and dams, high-rise buildings and homes, retail, office, manufacturing and municipal infrastructure.

A primary reason for this extensive use is the flexibility offered to the designer, but with this comes the responsibility to understand the strengths, limitations and optimization strategies to achieve the desired performance.



End use of cement based products in the U.S., PCA 2015. In addition to ready-mixed concrete, cement is an essential element in the production of precast, masonry, mortars, and cladding products for buildings and site-work.

This course examines many of the fundamental issues required for designing and specifying quality ready-mixed concrete for the building and site designer, although the principles are relevant to other concrete product producers as well, such as precast and masonry. Fundamentals of Concrete—Part 2, which will be published in the November 2017 issue of ARCHITECT Magazine, covers field practices and recommendations for successful installation and long service life.

PRINCIPLE CONCRETE COMPONENTS

In the simplest terms, quality concrete is a mixture of cement, aggregates, and water designed and produced for the anticipated service life and conditions under which it is expected to serve. Modern concrete mixes

Approximate volume of ingredients for a typical concrete mix.

often include other cementitious materials and a small quantity of chemical admixtures which provide performance benefits during and after placement. Each ingredient has a specific purpose and an impact on the plastic (freshly mixed) and/or hardened state properties of concrete.

Aggregates are natural or man-made (crushed) sands and gravel. These comprise the majority of the volume (65 to 75%) and mass (75 to 85%) for a unit of concrete. They are typically sourced locally and have a low embodied energy footprint.

Cement is the binder that glues the aggregate together into a rock-like mass and provides the greatest influence on the compressive strength of the final product. The ideal quantity of cement for durability and strength should be exactly enough to fully coat each aggregate particle and provide workability. Along with portland cement, the cementitious portion in a mix design may include supplementary cementitious materials (SCMs) such as fly ash and ground granulated blast furnace slag (GGBFS), also known as slag, which are often acquired as industrial by-products. SCMs offer a range of performance benefits, reduce the overall environmental impact of concrete, and remove materials from the waste stream. The cementitious content in a mix design typically ranges from 8 to 15%.

Water is the activator for cement. In the presence of water, cement undergoes hydration, combining with the water in a slow, non-reversible exothermic chemical reaction. Hydrated cement particles grow into a dense network of interlocking crystalline structures which provide the strength, durability and stiffness for which concrete is known.

Chemical Admixtures can be added to transform specific aspects of the concrete for the fresh and/or hardened states. Admixtures can change the setting rate, water demand, workability and freeze/thaw durability among other properties.

OVERVIEW OF THE ESSENTIALS FOR QUALITY CONCRETE

Both the designer and installer will benefit from an understanding that the performance of concrete is dependent on material characteristics, mix proportions, construction practices and adequacy of curing. Along with quality materials, many people with different skills come in contact with concrete throughout its production and installation. All have an influence on the successful performance of the product over the course of its service life.

Suitable Materials—This includes selecting the appropriate type of hydraulic cement and supplementary cementitious materials (SCMs) for the application; sourcing quality aggregates free from deleterious contaminants such as organic matter; sourcing aggregates that have resistance to chemical and physical deterioration; and using a clean source of water that does not adversely impact the properties of concrete.

Proper Proportioning, Mixing and Transportation—Ready-mixed concrete is made to order in quantities specific to each application on the project. The mix design of concrete for use in a 6 foot thick matt foundation, 3 constructed stories below grade, will be significantly different than that of a 4 inch thick sidewalk exposed to freeze-thaw conditions and de-icing chemicals. Equally important, consistency between batches is essential for ensuring uniformity in finishing, color and durability. Typically produced in quantities up to 10 cubic yards for transportation in a concrete truck, automated ready-mixed concrete production carefully controls quantities of each ingredient that goes into a batch. It is common for a modern ready-mixed concrete producer to maintain a catalog of several thousand mix designs covering the broad range of ingredients, proportions, admixtures and performance requirements for the multitude of applications for concrete. Issues such as delivery time, weather conditions, site conditions, and placement techniques add variables that need to be considered by the ready-mixed concrete supplier, contractor and specifier.

Proper Placing and Consolidation—Once delivered to the jobsite, the concrete is placed into the formwork by the concrete contractor. Placing the concrete may be as simple as discharging the fresh concrete from the chute mounted on the back of the concrete truck. This method is commonly employed for flatwork such as driveways, sidewalks and slab-on grade applications as well as basement foundations. Placement may also employ wheel barrows or buggies, pumps, conveyors, or crane-mounted buckets to move the concrete from the delivery truck to the final point of placement. Each method has its advantages and disadvantages (cost, delivery speed, material segregation, site logistics, etc.) and is an essential consideration for both supplier and contractor.

Consolidation refers to the physical vibration of the concrete or forms which enables pockets of air, trapped in the plastic concrete during mixing and/or placement, to rise to the surface. This process also helps concrete to fill the formwork corners and fully encase the reinforcing steel. Voids on the surface of concrete walls, known in trade parlance as "bugholes," can be minimized by proper consolidation techniques.

Proper Finishing—Finishing generally refers to the surface manipulation of flatwork. The contractor's experience and skill come to bear on the quality of finishing and jointing of the slab. This has a direct influence on both the aesthetic and long term durability of product.

CEMENT POWDER

Many people confuse the terms cement and concrete. Cement is typically a fine mineral powder and a fundamental ingredient in concrete. When mixed with water, it binds the coarse and fine aggregates into the rock-like mass known as concrete. Cement is to concrete as flour is to cake.

Sawcutting a control joint on a new slab.

Polished concrete commercial flooring—Image courtesy of Dancer Concrete Design, Fort Wayne, IN.

The combination of the concrete mix design characteristics and environmental factors create a myriad of variables to be accommodated by the finisher. Once water is added to the batched ingredients, the hydration process begins. The materials must be thoroughly mixed, transported, placed, leveled and properly finished before an initial set of the concrete occurs. This chemical reaction doesn't recognize traffic jams, difficult site logistics, equipment failure or man-power shortages as an excuse for delaying the discharge of a concrete truck.

As freshly placed concrete hardens, it undergoes volumetric shrinkage due to cement hydration and free (excess) water loss. On flatwork, this can result in random cracking if not controlled.

To mitigate random cracking, it falls on the contractor to either tool a joint into the freshly placed slab or saw-cut a groove into the hardened slab, creating a weak spot to propagate where cracking will occur. This functions similarly to the perforations in a roll of paper towels. Reinforcing steel in the slab does not stop cracking, rather it holds the cracks tightly closed when properly installed.

Concrete's versatility enables finishers to employ a range of decorative options to the final product. Color, textures and polishing can transform a concrete slab's surface to serve as a durable, attractive and healthy finish without the need for additional materials. For more information on decorative concrete see PCA's *Finishing with Color and Texture* (Kosmatka, S. and Collins, T. C., PCA PA124, 2007).

Curing—Curing is the final step for ensuring quality concrete. Concrete does not harden by drying, but rather through hydration, which requires the presence of water. Curing is the maintenance of a satisfactory moisture content and temperature in concrete for a period of time during and immediately following placement so that the desired properties may develop. Proper curing improves strength, volume stability, permeability resistance and durability. Supplemental heat may be required where cold temperatures can slow or halt the hydration process. While concrete can be placed in cold weather, once the internal temperature of fresh concrete drops below 14 degrees Fahrenheit and 80% relative humidity, hydration stops.

FRESH AND HARDENED PROPERTIES OF CONCRETE

Within a concrete mix, attributes of each ingredient have an influence on the properties of both the plastic (fresh) and hardened state of concrete. In all applications, concrete requires consistency from batch to batch including strength, color, slump (fluidity) and durability. Some aspects are more important to the contractor while others are more important to the end user. The desired properties for fresh concrete, as opposed to hardened concrete, are as follows:

Workability refers to the ability to place and finish the concrete. For most applications, freshly mixed concrete should be capable of being molded and placed by hand. If too fluid, the aggregate can separate from the paste portion during placement and consolidation. On the other hand, too stiff of a mixture causes difficulty in placement, voids and finishing impacts. Slump is the measurement of a mixture's consistency and is influenced by:

- Shape of the aggregates and ratio of fine and coarse aggregates
- Percentage of cementitious content
- Water/cementitious materials ratio
- Entrained air content
- Concrete temperature and environmental conditions
- Chemical admixtures
- Method and duration of transport

Uniformity—Often, a project requires multiple truckloads of concrete over the course of time (from hours to weeks). Samples are collected at the point of delivery to determine properties such as slump, air content, temperature and unit weight. Additionally, test specimens may be cast for lab testing of strength and other hardened properties. These tests provide uniformity checks and quantitative measurements to meet specification requirements.

Bleeding is the development of a layer of water at the surface of freshly placed concrete, caused by sedimentation of solid particles (cement and aggregate) displacing excess water. This bleeding is normal and does not diminish the quality of properly placed, finished and cured concrete. After the bleed water evaporates a window is available for the contractor to achieve the desired surface qualities before final set occurs. Beginning the finishing operation while bleed water is on the concrete surface will increase the water/cement ratio on the surface layer of the slab, causing surface durability issues.

Setting and Hardening—As cement particles hydrate they form a crystalline network that knits together, creating a rigid matrix around the aggregates. The rate of hydration determines the setting characteristics and rate of hardening, which must be slow enough to allow for transportation, placement and finishing. Setting is the transition period between fluid and solid states.

The desired properties for hardened concrete are as follows:

Drying Rate—After the final set, the body of the concrete must retain enough internal water (>80% relative humidity) during the curing process for the cement to hydrate to a level that achieves the desired (specified) properties. Temperature, humidity and air flow all contribute to the drying of concrete during this critical stage. Internal moisture loss can be reduced by specifying topically applied curing compounds, plastic sheeting or wet curing to promote optimal curing conditions.

Strength—Concrete's compressive strength comes from the aforementioned matrix of hydrated cement paste and aggregates. This strength is governed by the water/cement ratio and hydration progression influenced by curing conditions and time. In the U.S. strength is generally specified in pounds per square inch (psi) of axial loading at 28 days after placement.

Permeability—Permeability is the migration of water or other substances (liquid, gas or ions) through the hardened concrete and is a function of the permeability of both cement paste and aggregate components. Permeability reduction strategies include a low water/cement ratio, use of SCMs and lower w/cm to densify the paste, and adequate cement hydration by proper curing techniques and time. Decreased permeability improves concrete's resistance to corrosion, freeze/thaw degradation, and sulfate attack.

Volume Stability and Crack Control—Like most materials, hardened concrete will change volume due to temperature, moisture content and stress. This volume change in concrete ranges from around .01 to .08%. The thermal movement is about the same as that for steel, which is why steel is a compatible material for tensile reinforcement.

Drying shrinkage is an inherent property of concrete. Cracking is addressed by properly designed relief joints and placement of reinforcing steel. The tooled or saw-cut joints in sidewalks and exterior slabs are a common example of jointing to control random cracks that would otherwise occur. In applications such as a large building foundation, control joints and construction joints are commonly installed with integral waterproofing measures to prevent moisture infiltration.

Durability—Durability can be defined as the ability to resist weathering, chemical attack and abrasion while maintaining its desired application properties. Its use is extremely important to consider for exterior concrete applications such as in highways, bridges, ports, dams, as well as above and below grade aspects of building construction that subject the concrete to a greater variety of exposure conditions.

This article continues on http://go.hw.net/AR062017-4. Go online to read the rest of the article and complete the corresponding quiz for credit.

QUIZ

1. The largest portion of cement consumed in the U.S is by:
   a. Masonry and cast stone products
   b. Ready-mixed concrete
   c. Pre-cast products
   d. Pre-packaged concrete mix for retail sale

2 Hydraulic cement in the presence of water undergoes a chemical reaction called
   a. Hydrosis
   b. Scarification
   c. Hydration
   d. Calcification

3 Aggregates typically account for _____% of concrete's mass.
   a. 45–55%
   b. 55–65%
   c. 65–75%
   d. 75–85%

4 The 28 day compressive strength of concrete is most influenced by which ingredient?
   a. Sand
   b. Gravel
   c. Cement
   d. Reinforcing steel

5 During cement manufacturing, calcining (decomposition of minerals) accounts for _____% of CO_2 generated:
   a. 40%
   b. 50%
   c. 60%
   d. 70%

6 True or False: Installing steel reinforcing in concrete flatwork will eliminate random cracking.

7 A high water/cement ratio in the mix design will result in:
   a. Increased drying shrinkage
   b. High permeability
   c. Lower strength
   d. Lower durability
   e. All of the above

8 According to the American Coal Ash Association, how many tons of fly-ash was diverted from landfill to be used in the production of concrete in 2015?
   a. 500,000 tons
   b. 5,300,000 tons
   c. 9,400,000 tons
   d. 15,700,000 tons

9 Which of the following regarding maximum aggregate size is not true:
   a. 1/5 the narrowest dimension of a vertical concrete member
   b. 1/2 the size of the largest reinforcing bar
   c.3/4 of the clear spacing between reinforcing bars and between the reinforcing bars and forms
   d. 1/3 the depth of slabs

10. Each additional percentile of entrained air reduces the compressive strength of concrete by about:
   a. 1%
   b. 4%
   c. 6%
   d. 9%

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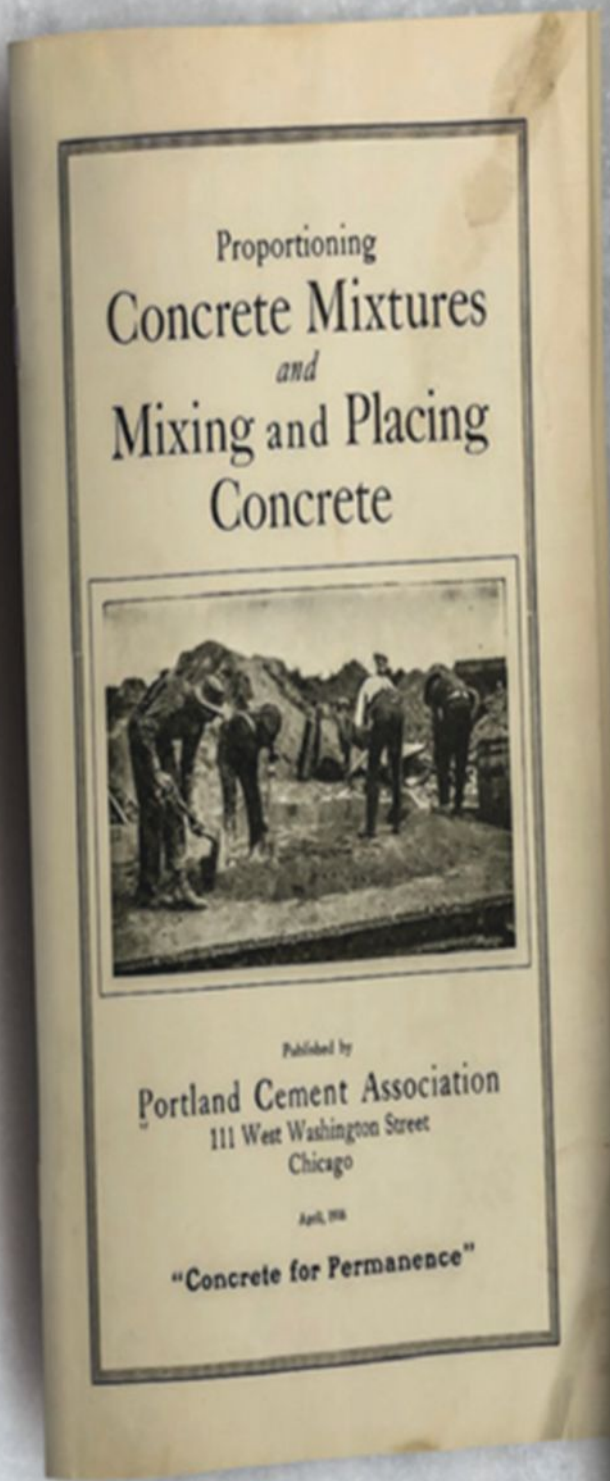
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SUSTAINABILITY AND STRUCTURAL STEEL: A CLOSER LOOK

Presented by:

Long spans, curved steel members and abundant natural light highlight the new Anaheim Regional Transportation Intermodal Center in Anaheim, Calif., which won a 2015 AISC IDEAS² Award and achieved LEED Platinum certification. Photo courtesy: Thornton Tomasetti, Inc.

LEARNING OBJECTIVES

Upon completion of this course the student will be able to:

1. List numerous sustainable characteristics of structural steel.
2. Establish an appropriate methodology for comparing the environmental impacts of structural framing materials.
3. Examine the cradle-to-cradle supply chain for domestically produced and fabricated structural steel.
4. Identify strategies for minimizing the environmental impacts associated with structural steel.
5. Locate available resources for additional information on structural steel sustainability.

CONTINUING EDUCATION

AIA CREDIT: 1 LU-HSW
AIA COURSE NUMBER: AR062017-3

Use the learning objectives above to focus your study as you read this article. To earn credit and obtain a certificate of completion, visit http://go.hw.net/AR062017-3 and complete the quiz for free as you read this article. If you are new to Hanley Wood University, create a free learner account; returning users log in as usual.

While commonly recognized for its high recycled content, structural steel is a multi-attribute building material, the use of which can significantly reduce the environmental footprint of a building.

The steel industry in the United States recycles more tons of waste than any other domestic industry with 81 percent of all steel products being recycled back into new steel products. Of all steel products, an impressive 98 percent of all structural steel is actively recovered and recycled or reused. The result is that the recycled content of domestically produced and fabricated structural steel used for structural framing systems is greater than 93 percent.

"The production of steel from recycled material can use less than one third the amount of energy needed from starting with raw ore only," states Donald W Davies, P.E., S.E., president, Magnusson Klemencic Associates, Seattle. "It's huge when buildings can take advantage of this type of recycling."

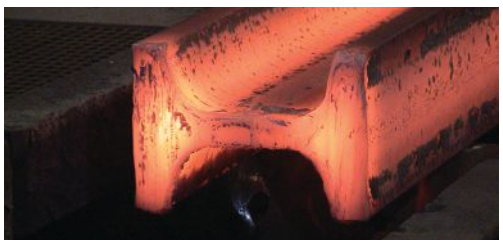
Steel's recyclable attributes are only part of the story as there is a larger storehouse of sustainability benefits provided by structural steel. Today we know that steel is much more than a single attribute material, and we recognize the multiple attributes of steel that contribute to sustainable construction in many ways.

Consider the following:

- Domestic structural steel mill capacity exceeds current and foreseeable domestic demand with more than 75 percent of current demand being met by domestic producers.
- Hot-rolled structural steel mills in the U.S. do not use iron ore, coke or limestone as primary feedstock materials; no mining operations are required.
- Unlike the legacy steel mills of the early 20th century, today's structural steel mills have highly sophisticated systems to minimize emissions. They are highly

automated, environmentally conscious good neighbors in the communities where they are located.

- Steel does not lose any of its metallurgical properties when recycled. Consequently, the quality and properties of recycled steel are the same as virgin steel.
- Iron is a non-depletable resource as all steel can be recycled, and any increase in demand beyond the available supply of scrap can be met by the earth's abundant supply of iron which comprises 35 percent of the earth's mass.
- Structural steel mills recycle all of the water they use through a closed-loop recycling system. Less than 70 gallons of water is consumed per ton of steel produced.
- There are close to 2,000 steel fabricating firms located throughout the U.S. that detail, cut, drill, bolt and weld structural steel for building projects, providing local employment and economic stimulus.



This beam blank is exiting the caster prior to reheating and rolling into a structural section. Photo courtesy: Nucor

COMPARING STRUCTURAL STEEL TO CONCRETE AND WOOD

In comparing structural steel to concrete and wood, Rob Still, P.E., senior structural engineer at T.Y.Lin International—Lindbergh, Charleston, S.C., points out that wood is subject to mold, mildew, rot and termite damage, so while it may be considered sustainable, its life expectancy is generally less than steel or concrete structures.

Compared to concrete, structural steel is a lighter, stronger material allowing for dimensionally smaller columns, longer spans, greater openness and reduced foundation requirements.

Of the major framing materials, only structural steel is regularly recycled back into new structural framing material. Some concrete members are down-cycled into road base. The rest goes into landfills, like wood, which cannot be recycled. Structural steel members can also be reused in-place or in new building projects.

"The steel advantage really comes from its light weight, speed and ease of installation, and resistance to corrosion and deterioration," summarizes Still.

Furthermore, the steel industry is actively working on new technologies and materials, such as buckling restrained brace frame systems and high strength steels, to further lighten steel structures. "Both of these advancements are leading to lighter, more efficient and more sustainable structures," he adds.

Pointing out another advantage of steel over wood, Alison Kung-Kellerer, LEED AP BD+C, associate, Carrier Johnson + CULTURE, San Diego, notes that steel is non-combustible with a high melting point, making it fire-resistant and able to be exposed to view. "Wood, on the other hand, most often has to be covered with gypsum wallboard or plaster to be fire-resistant," she explains. "Steel is also ductile, rather than brittle, so it can be used more efficiently than concrete when considering seismic forces."

Steel framing also offers the most long-term flexibility, in that it easily can be strengthened in the field, by welding on stiffening elements, should loading need to change over the life of a building, she says.

Shown during the erection of the structural steel frame, the new 33-story LEED Platinum Tower at PNC Plaza sits on a five-story podium and houses more than 800,000 sq. ft. of commercial office, auditorium, lobby, cafeteria, parking and amenity spaces. The superstructure is entirely steel-framed, using composite steel beams with a steel braced lateral system. In all, the project uses 8,000 tons of structural steel and 200,000 bolts. Photo courtesy: Sippel Steel Fab

Another example of the efficient use of structural steel is that it can be used for both the required support of structural loads and as a finish material, according to Tim Keil, RA, associate principal, Studio Ma, Phoenix.

He also adds that, "the ability to create seamless members and exploit the material's high strength through welding is a major benefit over other structural materials."

In a nutshell, if building teams are looking to reduce their carbon footprint, the real secret in the sauce, says Davies, is in making building choices that stand the test of time. "Steel solutions can achieve both resiliency and adaptability for the future in ways other materials can't on their own," he asserts. The steel industry has always been building hundred-year buildings.

And it remains true as well that domestically produced structural steel is a highly recycled and recyclable material. The recycled content of domestically produced hot-rolled structural steel is greater than 93 percent. The variation is the result of small amounts of ferrous and non-ferrous materials being added during the production process to achieve the proper chemical balance for the specific grade of steel being produced.

Unlike other materials such as concrete, which is typically down-cycled into road base, steel is 100-percent recyclable, without any loss of the metallurgical properties. Structural steel is a true cradle-to-cradle building framing material.

Of course, it's one thing to be fully recyclable, in theory, but another to actually be recovered and recycled or reused. Industry wise, 81 percent, by weight, of all steel products are recovered, with an impressive 98 percent of structural steel recovered for recycling or reuse. This compares to aluminum's recovery rate of 65 percent and a rate less than 40 percent for wood. Steel, by far, has the highest recovery rate.

PROPERLY COMPARING THE ENVIRONMENTAL IMPACTS OF STRUCTURAL FRAMING MATERIALS

The construction industry, as a whole, consumes a significant percentage of the world's natural resources and energy.

"As architects and designers, we believe that it is our professional responsibility to minimize the impact of the structures we design and build," states Kevin Nasello, AIA, LEED AP BD+C, senior associate and director of sustainability, CetraRuddy, New York. "Analysis of the embodied energy and other environmental impacts associated with each material is an imperative first step to a sustainable building design."

However, performing a true comparison is a complicated endeavor. Unfortunately, it is not

uncommon for building teams to mistakenly evaluate a framing material's sustainability characteristics based upon CO_2 emissions per unit of mass alone. On the contrary, a material's contribution to the environmental impacts of a project are a function of the amount of material used, the process utilized to make the material and the impacts directly associated with the material. You have to adjust the mass-based numbers to account for the differences in the amounts of each material that would actually be used in the building.

"Framing materials cannot be compared directly to each other," states John Cross, P.E., LEED AP, American Institute of Steel Construction, vice president, Chicago. "Simply put, the same square footage in a building does not require equal amounts of steel, concrete or wood. Structural steel is a stronger, more durable material, and less structural steel is required to carry the same structural load as would be required of concrete or wood."

In order for these factors to correctly be evaluated, a more comprehensive life cycle comparison is in order. For example, building teams must consider factors like the time to construct the building, the carbon footprint required to produce a specific quantity of material, the impact of other systems such as increased foundations in concrete buildings and the thermal qualities of the materials, says Still.

Adding to the list, Nasello asks the following questions: How is the material extracted at its source? How it is manufactured, including use of raw materials, recycled content and pollution as a result? What is the method of transportation to the construction site? What are the means and methods of construction? What about on-site and off-site waste management, use, and maintenance? And if it is demolished, how is it recycled?

Taken together, Davies points out that the longest standing, most durable buildings typically have the potential for the lowest overall carbon footprints because they are correctly evaluated over time. "Those findings get even better when our building materials that are taken out of a deconstructed project are able to be re-used for a next-generation design," he adds.

As opposed to a single-attribute comparison, a whole building life cycle assessment (LCA) produces a more objective, thoroughly evaluated comparison based upon multiple factors. A word of caution, though, as building teams might mistakenly believe that all a LCA comparison requires is a schematic design of a building, a list of the environmental impacts associated with all of the materials that will be used in the building, and a simple drop-in of the numbers into an estimation tool to create a legitimate building comparison.

"Pushing a 'smart' button and receiving a list of comparative environmental impacts for two building alternatives is not possible. In fact, nothing could be farther from the truth," states Cross.

At the Seattle Central Library, the design of a steel diagrid eliminates 90 percent of the aluminum that would typically go into a façade mullion system. Photo courtesy: Pragnesh Parikh/MKA

FOR A MORE ACCURATE LCA

In order to truly conduct a whole building LCA, the project team must answer the following questions:

- What portions of the building are to be considered in the analysis?
- How are the building alternatives selected?
- What is the basis of comparison between the two building alternatives—materials or design?
- At what stage of design should the comparison be performed?
- How will the quantity of materials used in the two alternative building designs be determined?
- How accurate are the material quantities being used?
- Is operating energy to be included in the evaluation?
- What was the scope of the collection of the impact inventories?
- Are all product inventories consistently using the same scope?
- What methodology and assumptions were used in determining the environmental impact inventories for each product or material?
- What is the veracity of the environmental impact inventories used for each material or product?
- What environmental impact categories will be evaluated?
- What level of environmental improvement is desired for each category?
- What level of environmental detriment will be tolerated in each category?
- How will impact categories be prioritized against one another?

While the Environmental Product Declarations furnished by a growing number of building product manufacturers and industry associations can help building teams fill in some of these blanks, they are limited in their contribution toward this end.

"EPDs often measure different variables at the start and end-use stages, and it is a bit of an apples and oranges comparison," reports Davies. A better comparison "is a long-term goal, but our industry is simply not there yet."

As a case in point, MKA was recently commissioned for a project where the client wanted to pursue an all Cross Laminated Timber (CLT) design. To thoroughly vet the option, MKA created comparative options and analyzed various options, in detail. In the end, the structural engineers parametrically combined the options in optimized building choices.

"Even with the optimized mass timber frame, it was not a clear, low-carbon winner over efficiently-designed composite steel or other frame alternatives, when all comparative building requirements, including acoustics and vibration, were taken into account," he reports.

Ultimately, an efficiently-designed composite steel frame showed a slightly lower total cradle-to-grave carbon footprint, but the variability between the EPD data didn't allow for declaring any one winner on a material-only basis.

"During design, I would argue that true sustainability comparisons are not practical with today's available material information," he suggests. "The most sustainable solutions, though, will often come from architects and engineers using materials for what they are most efficiently suited, exposing the materials to limit secondary finishes, and finding opportunities where more than one function is achieved for each material used. Most

importantly, looking for the options that give the greatest chance for the building to remain standing for the longest period of time is key."

On that note, Christopher Alt, RA, principal, Studio Ma, Phoenix, states that building with steel typically results in more openness and transparency, taking up less space within the floor plate. Overall, this usually yields a higher net-to-gross ratio, freeing up more usable space within the same footprint. Or, conversely, it allows for smaller buildings with the same amount of usable area.

ADDITIONAL LCA RECOMMENDATIONS

To assist building teams with performing whole building LCAs, the following key points are recommended:

- While simplified tools that estimate environmental impacts may be interesting, they should not be relied upon to accurately determine the relative environmental impacts of two alternative building designs.
- Any whole building LCA comparison must be based on structural quantities determined by a licensed design professional competent in the practice of structural engineering using an analytical design tool, not parametric estimates of material quantities generated by a simplified LCA tool.
- Just as a competent structural engineer should be determining material quantities, a competent professional, skilled and experienced in the performance of whole building LCAs, should perform the LCA. This task should not be assigned to a member of the design team, that is unskilled in the use and interpretation of LCAs.
- At this point in the evolution of whole building LCAs, the comparison of iterative designs, using similar products and materials, is much more instructive, reliable and worthwhile than attempting to compare buildings with dissimilar materials and products.
- Evaluation of building operating energy is best performed outside of the LCA by energy professionals using tools specifically designed for that level of analysis.
- Material producers and product manufacturers should be encouraged to publish environmental impact inventories for their products that clearly delineate the scope and methodology used to determine those impacts.
- Any comparison of materials, products or combinations of materials and products into assemblies and/or the whole building should only be performed when all products and materials are using consistent scopes and methodologies.
- Rather than rely on a cookbook approach to determining the relative importance of increases and decreases in environmental impacts, the design team should evaluate a broad range of impacts in the context of global, regional and local priorities.

QUIZ

1. What percentage of structural steel is actively recovered and recycled or reused?
   A. 90 percent
   B. 92 percent
   C. 95 percent
   D. 98 percent

2. What percentage of the earth's mass is made up of iron?
   A. 20 percent
   B. 30 percent
   C. 35 percent
   D. 40 percent

3. True or false: Structural steel can only be down-cycled into a lesser value steel product.

4. Which of the following is an important consideration for conducting a Whole Building Life Cycle Assessment?
   A. An accurate estimate of material quantities
   B. The impact categories to be evaluated
   C. The consistency of the scope of the impact data for various products
   D. All of the above

5. True or false: Environmental Product Declarations can be used to perform an accurate life cycle comparison of different structural framing materials.

6. The majority of the recycled steel in domestically produced structural steel comes from which product?
   A. Composite floor decking
   B. Appliances
   C. Automobiles
   D. Airplanes

7. Close to how many structural steel fabrication firms are there in the U.S.?
   A. 500
   B. 1,000
   C. 2,000
   D. 3,000

8. Why is specifying domestic steel more sustainable?
   A. The steel is produced using a more environmentally-friendly electric arc furnace process.
   B. More iron ore needs to be mined.
   C. More water is used.
   D. None of the above

9. The cost to deconstruct a structural steel building compared to a similar concrete or wood building is:
   A. More than concrete or wood
   B. Less than concrete or wood
   C. The same as concrete or wood
   D. More than wood but less than concrete

10. From a sustainability perspective, why is it important to involve the steel fabricator early on in a building project?
    A. To capitalize on their expertise in optimizing the structural system
    B. To improve the acoustics
    C. To reduce the number of subcontractors required
    D. To offer suggestions for interior finishes

This article continues on http://go.hw.net/AR062017-3. Go online to read the rest of the article and complete the corresponding quiz for credit.

SPONSOR INFORMATION

The AISC Steel Solutions Center provides a wide range of technical information and support services for building teams including information on the sustainable attributes of structural steel. To learn more about structural steel and sustainability, the Steel Solutions Center can be reached at 1-866-ASK-AISC or solutions@aisc.org.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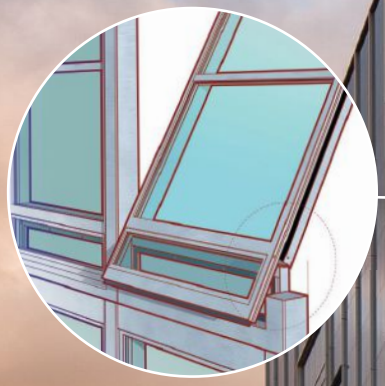

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Starting From Scratch

Running a small firm means building genuine connections with your team.

As the 2017 chair of the AIA Small Firm Exchange, Mel Price, AIA, is the voice for small firms around the country. Lucky for them, she's never been afraid to take a bold stance on the issues impacting her firm or the profession. A principal at Work Program Architects (WPA) in Norfolk, Va., she believes that unique tactics are required when running a small business. Whether it is satisfying clients or giving her employees detailed insight into firm operations, one of her tenets is to build a firm that other architects would want to emulate.

As told to Steve Cimino

I always knew a small firm was for me. I started at a small firm in San Diego—one so well-organized that it ran like a medium-sized firm—and then worked for another small firm once I moved back to Norfolk. I realized how quickly you learn and how much responsibility you get to take on, which does so much to advance your career. In 2010, my partner Thom White, AIA, and I started WPA, and we began with some very, very specific goals in mind, such as that the maximum size we ever wanted to be was 15 to 16 employees.

We had some out-of-the-box ideas for running our firm. We have a fully open office plan and we're financially transparent. One of our goals is to teach the business side of architecture as we learned it: salaries, what's in the checking account, and the flows of a small business. We want our employees to feel connected to the work they're doing, and to understand how we aim to be profitable.

Besides the typical benefits, we pay all AIA member dues and events tickets. We pay everyone's cellphone bill and gym membership. We have three company cars to ensure that all staff can bike to work while still being able to visit any projects under construction. We also send everyone to a conference of their choice every year. Salary is not the most important thing for many young architects. They want to feel connected to the company they're working for. They want to know that the company cares, and that they're being given opportunities to connect to their community. It was important to us to offer those types of things.

If you're buying or inheriting a firm, it's incredibly hard to change the culture; it's much easier if you're starting from scratch. When we began, we wrote down a dozen core values that we were unwilling to budge on—for example, the open office, the transparent office. On all the other things, there's room for anyone who joins us to have influence.

When we interview potential staff, we say, "You are signing up to work in a fully transparent workplace. It's not a great fit for everyone, and that's fine. It can be hard, and requires more communication, but long-term it is going to pay off." AIA

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Beyond Bricks and Clicks

Few market sectors have seen more technological and cultural changes than retail, which is redefining itself to remain relevant. The evolving retail model seems to be based in fusion. The exchange of goods and services is morphing and combining with other types of interactions, technologies, and categories. Concurrent with these shifts in the retail model, retailers, developers, architects, and designers are trying to define the role that the physical environment plays in this new shopping paradigm.

Read about the retail sector and more in the AIA Foresight Report 2017 at *aia.org/foresight.*

Tech | Traditional Retail

Amazon opened its first bricks-and-mortar bookstore in Seattle. The 5,000 volumes it stocks are based on online sales data and the retail location will likely feed that information into the company's online strategy.

Personalization

Macy's and **IBM Watson** have teamed up (through developer **Satisfi**) to create **Macy's on Call,** an AI-powered mobile shopping assistant that allows shoppers to use natural language to find where specific products, departments, and brands are located, as well as learn what services and facilities can be found in a given store.

Tech | Culture

The **Samsung 837 Store** on Washington Street in New York City carries no inventory but attracts customers through a combination of ultra-hip events and features such as a gourmet coffeehouse and café, live streams of product announcements, and a viewing party for the Oscars.

Experience

Westfield Corp., the $27.7 billion global shopping behemoth, has created **Westfield Labs** in order to redefine the complete shopping experience from planning the trip to parking, dining, and receiving goods purchased. Westfield's plan is to reinvent its 35-plus shopping centers throughout the world.

ILLUSTRATION: LAUREN NASSEF

AIAFeature

Shifting Gears in Today's Workforce

Architects share their attitudes about retirement, firm succession, and growing within their firms.

Written by William Richards and Steve Cimino

ILLUSTRATION: MICHAEL KIRKHAM

Since the Great Recession, one out of three Americans who planned to retire will continue to work indefinitely. The rest? They might have to work at least part-time, even if they're expecting to collect on retirement accounts, pensions, Social Security benefits, and investment dividends. Are architects really like "the rest," though?

According to AARP's 2014 Retirement Confidence Survey, the average expected age for retirement among all Americans 50 or older has increased since the mid-2000s, from 64 in 2004, peaking at 67 in 2012, and back down to 66 in 2014. It's true that the Great Recession of 2008 maps neatly onto that upward trend, with its nadir in 2008 corresponding to shrinking confidence in profitability and personal finances generally. But recessions are abstractions of everyday realities, and if you're in your late 50s or 60s, you've already been working long enough to have seen what collateral damage looks like at least three times in 1990, 2001, and 2008.

One of the major differences for boomers between 2008 and the previous recessions of 1990 and 2001 is that this time around many of them had college-age children. According to a 2017 report by the Federal Reserve Bank of New York, the number of Americans over the age of 60 taking out student loans on behalf of their children ballooned from 700,000 in 2005 to 2.8 million by 2015 (owing, in part, to the skyrocketing cost of college tuition and room and board, too). And, let's not forget about the unscrupulous lending practices of that period, with some schools pushing "preferred lenders." The net result for some of these parents was accruing massive amounts of debt—worth north of $100,000—at a time when some of them hadn't yet finished paying off their own houses. The rise in mortgage debt—or what *The Washington Post*'s Rodney Brooks called "the new retirement time bomb"—poses an equal if not greater threat to boomers, whether they have kids or not. According to the Consumer Financial Protection Bureau (CFPB), 30 percent of Americans over the age of 65, and 21.2 percent over the age of 75, are still paying off their home mortgages on either a primary or secondary residence. In real numbers, the CPFB puts the median mortgage debt among Americans over the age of 65 at $79,000.

So how do today's architects view retirement? We spoke to five architects and designers at various stages in their careers: from age 27 and headed down the path to licensure to age 62 and seriously considering what to do at age 70 and beyond. One trait they all share is a deep need to wring the most out of their skills for the benefit of their firms and their clients before it's time to move on.

Rusty Walker, AIA
Partner, Holabird & Root, Chicago
Firm Size: 50–55
Age: 48

Your portfolio sometimes doesn't mature until you're my age, or even older than I am. But you are still gaining experience along the way. We basically have a lot of people [in our firm] that are homegrown partners—this was their first job and are partners now. I came in mid-career and have advanced to partner. In the first 10 to 15 years of my career, there was extremely high attrition [among my peers]. The people that stuck with it are doing extremely well now, and have made principal level. Folks who moved on, because they were looking for different experiences, have also done well. In the first 10 to 15 years, folks jumped to the development side or the university side to teach—and my generation was almost completely wiped out by the two recessions. Right now you could count on one hand how many architects are around in their 40s. I'm 48 now, and a lot of the people I graduated with moved on.

For each generation that I interact with, there are differences. There are people who see it as a job. There are people who see it as a career. There are people who see it as a calling. And the folks who see it as a calling are never leaving. When you take on a partner role, like I have, there's a real need to bring the firm along with what you've acquired.

There's a balance, though, as you think that you need to get out of the way at some point—and you want to create a smooth transition. We have a saying here: Being a good leader is about getting over yourself.

My retirement plans? My wife and I will

AIA Feature

CONTINUED

go to Colorado. My firm has a mandatory retirement age of 70, so at that point I'll have to step down. I should say, though, that there's an interesting quality of legacy firms, as we are, that we are constantly thinking about the next generation. That's important to us.

Jennifer Matthews, ASSOC. AIA
Associate, Array Architects, Washington, D.C.
Firm Size: 150
Age: 27

I think I could someday be comfortable with retirement if I felt completely at peace with the idea that I have utilized my skills to the best of my ability in all aspects. I am currently taking advantage of, and strengthening, the technical design skills I have, but I also focus on my leadership skills by developing programs that assist emerging professionals and students.

To really be comfortable approaching the end of our professional careers, we owe it to ourselves to tap into our strengths and use them, whether it is within a traditional path of architecture or a nontraditional one. If I am certain that I have successfully helped the profession progress through each of the skills I define as a strength, I would be okay with making the decision that I have given all that I can.

Although I currently work at an architecture firm and am pursuing licensure, I remain interested in other aspects of architecture as it pertains to programming and professional development for students and emerging professionals. I maintain a presence in the leadership and advocacy realm of architecture, where I can speak to going through the traditional process of licensure and using that knowledge and experience to become part of the solution.

I admire my generation's ability to step outside our comfort zones and adapt to change for the sake of progress, because we need individuals who are not afraid to go against the norm to create the change we wish to see in our profession. We value stability and want to be comfortable, as previous generations did; however, we are also interested in accomplishing goals bigger than ourselves and contributing to causes that have an impact beyond our own lives and careers.

It is important for employers to take advantage of the leadership abilities and professional interests of their younger employees. There are some firms who do not encourage young employees' multifaceted skills because they feel that the particular individual was hired for [one] certain skill, or because the implementation of [other] skills might take away from daily duties of architectural production. But a successful employer should embrace all skills and allow their employees to act on them. That is what we do at Array; our leadership encourages ideas and provides opportunities and support to execute them.

George Knight, AIA
Founder and Principal, Knight Architecture, New Haven, Conn.
Firm Size: 4
Age: 49

I'm 49, and am happy to report that many of my contemporaries are still practicing architecture. Predictably, some of them have pursued careers collateral to architecture, like planning, development, teaching, graphics, etc. No doubt that 2008 was a body blow, and it changed the way I approached my own firm, certainly. But the group that I grew up with shared a similar love for the work. I think nimbleness is central to my peer group, drawing in other disciplines and being flexible about the kind of work we take on. I teach at Yale, and I have found that the energy and quality of work the students produce is undimmed from the energy and quality of the work that my peers were doing in school a generation ago. The world needs architecture more than ever—not simply because of the patterns of contemporary demography, but qualitatively as well.

Advancement is possibility, and one of the things I've tried to do in my firm is to expect and appreciate contributions from staff at every level. I'm excited that, when people first start here, they feel empowered to make contributions that are perhaps above their level. There are no discrete offices in our space—it's one big room—and we try to create a salon environment so that open interaction can occur. At a very small firm, a tiered arrangement does not make sense. When we were around eight or nine people—before the recession, a number that I want to return to soon—we had to have tiers to organize teams. And I expect to reorganize once we grow again, so that our designers can have a defined position relative to others—not to create a power hierarchy, but to create clarity.

When I worked for Cesar Pelli & Associates, it was upwards of a hundred people in New Haven alone. But because they had strategic alliances with firms around the world, those hundred did the work of a thousand people—and they could produce a staggering amount of architecture. I took a great deal of inspiration from that office. Certainly, as you would expect with a seasoned office, there were tiers there, yet one never felt that those tiers were oppressive. They presented a kind of organizational clarity, defining relationships between the principals, among project teams, and within specific projects. Cesar always went out of his way to know everyone on his staff. My first week he came over to me to introduce himself, we had a brief exchange, and I eventually worked my way up to being a senior associate.

One of the practices that was instrumental—and perhaps to a lesser degree still is—was the Pelli office's reliance on physical models to study and present architectural ideas. Cesar came out of Eero Saarinen's office, which also made use of extraordinary physical models, and there it was frequently the entry-level person's task to get really good at being a model builder. We had the same system at Pelli's office. If you're a model builder, in general, you are forced to address gaps in the design directions you receive on paper sketches and drawings. Starting as an avid model builder myself, I found that to be a fabulous opportunity to contribute to projects, even in minor things.

Retirement means the same thing to me today as it did on my first day 25 years ago. I want a greater amount of free time for vacations, for instance, but I love working every day—and I don't expect that to change. I won't be content if I don't feel productive.

A.J. Sustaita, AIA
Associate, Corgan, Houston
Firm Size: 604
Age: 39

I firmly believe that architects can make money, have a successful career, and support a family. I am a second-generation architect, following in the footsteps of my father before me. Growing up, my family was always comfortable and well provided for. To me, that is the definition of success.

I love speaking to emerging professionals younger than me or around my age about the

financial potential for our profession. In my opinion, the financial aspect of an individual's career can work itself out if you find the right firm and work towards ambitious goals. Having spent over 20 years working in architecture with a family of my own now, I can state with all certainty that architecture will provide a good life for us.

My ultimate career goal is to become a principal at Corgan. Although that end result may be several years away, I'm fortunate to work for a firm that provides a clear path from my current position to where I want to be in the future. It also should be noted that our firm leaders are very supportive regarding professional development. That's the way it should be for all emerging professionals: the ability to sit down with senior-level staff and map out goals, as well as the path to reaching those milestones.

The present is always the right time to start thinking about long-term goals, especially when it comes to retirement. For me, successful retirement means the freedom to walk away whenever I am ready. I have a minimum age of 65 in mind, but when I reach that age I may find a passion for mentoring and developing the next generation of architects and leaders in architecture.

I want to have the freedom to accommodate those motivations in the latter stages of my career. In that sense, retirement should be a large part of our current conversation when it comes to work-life balance. For me, that's retiring between the ages of 65 and 70. Working beyond those ages is not something I want to do. Ideally, I'm going to work hard and make my mark while training the next generation to lead when I'm ready to bring that balance to life.

David Haresign, FAIA
Principal, Bonstra Haresign, Washington, D.C.
Firm Size: 26
Age: 62

Our firm does essential urban mixed-use work, and we attract talented young people who aspire to be well-rounded urban architects. Our folks tend to stay with the firm for long periods of time, and we hire three to five people each year—in a robust year. Usually one or two of them are new graduates, and one or two of them are seasoned folks with a lot of experience. We're active in the schools as critics and through teaching, so we are able to scout and recruit very talented folks there. Our firm is set up to provide a great postgraduate education, where all are exposed to a full range of architecture. They're not pigeonholed into one thing because we want to nurture well-rounded practitioners.

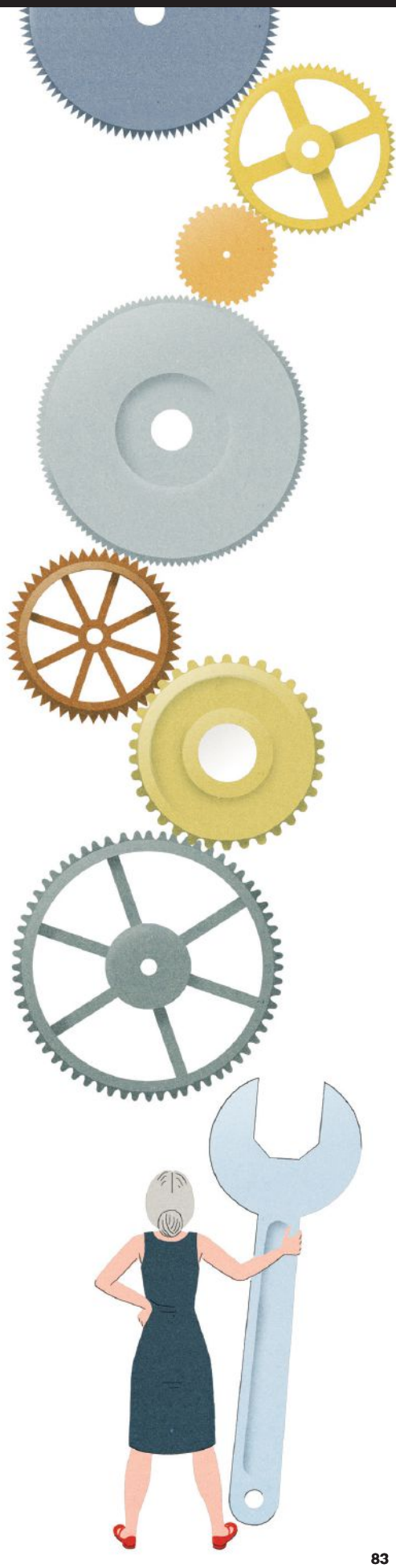
I am not certain that I'll ever fully stop working as an architect. I've never really thought about retirement; I just figured I'd just die at my desk. When I first started as an architect, I was very hungry and driven—I worked long hours that were consistent with high achievers in my peer group. Sixty hours a week was average then; I'm the oldest architect in our firm, and I still am close to averaging that now.

Other people in our lives—like my wife, Patricia—may have their own vision of our future, and hers is where we both work a little less and we have the opportunity to enjoy time together. Neither of us is ready to fully cash in our chips and stop working. We're both fulfilled professionally, but we would like—in five or six years—to slow the pace a hair. I may feel differently as that number approaches, but by the time I'm 70 years old, I'd like to be divested from the business.

Whenever cash flow is slow, I tend to wake up in the middle of the night. I'm a worrier by nature, and I am always wondering how I can do something differently or better. I'd like to feel a little less pressure in that regard, however, to be able to focus on other things.

My partner [Bill Bonstra, FAIA] is 56, and there are other folks in their 50s, a few in their 40s, and lots and lots in their 20s and 30s. I think we have a nice spread in our own office, in terms of generations. The folks in their early 50s are kind of early Gen Xers, and the folks in their 40s are mid-Gen Xers—that's a transitional cohort. They want balance in their lives, but on the other hand they will work extra to make something happen.

I like what I do. I like the impact that we have as architects—creating memorable experiences and dignified places for people to live and work. I still design as much as I want to, now in an even more collaborative role with our talented studio members, and the design work we're doing is terrific. I'm pleased with that, and I'm pleased with the ability of our firm to keep the design coming at a very high level. As long as my partner, Bill, and I are satisfied with our ability to impact the work positively, and we are still accepted by the next generation of firm leaders, we will work to contribute to our firm's legacy and future. AIA



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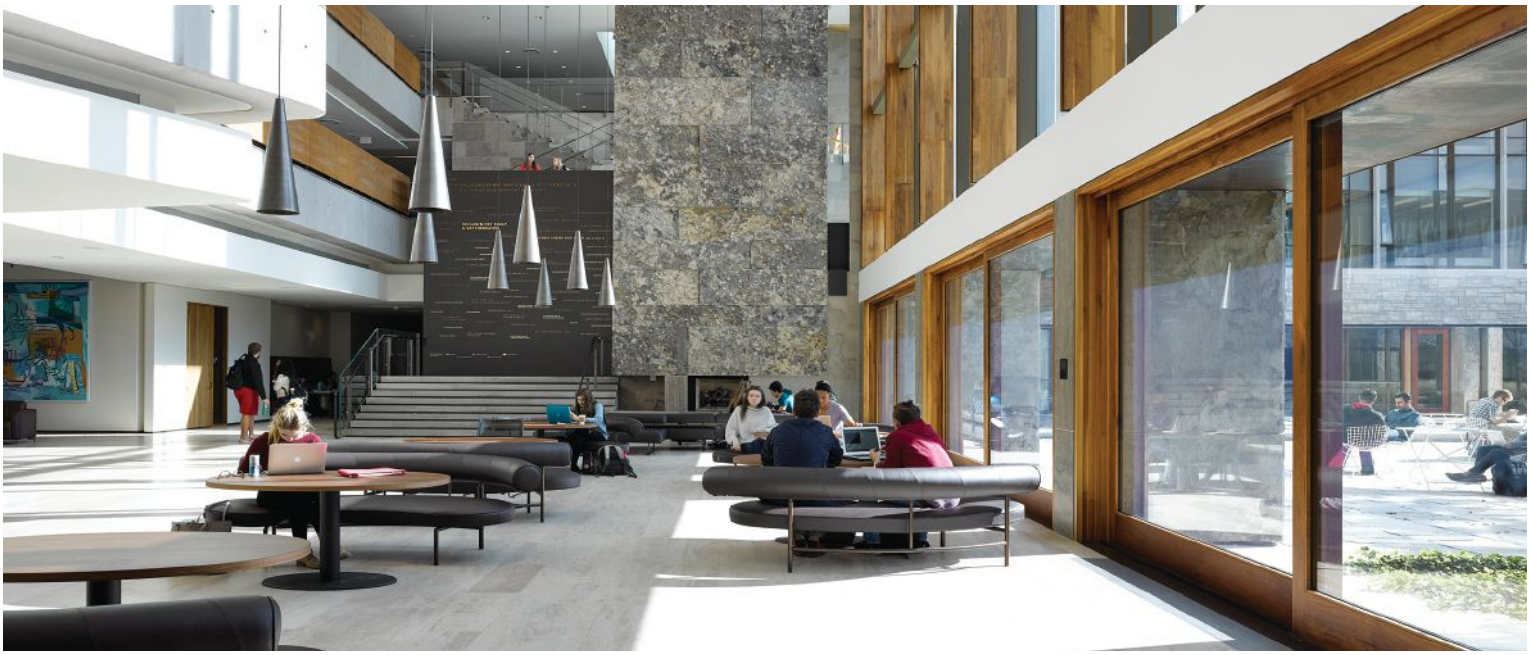

PHOTOGRAPHY: BEN RAHN

The Richard Ivey Building at Western University, a 2016 AIA Education Facility Design Awards recipient designed by Hariri Pontarini Architects, offers students well-lit and airy surroundings in a traditional academic setting.

The Answers to Your Clients' Questions

A new site from the AIA aims to connect clients and architects in a valuable partnership based on trust.

How many times has a client asked, "Can you explain these plans in language I understand?" Or requested answers to some basic questions on the design process? That information and more can now be found at *topicarchitecture.com*.

TopicA, as it's also known, launched in the spring of 2017 with the goal of increasing awareness of the profound value that architects represent. Aimed at homeowners and decision-makers in the professional and community circles, TopicA reinforces the fact that great projects grow out of great partnerships between clients and architects. To do that, the new site addresses three broad topic areas—home, work, and community—with a special section on how to effectively work with an architect.

At the highest level, *topicarchitecture.com* answers one of the biggest questions asked of an architect: "Why should I hire you?" Rather than search for the right words, you can now point your prospective client to *topicarchitecture.com*. No matter your area of expertise, the prospective client will find something on TopicA that demonstrates an architect's commitment to the client, to society, and to design solutions that can transform lives.

Why TopicA Matters to Your Practice

For homeowners who are looking to renovate existing spaces or undertake a small improvement that will make a big difference, TopicA will help them see the whole picture—such as how decisions about materials can have a physical and emotional impact or how energy costs can make or break a household's budget. As resilience in the face of a changing climate moves to the top of the list of client concerns, an architect's expertise can make the difference between safety and peril. TopicA aims to showcase that expertise for residential clients everywhere.

Designing for the workplace also takes center stage on TopicA. It seems like every week offers up a new trend for employees, managers, and business leaders to embrace or shun: open or semi-open offices, trendy standing desks, or company-wide wellness initiatives. It's enough to drive a business owner or CEO to madness. But, investing in a relationship with an architect to create the right environment with strong bones will ensure fewer headaches and produce an office atmosphere that people will want to work in. TopicA can help here.

And when it comes to buildings and spaces that knit communities together, architects are needed more than ever, to design schools, libraries, hospitals, public safety complexes, and town halls that need to be beautiful, long-lasting, healthy, and accessible—for an aging population or for the next generation. If community leaders consult an architect beforehand, they'll see these projects flourish in a whole new light. TopicA can help here, too.

Of the Institute's public-awareness efforts, which have featured three nationally televised commercials and the "I Look Up Film Challenge," TopicA will serve as the centerpiece in the process of educating prospective clients on the work of architects. The site will continue to highlight general best practices when commissioning an architect for home renovations, schools, churches, or workplaces. It will also take a deep dive into the stories behind the projects and people featured in AIA's public awareness campaigns.

It used to be that anyone looking to hire an architect had to rely on their own knowledge and experience. Concepts such as the "five phases of design" were industry-speak that clients couldn't decipher. What TopicA proposes is that the architect-client business relationship can be a close partnership based on a common set of concepts and trust. When trust is mutual, the power of design and the needs of the client can come together to produce the perfect end result. **AIA**

Steve Cimino

For more, visit *topicarchitecture.com*.

AIAPerspective

PHOTOGRAPHY: CARL BOWER

Workforce Begins with "Work"

Addressing the need to feed the pipeline.

The key constituents of our profession—practitioners, educators, and regulators—are all giving greater attention to architecture's workforce and to the "pipelines" that feed it.

Our demographic profile as a profession is well out of whack with the national picture. In addition to imbalances and inequities—apparent for some time but now being identified with more precision—we may also be facing a national shortage of architects, given current rates of retirement, architecture-school enrollments, and economic factors.

Of course, we want to be sure that we have a sufficient number of architects and a profession that reflects the populations it serves. But to have a strong and equitable workforce, we must first have work.

This is why we have launched programs to enhance the perceived value of architecture and design. Business and industry leaders, policymakers, and public officials—indeed, the public itself—need to see architecture as essential to successful communities, to responsible investment policies, and to the quality of life. That's how we will stimulate wider demand for our work.

A flourishing, highly visible profession is the best at attracting people. And as our profession thrives, populations that are now underrepresented need to be able to see themselves as one of us—as architects, and eventually, as principals and firm owners, too. Today's college populations are more diverse than ever. The schools, partly through *studyarchitecture.com*, are helping, and the AIA is ramping up programs for elementary and high school students.

These are all reasons to feel encouraged, but no guarantee that our profession's ranks will grow or even change much. Many students never come to architecture in the first place; and too many leave before completing studies, or defect shortly after graduation. Some graduates never become licensed, and many of those graduates who disconnect, or become disaffected, are women and members of minority groups—the very people we most want and need to retain.

We are doing some promising seeding—the AIA's diversity scholarship fund now stands at $2 million, and such support makes profound differences in individual lives. These investments will pay dividends, but because it usually takes a decade or more for graduates to become licensed, the returns remain well ahead of us.

It is fortunate that the Institute is in a position to identify and seek remedies for such challenges. But let's never lose sight of the fact that this advantaged position comes from having ample and rewarding work. That is the necessary first condition, the key to prosperity and drawing new populations toward architecture. A basic part of the mission of the American Institute of Architects is to stimulate the demand for architecture. Each of us can do more to show how design yields positive outcomes and repays investments—to do more to advocate for architecture. With work aplenty in hand, and good stewardship, all else will follow. AIA

Thomas Vonier, FAIA, 2017 AIA President


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ELIGIBILITY

All full-time, part-time, and visiting faculty and administrators at schools accredited by the National Architectural Accrediting Board or the Canadian Architectural Certification Board may submit studio course curricula, and the resulting student work, for consideration. All studio courses must have occurred in the context of a professional Bachelor of Architecture or Master of Architecture program, or their equivalents, and all must have been concluded within the 2016–2017 academic year. Summer 2016 studios are also eligible.

PUBLICATION

The winning studios and student work will be featured in the September issue of ARCHITECT, both in print and online.

DEADLINE

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Affordable Housing in the Age of Trump by Karrie Jacobs

"It's Heaven, It's Paradise": That's the headline of a story in the April 1940 issue of *Fortune* magazine about the Red Hook Houses, a phalanx of 25 red-brick, six-story buildings that, to this day, dominate nearly 40 acres of the Brooklyn waterfront. An early example of public housing, it was a product of the United States Housing Act of 1937, which provided federal subsidies for low-income housing, and it was built under the auspices of the New York City Housing Authority (NYCHA), the agency that still owns and manages all 176,066 units of the city's public housing.

The *Fortune* story is a dazzling production, with every detail of this new housing type lovingly photographed or illustrated. That a leading business magazine would be so enthusiastic about the concept is unimaginable today. For starters, the government no longer builds public housing in this country, not directly anyway. By the late 1960s, the ethnically diverse, working-class population celebrated in the *Fortune* story about the Red Hook Houses had become, in most public housing projects, predominantly African-American and poor. In 1972, the city of St. Louis blew up several of the towers that made up the Pruitt-Igoe complex, public housing's most infamous failure.

Shortly thereafter, President Richard Nixon began introducing incentives for the private sector to take over the creation of low-cost housing: Section 8 vouchers issued by the Department of Housing and Urban Development (HUD) to subsidize rents in privately owned properties and Community Development Block Grants awarded by HUD to states and cities based on population, which allowed local governments to fund programs—including housing—that they most desperately needed.

That approach is still very much in use today. It's a financial toolkit filled with an alphabet soup of acronyms, programs tagged by the word "section" or "title," plus a smorgasbord of tax credits, zoning incentives, and rent subsidies. Most of the funding for affordable housing still comes from the federal government, but it is distributed through a variety of local government agencies, banks, and syndicators—often via corporations that have nothing to do with housing—to a legion of private developers. The result is affordable housing in a wide variety of shapes and sizes, from the townhouse developments typical of the 1990s HOPE VI program to the mid-sized apartment complexes built today.

The problem is that the toolkit approach is indirect and inefficient, contributing to an increasingly acute shortage of affordable housing in this country. "There's about 2.8 million regulated affordable housing units in America, and that number declines by about 120,000 units a year," says Jonathan F.P. Rose, HON. AIA, president of the Jonathan Rose Companies, a for-profit developer who has been building affordable housing for almost 30 years. "So we're going negative. We're only solving one-eighth of the need, and each year we only build about 65,000 new units … nationally."

Red Hook Houses

BEBETO MATTHEWS/ASSOCIATED PRESS

I spoke with Rose as he was waiting to board a plane in Columbus, Ohio. "Housing prices keep rising nationally and incomes are not." He said that even in Columbus, "of the top ten most advertised job categories in the market, only one—nursing—pays a salary in which someone could afford to live here."

Meanwhile, the current administration's proposed budget cuts and tax reforms are threatening to make things even worse. At press time, HUD was targeted for a 13 percent budget cut, or more than $6 billion. The agency's new secretary, Ben Carson, argues that providing the poor with "a comfortable setting" in which to live breeds complacency.

Rose, whose projects are known for being community-spirited and sustainable, ended our conversation with an apology: "I'm sorry there's no optimism in this."

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From Luxury Condos to Affordable Housing

Perhaps, but over the past decade or two, good, thoughtful architects have become passionate about designing affordable housing. Consider Brooklyn, N.Y.–based Bernheimer Architecture. I first encountered the work of the firm's principal, Andrew Bernheimer, AIA, nearly a decade ago. His 245 Tenth Avenue is a spectacular tower clad in shiny steel tiles that features lava-rock tile in the bathrooms and offered direct views up and down a notorious magnet for upscale development, Manhattan's High Line. It was designed and developed with his then-business partner Jared Della Valle as the housing bubble went bust, when apartments in the $2,000-per-square-foot range were languishing on the market.

A year or two ago, I started hearing about Bernheimer again. He was working at the opposite end of the real-estate spectrum. Teaching at Parsons with another architect (David Leven, AIA, of LevenBetts), Bernheimer and his students published NYCHAPEDIA, a 382-page compendium cataloging the components of the city's housing projects. All the original buildings are still in use—albeit crippled by insufficient maintenance budgets and poorly served by their Le Corbusier–influenced designs. The idea was to look at ways NYCHA could exploit its resources—in particular the abundance of unbuilt land on sites that relied on the tower-in-park approach—to revitalize its operating budget and help update mid-20th-century ideas. Current proposals include adding ground-floor retail to existing buildings and filling the spaces in between them with more housing or much-needed facilities like schools.

Meanwhile, since 2011, Bernheimer's firm has become a key player in designing public housing for the 21st century, competing via the city's Request for Proposals process to build new projects, mostly in collaboration with private, for-profit developers. At the firm's office in downtown Brooklyn, 11 architects work elbow-to-elbow, creating designs that are studies in efficiency. It's not the kind of architecture that allows big gestures or affords much glory. The schemes are generally constrained by tight budgets and government restrictions that, while intended to protect low-income renters from substandard housing, hinder innovation. "We can't design a building like the Via that Bjarke did on West 57th Street," laments Bernheimer. "Never."

Instead, his team focuses on using low-cost construction methods and readily available materials to make a building that looks and works just a little better than it has to. "Its always a budget question. Where are your opportunities? Can you convince the developer to spend a little more on this or even within the kit of parts, can you make something good out of bricks, and blocks, and planks? It can be very difficult. The budgets are really constrained," Bernheimer says. He adds, "I think we try to compose things well."

What that might mean is making "windows 6 inches wider and 10 inches taller" than the size they'd be if the developer and contractor were left to their own devices. On a building in Flushing, Queens, that will provide 230 units of affordable housing, including 66 units for seniors and an adult day care facility, Bernheimer was able to vary the color of the bricks on successive sections to break up the monotony of a 400-foot-long façade. He also made the hallways more colorful and brightly lit than in other buildings by the same developers. "It's just a matter of a little extra light and a change in paint," says the architect. "That makes a big difference. It makes the common spaces of the building that much nicer."

In the South Bronx, Bernheimer's 1490 Southern Boulevard, which will begin construction next year, has 113 units of supported housing for seniors and a ground floor center providing services for the LGBTQ community. Set on a steeply sloped, city-owned lot that looks out on a stretch of elevated subway tracks, the rectilinear building in the renderings features a dark brick façade, large windows, and a generous communal terrace in the back. More distinguished than the surrounding hodgepodge collection of disused commercial and industrial buildings, and more handsome than the archetypal affordable housing complexes—basic red brick, no conspicuous sign of architectural thinking—the design itself, according to Bernheimer, is "quite straightforward." The apartment layouts, where architects of more upscale projects might make an impact, are based on floor plans issued by New York City's Department of Housing Preservation and Development. The challenge came from dealing with the slope of the site, the fact that there's a large rock formation in the middle of the

1490 Southern Boulevard by Bernheimer Architecture

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property (some of which will have to be blasted away), and that the presence of the elevated tracks will limit the positioning of hoists necessary in buildings with pre-cast concrete floor slabs.

The Art of Financing

The real complexity of the project isn't in the architecture, however, but in the Rube Goldberg–esque way 1490 Southern Boulevard is financed. The project is being developed by a firm called Type A Real Estate Advisors, which is, significantly, a "certified Women-Owned Business Enterprise." In New York City, Mayor Bill De Blasio has not only called for the building of more affordable housing (some 80,000 units over 10 years) but also for expanding the pool of developers to include firms headed by women and minorities.

One of the Type A partners, Andrea Kretchmer, started out her professional life as a geologist but later began developing affordable housing in partnership with her father, Jerry, a longtime developer and restaurateur. Kretchmer walked me through the process of how they responded to RFPs for a pair of sites, one in Brooklyn (which Jonathan Marvel, FAIA, worked on) and the 1490 Southern Boulevard project. Even making the submission requires a degree of sophistication and significant resources. "So let's say it costs somewhere between $15,000 and $30,000 for a developer to submit an RFP," Kretchmer told me, as we sat at a borrowed desk in her father's office. "Depending on who is on your team, you're certainly paying an architect. You may pay a zoning consultant if it's a complicated site. You probably have engineers who are just putting their time in for the planning process at no cost. You have an attorney. You maybe are using a financial consultant. Again, it depends on your in-house expertise, and that sometimes costs some money, too."

Beyond tapping the necessary players, a firm competing for one of the city's affordable projects requires a plan that describes who will be helped by the housing and how resident support services will be provided. "The goal for the developers is to be incredibly creative," Kretchmer continues. "You needed to come up with a program that would be enticing to the city. You put together a team of users. For example, on Southern Boulevard, the project we did with Andy [Bernheimer], we brought in JASA, which is the Jewish Association for Services for the Aging. They are going to not only operate the residual units, but they're going to facilitate programming for the seniors." Kretchmer's program also included the LGBT Network as ground-floor tenants offering services that are still scarce in the Bronx.

Once chosen, the developer begins the task of financing the project. An affordable housing development typically needs to secure financing from about six to 12 sources, according to Rose's estimate. The city's Housing Preservation and Development (HPD) agency is the pivotal player in this process for 1490 Southern Boulevard, arranging mortgages through a program called Extremely Low & Low-Income Affordability (ELLA). A substantial portion of the $46 million construction budget comes from ELLA loans supplied by tax exempt bonds and other sources. Another portion, as much as 30 percent of the budget, comes from the Low Income Housing Tax Credit (LIHTC), which the Treasury Department has used since 1986 as way to entice private equity to finance low-income rental apartments. A project like 1490 Southern Boulevard is awarded these credits "as of right" says Kretchmer. These credits are then sold by a syndicator to a corporation that wants to lower its tax bill. "So an entity like Chevron or any corporation in America uses these tax credits to offset their own tax bill," Kretchmer explains. "They get this reduction in their tax bill for making this investment in your project."

> Ideas that are gaining traction in many cities—micro-units, co-housing, multi-generational housing—are regulated out of the affordable sector.

During the first 15 years after the project's completion, the purchaser of the tax credits technically owns the building and can deduct any of the losses associated with it, such as depreciation. The developer, meanwhile, earns money on rents and other fees (an estimated $7 million in the case of 1490 Southern Boulevard) before assuming ownership of the project after the 15-year period.

How to Improve an Inefficient System

While many countries worldwide still directly fund and build affordable housing, here in the U.S. we shift the risks (and rewards) to the private sector, which is not unlike our approach to healthcare. By peddling tax credits to corporations so that private developers will build affordable housing, our system obviates the political difficulty of raising taxes to pay for the needs of the poor. But it's a very inefficient way to generate housing.

Indeed, this is the argument made by Marc Norman, curator of "Designing Affordability," an

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exhibition mounted at AIA New York in 2015. He was trained as a planner, used to work at Deutsche Bank on funding for affordable housing, and is currently a consultant focusing on community development. "Here are people sitting in investment banks, high-powered law firms, making a fortune with the goal of getting affordable housing built," he says.

Norman proposes a solution that involves changes to another tax break that largely benefits the wealthy: "You could still have the mortgage interest deduction," he argues, "but cap it at $1 million." Rose makes a comparable case: "If you indexed the mortgage interest deduction and said that it only served families making $200,000 a year or less, you could take the savings from that, double the amount of low income housing tax credits and therefore double the amount of affordable housing construction. And you could provide Section 8 vouchers to every family earning under 150 percent of the poverty limit, so $29,000 a year."

Improvements to the system can also be made from "the architecture angle," as Rose calls it. "The rules that come with affordable housing require minimum unit size, certain bedroom size," he told me. "All that was to protect against building really crummy things. What it has constrained against, from an architecture point of view, is innovation. So we are cranking out the same one- and two-bedroom apartments that we cranked out 30 or 40 years ago."

In other words, ideas that are gaining traction in many cities—micro-units, co-housing, multi-generational housing—are regulated out of the affordable sector. Similarly, Norman points to Detroit's experiment with "Pink Zoning," areas of the city where red tape has been eliminated to encourage "lean urbanism." "Most cities have a zoning policy that is about dictating how people live and how they shouldn't live," Norman says. "Well, why are we dictating how people live, which lowers their options and increases their cost? If I want to have a home-based business, if I want to take in a boarder, if I want to put in an accessory dwelling unit for my elderly grandmother, why can't I?"

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Tax Incentives Under Siege

Washington's current approach to innovation is dramatically different. Consider the case of Bernheimer. He devoted himself to affordable housing after weathering the housing crash because he wanted to design something that had an ethical dimension as well as bottomless demand: "I like the idea that there's a building type that provides a kind of personal satisfaction as well as some level of stability."

Yet that stability may turn out to be illusory. Eighty-four percent of NYC's Housing Preservation and Development budget for next year comes from federal programs that, according to the latest proposed budget by the current administration, may be eliminated or downsized. Even the LIHTCs, the workhorse of the affordable sector, are encountering turbulence. Until recently, they were valued at $1.20 each, meaning that an investor would be able to deduct a dollar in taxes for every credit, and additionally write off a variety of other project losses. But news of President Donald Trump's proposed cut in the corporate tax rate has driven the price of credits down, to about $1.05 each. "If you cut the tax rates, those losses are worth less," explains Mark Willis, a senior fellow at New York University's Furman Center for Real Estate and Urban Policy. The tax credits are reputed to have strong bipartisan support, however, and Congress may pass legislation to somehow increase their value to compensate for any tax cut.

Ideally, says Bernheimer, "The government should be providing buildings. Which they're not really doing. They're not providing buildings, they're providing mechanisms."

Now those very mechanisms, jury-rigged to remove the "public" from public housing, are under siege. Without a fully funded and functional HUD, without marketable tax credits, without a federal government that gives a damn about affordable housing, the whole fragile ecosystem will crumble, much like Pruitt-Igoe a half-century ago. Unless, of course, the Trump administration crumbles first.

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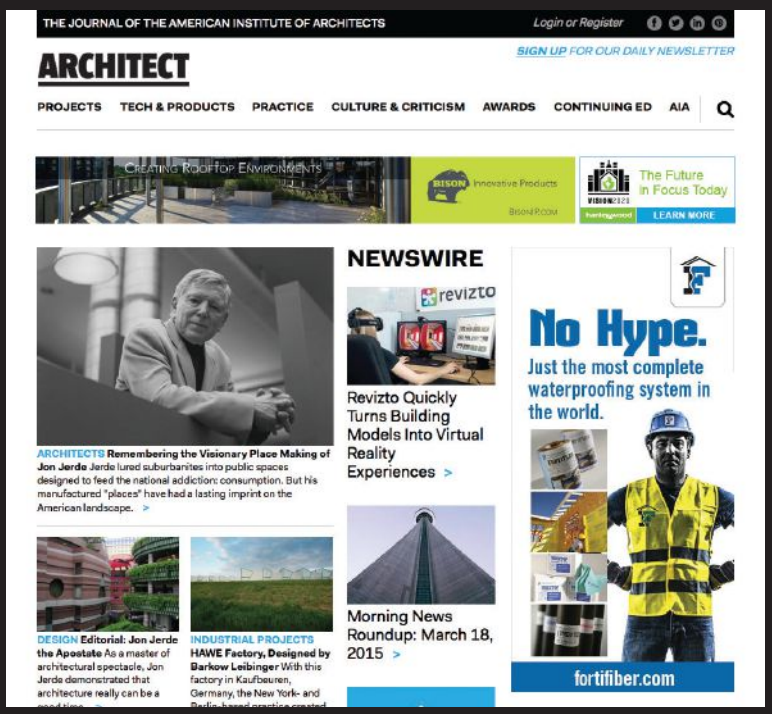

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“We wanted to make a building that would transcend the moment,” says Stern—meaning, presumably, the colonial period, though he could as easily mean our own.

Robert Stern’s Museum of the American Revolution by Ian Volner

The brief seems straight out of an undergraduate studio course: Design a museum of 118,000 square feet, located on a prominent urban site in a historic district, with adequate provisions for dining facilities, offices, and special exhibition and event spaces. The building will abut a modern structure on one side, a high-security government office on the other, and—just to throw the students a conceptual curveball—it will be devoted to one of the most hotly contested subjects in American history and built at one of the most divisive moments in the nation's political life.

This was the challenge facing Robert A.M. Stern Architects (RAMSA) as the firm was designing the Museum of the American Revolution in Philadelphia, which opened in April. Stern, FAIA, who recently stepped down as dean of the Yale School of Architecture, says that for him, "Job number one was to make a good museum," a modest enough objective for a designer whose present portfolio includes a mini-city in China and landmark towers in Manhattan. But the architect and his partners knew that their Philly project would have to be more than just an adequate receptacle for the curatorial program. "We wanted to make a building that would transcend the moment," says Stern—meaning, presumably, the colonial period, though he could as easily mean our own.

Or maybe both. Spearheaded by partner Alexander Lamis, FAIA, RAMSA's design tries to circle the square between the Georgian style prevalent in the surrounding Independence National Historical Park (which includes such landmarks as Independence Hall) and a more contemporary aesthetic appropriate to the recent development in this increasingly kinetic city. This kind of architectural "double coding," as critic Charles Jencks famously called it, is old hat for Stern, who made his bones as a historically minded Postmodernist as far back as the 1970s. Since then, RAMSA has refined the approach to the point of making it into a cogent in-house language, of which the museum is a familiar iteration. The George W. Bush Presidential Center in Dallas, the Lakewood Public Library in Ohio, the East Academic Building at Missouri's Webster University: In many of its institutional projects, the firm has created an adaptable typology of variously massed boxes, lightly styled to pair with their surroundings.

In this case, that means red brick, keystones, and arches—just like the majority of the residential buildings in the neighborhood, some of them dating back to the 18th century—with a little modulation towards modernity in the museum's squared volumes and the regular rhythm of its upper-story apertures.

The museum, which is located adjacent to the 1934 U.S. Customs House

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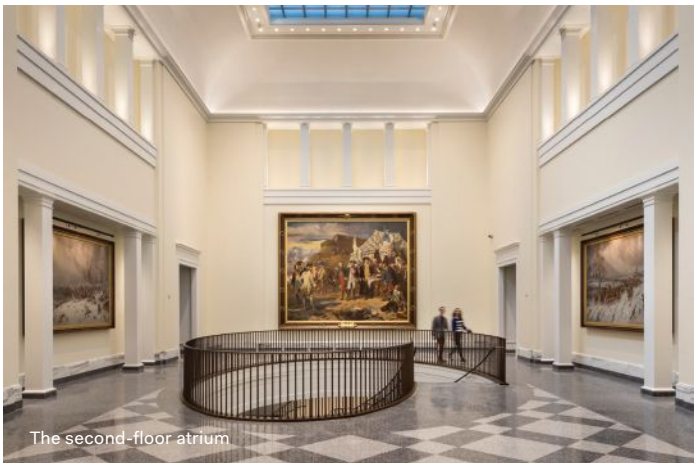
The second-floor atrium

"Most museums today have very poor relations to the street," says Stern; the project's contextual gestures, as well as its outdoor seating and ground-level restaurant and gift shop, were all intended to "give back," as the architect puts it. On a sunny day just a week after the building's opening, Philadelphians seemed to be taking what Stern was giving, lounging around the entry plaza and drifting through the café.

A Retro-Monster?

But not all the locals have been so grateful. Writing in the *Philadelphia Inquirer*, critic Inga Saffron has called the building "stodgy," observing trenchantly that America "fought a bitter and protracted war to free ourselves from the Georgian tyranny," only to have the struggle commemorated by RAMSA's "retro-monster." Local blog Hidden City Philadelphia was even more stinging, calling the building "far more goofus than gallant."

As built, the museum is measurably less historicist than originally planned—a rooftop cupola was nixed by the Philadelphia Art Commission—but it is nonetheless thoroughly retardataire in spirit. This is in sharp contrast to the contents of the museum, which attempt, however falteringly, to assimilate storylines beyond the noble-patriots-versus-scowling-monarchists of traditional grade-school textbooks. "We really tried to have all perspectives represented," explains R. Scott Stephenson, vice president of collection, exhibitions, and programming, pointing out the different narratives of Native Americans, slaves, women, and loyalist Americans woven throughout the main second-floor exhibition space. RAMSA's staid, suburban envelope seems almost a betrayal of that forward-thinking vision.

"We wanted our building to have popular appeal," says Stern, in defense of his play-it-safe scheme. ("I like it when the public likes my buildings," he adds, in a quiet aside.) The public, it should be noted, has been


The lobby

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Third-floor balcony

prepared to like buildings of much less conservative character. But *argumentum ad populum* may actually be a sound tactic in this instance, if for a slightly counterintuitive reason. To the curators' credit, their exhibition—which includes paintings and rare artifacts as well as interactive exhibits—is sufficiently diverse to challenge almost anyone's conception of our founding narrative. In today's America, where the direction and meaning of our democratic experiment is in intense dispute, any such challenge brings with it a high dose of nervous tension. Walking through the upstairs exhibition, this visitor couldn't help asking the question: *Is some sort of political brawl going to break out?*

In this sense at least, RAMSA's building may be a sort of palliative: It's not likely to offend anyone, and its innocuousness might even act as effective camouflage, luring in rigid ideologues and then hitting them with the richness and complexity of the exhibitions. (In any case, attempting to make the exterior more reflective of the program—an Iroquois longhouse on the roof?—might have looked even worse.) What's more, as Stern notes, "Those exhibits always last 10 or 15 years, and then have to be redone." History, and its interpretation, never ceases, and the curators will always be trying to keep pace. Stern's building is meant to sit back and give them room, even if it doesn't give them much of a hand.

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“It’s very easy for architects to think that they have nothing to do with the workers. Part of our mandate is to show these connections and links.”

Who Builds Your Architecture? by Elizabeth Greenspan

How does one understand, and visualize, the global supply chain involved in building a building? The network of architects, engineers, contractors, clients, banks, construction workers, corporations, and conglomerates that creates, over years and across countries, a stadium or a museum or a skyscraper? For the past six years, the research and advocacy group Who Builds Your Architecture?, or WBYA?, based out of Barnard College's Department of Architecture and Columbia University's Graduate School of Architecture, Planning and Preservation (GSAPP), has worked to document this complex global supply chain, with the hope of making architects more aware of their connections to others in it, including, most importantly, on-site laborers. "It's very easy for architects to think that they have nothing to do with the workers. That it's the subcontractors, or the sub-subcontractors, who really hire them," says Kadambari Baxi, a professor of professional practice in architecture at Barnard and one of the founders of WBYA?. "Part of our mandate is to show these connections and links—to show that we do have something to do with this."

By "this" Baxi means the series of human rights abuses that increasingly occur at large-scale construction projects around the world, including dangerous living conditions and unregulated sites, both of which lead to worker injuries and deaths. For example, a 2016 Amnesty International report on the renovation of the Khalifa International Stadium in Doha, Qatar, a FIFA 2022 World Cup site, identified more than 100 workers living in squalid labor camps who were, in many instances, subject to forced labor. And in 2014, *The Guardian* newspaper investigated the increasing numbers of Nepalese migrant workers dying from cardiac arrest and brain hemorrhages while working on construction sites, a phenomenon often called "labor murders."

Untangling the global supply chain behind even a single building is no easy feat. WBYA? found it practically impossible, given the scores of industries involved. Instead, for its latest project, the group focused on a single aspect of construction: the supply chain for the façades of roughly 50 buildings in four cities (New York, Istanbul, Chicago, and Doha, Qatar). WBYA? teamed up with Graph Commons to visualize their findings in a series of intricate graphics, some of which are on display at the Art Institute of Chicago through June 11. The exhibition, titled "Who Builds Your Architecture?," aims to highlight the problem of unfair labor practices, and to identify ways that architects can respond.

"A lot of designers I talk to say, 'I don't know what I can do,'" says Mabel Wilson, an associate professor at the GSAPP and one of WBYA?'s founders. "They say, 'This is so immense. I am just trying to manage my practice, and pay my employees, and keep good work in the office.'" While the sense of helplessness is understandable, WBYA? argues that architects have more leverage than they realize to influence the construction process. The group points to other labor movements as models. "Fair trade coffee is about maintaining adequate wages and fair working conditions when you drink your morning coffee," Wilson says. "Why couldn't the same be said about a building?"

The Panel that Gave Rise to a Movement

Baxi and Wilson originally set out to "start a discussion," not an advocacy group. Inspired by Gulf Labor Artist Coalition—an arts advocacy group that began protesting human rights abuses in 2010 at the construction site of the Guggenheim Abu Dhabi, designed by Frank Gehry, FAIA—Wilson and Baxi organized a panel at the New School in New York to discuss labor practices. The panel included Bill Van Esveld, a senior researcher at Human Rights Watch, and Peggy Deamer, a professor of architecture at Yale University and member of the Architecture Lobby. The discussion was so lively, Baxi says, "we realized we had to keep going." A workshop in New York followed, and then another in Stockholm. By the time Zaha Hadid uttered her famous remarks about migrant workers—"I think that's an issue the government, if there's a problem, should pick up. Hopefully, these things will be resolved."—WBYA? was two years old. "Hadid was right," Wilson says. "There are laws, and governments do have to negotiate and enforce those." But laws don't insulate designers from these issues, she says. "There are

The WBYA? exhibition at the Art Institute of Chicago

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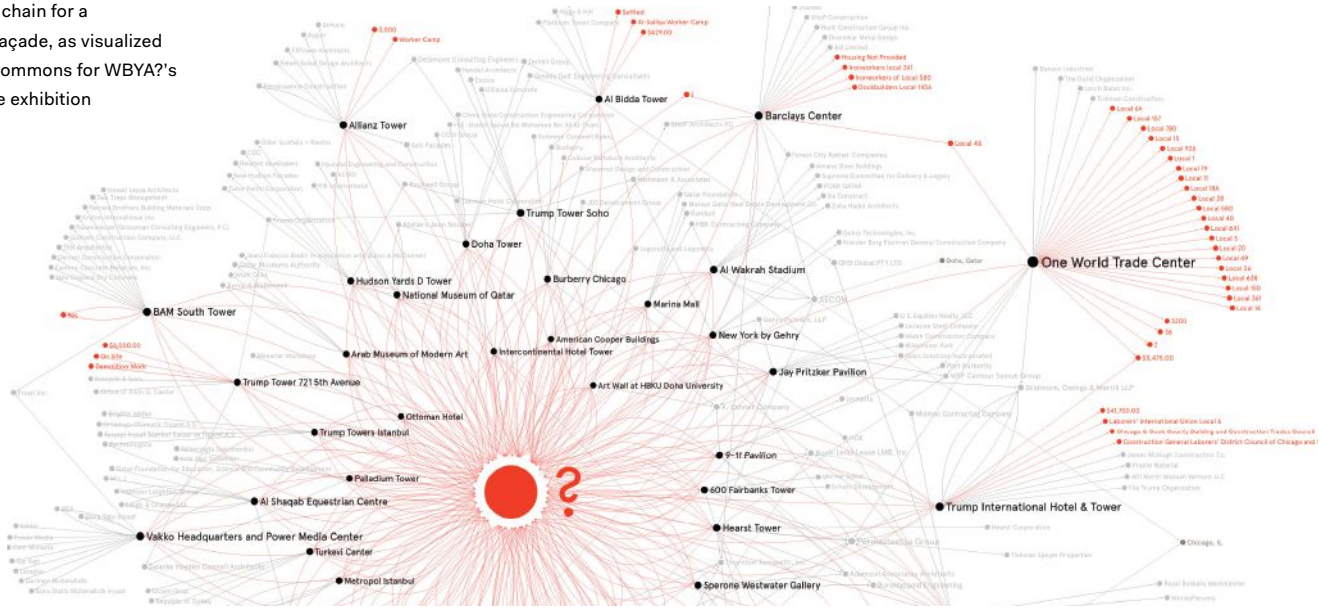


The supply chain for a building's façade, as visualized by Graph Commons for WBYA?'s Art Institute exhibition

clearly relationships between architects and those who are building the buildings. Hadid's comments made it clear that we have to make those relationships visible and recognizable."

WBYA? conceives of the building industry's global supply chain as consisting of two sides, or halves: a tightly conceived "design half," and an opaque "construction half." The design networks are so intricate and complex that, as Baxi puts it, "If something as small as a screw is in the wrong place, it can be traced back and forth, and eventually corrected." By comparison, the construction networks are loose, leaving more space for exploitation. Since the people working on these two sides usually don't come into direct contact, each side remains relatively unknown to the other. "The atomization of the building process occludes the ability to see the larger system or assemblage," Wilson says.

The Art Institute exhibition shows how these halves intersect by visualizing the movements across the globe of the materials and people involved in the design and construction of six building façades, all for major international projects, including Hamad International Airport in Doha and BAM South Tower in Brooklyn, N.Y. (An online database documents all 50 façades the group researched.) Laura Diamond Dixit, another member of the group and a Ph.D. candidate at the GSAPP, combed design journals, newspaper articles, and lawsuits to identify the firms and workers involved in these façades. The data reveals concentrations of influence: A handful of companies appear frequently in the supply chain, including Skidmore, Owings & Merrill and the construction firm Skanska; Permasteelisa Group and AECOM supply materials. The Trump Organization figures prominently too. Frequent controversies around Trump projects, including unpaid workers and deaths on sites, have left long paper trails, Dixit says.

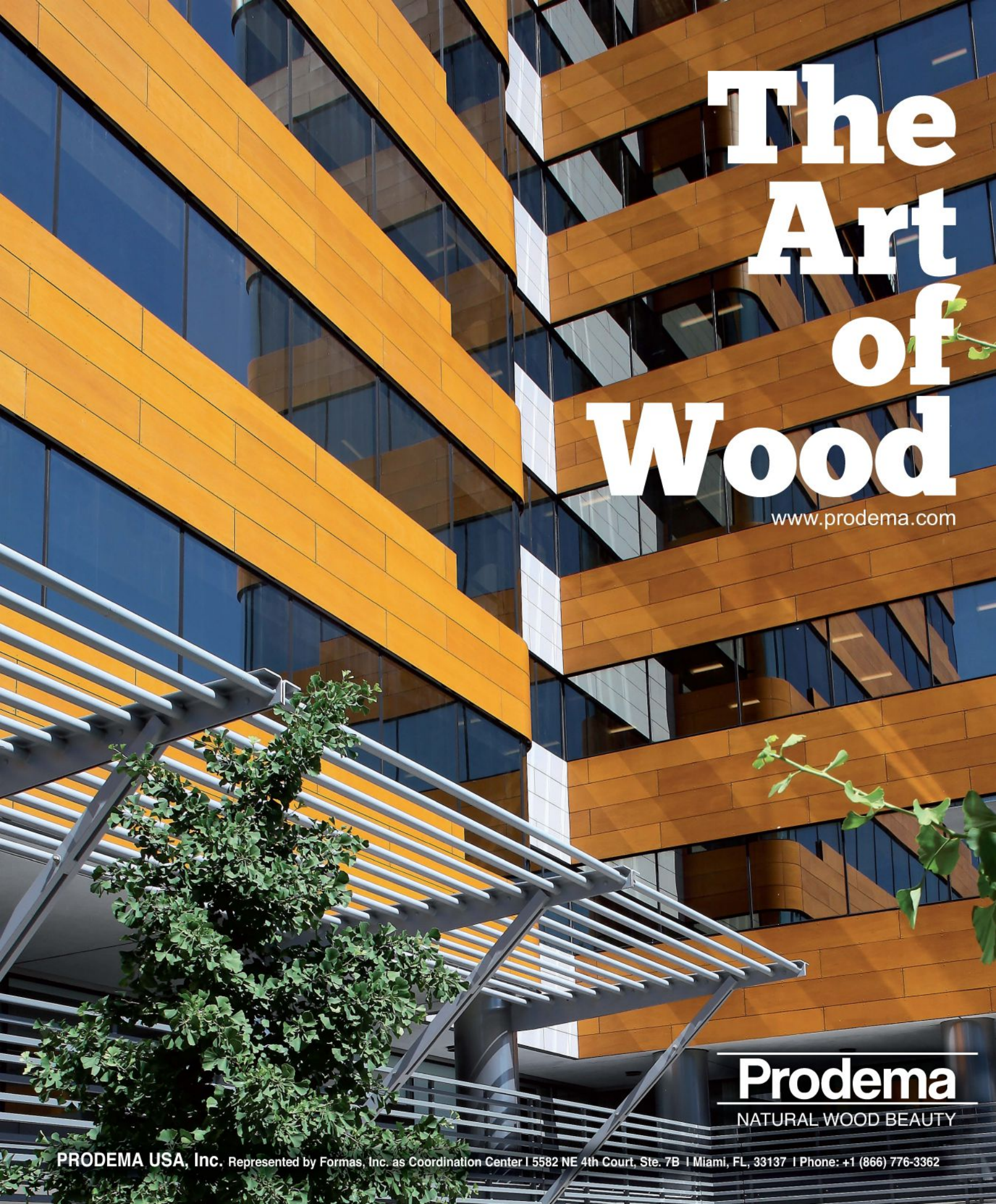
In nearly every project, the workers at construction sites were the most difficult to trace. Basic information, including where workers came from and how much they were paid, was, in some instances, impossible to find. "It proved our question mark," Wilson says, referring to the group's name. "You can't find out about the worker. It's a black hole."

A Field Guide to "Human Sustainability"

When WBYA? began to think about what architects could do, it turned to the AIA's Code of Ethics, where it found one brief statement dedicated to human rights: "Members shall not engage in conduct involving fraud or wanton disregard of the rights of others." By contrast, WBYA? discovered extensive guidelines about the environment. For the group, this discrepancy was both problematic and hopeful: If environmental advocates could succeed in persuading the industry to adopt meaningful standards, so too could WBYA? succeed in bringing greater awareness to human rights—or, as Wilson reframes it, to "human sustainability."

For now, WBYA? believes it can wield the greatest influence by supporting hands-on education efforts and activism. In February, on its website, it published "a critical field guide" to the ethical questions surrounding migrant labor. The guide asks architects to think about how to improve worker housing, particularly at sites in the Middle East and Asia, where workers often live in crowded, poorly constructed tents, or even on the bottom floors of the building they are constructing. As Wilson puts it, "Why couldn't you think about how you house the workers as you're planning the staging and phasing of a project?"

The field guide also asks architects to conceive of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construction sites as sites of knowledge-transfer; that is, as places where laborers develop skills (how to read drawings or handle sophisticated machinery) that they can bring back to their home countries and villages. By encouraging architects to facilitate this kind of information exchange, WBYA? implicitly asks designers to think of themselves as workers, too. "You have to see yourself as a worker to even think about your relationship, in solidarity, with the people you're working with to build a building," Wilson says.

With its Art Institute show, the group hopes to expand its audience beyond just architects. Zoë

WBYA?'s Istanbul Design Biennial call for entries question: "If low-cost labor enables architects' uninhibited creative expression, what is the human cost?"

Ryan, the curator of architecture and design at the Art Institute, learned of the group's work when she curated the Istanbul Design Biennial in 2014. The group responded to the biennial's call for entries by posing a provocative question: "If low-cost labor enables architects' uninhibited creative expression, what is the human cost?" WBYA? designed maps of global migrant workforces and visualizations of designers' roles in the global supply chain. The installation was so well received, Ryan says, that she asked the group to develop a show closer to home. "It's a conversation that needs to happen."

As the group has traveled to share its work, it has learned how widely labor practices vary across sites and countries. In the Middle East, workers are not allowed to unionize, and therefore lack basic protections. Closer to home, activists are increasingly concerned about the rights of undocumented workers. A few weeks ago, Baxi and Wilson spent a day giving a workshop at Studio Gang's Chicago office. It was WBYA?'s first workshop at an architecture firm, and it focused, in part, on undocumented workers. Jeanne Gang, FAIA, the firm's founding principal, says the session was "so productive": "We look forward to continuing the dialogue with our colleagues and collaborators toward helping affect positive change in our city."

Helping architects think more critically about their own role in the global supply chain is central to WBYA?'s mission, Baxi says. "People always want to talk about the workers. And we say, 'Yes, the workers. But architects have to do some work, too.'"

Photo Mimi Teller

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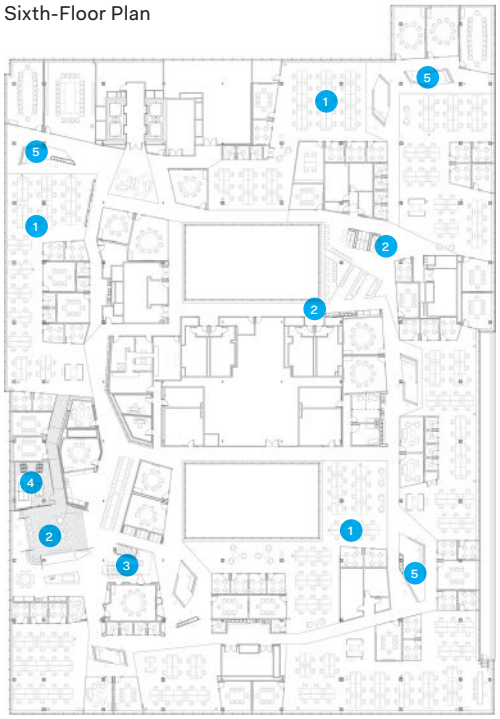
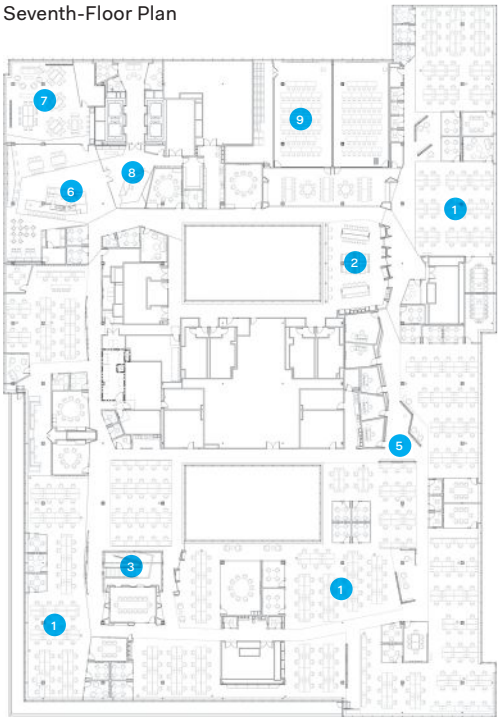
Sixth-Floor Plan



Seventh-Floor Plan



1. Open office
2. Pantry
3. Communicating stair
4. Game room
5. Collaboration space
6. Coffee bar
7. The Garage
8. Lobby
9. Multipurpose room

0 20 40

Los Angeles–based Clive Wilkinson Architects (CWA) began working with Microsoft three years ago, when the tech giant contracted the firm "to look into how to develop their workplace for the future," says principal Clive Wilkinson, FAIA—in particular around areas of collaboration. CWA developed guidelines for a more engaged workplace, and when the opportunity arose to deploy them in a new satellite hub in Vancouver, British Columbia, it jumped at the chance.

Designed and built out in 15 months, the new Microsoft Canada Excellence Centre occupies the top two floors of a recently reskinned former department store. Part of the goal for the new space was to have a much more open office floor plan than existed at the company's Redmond, Wash., headquarters, but navigating such a shift in office culture is tricky. "Microsoft is a very large company," Wilkinson says. "It's a bit like dealing with a country—there are lots of different population groups and cultural areas." In Vancouver, there are three working groups: two focused on gaming and a third on software development.

Lead designer Sasha Shumyatsky says that the aesthetic for the flexible workspace was a study in analyzing Microsoft's corporate identity, which isn't always easy to pin down. "They are comfortable with their legacy brand flexibility," he says. "They've been less concerned than companies like Apple about consistency in the brand, so we persuaded them to take it more seriously. We wanted to leverage characteristics of Microsoft's Redmond campus, which is in a forest."

In Vancouver, that translated to a theme of branches and boulders that plays out in the 142,000-square-foot interior. For the "branches," open wood-slatted ceiling planes have integrated light fixtures that obscure the mechanical systems above. Making up the "boulders" on the "ground" are collaborative meeting pods interspersed along circulation routes. Wood tones appear throughout, and the firm used pops of color from carpets and furniture to "create zones and character," Shumyatsky says. The team widened the opening for an existing escalator and replaced it with a sculptural stairway. To encourage interaction between the working groups, amenities such as a coffee bar, dining spaces, and a maker space called the Garage are threaded through areas of bench seating.

The notion of an open-office plan for the high-tech industry is hardly a new one, but for this client it pushed the envelope of where their workspace can and should be: "They were keen on doing something innovative, but they had to be conscious of benchmarking against company standards," Wilkinson says. It was a very adventurous project for them, and I think you can read Microsoft's future into this."

Previous Spread: Work areas with whiteboards double as acoustical barriers

Above: A communal coffee bar, flanked by a maker space called the Garage (at left) and the seventh-floor lobby (at right)

A central, wood-clad stair connects the two levels

Above: Seating areas throughout double as spaces for lunch breaks and group work

Opposite: A semi-enclosed collaboration space with whiteboard-paint walls

Project Credits
Project: Microsoft Canada Excellence Centre, Vancouver, British Columbia
Client: Microsoft Corp.
Design Architect/Interior Designer: Clive Wilkinson Architects, Los Angeles · Clive Wilkinson, FAIA (design director); Sasha Shumyatsky (lead designer); Meghan Kelly, Danielle Shaffner, AIA (project managers); Ying Song, AIA (project architect); Amelia Wong, Reiko Wei (architectural assistants)
Executive Architect: Perkins+Will, Vancouver
M/P Engineer: AME Consulting Group
Electrical Engineer: AES
Structural Engineer: Read Jones Christoffersen
Project Manager: Jones Lang LaSalle
General Contractor: Kindred Construction
Lighting Designer: Horton Lees Brogden Lighting Design
Size: 142,000 rentable square feet
Cost: $22.23 million Canadian (approx. $16.51 million)

Hubba-to Co-Working and Artisan Space
Bangkok
Supermachine Studio

Bangkok's tech boom is well underway, and brightly detailed co-working and maker spaces are popping up around the city to accommodate it.

TEXT BY IAN VOLNER
PHOTOS BY WISON TUNGTHUNYA


FOOD MENU
EXTREMELY
TODAY SPECIAL
HUB
GOOD LIFE
UP
STAIRS

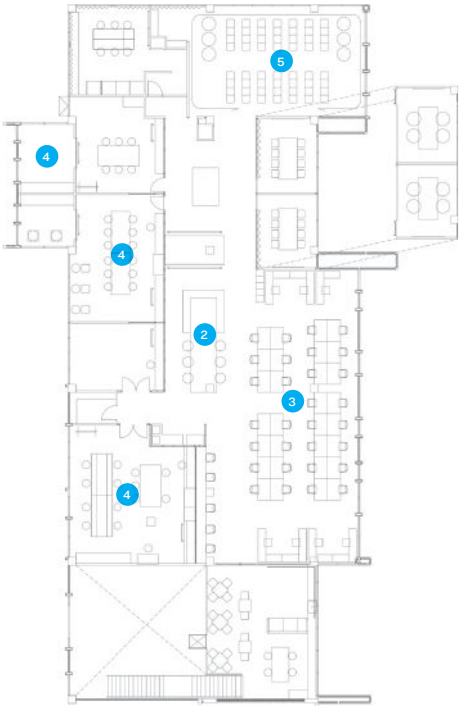
Bangkok, the teeming capital of Thailand, has more than its share of wonders: its ancient temples, its outré nightlife, even the longest official name of any city in the world (a 168-letter, rarely used, honorific). But among its lesser known highlights is a booming tech industry, one that's attracted a cosmopolitan cultural element for which the city—with its population already surging toward 10 million—is now rushing to provide urban amenities.

Enter Hubba-to, a new co-working space created by local firm Supermachine Studio. The third in the growing Hubba chain of shared office suites scattered around town, the latest location takes the "-to" suffix from its location within the Habito mall, a commercial complex surrounded by an all-new high-rise development of 5,000 residential units east of the historic center. Also, "it's to make it sound Japanese," says Pitupong Chaowakul, Supermachine's founding principal: Everything in the new district is aimed to appeal to an international crowd, and Chaowakul (who prefers to go by "Jack" with English speakers) designed Hubba-to with the same audience in mind. "They need activities and a space that suits that community," he says.

Hubba-to caters to the entrepreneurial set with spaces that serve not only the computer-programmer but more hands-on creatives as well. "It's co-working plus artisan space," Chaowakul says, noting that the facility's conventional offices are complemented by painting studios, ceramic and wood workshops, and darkrooms, making it a destination for makers of all descriptions. A screening room and lecture hall, as well as an ample kitchen, give the space the potential to act not just as a working environment, but as a social one too, living up to the "hub" half of the title.

Supermachine's formal approach started with a visual token of that networked, integrated sensibility—Hubba's logo, a web-like figure that the architects tried to expand into a comprehensive spatial concept. Ultimately, "it's a net that connects dots," Chaowakul says, and the firm quickly struck on a way to carry the winding, linear geometries through the whole of the interior: They used the piping that serves the mechanical and electrical systems, painted it in livid turquoise, and snaked it from room to room in dramatic bands. Celebrating those kinds of service details is hardly novel (one thinks of Paris' Centre Pompidou, and of the High-Tech movement of a generation ago), but endowing them with this sort of symbolic resonance is novel. It's also, Chaowakul says, symptomatic of his office's work. "We try to look at those banal objects around us, taking ready-made forms and creating a different result."

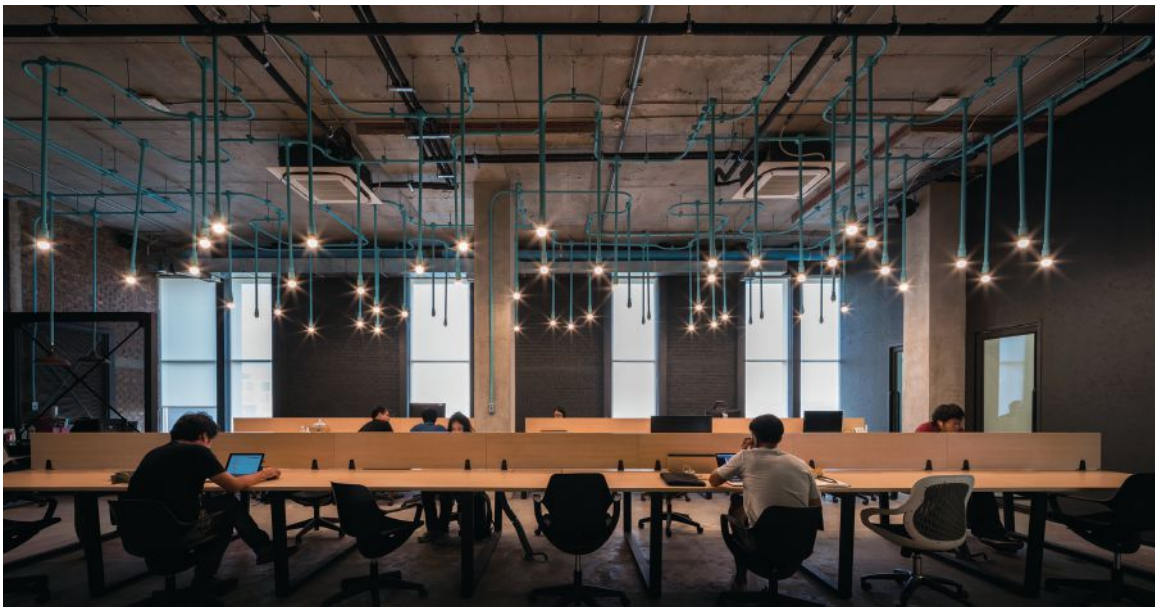
Upper-Level Plan



Lower-Level Plan

1. Café
2. Seating
3. Co-working space
4. Art studio
5. Screening room

0 10 20



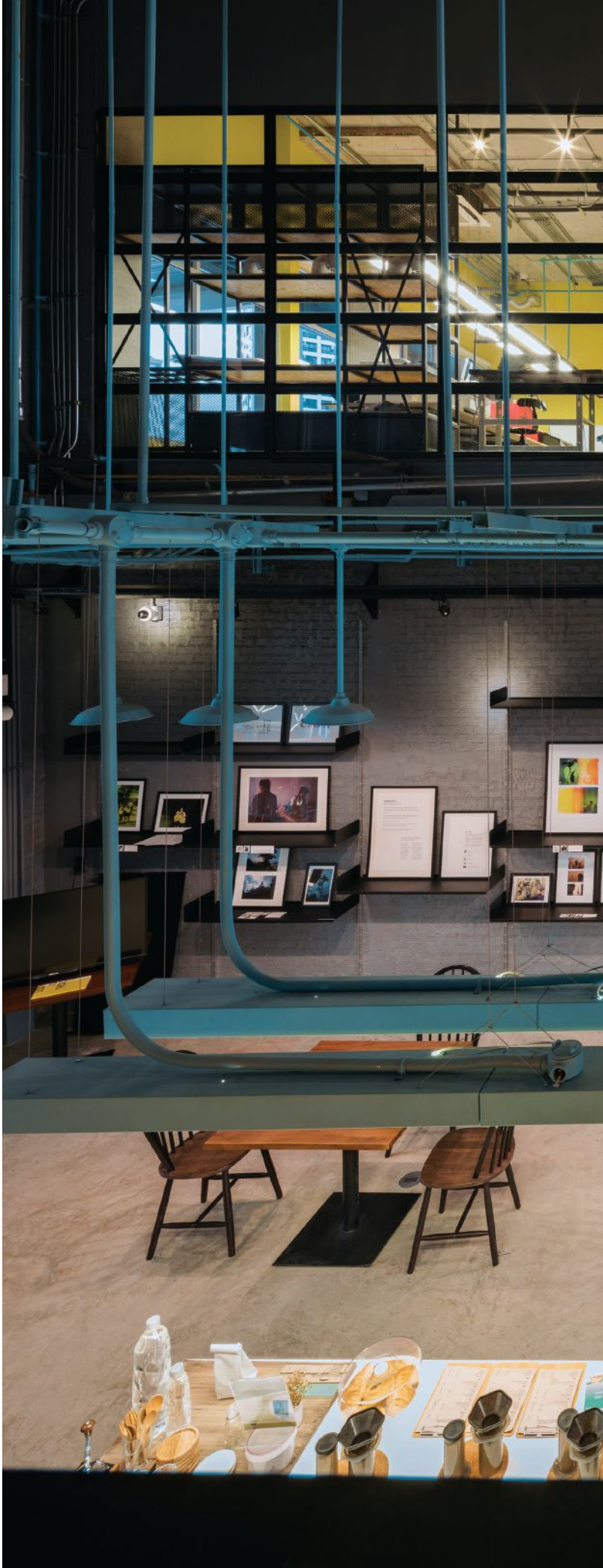
Top: Upper-level co-working space

Previous Spread: Coffee bar and gathering area just inside entrance

Above: Ceramic workshop for artist use

View over lower-level café, seating area, and terrace, and into upper-level jewelry and textile studio

Project Credits
Project: Hubba-to Co-Working and Artisan Space, Bangkok
Client: Hubba; Sansiri
Designer: Supermachine Studio, Bangkok · Pitupong Chaowakul, Yupadee Suvisith (project team)
Contractor: Project Direction and TTS Engineering
M/E Contractor: Mobilize
Size: 989 square meters (10,645 square feet)
Cost: Withheld



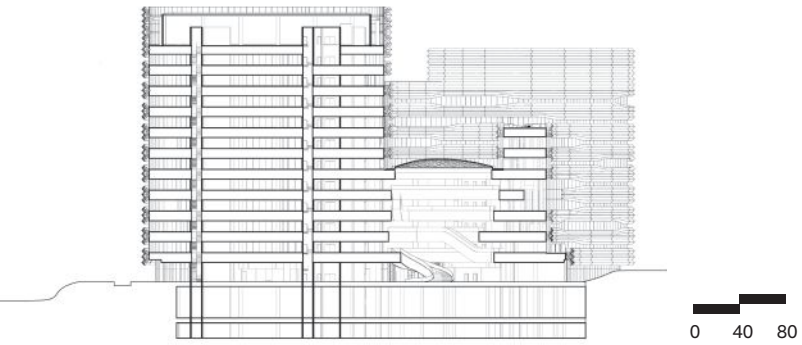
CJ Blossom Park
Suwon, South Korea
CannonDesign

Mehrdad Yazdani and Mark Hirons design flexible and collaborative spaces for an R&D lab in South Korea.

INTERVIEW BY NATE BERG

PHOTOS BY CHRISTOPHER BARRETT

Section A–A₁



Previous Spread: A central atrium connects the three towers in the CJ Blossom Park complex, and it is lined in amenity spaces outfitted in CJ branded colors.

Above: The towers are clad in a horizontally pleated, perforated aluminum scrim, which pulls back to reveal full-height glazing at public areas.

Opposite: Computer modeling helped determine the ideal size of the perforations, which vary over the surface of the building, to minimize heat gain and maximize natural light to the different interior spaces throughout the year.

TIM GRIFFITH

You researched the client and its company culture while preparing for the competition for this project. What did you learn and how did it influence your design?
Mehrdad Yazdani, ASSOC. AIA, design principal: This is a 1.2 million-square-foot research and development facility on a fairly new campus to the south of Seoul, and the intent was to bring three divisions of CJ Corp.—food, pharma, and biotech—under the same roof to foster innovation and help turn emerging ideas into new products. The building has three elliptical towers, each housing one of the divisions. These are lab towers, designed with optimum flexibility and adaptability: We created what we dubbed "the new scientific workplace." Unlike many laboratories where fixed elements and shelving clutters the space, here, everything is on wheels, so they can reorganize the laboratories for teams and collaborations. The towers are different heights and the first five floors are joined by a multistory atrium that becomes the civic focal point of the building. As we planned for the three distinct business units, we wanted to provide comfortable, light-filled, and, at times, fun spaces for the scientists to come together to find commonalities and opportunities to collaborate.

Mark Hirons, AIA, interior design principal: CJ really wanted this to be a living discovery center, and the environment reflects that with organic forms and natural light that carves and complements spaces. The building's central atrium reinforces the circulation, and amenities are integrated around it, which encourages interdisciplinary engagement between the different groups of scientists. There are almost 50 different types of spaces in the building that respond to different types of behaviors—ones that connect people, like café and coffee areas; where people can meet, like seminar rooms; places for repose, like lounges and a living forest; and places for rejuvenation, like fitness areas. Having that broad spectrum of spaces helps people who are doing very intensive, focused work to have moments of balance in their lives. We looked at the workplace in a very holistic way, and wanted to create an environment that helps the staff feel like they are connected to each other as well as to nature.

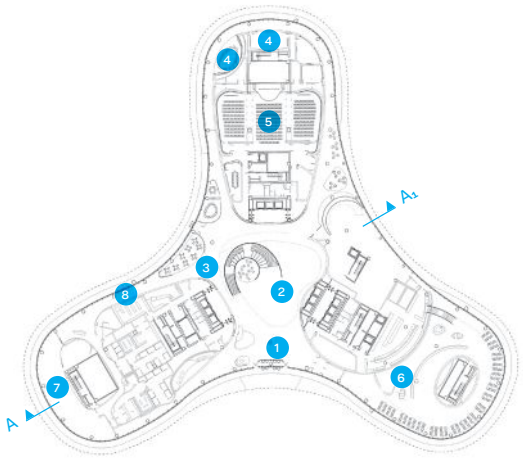
These public areas seem almost more like hospitality spaces than the entry to a research and development facility. How did you differentiate them from the more serious work environments in the towers?
Hirons: CJ wanted a context that was innovative and creative, and the spaces and environment needed to be that canvas. What we wanted to look at, behaviorally, is the full spectrum of the different types of settings that would enrich their working experience. So there are huge seminar rooms and large media rooms that are more traditional, but we also needed to challenge the context. We wanted to make sure that no matter where you are in the building, it is creative and looks at things in a different way. The texture varies, from the small coffee shop, to the waiting area, to the large café where daylight comes in and bounces off of the tile and glass walls and creates a sense of engagement. A lot of the form has a neutral perspective, but we used bright colors that emerge in spaces where there's a café or garden. The color becomes more saturated and experiential in those environments, and draws people to them. There are unexpected elements throughout that speak to the spirit of discovery and offer a sense of enjoyment—that's really at the core of CJ's mission.

Yazdani: And as we see in high-tech workplaces, when we are talking about people innovating and collaborating, it's very important to create spaces and amenities that enable them to stay longer with ideas. We have sleeping pods that allow scientists to take a break, and gardens where they can get away for a bit and come back rejuvenated. There are no boundaries to how much time you need to stay with a problem in order to discover something new. So the more you can create spaces of comfort, the more employees can stay with a problem and the more discoveries are found.

A theme seems to be curves, both inside and out. What inspired you to make the project so curvaceous?
Yazdani: The curves are a little misleading—the laboratory towers actually have regular column grids around central cores. The shape of the towers were inspired by the "petals" that reflect the three facets of CJ, and feature in their logo. As we began to try to connect the three towers into a united form, the curves began to reinforce that, certainly on the exterior and ultimately, through the interior expression as well.

What was the most challenging aspect of this design?
Yazdani: Probably convincing the scientists to go where we were going. While office environments have evolved and radically changed, laboratories haven't. Equipment has advanced, lab benches have advanced, but in terms of their layout, labs really haven't kept up with the world around us. So this notion of a new scientific workplace—where things can move and are meant to encourage teams of scientists and investigators to work together—was a fairly radical idea. The leadership of CJ was convinced, but it was a little more challenging to bring the scientists along. We had to provide substantial data and prove that it would work.

Ground-Floor Plan



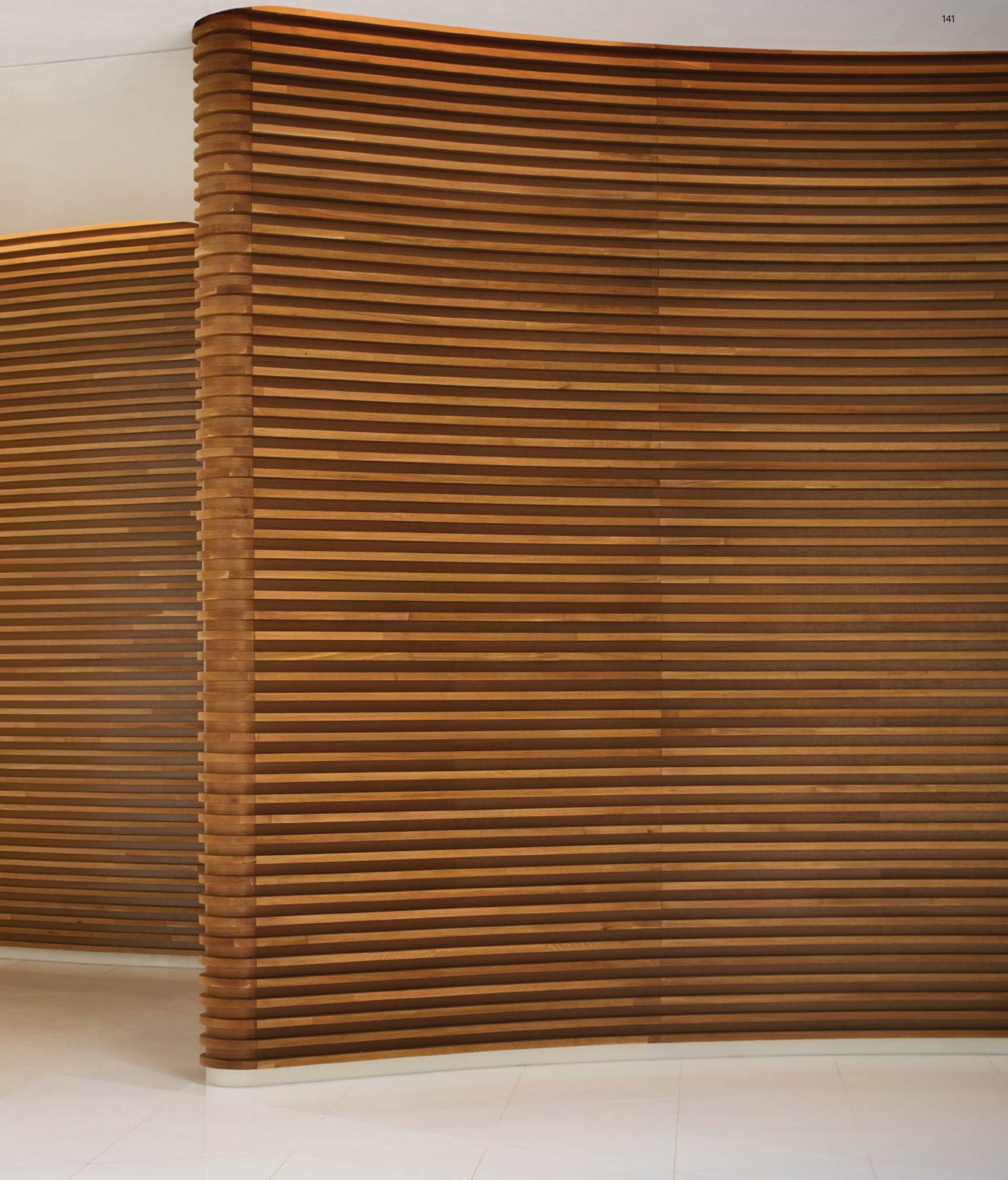
Fifth-Floor and Typical Lab-Level Plan

1. Lobby
2. Atrium
3. Café
4. Meeting room
5. Seminar room
6. Dining
7. Fitness center
8. Retail
9. Flexible laboratory
10. Enclosed laboratory

0 40 80

Above: Secure lab spaces fill the towers' upper floors, and are designed to be flexible. Rolling furniture and minimal overhead elements allow the spaces to be reconfigured to accommodate changing product teams.

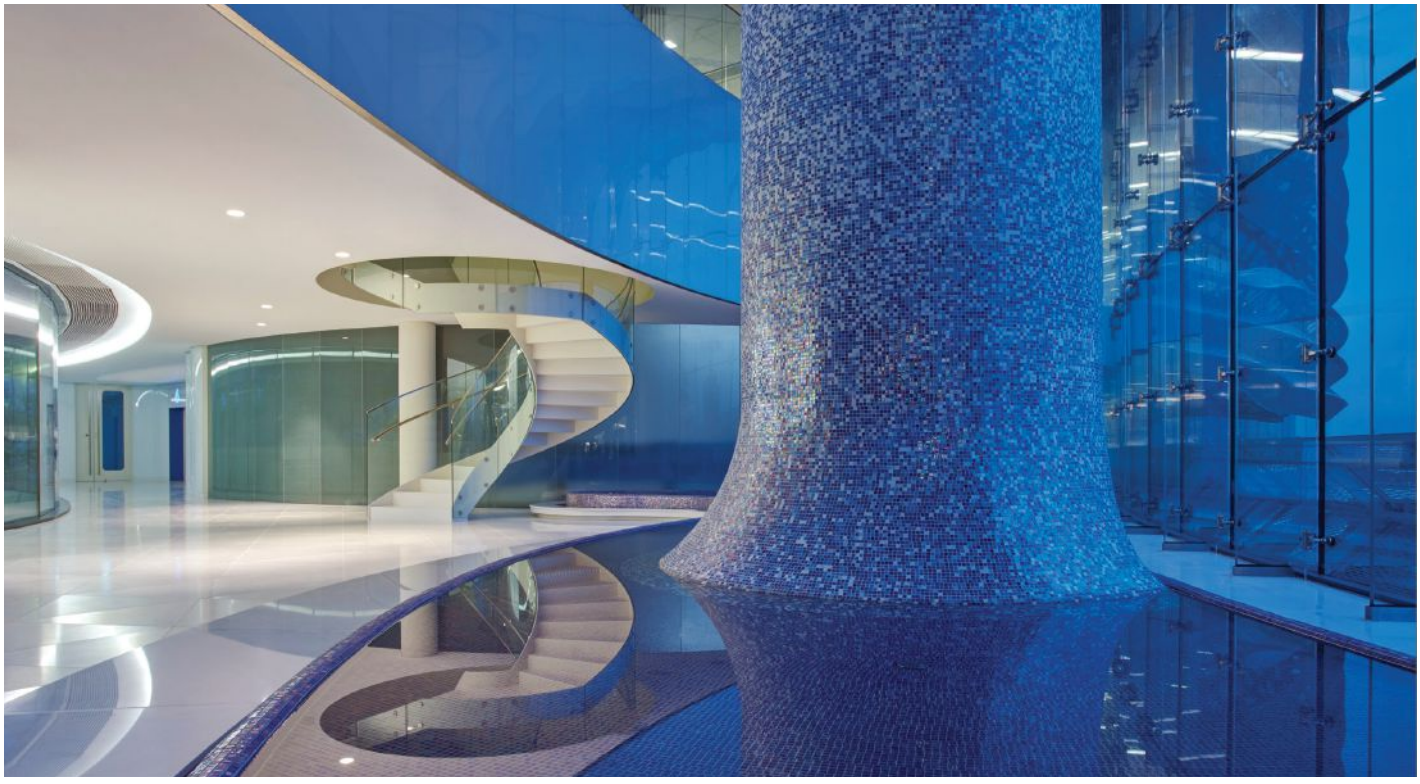
The first five levels are largely devoted to myriad types of amenity spaces. The designers deployed textures, colors, and patterns to differentiate uses. This wood-clad, ground-floor circulation area opens onto a breakout space.

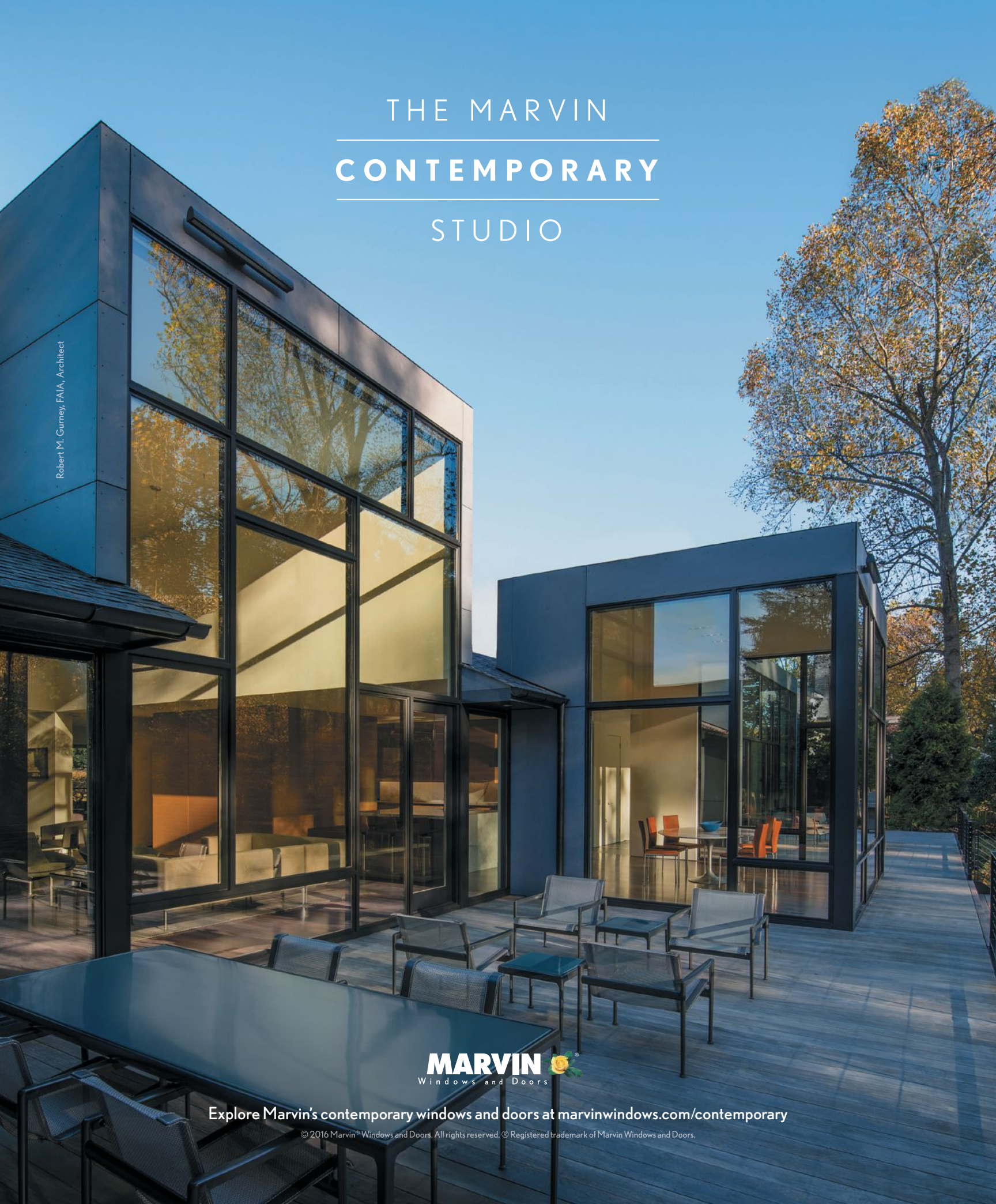


Bright colors were used to signify larger gathering spaces such as an indoor garden (above), a café (opposite, top), and a water garden (opposite, bottom), where employees can find respite and collaborate outside the laboratories.

Project Credits

Project: CJ Blossom Park, Suwon, South Korea
Client: CJ Corp.
Design Architect and Interior Designer: CannonDesign, Los Angeles · Mehrdad Yazdani, ASSOC. AIA (design principal, director of Yazdani Studio at CannonDesign); Mark Hirons, AIA (interior design principal); Yong Kang, AIA (project principal); Meg Osman (corporate interiors design director); Paul Gonzales (project manager); Myung Kim, AIA (project manager, interiors); Mark Whiteley, Steve Copenhagen (science & technology planning); Joseph O'Neill, Philip Ra, Nadine Quimbach, Mimi Lam, ASSOC. AIA, Sepideh Nabavi, Manson Fung, Ellen Mulvanny, Yan Krymsky, Noelle Kinyon, Michael Tunkey, AIA, Henrick Borjesson, Roshanak Mostaghim, Jennifer Marckx, Melissa Cataldo, Frank Gartner, AIA, Daniel Niewoehner, AIA, Jigar Patel, Christopher Defosset, Robert Johnson, AIA, Mike Tillou, Gerry Horner, John Swift, Michael Smith, AIA (project team)
Structural Engineer: Arup
M/E Engineer/Lighting Designer: CannonDesign
Construction Manager: CJ Engineering & Construction
Prime Architect: Heerim Architects & Planners
Ventilation Consultant: RWDI
Size: 1.23 million square feet
Cost: Withheld





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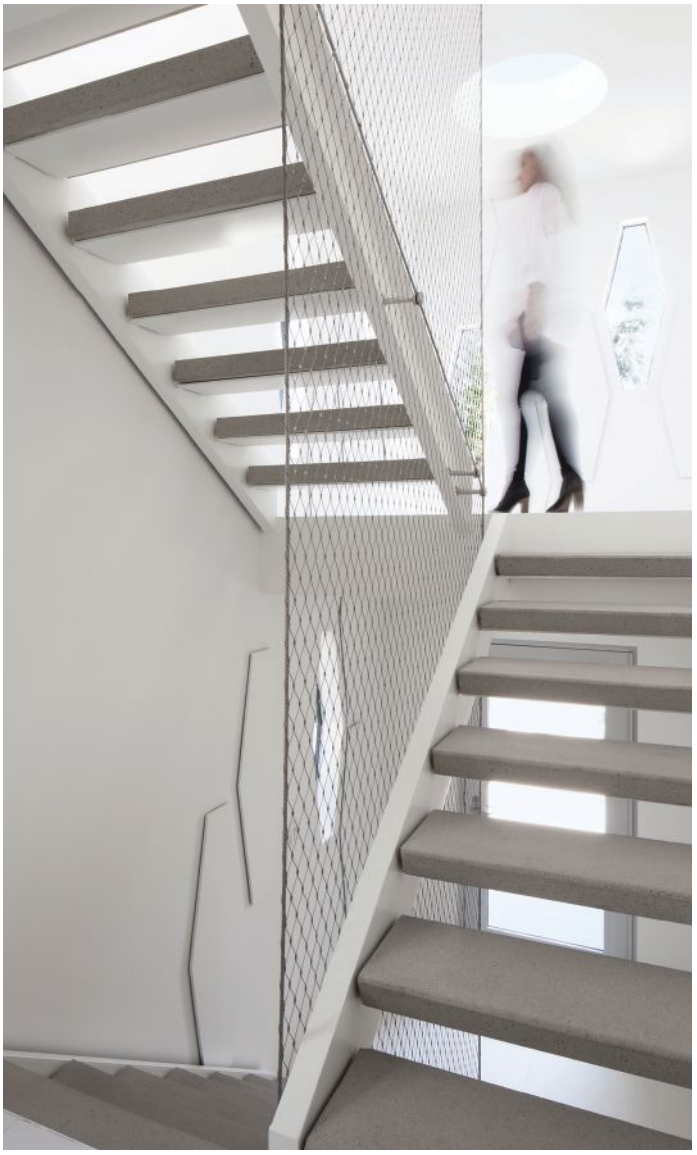

AIA Los Angeles Lauds 29 Examples of Innovative Residential Design

TEXT BY SARA JOHNSON

AIA Los Angeles has named 29 winners for its 2017 Residential Architecture Awards, which recognizes both single- and multifamily projects. Most of the projects are located in California, but residences in Thailand, Spain, China, and New York—all with teams that included L.A.-area firms—also made the list. Three projects by L.A.-based Patrick Tighe Architecture were recognized this year (the most by a single firm), including the Garrison Residence (above) in Redondo Beach, Calif., which won a merit award in the single-family residential (up to 5,000 square feet) category.

> *Read about the rest of the winners in the 2017 AIA|LA Residential Architecture Awards at bit.ly/2017AIALAResidentialAwards.*

Paint that Has You Covered in More Ways Than One

TEXT BY SELIN ASHABOGLU

Three coats of Healthy House Paint by Denver-based nanoscience company Synavax don't just embellish a house—they insulate it. The zero-VOC coating uses patented technology that incorporates a nanocomposite that the company calls Hydro-NM-Oxide, which lessens heat loss and gain by up to 34.8 percent, according to third-party testing. The water-based Healthy House Paint also provides resistance to moisture and mold through its permeable formula that does not block vapor, but does block UV rays. It is suitable for indoor and outdoor applications on multiple surface types, including wood, brick, and drywall. The paint is currently offered on the company's website in clear, white, and custom colors to coat fresh or already painted surfaces. *synavax.com*

BRUCE PETERSON

> *For more information about Healthy House Paint, visit bit.ly/HealthyHousePaint.*

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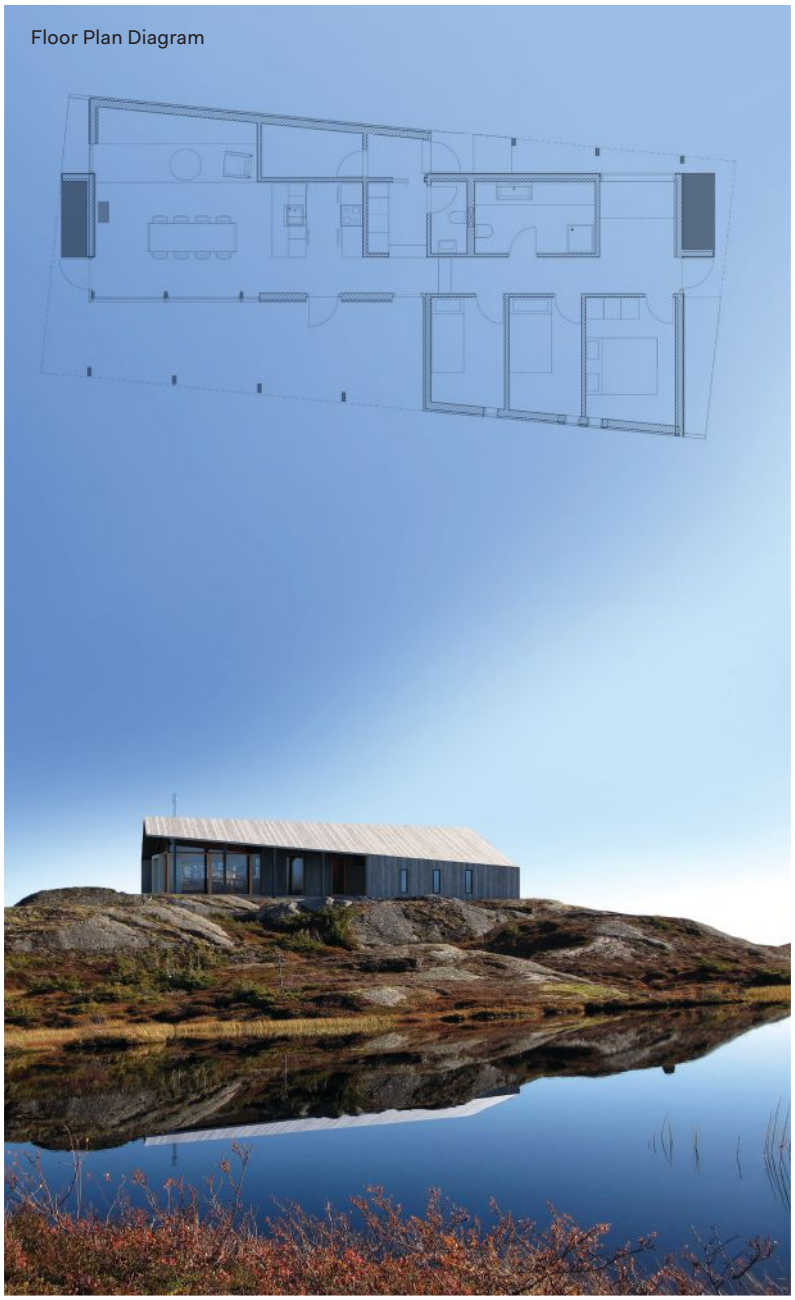
Snøhetta Creates a Modest Three-Bedroom Wood Cabin Designed to be Constructed Anywhere



COURTESY SNØHETTA

TEXT BY SARA JOHNSON

As soon as the ice melts in Norway, construction can begin on the first of the Snøhetta-designed Gapahuk cabins, a 1,000-square-foot, three-bedroom, wood-clad shelter designed for Norwegian cabin company Rindalshytter. Launched in April, the prefabricated structures begin at 1.3 million NOK (approximately $155,670), says lead architect Anne Cecilie Haug, who spoke to ARCHITECT about the concept.

What is a Norwegian *gapahuk*?
A *gapahuk* is a simple form of shelter you make when you want to live outside. It's not even a tent; it's just a roof, basically. You can make it out of branches, or you tie a tarp between two trees at a slope so water will fall off.

Who was Gapahuk designed for?
The client was the company that makes prefab cabins. They've done that for a lot of years in Norway, and it's been a tradition for a long time to have really old-fashioned cabins. ... But now they have seen that younger people want a cabin that's more related to their lifestyle and how they live—they want it to look good, but good is not necessarily the same as old-fashioned. So they came and asked us to make something that was new and modern, but still had a lot of the traditional elements. Since they didn't have a specific site—it's designed to be placed by the sea, [or] it could be in the mountains, in the forest—we had to work with a few elements and try to connect those elements to nature, to the ground.

Has Snøhetta worked on other prefabricated structures like this?
No, not really. At Snøhetta, the connection between nature and structure is important to us, so every time we have a new project, we have landscape architects work on the elements of the siting for the project. So it was an interesting challenge for us—to still make something that relates to nature [even] if we don't have a particular site.

> *For more images of Snøhetta's Gapahuk, visit ARCHITECT's Project Gallery at bit.ly/SnohettaGapahuk.*

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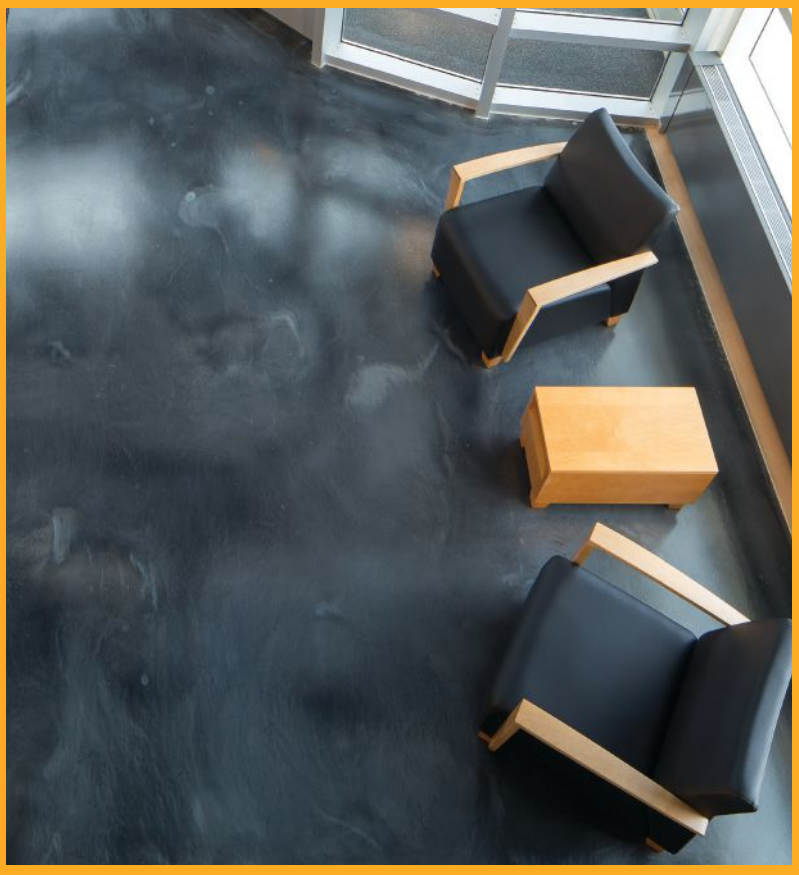

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JENN-AIR

OZ Residence
Atherton, Calif.
Stanley Saitowitz | Natoma Architects

TEXT BY EDWARD KEEGAN, AIA
PHOTOS BY BRUCE DAMONTE

Two 27-foot cantilevered volumes contain the master suite (at left) and living room.

San Francisco–based architect Stanley Saitowitz has compared his design for the OZ Residence to an iPhone—a deceptively simple-looking object whose minimalist exterior obscures a great deal of complexity. Located at the end of a cul-de-sac on a hill in Atherton, Calif., the 17,000-square-foot complex is oriented so that it has views of San Francisco, which is located about 25 miles to the north. "This is the high point in the neighborhood," Saitowitz says.

The south-facing façades, along the street, are almost entirely opaque; those facing the landscaped property are almost entirely glazed. Saitowitz and his firm, Stanley Saitowitz | Natoma Architects, composed the house out of two L-shaped masses that overlap in plan and section around a central courtyard. The western L has spaces on the ground floor and basement, which, thanks to the site's downward western slope, offers views and access to natural light; the eastern L contains spaces on the ground and second floors. The western end of each L terminates in a cantilever.

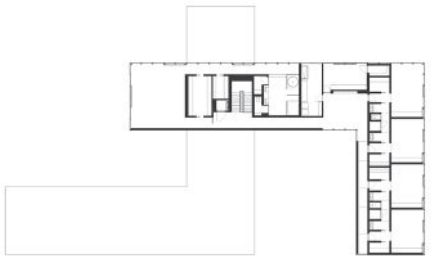
The entry hall in the western volume is bookended by the living room and a stair to a basement recreation room. The other leg contains a sequence of dining, kitchen, and family rooms. In the eastern volume, four children's bedrooms sit above a four-car garage and guest room. The second floor also houses the master suite, which spans the ground-level courtyard and then cantilevers over the backyard.

The ground-floor and basement façades are composed of exposed concrete and glass, and the second floor is sheathed in white stucco and glass. The interiors are equally straightforward, with light oak flooring and exposed concrete ceilings on the ground floor.

Aside from the plan, another complex feature of the house lies in how Saitowitz realized the house's aesthetic through an integrated composite of structural systems. Post-tensioned concrete is employed for the basement and ground floor, including the ceilings on the main level; the second floor and roof are framed in wood, supplemented by steel for the larger spans, including the two cantilevers and courtyard bridge.

Precise glazing detailing was critical to the house's minimal expression. The 13-foot-tall windows conceal the floor framing and ceiling soffit. "It's almost an office building curtainwall detail," Saitowitz says, noting that his practice's range of project typologies enriches their approach to single-family residential design. OZ Residence, completed in January, is an elegant exercise in creating a house with a minimal palette and limited, yet bold, formal moves.

Second-Floor Plan



Ground-Floor Plan

Basement Plan

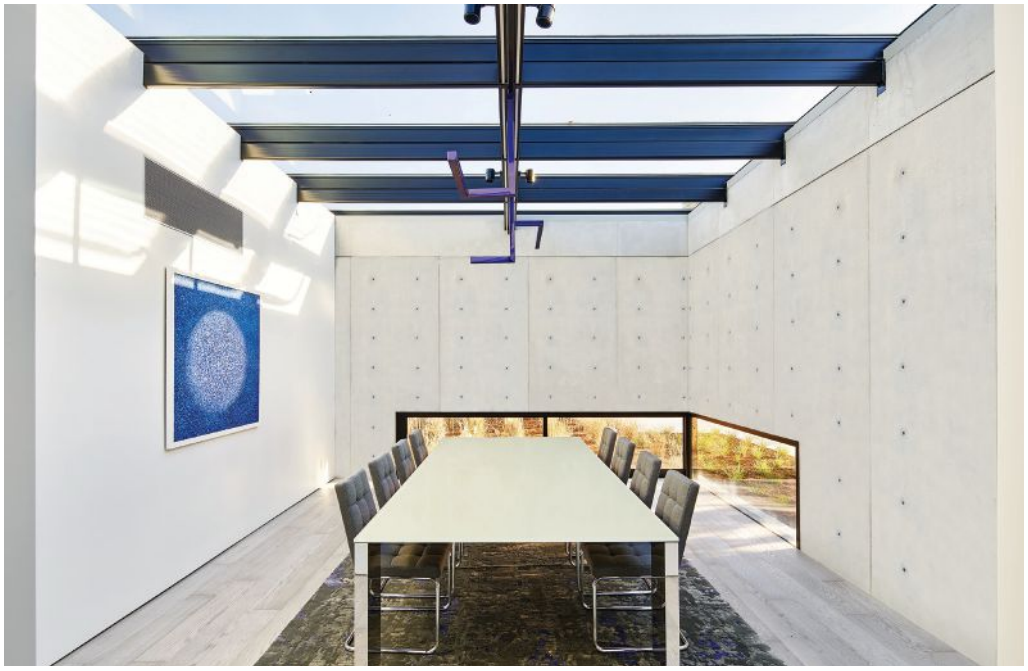
Opposite: Seen here from the west, the eight-bedroom house was designed to preserve privacy.

Top: Glass from Fleetwood Windows & Doors forms the transparent façade.

Above: A 54-foot bridge containing the master suite spans a central courtyard.

The glazed northern façade provides views of the backyard, swimming pool, and freestanding pool house.

Windows in the second-floor corridor overlook the courtyard and driveway.



Top: Skylights and 30-inch-tall ribbon windows illuminate the dining room.

Above: The living room fireplace is set within a white-glass enclosure.

Project Credits
Project: OZ Residence, Atherton, Calif.
Client: Olana and Zain Khan
Design Architect/Interiors: Stanley Saitowitz | Natoma Architects, San Francisco · Stanley Saitowitz (design principal); Neil Kaye, AIA, Michael Luke (project architects); Steven Sanchez (project designer/manager)
General Contractor and Project/ Construction Manager: Redhorse Constructors
Landscape: Christopher Yates Landscape Architecture
Civil Engineer: Lea & Braze Engineering
Structural: Yu Structural Engineers
Mechanical/Plumbing: Monterey Energy Group
Electrical: Techlinea
Lighting: Anna Kondolf Lighting Design
Audio Visual: Sight and Sounds
Size: 17,000 square feet
Cost: Withheld

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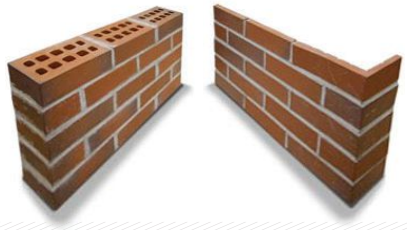

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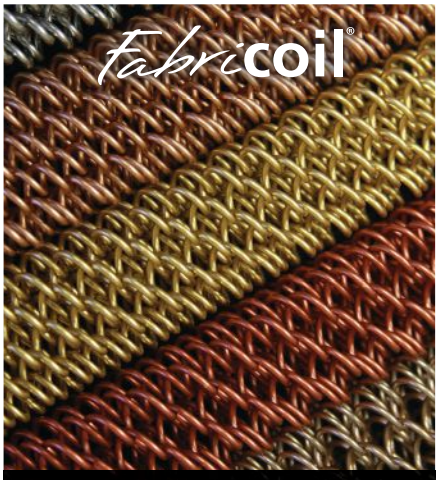

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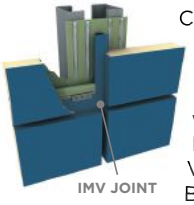

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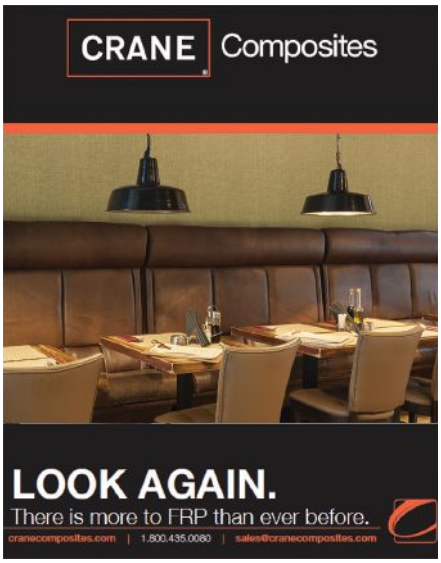

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Editorial: Happy Birthday, You Old So-and-So

Is there anything left to say about Frank Lloyd Wright that hasn't already been said? How about this: He makes a curious role model.

No one doubts his significance: Wright was born on June 8, 1867, and 150 years later the commemoration of his life and his architecture amounts to an industry in itself, serving up coffee table books, documentaries, exhibits, wall calendars, and Prairie Style keepsakes beyond count. At ARCHITECT, we joke that the best remedy for a lull in website traffic is to post something, anything, with his name in the headline. Wright's still got it: He's the Kim Kardashian of digital design journalism.

The comparison has its limits, of course. Wright is famous for a much better reason than for just being famous. He's one of those towering figures, like Shakespeare and Rembrandt, whose genius really does transcend time and place. Each successive generation can find relevance in a Unity Temple (newly restored by Harboe Architects) or a Taliesin West.

It's the cult of personality that rankles, not the work. Numerous accounts give the impression that the man could be … shall we say … difficult. (Every architect knows some version of the tale in which Wright glibly tells the client with a leaky roof, "Move your chair.") Whether factual or mythic or something in-between, Wright's attitude wouldn't be an issue today were it an isolated matter of historical gossip. Unfortunately, it's not just the work that endured. Ayn Rand's blockbuster 1943 novel *The Fountainhead* and the 1949 movie of the same name heroized Wright's *contra mundum* personality, *ad absurdum*, in the character of architect Howard Roark.

Can any real-life architect possibly think it's OK to blow up a building, the way Roark did, because it wasn't built precisely according to his specifications?

Rand talked down Wright's influence on the book, but she didn't dissemble when asking him for a meeting: "It is not anything definite or tangible that I want from an interview with you. It is only the inspiration of seeing before me a living miracle—because the man I am writing about is a miracle whom I want to make alive."

Wright presumably lapped up the praise—an ego does need feeding. But he declined to see Rand and, according to biographer Ada Louise Huxtable, he said of Roark and *The Fountainhead*, "I deny the paternity and refuse to marry the mother." Nonetheless, the association stuck, and it contributed to a lasting and harmful stereotype—the architectural equivalent of the dictatorial surgeon with the awful bedside manner.

Do you remember that Kohler TV spot from the early 2000s, in which a young couple turns the tables on an arrogant architect by demanding that he design a house based on a faucet? The marketers bet that the egotistic designer type would ring as true, and as off-putting, to a mass consumer audience. They were right.

The persistent mythos of Wright, Roark, and Rand gives a flawed impression of the profession and its values. Expertise and arrogance don't necessarily go together. Certainly, architects today are fighters and visionaries, no less than Wright was. But they are also open to criticism, eager to collaborate, and willing to compromise when prudent. Good will leads to great architecture.

STEPHEN VOSS

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